



ESKOM REPORT

BUSINESS ANALYSIS REPORT AND FUTURE ELECTRICITY
CONSUMPTION PREDICTIONS

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Executive Summary

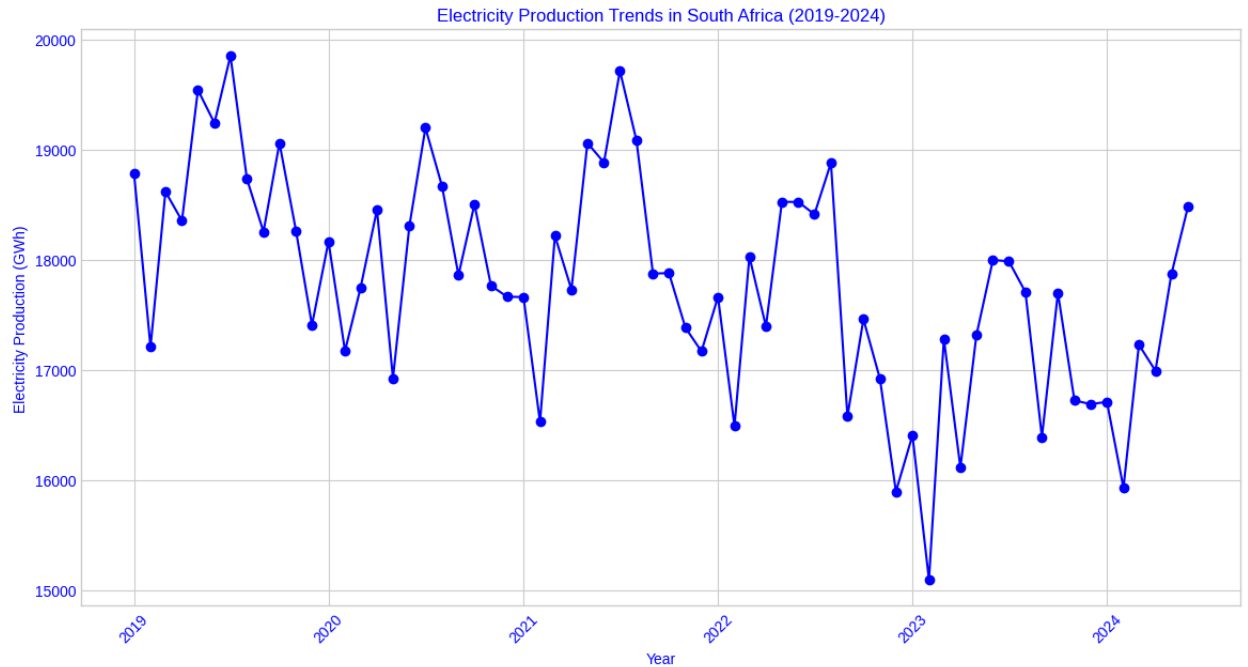
- **Brief Overview of the Analysis:** The analysis focused on understanding electricity production trends in South Africa from 2019 to 2024, examining regional variations, seasonal patterns, and drivers of electricity consumption.
- **Key Findings and Recommendations:**
 - **Key Findings:** Electricity production shows significant regional differences, with peak loads during winter months. The data from 2024 indicates a moderate YoY increase of 1.85% in January and fluctuations in subsequent months.
 - **Recommendations:** Implement demand-side management during peak periods and explore energy efficiency improvements in regions with high variability.

