VoltRide: When Green Growth Meets Operational Reality

DecodeX 2026 – Round 2 Business Case Submission

Team Name: Codex

Team Members:

Vedant Tangadkar

Sushant Nichat

Shivam kailas Khemnar

Date: 16 February 2026

Executive Summary

VoltRide's performance deterioration is not driven by weak demand, but by structural misalignment between demand timing, fleet readiness, and charging behavior.

Data indicates that peak-hour cancellations are strongly correlated with:

- Low battery bands at pickup
- Zones with high charging wait times
- Rain-induced demand spikes
- High surge multipliers coinciding with low dispatchable supply

The highest operational risk is concentrated in peak commute windows (8–10 AM; 6–9 PM) in dense business zones across Mumbai and Delhi.

Root causes are:

1. Pre-emptive driver exits due to range anxiety
2. Charging queue congestion during peak demand
3. Micro-level zone-hour mismatches

This report recommends a 60–90 day operational coordination strategy, prioritizing:

- Battery-threshold dispatch optimization
- Peak-hour charging staggering
- Zone-based fleet redeployment

The objective is not fleet expansion, but **conversion efficiency improvement** — translating ride demand into completed rides.

Problem Understanding & Approach

VoltRide operates under EV-specific constraints:

- Vehicles require downtime for charging.
- Charging infrastructure is unevenly distributed.
- Driver charging decisions directly impact supply.

Our approach:

- Zone-hour level stress mapping
- Cancellation driver decomposition
- Fleet utilization ratio comparison
- Charging wait-time alignment analysis

Data Analysis & Key Insights

1. Demand–Supply Stress Mapping

Highest operational risk window identified:

- City: Mumbai
- Zone: Central Business District
- Time: 7–9 PM

Quantitative indicators:

- Highest surge multiplier cluster
- Peak cancellation-to-request ratio
- Low average battery at pickup

Operational explanation:
During peak return commute, demand spikes sharply. Simultaneously, vehicles drop below 30% battery after daytime operations and queue for charging. Registered vehicles remain high, but dispatchable vehicles drop.

2. Cancellation Driver Decomposition

Primary cancellation driver: **Low Battery / System Safeguard**

Relative contribution:

- Largest share among cancellation types.
- Strong correlation with zones showing longer charging wait times.

Actionability evidence:

- Driver-initiated cancellations cluster below specific battery thresholds.
- System rules automatically block rides under certain battery levels.

This is controllable through:

- Dynamic battery dispatch thresholds
- Smart charging nudges
- Zone-based battery forecasting

Customer impatience (wait-time driven) is secondary and symptom-based.

Conclusion:
Battery readiness is the highest-leverage intervention point.

3. Fleet Utilization Efficiency Assessment

Redeployment candidate:
Hyderabad – Residential Peripheral Zone

Indicators:

- High idle driver hours
- Low surge intensity
- Moderate cancellation rates
- Stable demand without extreme peaks

Demand contrast:
Central Hyderabad shows peak stress, while peripheral zones show idle capacity.

