1. Executive Summary

This report presents an analysis of battery time series data, showcasing energy flow patterns between batteries and the grid. The analysis covers 15818 data points from 11 unique battery units.

Total energy purchased from the grid: 23802085.00 units. Total energy fed back to the grid: 1268962.00 units.

There were 2085 instances of batteries feeding energy back to the grid.

The visualizations in this report highlight patterns in grid interaction, including hourly trends, battery comparisons, and energy flow distributions.

2. Key Findings

- Grid purchase and feed-in patterns show distinct daily cycles.
- Batteries exhibit varying behaviors in terms of grid interaction.
- Some time periods show significantly higher grid feed-in activity.
- Hour 3 shows the highest activity with 660 records.

3. Visualization Charts

The following charts visualize different aspects of the battery data, focusing on grid interaction patterns and energy flow. Each chart provides insights into specific dimensions of the battery system behavior.

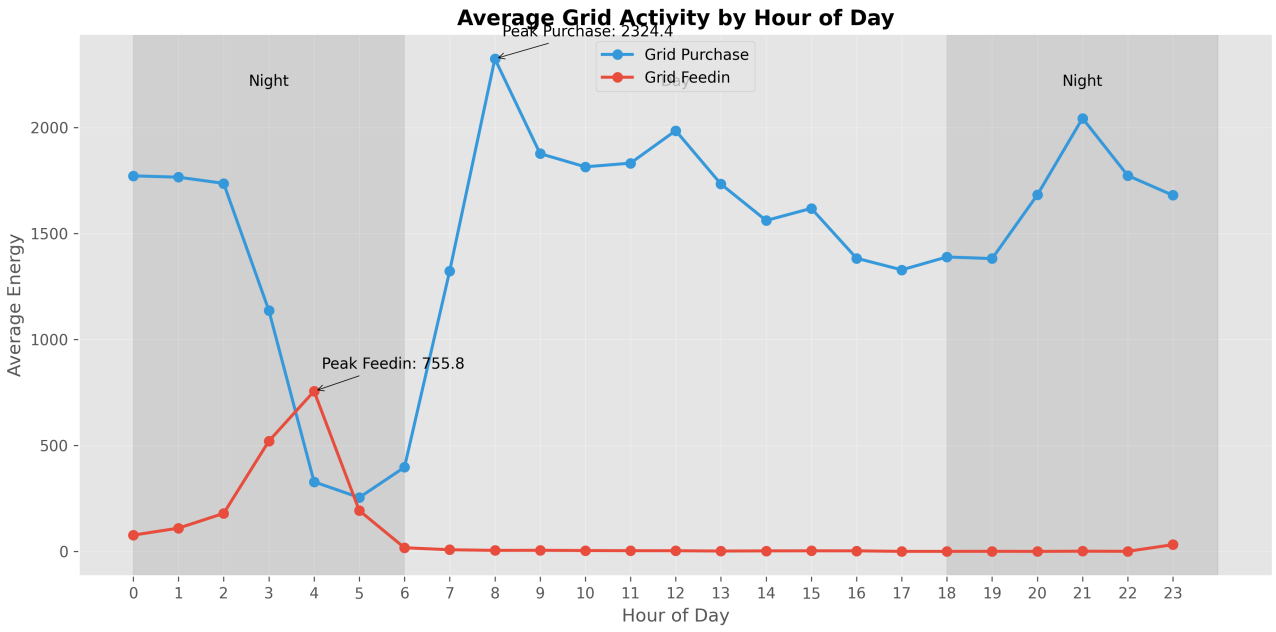

Figure 1: Hourly Grid Activity showing average grid purchase and feed-in patterns throughout the day.

