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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.

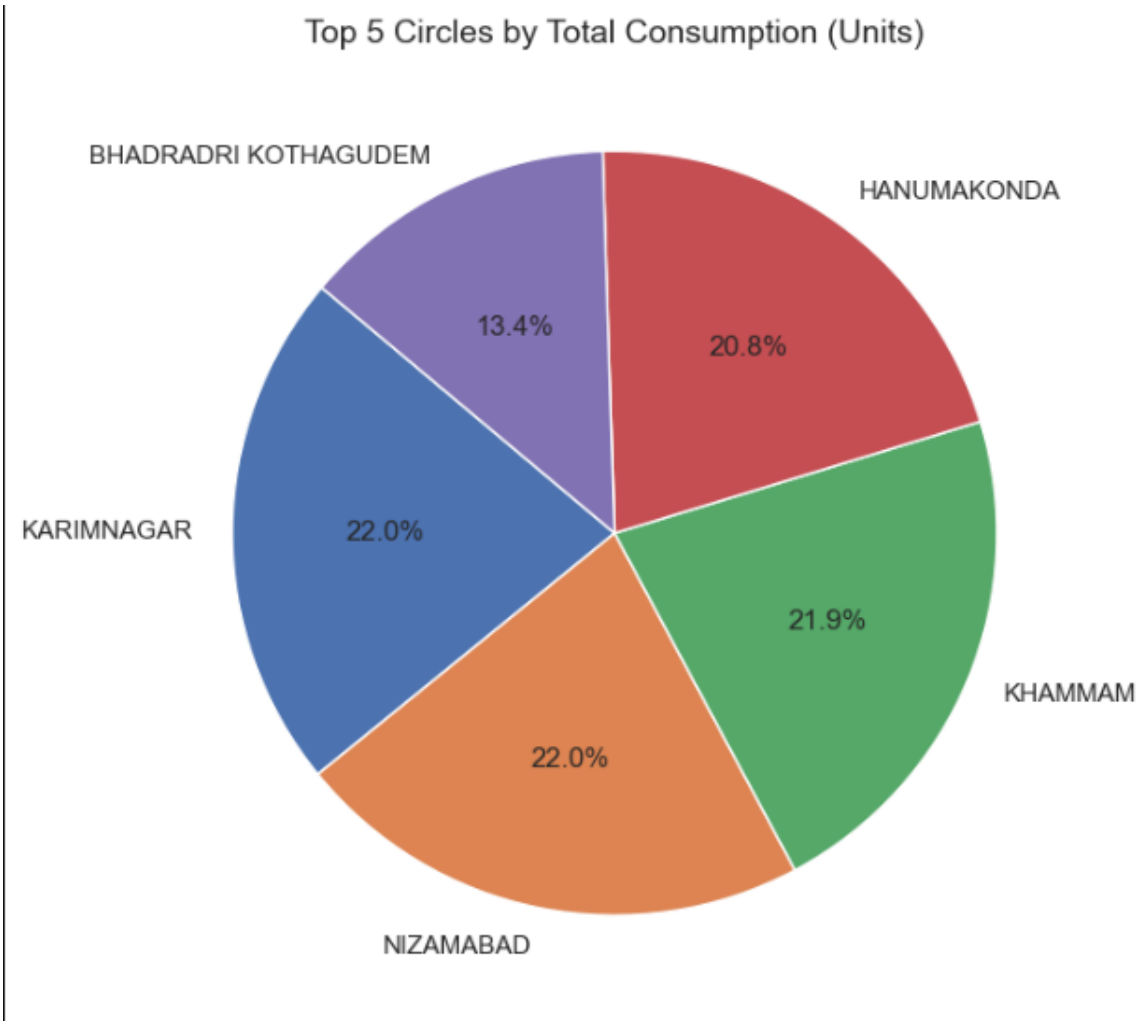
3.4 Load Distribution

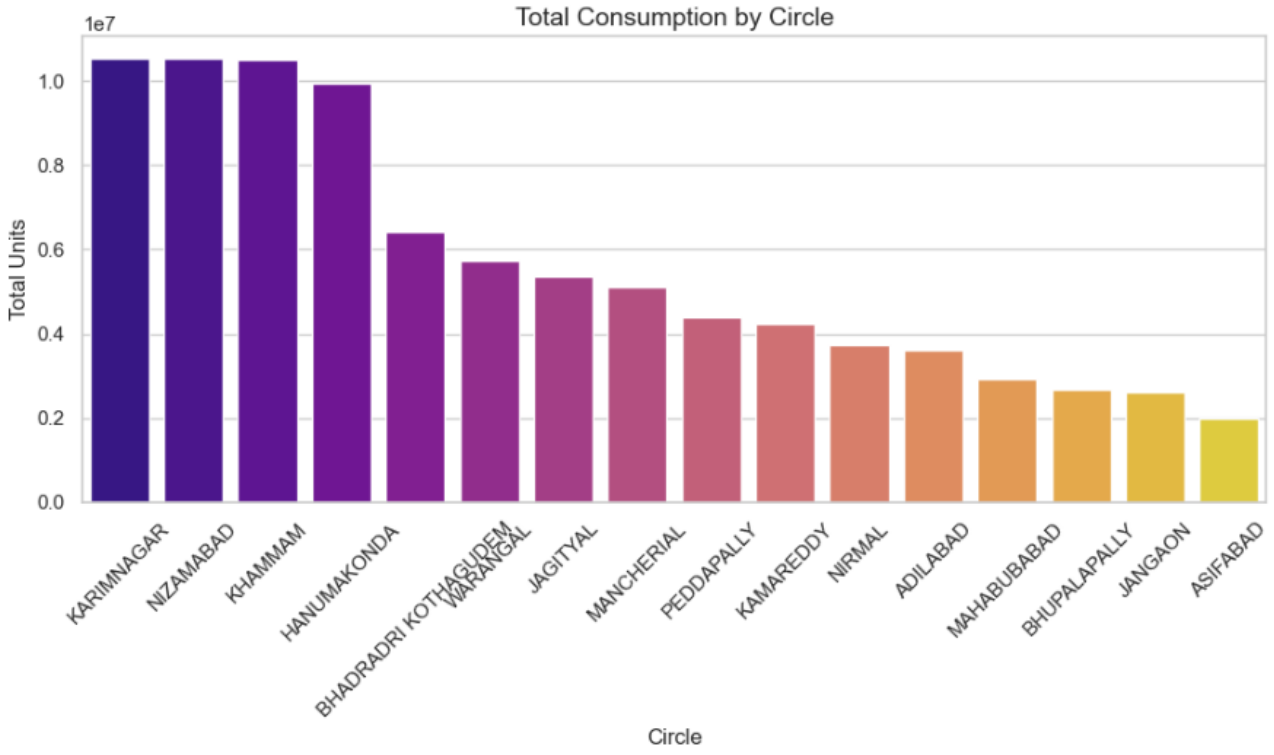
Urban centers show higher connected loads per service, reflecting denser commercial establishments.
Rural zones exhibit lower loads but higher connection counts, consistent with small-scale businesses