Introduction

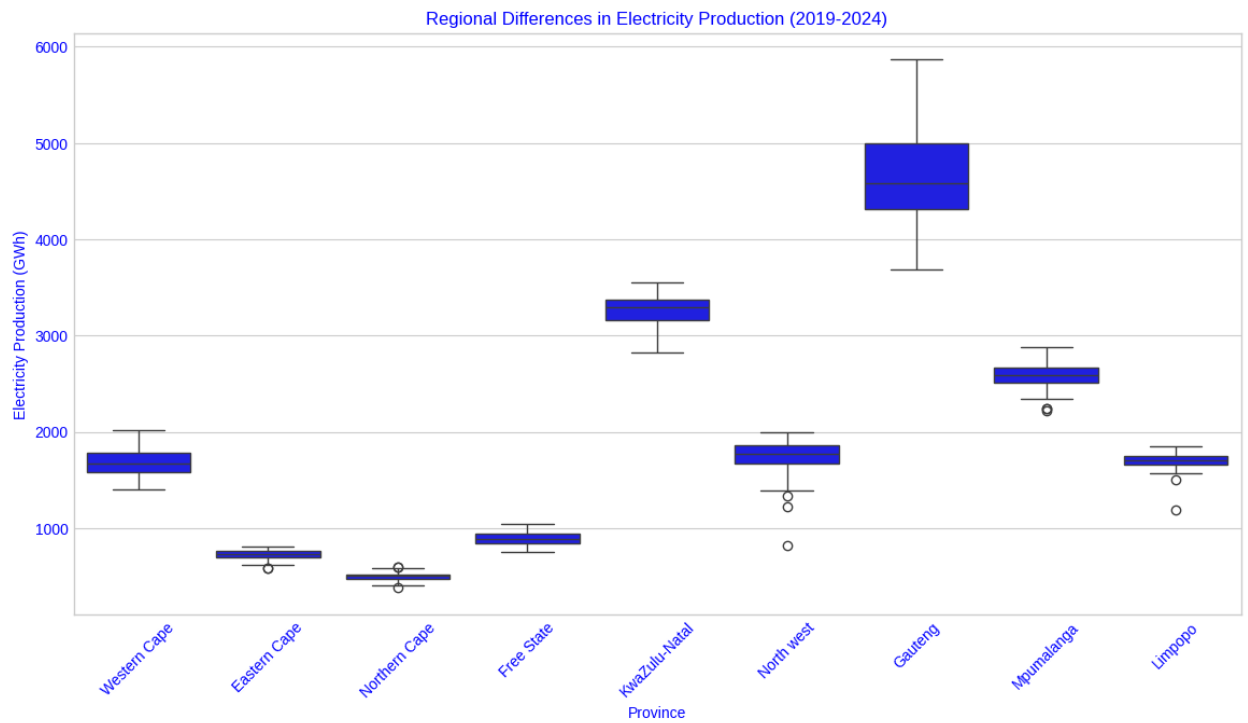
- **Purpose of the Analysis:** To evaluate electricity production trends and identify patterns that could inform Eskom's operational and strategic decisions.
- **Data Sources and Methodology:** The analysis utilized provincial electricity production data from Eskom (2019-2024) and employed statistical analysis and time series decomposition to understand trends and patterns.
- **Scope and Limitations:** The analysis is limited to historical production data and does not account for future economic or policy changes.

Data Exploration

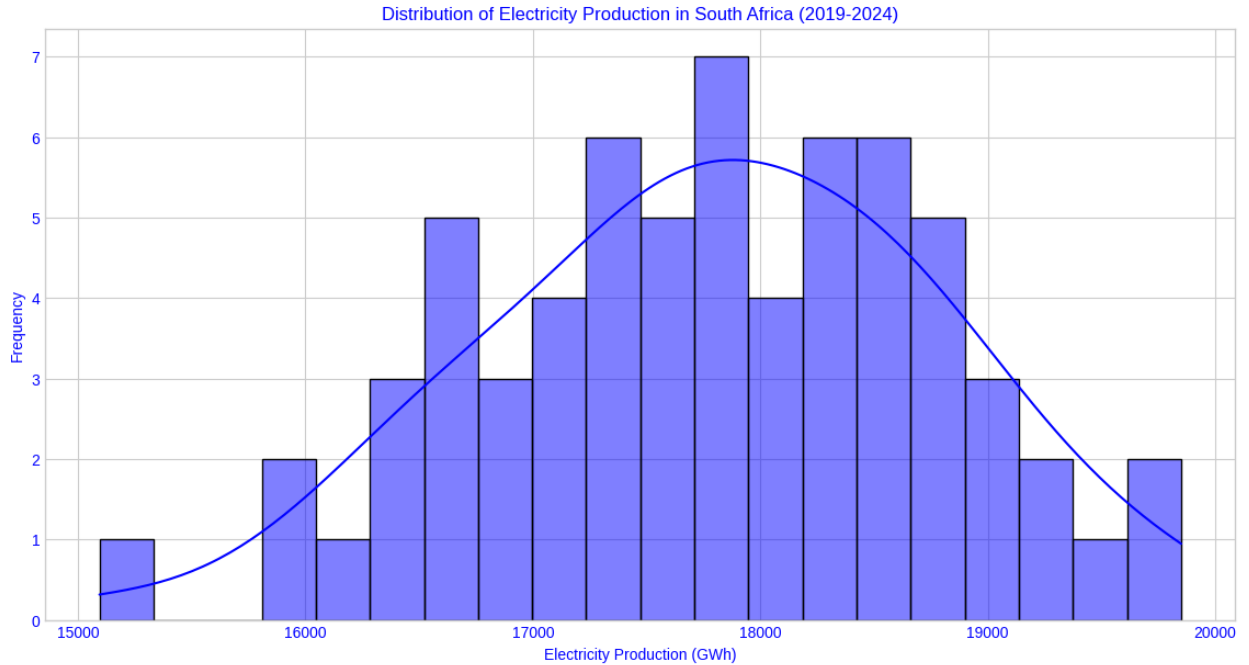
- **Descriptive Statistics:**
 - The mean electricity production in South Africa from 2019-2024 was 18,369 GWh, with the highest production in Gauteng.
 - Standard deviation indicates significant variability, especially in high-demand regions.
- **Data Visualization:**
 - **Line Plot:** Shows overall trends and seasonal peaks, especially during winter.