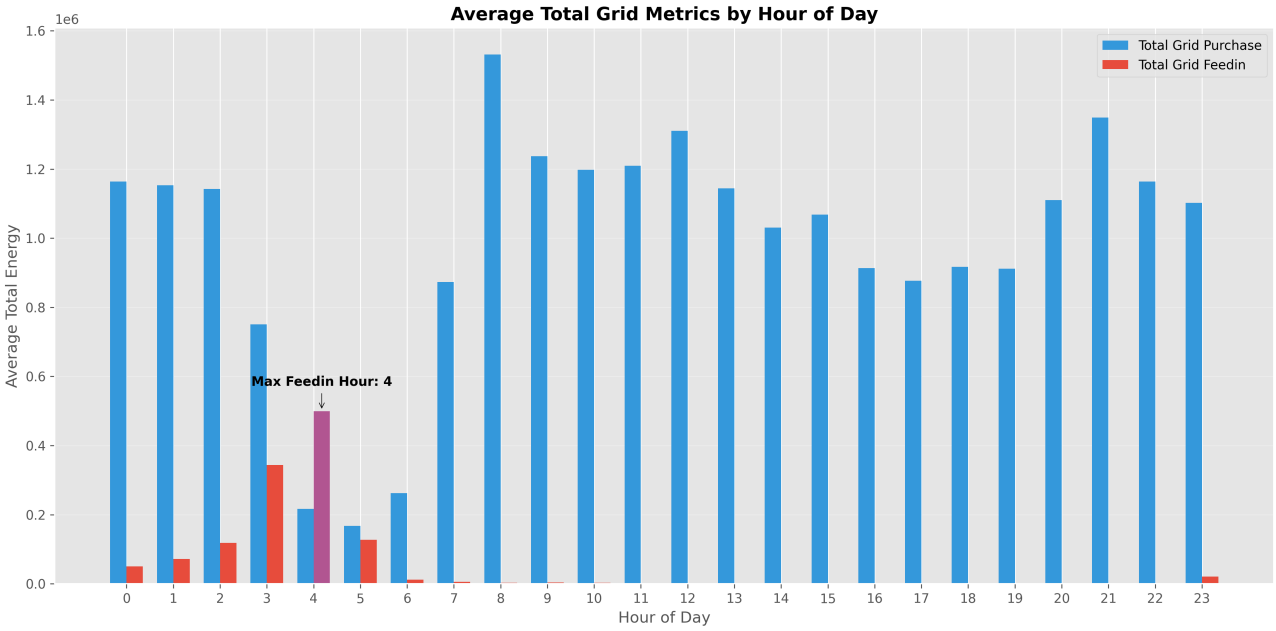

Figure 2: Total Grid Metrics aggregated by hour, showing the combined energy flow across all batteries.