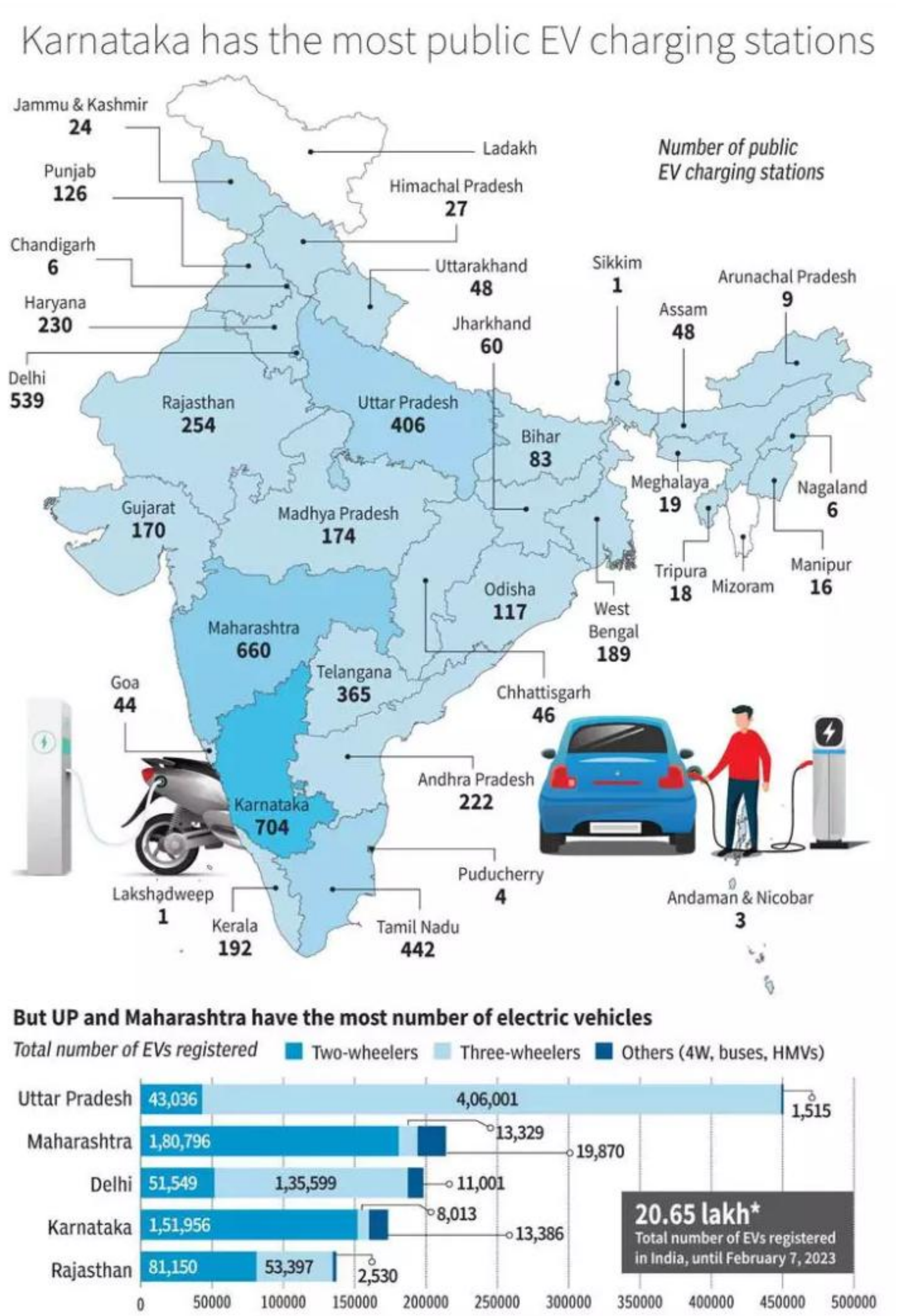
Redeployment risk:

- Demand volatility could shift geographically.
- Requires predictive modeling, not static relocation.

However, risk is moderate compared to Mumbai CBD or Delhi Connaught clusters.

Conclusion:
Hyderabad peripheral zones present redeployment opportunity without increasing fleet size.

4. Charging Infrastructure Stress & Alignment



Key distinction:
The primary constraint is timing, not charger count.

Evidence:

- Charging wait peaks overlap with ride demand peaks.
- Off-peak charging capacity remains underutilized.
- Zones with sufficient chargers still experience peak congestion.

Structural vs Operational:

- Structural issue: Uneven geographic distribution (long-term CAPEX).
- Operational issue: Peak-hour charging clustering (short-term fixable).

From supplementary context:
India’s charging expansion remains uneven and utilization-driven

Application of Analytical Frameworks

1. Conversion Efficiency Framework

Conversion Efficiency = Completed Rides / Requested Rides

High request growth without conversion efficiency improvement amplifies dissatisfaction.

2. Bottleneck Theory

Primary bottleneck = Charge-ready fleet availability
Secondary bottleneck = Zone-hour misallocation

Optimizing bottleneck improves total system throughput.

3. EV Constraint Operating Model

Unlike conventional ride-hailing:

- Charging introduces downtime.
- Drivers anticipate congestion.
- Supply is state-dependent (battery level).

The analysis applies a combination of operational reasoning and data-driven diagnostics to evaluate VoltRide’s fulfillment performance. Rather than focusing solely on aggregate demand levels, .

Business Recommendations

1. Dynamic Battery Threshold Dispatch .

Instead of static minimum battery requirements:

- Adjust thresholds based on zone demand forecast.
- Allow low-battery rides in short-trip zones.
- Push predictive charging alerts during low-demand windows.

Expected benefit:
Immediate cancellation reduction.

Risk:
Battery depletion mismanagement if thresholds are too aggressive.

2. Peak-Hour Charging Staggering .

Introduce:

- Incentives for off-peak charging
- Zone-based charging reservations
- Real-time congestion alerts

Expected benefit:
Reduced queue clustering.

Risk:
Driver compliance variability.

3. Smart Fleet Redeployment .

Deploy idle fleet from:

- Low-utilization peripheral zones
- To high surge-intensity clusters

Supported by:

- Zone-hour historical demand heatmaps
- Battery-level distribution modeling

Expected benefit:
Improved supply-demand match without CAPEX.

Risk:
Temporary oversupply shifts.

4. Incentive Redesign

Move from ride-count incentives to:

- Peak-hour availability bonuses
- Battery-ready rewards
- Zone compliance incentives

Aligns driver economics with platform conversion efficiency.