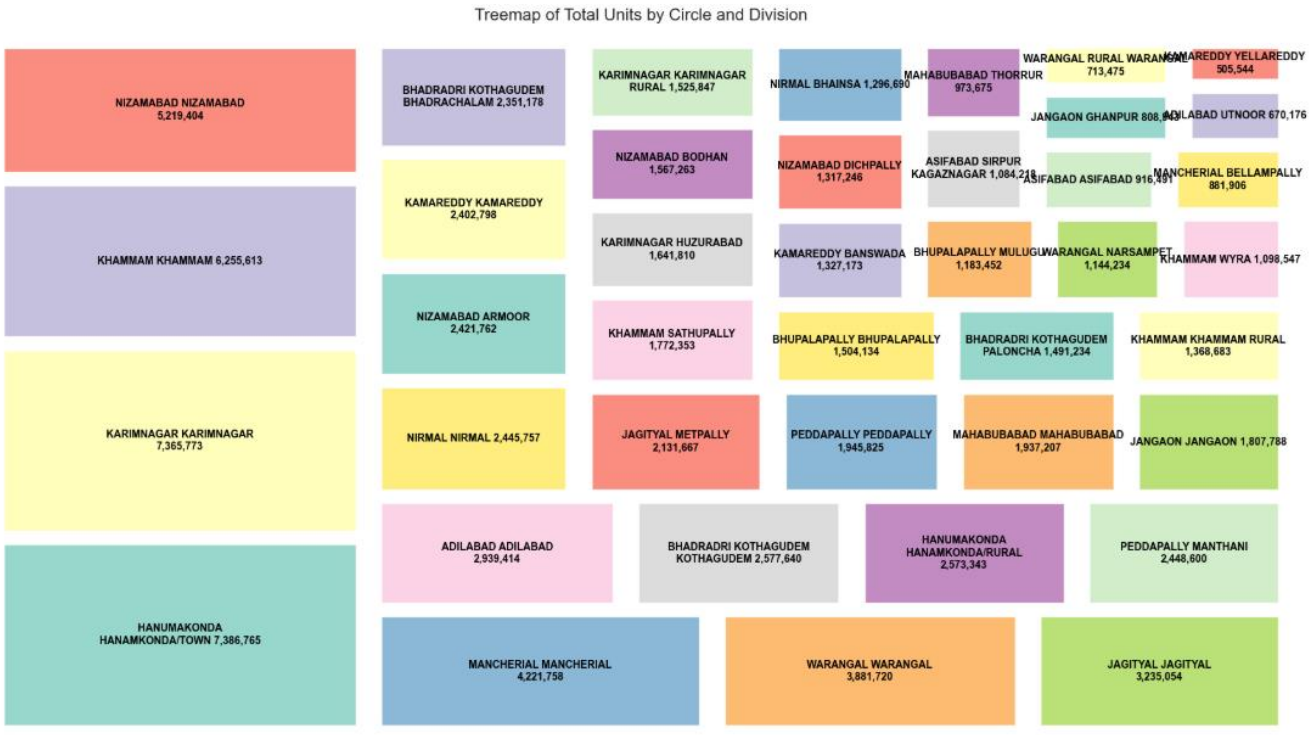
3.5 Trends and Observations

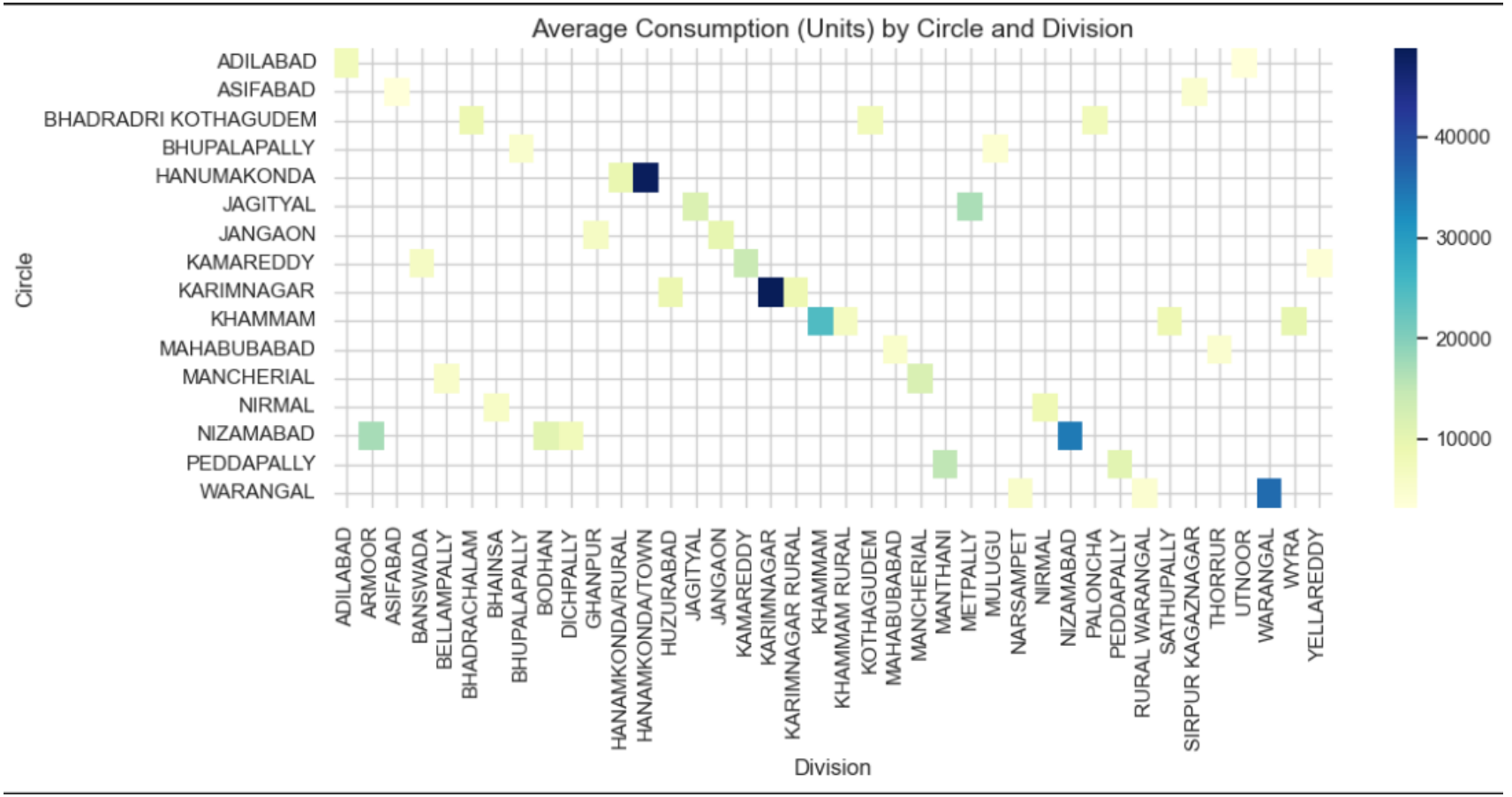
The month of September 2025 shows stable consumption with no extreme outliers.
Warangal and Khammam circles maintain consistent dominance in both total units and load capacity.
The dataset is well-structured and suitable for further time-series expansion in future months.