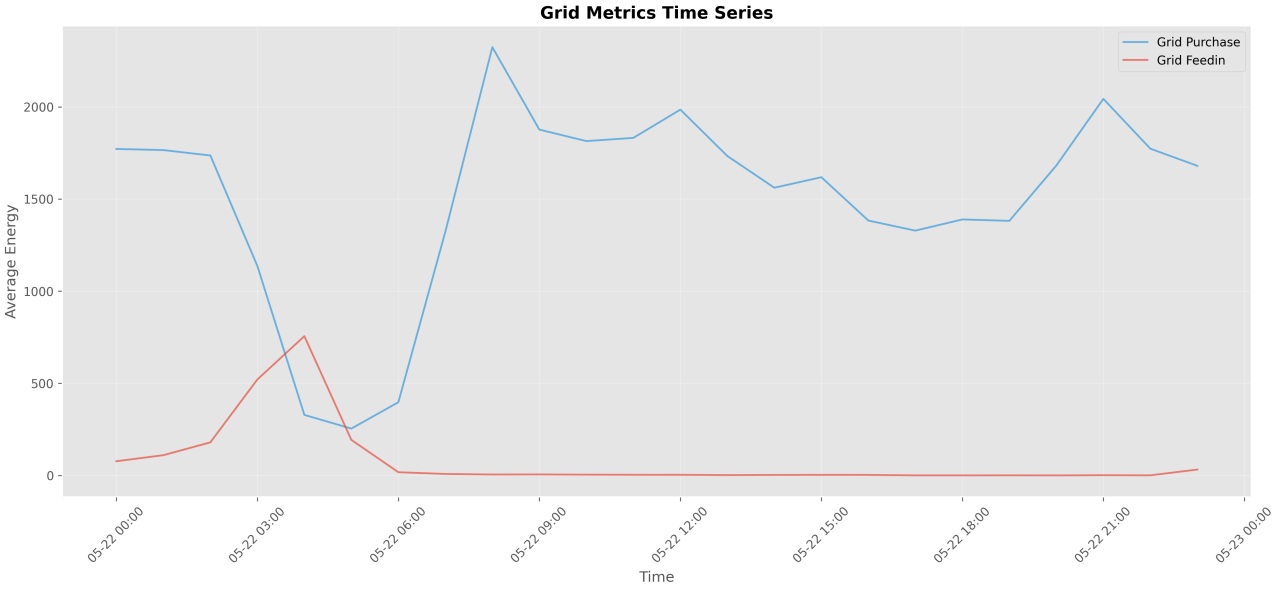

Figure 3: Time Series of Grid Metrics showing purchase and feed-in trends over time.

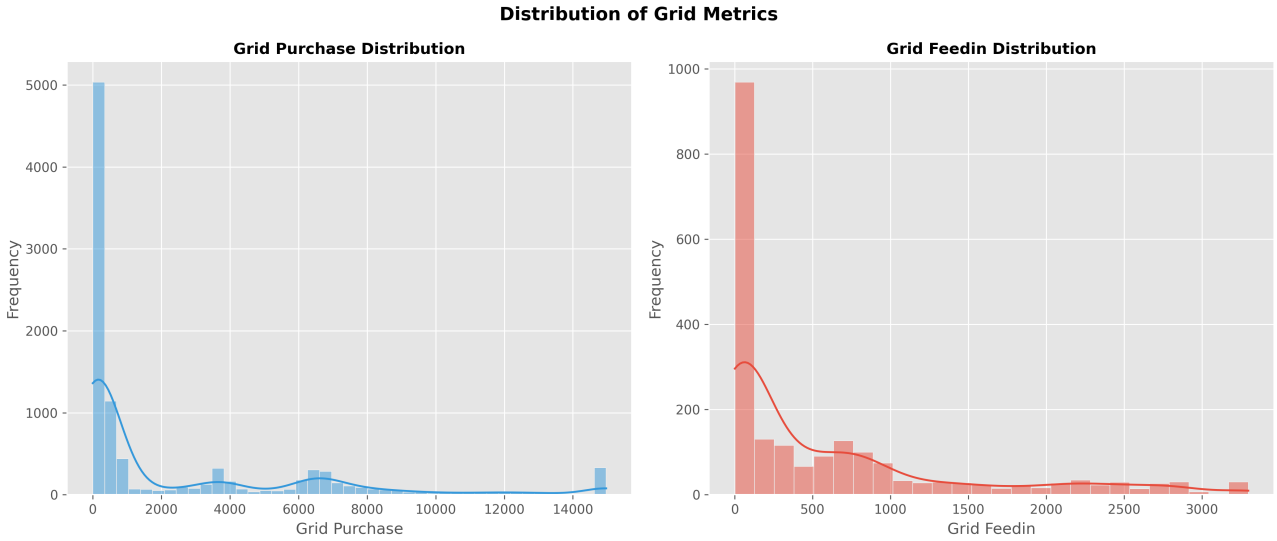

Figure 4: Distribution of Grid Metrics showing the statistical spread of purchase and feed-in values.