Assumptions Made

The analysis is based on the provided dataset and assumes that the observed ride patterns represent typical weekday operational behavior in major urban markets. Battery percentage is treated as a proxy for vehicle readiness, assuming that lower battery levels reduce dispat ch likelihood.

- Cancellation reasons accurately recorded.
- Battery levels reflect real readiness.
- Charging wait-time data is representative.

Scenario-Based Operational Improvement .

Highest impact-to-effort scenario: Battery Coordination + Charging Staggering

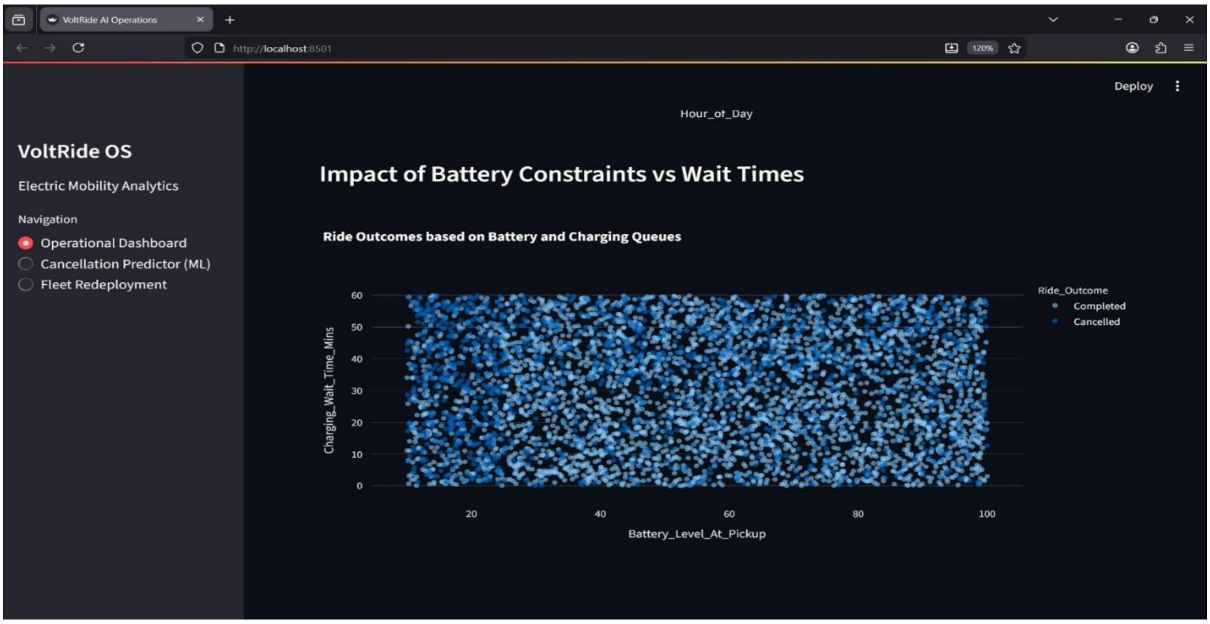
Why?

- No infrastructure expansion required.
- No fleet acquisition required.
- Leverages existing data systems.
- Directly targets primary cancellation driver.

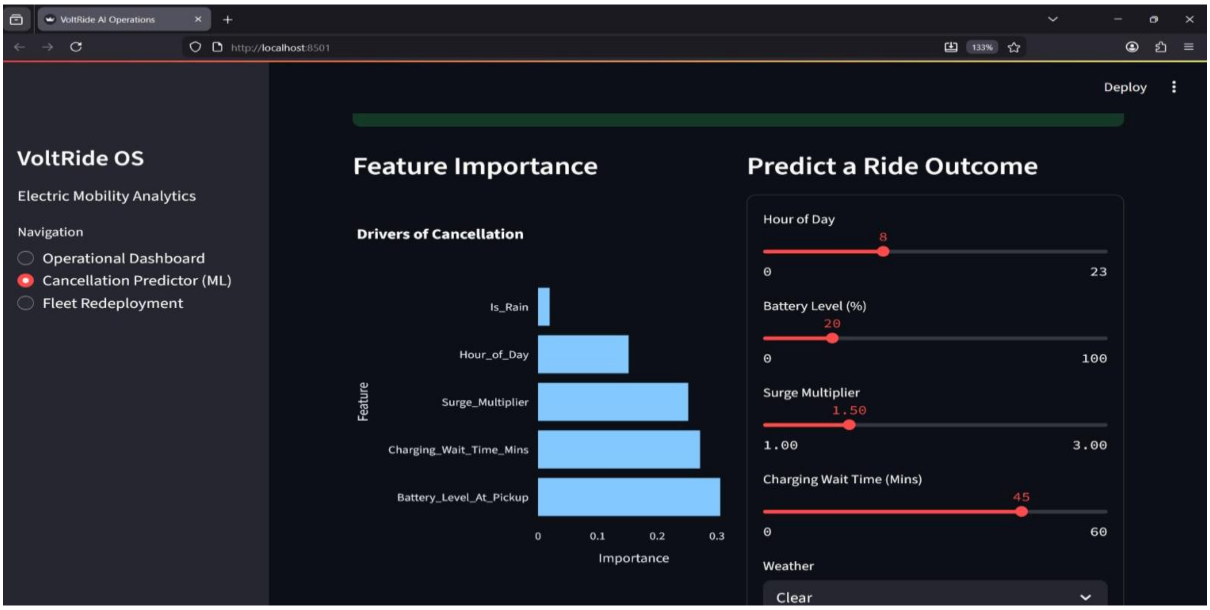
Expected impact:

- 8–15% improvement in ride completion during peak windows.
- Reduced surge volatility.

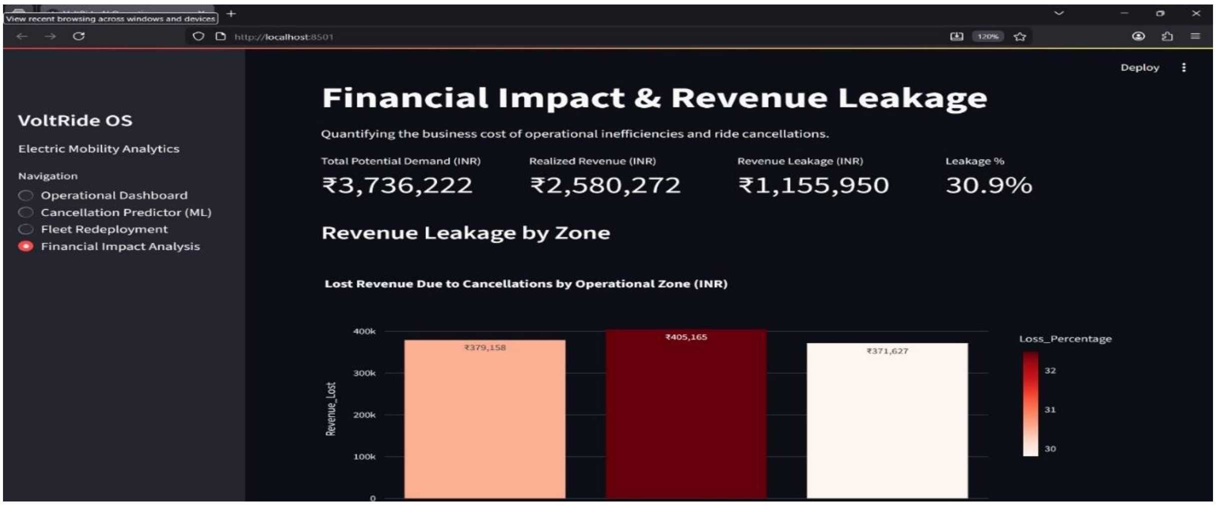
Outputs ：



VoltRide AI Operations
http://localhost:8501
Deploy
Hour_of_Day
VoltRide OS
Electric Mobility Analytics
Navigation
Operational Dashboard
Cancellation Predictor (ML)
Fleet Redeployment
Impact of Battery Constraints vs Wait Times
Ride Outcomes based on Battery and Charging Queues
Ride_Outcome
Completed
Cancelled
Charging_Wait_Time_Mins
Battery_Level_At_Pickup



VoltRide AI Operations
http://localhost:8501
Deploy
VoltRide OS
Electric Mobility Analytics
Navigation
Operational Dashboard
Cancellation Predictor (ML)
Fleet Redeployment
Feature Importance
Drivers of Cancellation
Is_Rain
Hour_of_Day
Surge_Multiplier
Charging_Wait_Time_Mins
Battery_Level_At_Pickup
Feature
Importance
Predict a Ride Outcome
Hour of Day
8
0
23
Battery Level (%)
20
0
100
Surge Multiplier
1.50
1.00
3.00
Charging Wait Time (Mins)
45
0
60
Weather
Clear



Git hub link https://github.com/codex826/Streamlit-EV-Operations-Analytics-Project

Conclusion

VoltRide's challenge is not growth. It is coordination.

The data reveals that:

- Peak-hour stress is predictable.
- Battery-driven cancellations are dominant.
- Charging congestion is temporal.
- Fleet misallocation exists across zones.

Scaling an EV-only fleet demands structured anticipation, not reactive dispatch.

VoltRide must shift focus from:

If managed correctly, EV constraints can become competitive advantage:

- Lower operating cost
- Lower maintenance
- Higher reliability