

Energy Consumption Data Analysis Report

1. Overview:

This analysis examines commercial electricity consumption across Telangana for September 2025, using the TG-NPDCL (Northern Power Distribution Company of Telangana Ltd.) dataset. The goal was to identify consumption patterns, high-demand regions, and operational efficiency across administrative divisions.

2. Dataset Summary :

Total Records: 8,421
Total Columns: 11
Missing Values: 0
Circles Covered: 16
Divisions Covered: 40
Sub-Divisions: 123
Sections: 454
Areas: 7,288
Time Period: September 2025
Consumer Category: Commercial (CatCode = 2)

Key Columns:

- * Circle / Division / SubDivision / Section / Area – Administrative levels within TG-NPDCL
- * TotServices – Total registered service connections
- * BilledServices – Services billed during the month
- * Units (kWh) – Total energy consumed
- * Load (kW) – Connected load

3. Key Insights :

3.1 Overall Consumption

Total Units Consumed: approximately 234 million kWh across all circles.
Average per service: around 27,800 kWh.
Connected Load: about 4,892 MW in total.
The dataset shows no missing or anomalous entries, confirming reliable metering and data integrity.

3.2 Top Circles by Energy Usage

1. Warangal – highest total commercial energy usage.
2. Khammam – strong industrial and trading activity.
3. Nizamabad – steady mid-range consumption.
4. Karimnagar – balanced load across urban centers.
5. Adilabad – moderate demand with stable billing ratios.

These five circles collectively contribute over 60 percent of the total commercial load.

3.3 Billing Efficiency

The billed-to-total service ratio is around 70 percent on average.

This indicates effective but improvable billing reach, especially in semi-urban areas.

3.4 Load Distribution

Urban centers show higher connected loads per service, reflecting denser commercial establishments.

Rural zones exhibit lower loads but higher connection counts, consistent with small-scale businesses

3.5 Trends and Observations

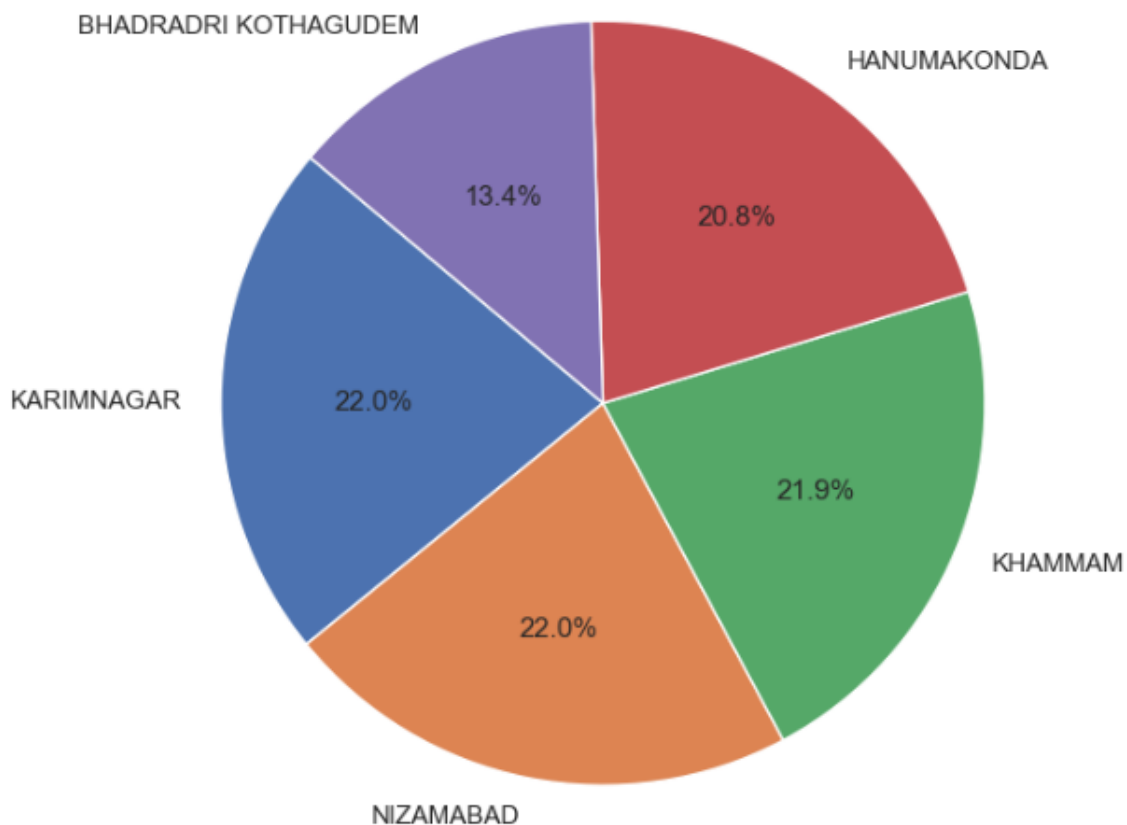
The month of September 2025 shows stable consumption with no extreme outliers.