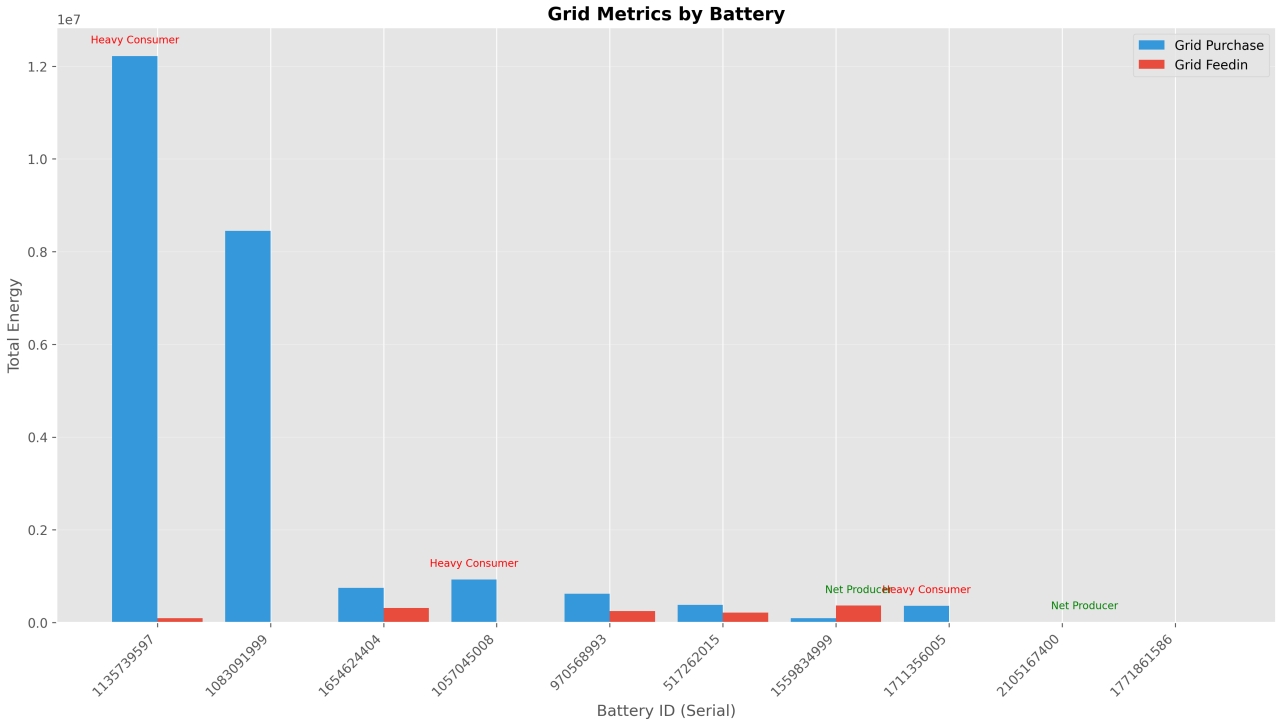

Figure 5: Battery Comparison showing relative grid interaction across different battery units.