- **Box Plot:** Highlights regional differences in electricity production.



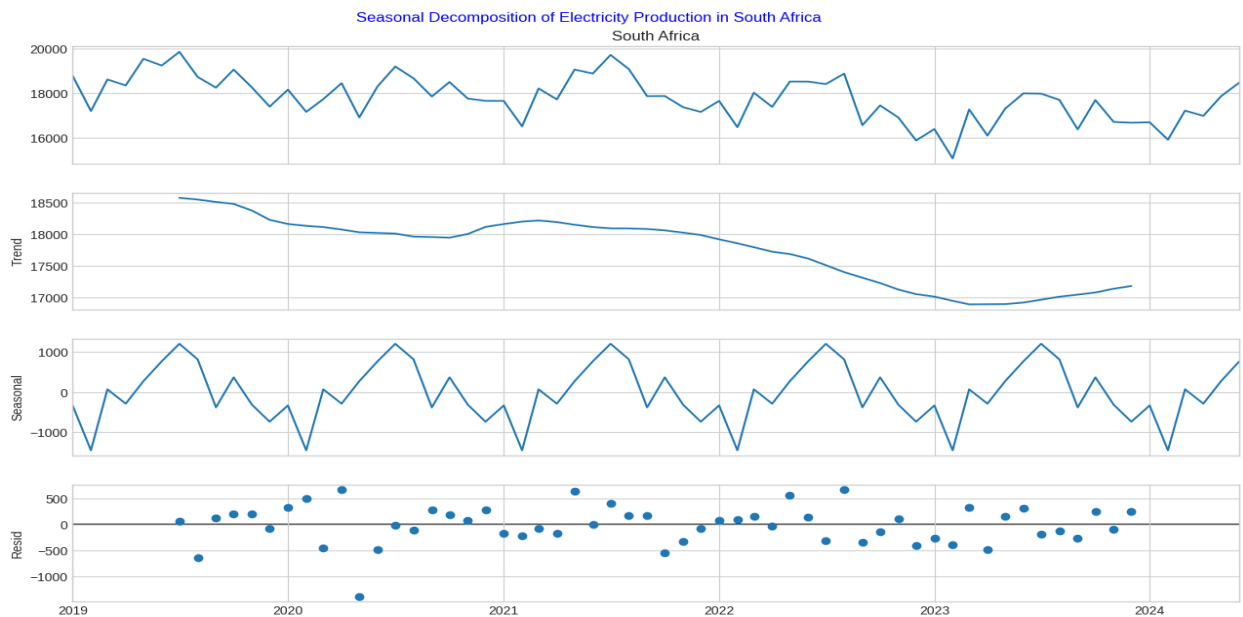
- **Histogram:** Illustrates the distribution of production levels, indicating normal distribution with a slight skew in high-production areas.



- **Identification of Outliers or Anomalies:** Outliers are observed primarily in high-demand regions, often correlating with seasonal peaks or economic events.

Consumption Trends and Patterns

- **Overall Trends Over Time:** Increasing trends in certain regions, with overall stability across the national level.
- **Seasonal Variations:** Clear peaks in electricity consumption during winter months, driven by heating demands.