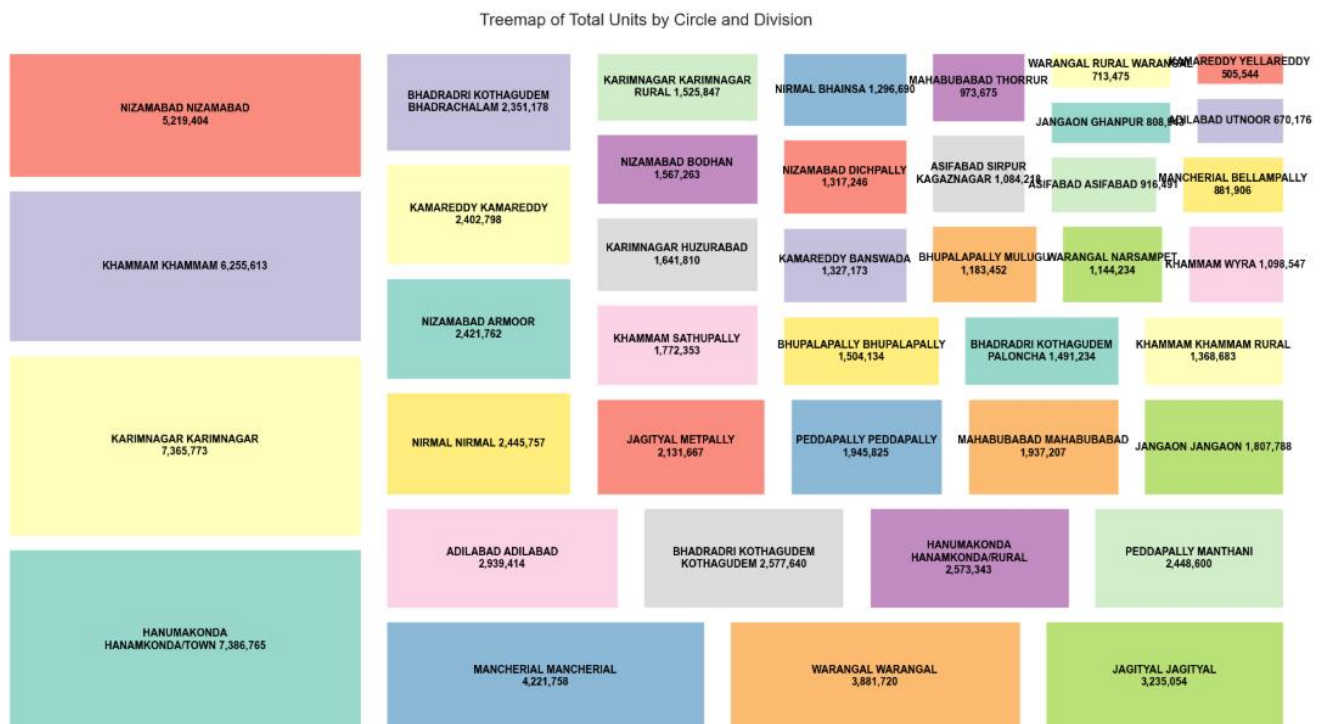
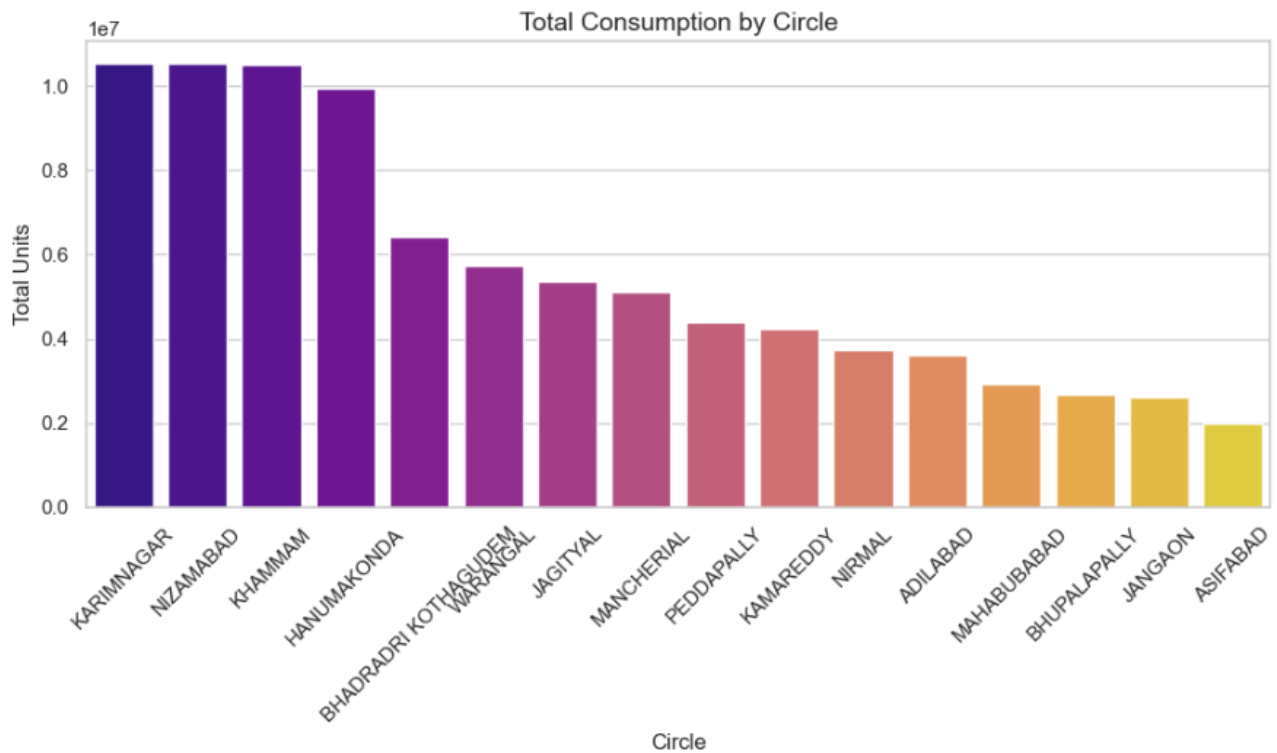
Warangal and Khammam circles maintain consistent dominance in both total units and load capacity.