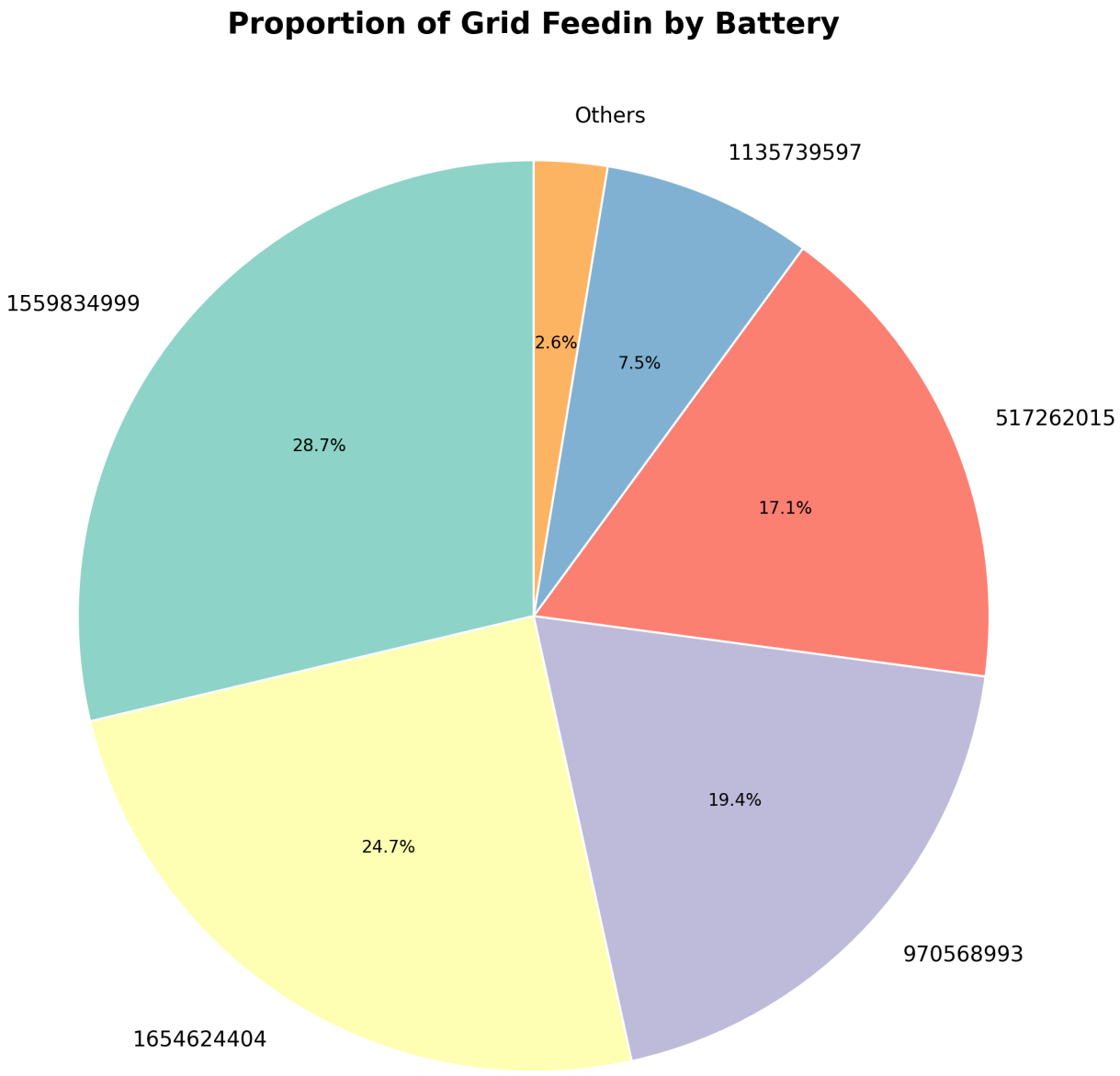

Figure 6: Proportion of Grid Feed-in by Battery showing which units contribute most to feeding energy back to the grid.

