Power forecasting operational activities at Eskom system operator

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Overview

Introduction

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Overview

Regulated Businesses

NERSA

Eskom Holdings LTD

Generation

Transmission

System Operator

National Control

Distribution

Regulated Businesses
One of the responsibilities of the National Control center is to balance Supply and Demand.
Purpose of Short Term Load Forecasting

Generation Scheduling and dispatch

- To optimally plan generation usage.
- To ensure smooth running of the system.
- Give day ahead warnings of possible capacity shortage

Generation maintenance plan

- Outage planning process based on peak demand forecast (Plant maintenance season is in summer)
- Capacity planning
Short Term Load Forecasting (STLF) Model

It is a residual forecast. The forecast model takes into account many variables, like weather and the economy, the most dominant ones:

- Seasonality
- Day type
- Public holiday
- School holiday
- Industrial action
- Sports events
- Tariffs
- REIPP’s

When Gauteng becomes overcast during the day, the demand increases due to lighting and less or no PV generation (>1000MW).

Anomalies and change in profile is also taken into account.
Forecast Model

- A combination of a time series model and judgemental methods

\[ Y_i = \alpha + \gamma X_{1i} + \delta X_{2i} + \theta X_{3i} + \zeta X_{4i} + \eta X_{5i} + \eta X_{6i} + \varepsilon \]

Where:

- \( Y_i \) = Hour \( i \) forecast, \( i = 1,2,\ldots, \ 168 \)
- \( X_{1i} \) = Day type and seasonality
- \( X_{2i} \) = Weather variable
- \( X_{3i} \) = Public events
- \( X_{4i} \) = Holidays
- \( X_{5i} \) = Anomalies
- \( X_{6i} \) = Change in profile
STLF Model Variables

- **Seasonality**

- **Day type**

- **Weather - temperature**

- **Weather - humidity**
STLF Model Variables

- **Weather**
  - Precipitation and thunder showers
  - Cloud cover
  - Wind

- **Holidays**
  - School & public holidays

![Graph showing precipitation and holiday effects]
Public Holiday on a week day affects the entire week

- Day before a public holiday like a Friday
- Day after a public holiday is like a Monday

Tariffs

- Winter is a period of high demand and therefore prices are also high
- Customers switch off their plant during Peak periods
- Some customers maintain their plant in winter.
Forecast Model

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IPP Impact Short Term Load Forecasting

• As % renewables increases in the mix so does the impact of term $\eta X6i$ in the previous model.

• Currently get two forecasts from the individual REIPP’s and Energy Meteo Systems through GIZ which helps in adjusting the residual load forecast accordingly.

• Current state:
  - Working at forecasting the total country’s demand, however residual forecast is still needed for generation maintenance planning.
  - More work to be done on RE forecasting models.
Conclusion

• The STLF function provided answers as to how much energy has to be produced and at what time it needs to be produced.

• To achieve this, extensive operational research was conducted to determine the primary drivers in the energy market, which affect the system demand and supply equilibriums.

• Forecasting accuracy is the objective of the STLF process, but equally important is the confidence of the forecasts produced.

• Good communication between market participants, stakeholders and customers form an essential part of this function in order to enhance confidence in the STLF deliverables.

• Variable resource forecasting will become increasingly important as the % of variable produced energy in the mix increases
Thank You