- **Regional Differences in Consumption Patterns:** Gauteng and KwaZulu-Natal lead in production, while Northern Cape and Limpopo have the lowest production levels.

Peak Load Analysis

- **Identification of Peak Load Periods:** Notable peaks in July and August, aligning with cold weather.
- **Factors Influencing Peak Load:** Weather conditions and economic activity are the primary drivers.
- **Strategies for Managing Peak Load:** Implement dynamic pricing to encourage off-peak usage and invest in renewable energy to mitigate peak loads.

Consumption Drivers

- **Analysis of Key Consumption Drivers:** Industrial and residential demand are the primary drivers in high-production regions.
- **Correlation Analysis Between Consumption and Other Variables:** A moderate correlation between production levels and economic indicators, suggesting production aligns with economic growth.

Efficiency and Usage

- **Comparison of Electricity Usage Efficiency Across Different Regions:** Higher inefficiency observed in industrial-heavy regions.
- **Identification of Opportunities for Energy Efficiency Improvements:** Targeting high-consumption and high-variability regions for efficiency improvements.
- **Analysis of Energy-Efficient Technologies and Practices:** Promoting energy-efficient appliances and practices, especially in regions with high residential and commercial consumption.

Relationship Analysis

- **Correlation Analysis Between Consumption and Other Variables:** Positive correlation between population density and electricity consumption.
- **Identification of Causal Relationships:** While strong correlations exist, further analysis is needed to establish causality.

Business Implications and Recommendations

- **Cost Optimization Strategies:** Implement differential pricing to manage demand and optimize costs.
- **Sustainability Initiatives:** Invest in renewable energy sources and promote energy-efficient practices.
- **Capacity Planning Recommendations:** Upgrade infrastructure in high-demand regions and integrate renewables to reduce dependence on fossil fuels.

Predicted Values for Electricity Consumption using SARIMA

Predicted values for the next 6 months:

2024-07-01 18554.822628

2024-08-01 18284.571544

2024-09-01 16955.141953

2024-10-01 18060.512370

2024-11-01 17198.552969

2024-12-01 16969.238666

1. Seasonal Decline in Consumption:

- **Observation:** The predicted values show a decrease in electricity consumption from July (18,554 GWh) to December (16,969 GWh). This suggests a seasonal decline, possibly due to milder weather conditions reducing the need for heating or cooling.
- **Implication:** Eskom may experience lower demand in the latter half of the year, aligning with historical seasonal patterns where electricity usage typically decreases as temperatures moderate.

2. Monthly Variations:

- **Observation:** There is notable monthly variation, with a dip in September (16,955 GWh) and a slight rebound in October (18,060 GWh), followed by another decline into November (17,198 GWh) and December (16,969 GWh). This pattern might indicate fluctuations in industrial activity or other economic factors.
- **Implication:** These fluctuations suggest that Eskom should remain adaptable in its operational strategies, possibly preparing for lower demand in certain months while ensuring capacity for minor upticks.

3. Potential for Strategic Adjustments:

- **Observation:** The consistent decline from July to December suggests a need for strategic adjustments, such as promoting energy efficiency or exploring demand-side management to optimize grid performance and reduce costs during low-demand periods.
- **Implication:** Understanding these trends allows Eskom to plan maintenance, manage resources, and adjust pricing strategies to align with lower consumption levels.

4. Forecast Reliability:

- **Observation:** While these predictions offer a useful guide, actual consumption may vary based on unforeseen factors like economic changes, weather anomalies, or shifts in consumer behavior.
- **Implication:** Continuous monitoring and updating of forecasts are essential for ensuring that Eskom can respond effectively to real-time changes in electricity consumption.

Conclusion

- **Summary of Key Findings:** The analysis highlights significant regional and seasonal variations in electricity production, with opportunities for efficiency improvements and demand management.
- **Reinstatement of Recommendations:** Focus on managing peak demand, improving efficiency, and diversifying energy sources.
- **Potential Future Research Directions:** Investigate the impact of new technologies and policies on energy production and consumption patterns.

Appendices

Link to raw data and code:

<https://drive.google.com/drive/folders/1yfvIVvsosjqRiD7XcziickFwqDJlg3Hw?usp=sharing>

Source: https://www.statssa.gov.za/?page_id=1854&PPN=P4141&SCH=73631