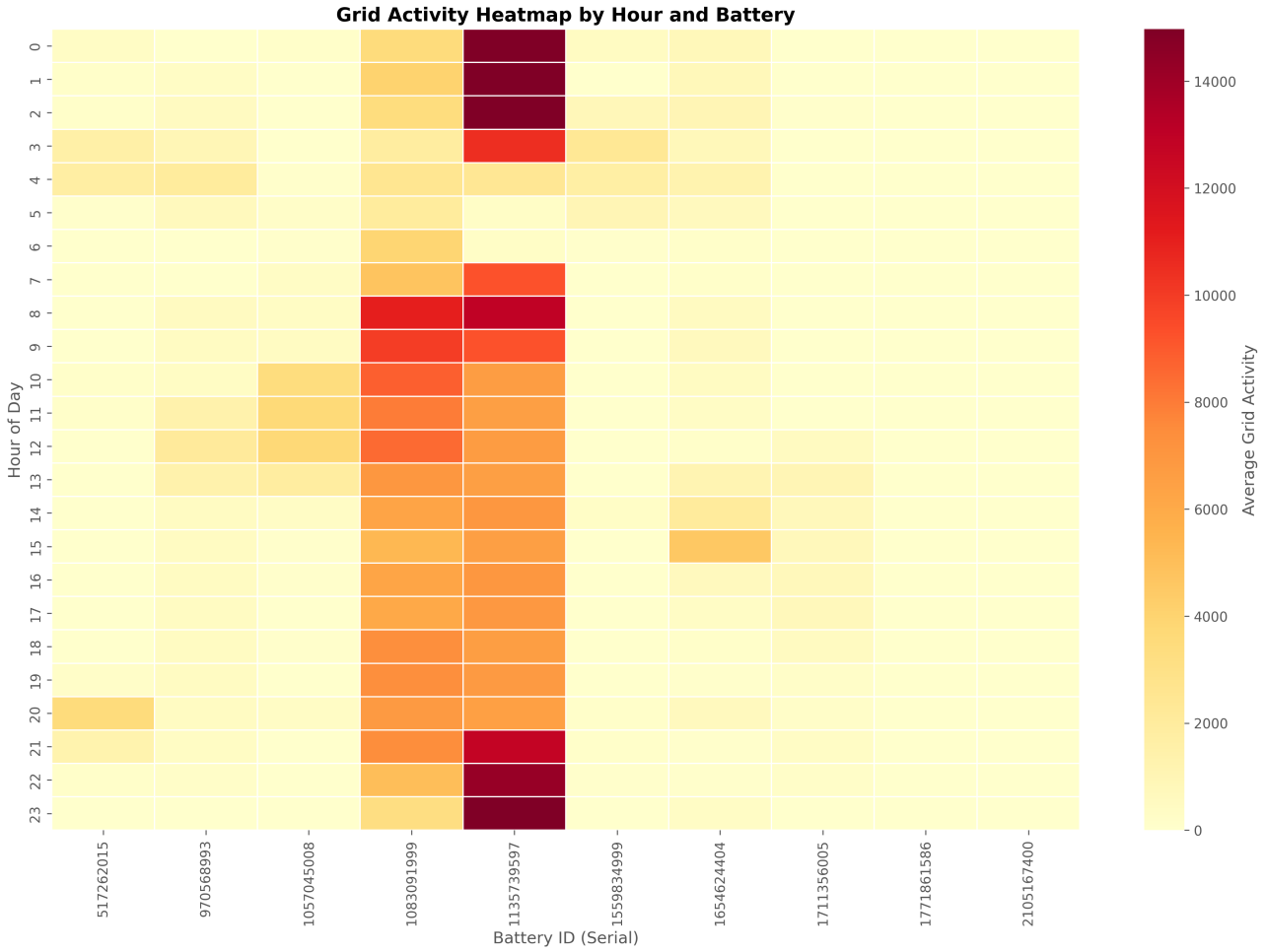

Figure 7: Grid Activity Heatmap visualizing patterns across hours and batteries.

4. Methodology

The analysis followed these steps:

1. Data Collection: Time series data was collected from battery systems.

2. Data Cleaning: Missing values were handled, data types were corrected, and duplicates were removed.

3. Transformation: Hourly aggregations were calculated and metrics were derived.

4. Visualization: Multiple chart types were generated to visualize different aspects of the data.

5. Analysis: Patterns and insights were identified from the visualizations.

The analysis focuses on two key metrics:

- Grid Purchase: Energy drawn from the grid by the battery systems.

- Grid Feed-in: Energy returned to the grid from the battery systems.

These metrics help understand the bidirectional energy flow between the batteries and the power grid.

5. Conclusion

The battery data analysis reveals important patterns in energy flow between battery systems and the power grid. Understanding these patterns can help optimize battery utilization, reduce costs, and improve grid stability.

Key takeaways include:

- Daily patterns in grid interaction suggest opportunities for optimization.
- Variations across batteries indicate different usage patterns or efficiencies.
- Grid feed-in activity shows potential for energy contribution back to the grid.

Further analysis could explore seasonal variations, correlate with external factors like weather, and develop predictive models for battery behavior.