

EV CHARGING STATIONS

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INTRODUCTION

This report analyzes the electric vehicle (EV) charging infrastructure across the United States and Canada. The goal of this analysis is to assess the availability, growth, and distribution of EV charging stations and provide insights for potential improvements in infrastructure.

This analysis uses the 'Electric Vehicle Charging Stations in the USA' dataset, which is publicly available on Kaggle. The data includes various attributes for each charging station, such as:

1. Location (city, state, latitude, longitude)
2. Operational status (active or inactive)
3. Proximity to highways
4. Type of connectors
5. Station ownership (public or private)
6. Usage metrics, including the annual usage rates.

By using the dataset, we aim to explore the key trends in EV charging infrastructure, identify gaps in the coverage, and understand the factors influencing the usage of charging stations. The dataset is part of a broader initiative to support the transition to electric vehicle.

PURPOSE AND GOALS

The purpose of this analysis is to assess the current state and future potential of electric vehicle charging infrastructure in the US and Canada. Our goals include:

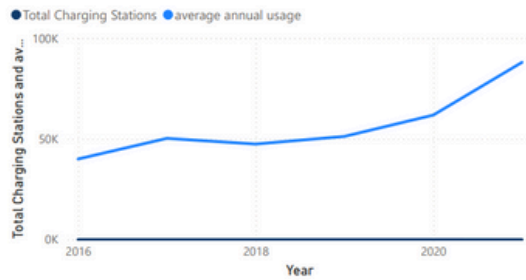
1. Evaluate the distribution of EV charging stations:
Understanding the concentration of stations and their alignment with population density and travel patterns.
2. Analyzing whether stations near highways experience higher usage and informing the optimal locations for new stations.
3. Track the growth of EV charging stations over time and assess whether it keeps pace with the increasing number of EVs on the road.
4. Provide recommendations for future infrastructure investments based on current usage patterns and growth projections.

EV Charging Station

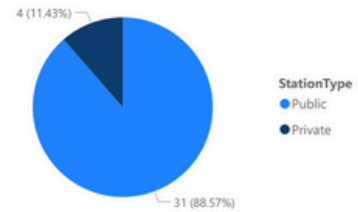


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Total Charging Statio...

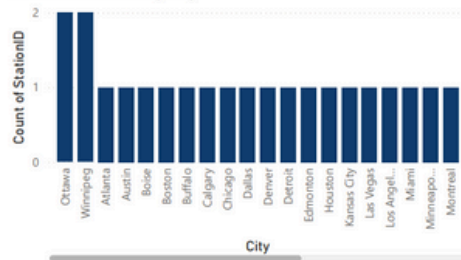
Total Charging Stations and average annual usage by Year



