KEY FINDINGS: SOLAR PERFORMANCE ANALYSIS

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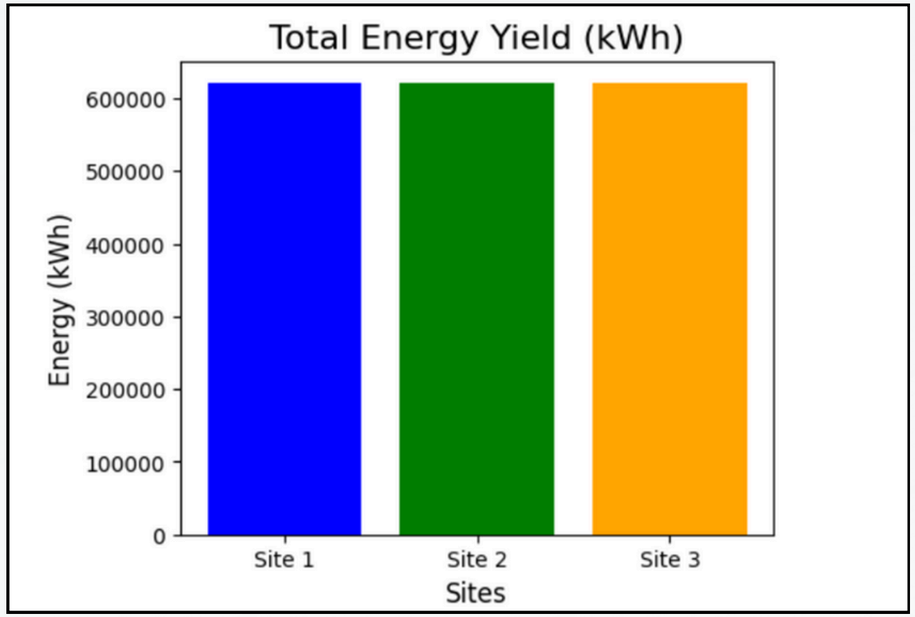
CONTENT

SITE COMPARISON VISUALISATIONS

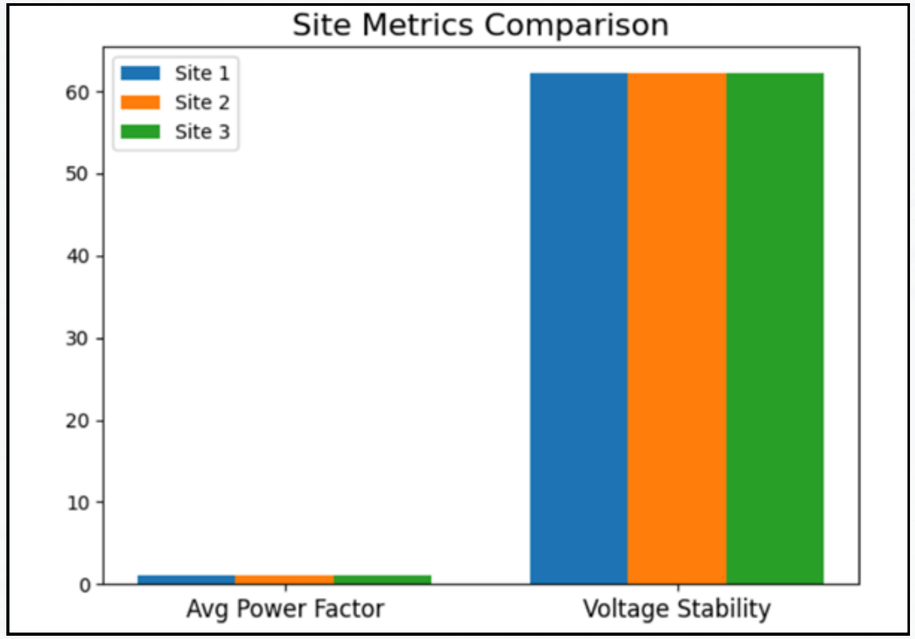
Energy Yield Comparison

- The bar graph titled "Total Energy Yield (kWh)" compares the energy yield of three sites.
- All three sites exhibit identical total energy yield, indicating uniform performance.
- Energy generation patterns show consistent fluctuations across sites.