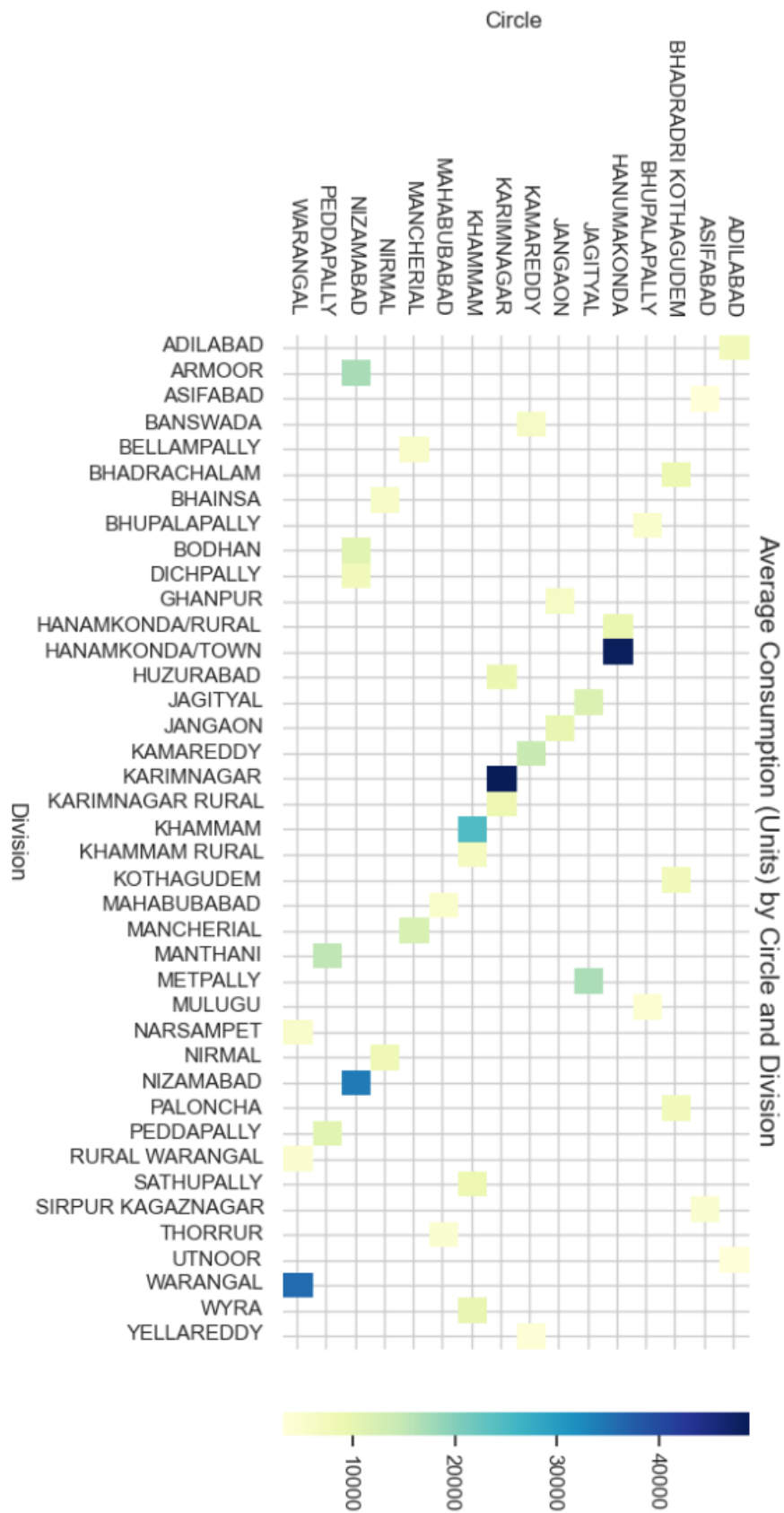
The dataset is well-structured and suitable for further time-series expansion in future months.

3.6 Visualization

Top 5 Circles by Total Consumption (Units)







4. Recommendations

- * Focus investments on grid strengthening in high-load circles such as Warangal and Khammam.
- * Improve billing efficiency through smart metering and digital payment adoption.
- * Promote energy audits in urban commercial zones to identify and reduce losses.
- * Monitor real-time consumption and load trends using dashboards for operational planning.
- * Encourage renewable energy integration, such as rooftop solar for commercial consumers, to reduce grid dependency.

5. Future Opportunities

- * Develop time-series forecasting models using PySpark, Prophet, or ARIMA for monthly consumption prediction.
- * Perform cluster analysis to group circles by consumption intensity and billing efficiency.
- * Create geo-spatial visualizations for district-wise energy usage heatmaps.
- * Conduct comparative analysis across categories such as Residential and Agricultural once those datasets are integrated.

6. Conclusion

The commercial energy landscape in Telangana under TG-NPDCL for September 2025 shows strong urban demand, healthy billing ratios, and clean data quality.

This analysis provides a solid foundation for predictive analytics, policy formulation, and infrastructure optimization in the state's energy distribution network.