3.6 Visualization




Total Consumption by Circle
1e7
1.0
0.8
0.6
0.4
0.2
0.0
Total Units
KARIMNAGAR
NIZAMABAD
KHAMMAM
HANUMAKONDA
BHADRADRI KOTHAGUDEM
WARANGAL
JAGITYAL
MANCHERIAL
PEDDAPALLY
KAMAREDDY
NIRMAL
ADILABAD
MAHABUBABAD
BHUPALAPALLY
JANGAON
ASIFABAD
Circle


Treemap of Total Units by Circle and Division
NIZAMABAD NIZAMABAD 5,219,404
KHAMMAM KHAMMAM 6,255,613
KARIMNAGAR KARIMNAGAR 7,365,773
HANUMAKONDA HANAMKONDA/TOWN 7,386,765
BHADRADRI KOTHAGUDEM BHADRACHALAM 2,351,178
KAMAREDDY KAMAREDDY 2,402,798
NIZAMABAD ARMOOR 2,421,762
NIRMAL NIRMAL 2,445,757
KARIMNAGAR KARIMNAGAR RURAL 1,525,847
NIZAMABAD BODHAN 1,567,263
KARIMNAGAR HUZURABAD 1,641,810
KHAMMAM SATHUPALLY 1,772,353
JAGITYAL METPALLY 2,131,667
NIRMAL BHAINSA 1,296,690
NIZAMABAD DICHPALLY 1,317,246
KAMAREDDY BANSWADA 1,327,173
BHUPALAPALLY BHUPALAPALLY 1,504,134
PEDDAPALLY PEDDAPALLY 1,945,825
MAHABUBABAD THORRUR 973,675
ASIFABAD SIRPUR KAGAZNAGAR 1,084,218
BHUPALAPALLY MULUGU 1,183,452
BHADRADRI KOTHAGUDEM PALONCHA 1,491,234
MAHABUBABAD MAHABUBABAD 1,937,207
WARANGAL RURAL WARANGAL 713,475
JANGAON GHANPUR 808,[illegible]
ASIFABAD ASIFABAD 916,491
WARANGAL NARSAMPET 1,144,234
KAMAREDDY YELLAREDDY 505,544
ADILABAD UTNOOR 670,176
MANCHERIAL BELLAMPALLY 881,906
KHAMMAM WYRA 1,098,547
KHAMMAM KHAMMAM RURAL 1,368,683
JANGAON JANGAON 1,807,788
ADILABAD ADILABAD 2,939,414
BHADRADRI KOTHAGUDEM KOTHAGUDEM 2,577,640
HANUMAKONDA HANAMKONDA/RURAL 2,573,343
PEDDAPALLY MANTHANI 2,448,600
MANCHERIAL MANCHERIAL 4,221,758
WARANGAL WARANGAL 3,881,720
JAGITYAL JAGITYAL 3,235,054


Average Consumption (Units) by Circle and Division
Circle
ADILABAD
ASIFABAD
BHADRADRI KOTHAGUDEM
BHUPALAPALLY
HANUMAKONDA
JAGITYAL
JANGAON
KAMAREDDY
KARIMNAGAR
KHAMMAM
MAHABUBABAD
MANCHERIAL
NIRMAL
NIZAMABAD
PEDDAPALLY
WARANGAL
ADILABAD
ARMOOR
ASIFABAD
BANSWADA
BELLAMPALLY
BHADRACHALAM
BHAINSA
BHUPALAPALLY
BODHAN
DICHPALLY
GHANPUR
HANAMKONDA/RURAL
HANAMKONDA/TOWN
HUZURABAD
JAGITYAL
JANGAON
KAMAREDDY
KARIMNAGAR
KARIMNAGAR RURAL
KHAMMAM
KHAMMAM RURAL
KOTHAGUDEM
MAHABUBABAD
MANCHERIAL
MANTHANI
METPALLY
MULUGU
NARSAMPET
NIRMAL
NIZAMABAD
PALONCHA
PEDDAPALLY
RURAL WARANGAL
SATHUPALLY
SIRPUR KAGAZNAGAR
THORRUR
UTNOOR
WARANGAL
WYRA
YELLAREDDY
Division
40000
30000
20000
10000

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.