Site Metrics Comparison

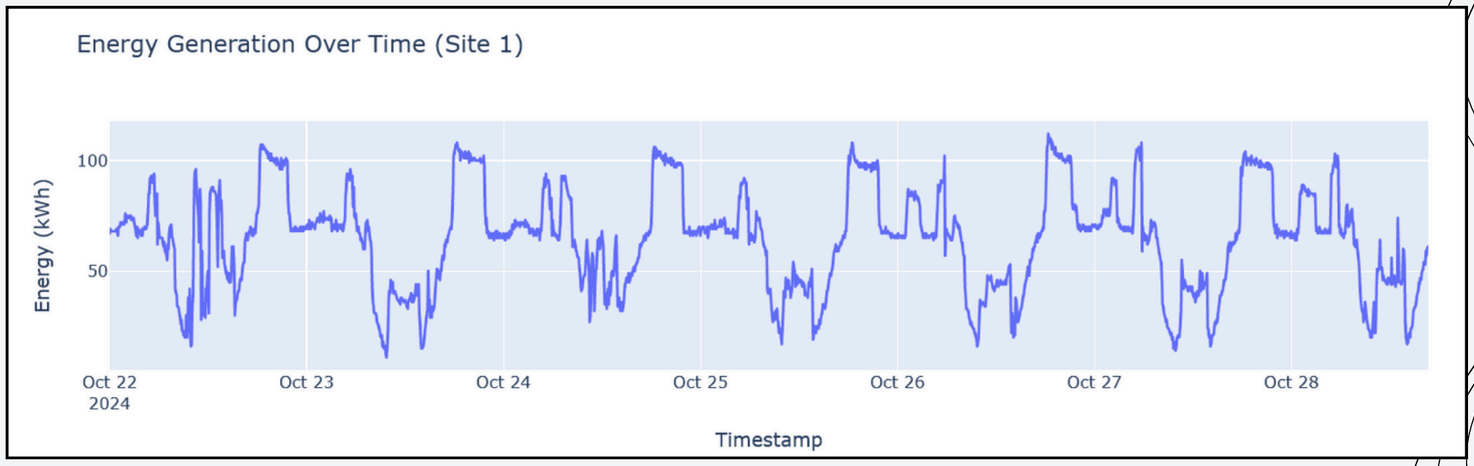
- The Site Metrics Comparison graph suggests that all three sites have good same voltage stability and same avg Power Factor.



