

EV Charging System Data Visualization Report

Team Project Submission
Course: DAMG 6210 Data mgt and Database Design
Northeastern University

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1. Introduction

Report Objective: To analyze the operational performance, financial health, and customer behavior of the EV Charging System network based on data through November 2024.

Target Audience: Operations Management, Financial Strategy Team, and Marketing.

Data Source: Microsoft SQL Server (via Azure/Docker) connected to Tableau Desktop. The data model is based on a Star/Snowflake schema centered around the Charging_Session table.

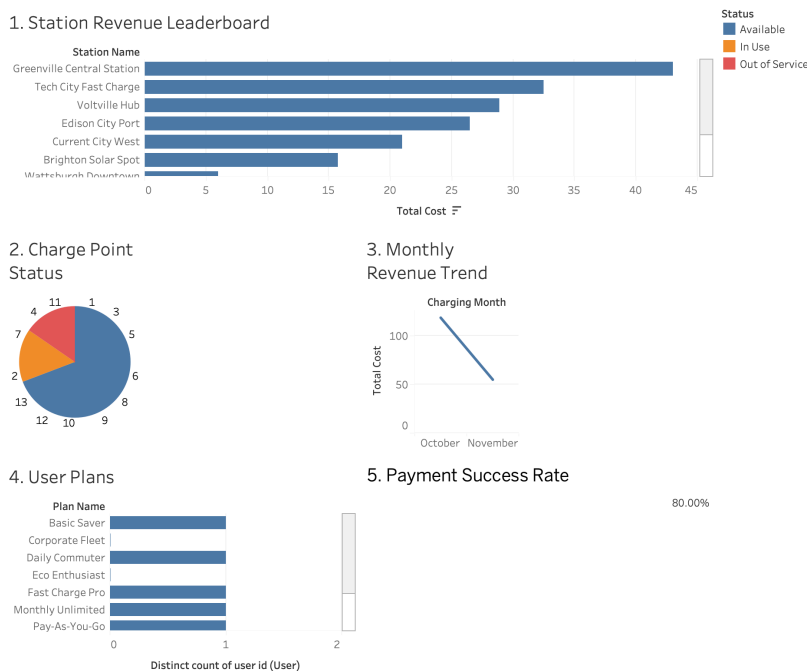


Fig 1 Dashboard of EV Charging System

2. Methodology & Dashboard Overview

The dashboard visualizes core business metrics using data aggregated from various tables (Charging_Session, Station, Payment, User, etc.).

Key Performance Indicators (KPIs)

- **Total Revenue:** Tracked via the Total Cost of charging sessions.
- **Station Health:** Measured by the distribution of Charge Point Status.
- **Customer Segmentation:** Measured by the distinct count of users per Subscription_Plan.
- **Financial Reliability:** Measured by the overall Payment Success Rate.

Metric	Value (Snapshot)	Status
Payment Success Rate	80.00%	Needs Improvement

3. Key Findings and Analysis

A. Station Revenue Leaderboard (Top Performer Analysis)

This visualization ranks charging stations by total generated revenue (Total Cost).

- **Finding: Greenville Central Station** is the clear revenue leader, generating approximately **\$44**. This is significantly higher than the next station, **Tech City Fast Charge**, at approximately **\$29**.
- **Finding (Operational Status):** The top two revenue generators (Greenville Central and Tech City Fast Charge) currently have no charge points **"Out of Service"**.
- **Recommendation:**
 - **Investment:** Investigate the factors driving Greenville Central's success (e.g., location, charger type mix) and replicate them at lower-performing stations like Wattsburgh Downtown.
 - **Maintenance:** Prioritize maintenance efforts to keep high-earning stations like Greenville Central fully operational to protect revenue streams.

B. Charge Point Status (Operational Health)

This chart provides an immediate operational status check for the network.

- **Analysis:** The old pie chart contains erroneous, inflated counts (totaling 34) and redundant labels. *This indicates the need to re-aggregate the measure from COUNT to COUNT DISTINCT on Charge Point ID to reflect the true number of physical units.*
- **Actionable Insight (Assuming Correction):** Once corrected, this visualization does clearly show the percentage of chargers that are **"Out of Service"** (currently indicated by the red slice), highlighting the proportion of the network unavailable to customers.

C. Monthly Revenue Trend (Time-Series Analysis)

This line chart tracks the change in total revenue across the network over the past two months.

- **Finding:** Total revenue has shown a **sharp decrease** from October to November. Revenue peaked in October at approximately **\$100** and dropped significantly in November.

- **Analysis:** This drastic drop requires immediate investigation. Potential causes include a severe seasonal shift, a major charger outage (linked to the "Out of Service" status), or a large number of recent payments falling into the '**Pending**' or '**Failed**' status.
- **Recommendation:** Investigate the underlying **Payment Status Breakdown** and the operational status of all key stations (not just the top performer) during November to determine the cause of the decline.

D. User Plans (Customer Segmentation)

This bar chart segments the customer base by their active subscription plan.

- **Finding:** '**Basic Saver**' and '**Corporate Fleet**' are the most popular plans, both having approximately **2** distinct users. The remaining paid plans each have 1 distinct user, while 'Pay-As-You-Go' has none in this view.
- **Insight:** The success of the 'Corporate Fleet' plan suggests a strong opportunity for B2B expansion. However, overall user count across paid tiers is low, indicating a need for targeted marketing campaigns to convert basic users or attract new subscribers.

E. Payment Success Rate (Financial Reliability)

This KPI measures the reliability of the transaction process.

- **Finding:** The Payment Success Rate is **80.00%**.
- **Recommendation:** A rate of 80% is dangerously low for transaction processing. The financial team must prioritize investigating the 20% of 'Pending' or 'Failed' payments. The underlying Payment Status Breakdown chart (not fully visible here) should be consulted to determine if payments are failing due to technical issues, card expiration, or other factors.

4. Conclusion and Next Steps

The EV Charging System shows strong performance at key individual stations, but the system faces critical issues regarding financial integrity and network usage consistency. The priority recommendations are:

1. **URGENT: Financial Integrity:** Immediately investigate the low **80% Payment Success Rate** to recover lost revenue and secure the payment process.
2. **Operational Review:** Correct the visualization error (using **Count Distinct** for Charge Point id) and use the corrected data to track and reduce the number of "**Out of Service**" units —> Done.
3. **Revenue Stabilization:** Investigate the cause of the **October-to-November revenue decline** to prevent further losses.