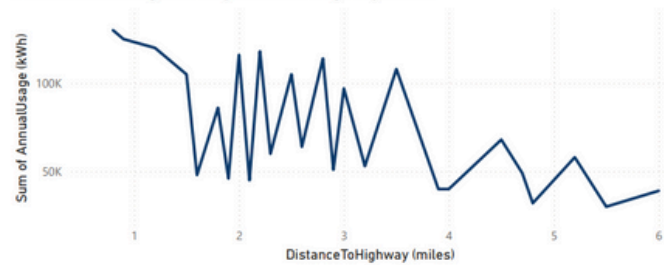
Count of StationID by StationType



Count of StationID by City

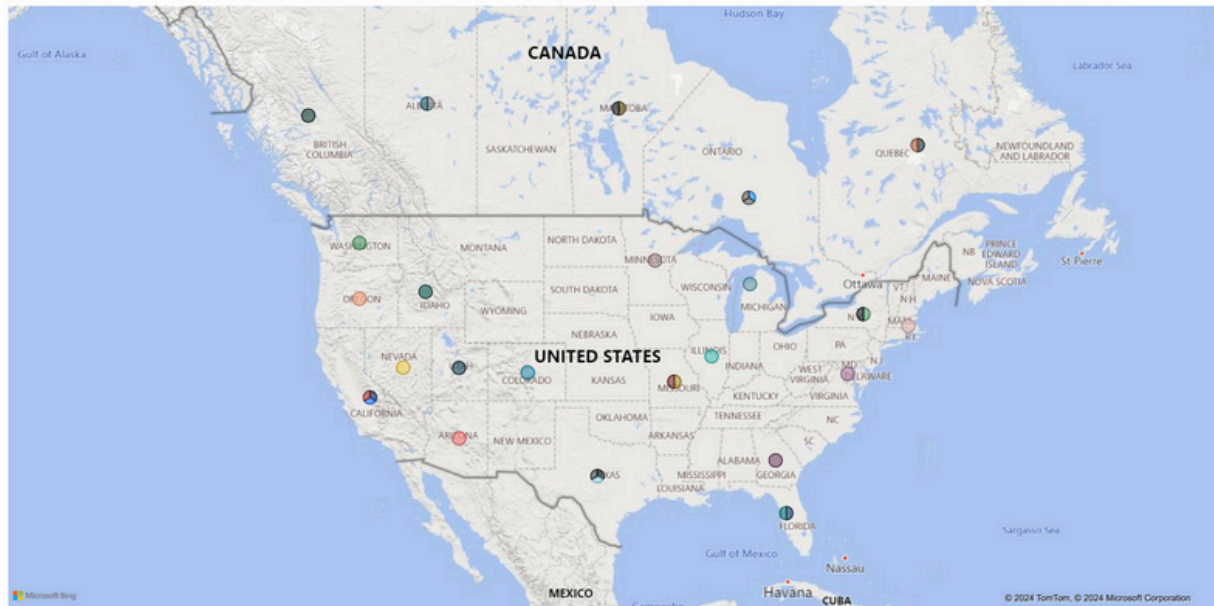


Sum of AnnualUsage (kWh) by DistanceToHighway (miles)



State/Province and StationID

StationID ● 1 ● 2 ● 3 ● 4 ● 5 ● 6 ● 7 ● 8 ● 9 ● 10 ● 11 ● 12 ● 13 ● 14 ● 15 ● 16 ● 17 ● 18 ● 19 ● 20 ● 21 ● 22 ● 23 ● 24 ● 25 ● 26 ● 27 ● 28 ● 29 ● 30 ● 31 ● 32 ● 33 ● 34 ● 35



KPI AND METRICS

I defined several Key Performance Indicators (KPIs) to ensure our analysis aligns with operational goals and broader strategic objectives:

1.Total charging stations:

This represents the total number of EV charging stations available in a given area, helping us understand the infrastructure scale.

2.Average annual usage: Measures how often charging stations are used. This indicates the demand and network efficiency.

3.Average distance to highways: This assesses the distance of charging stations from major highways, as proximity influences convenience for long-distance travelers.

4.Growth rate: This is the rate at which new EV charging stations are added, helping understand whether the infrastructure expansion meets future demand.

5.Geographic Dimensions: This categorizes EV charging stations based on their location - whether rural or urban - and their proximity to highways, enabling visualization and comparison across different regions.

RESULTS

This analysis gave us valuable insights into the state of EV charging infrastructure.

- Highway Proximity and Usage: Stations located within 1 mile of a highway experienced the highest average annual usage. As the distance from the highway increased, usage dropped. This tell us that proximity to major travel routes significantly impacts station utilization.
- Growth in Annual Usage: The average annual usage of charging stations has steadily increased since 2016, with a notable spike from 2020 onwards. This trend reflects both the rise in EV adoption and the expansion of charging networks to meet growing demand.

- The pie chart reveals that the majority of the charging stations are public, while private stations represent a smaller share. This trend aligns with efforts to provide accessible infrastructure for the general public.
- The bar chart highlights the distribution of charging stations across various cities. The presence of stations in key metropolitan areas suggests that urban centers are well-covered, although rural coverage could be improved.
- The map visualizes the state/province and station IDs across Canada and the USA. The spread of charging stations covers both countries, noticeably in the Midwest and East Coast regions of the USA and Central and Western Canada. This helps to identify regions with a higher density of stations and potential areas where more stations are needed.

FUTURE STRATEGIES

Based on the dashboard, several recommendations can be made to optimize the EV charging infrastructure:

1. Focus on expansion in high-usage areas: As stations near highways see the highest usage, future development should target these regions to maximise station efficiency.
2. Balance rural and urban development: Continued investment in rural areas is crucial for supporting long-distance travel and reducing charging deserts.
3. Improve data collection on station utilization: More detailed data on the type of EV chargers (Level 1, Level 2, or DC fast charging) can help in further refining the charging infrastructure strategy.
4. Monitor growth trends: With a steady growth rate, maintaining the pace of infrastructure expansion is essential to meet future demand.