TIMESERIES GRAPH PATTERN AND PHASE ANALYSIS

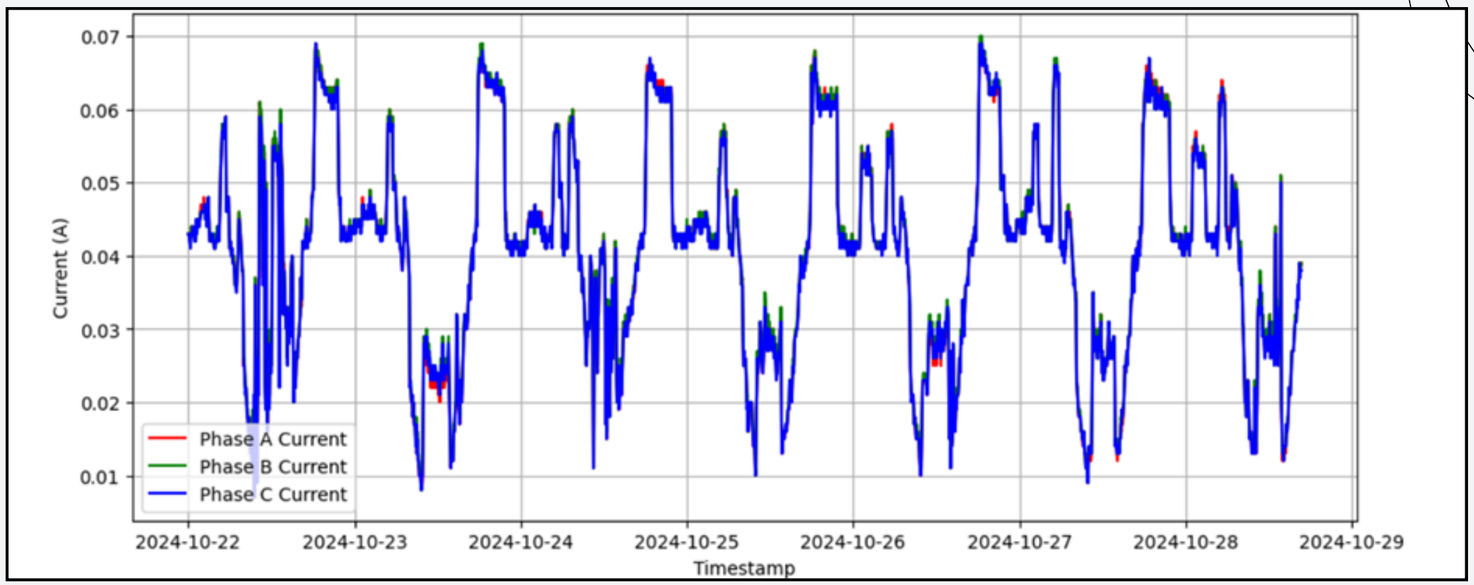
Energy Generation Over Time

- All three sites exhibit similar fluctuating patterns in energy generation, with periods of higher and lower output.



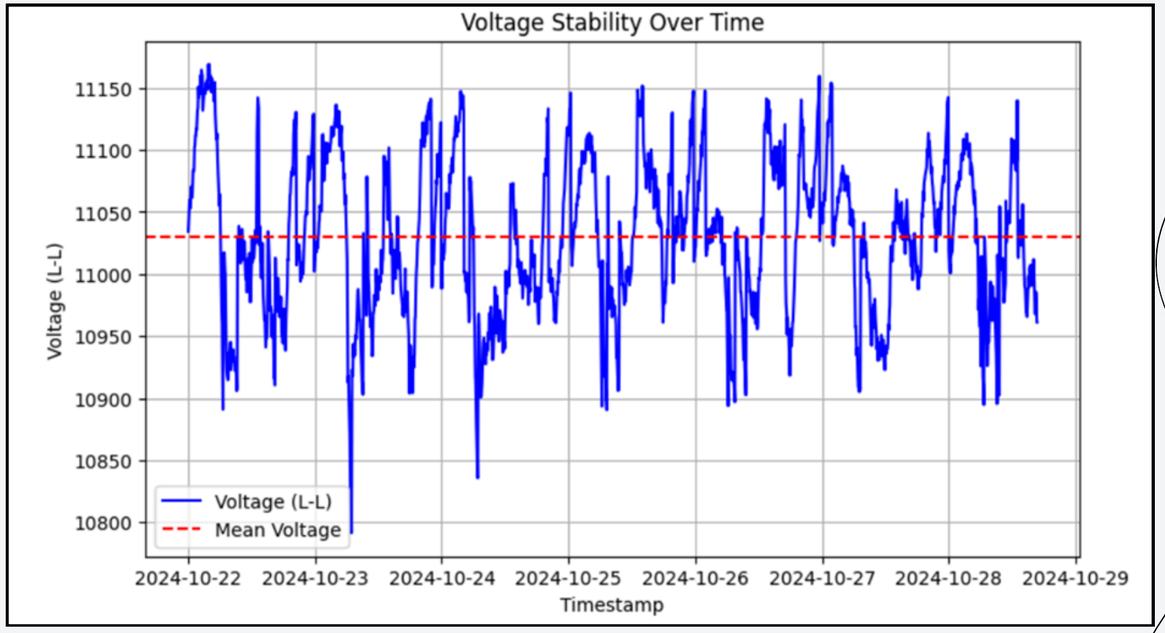
Current Distribution Across Phases

- The graph shows the current fluctuations across 3 phases.
- All three phases exhibit similar fluctuating patterns with periods of higher and lower current values. The peaks and troughs of the current fluctuations align across the three phases, suggesting a synchronized behavior.



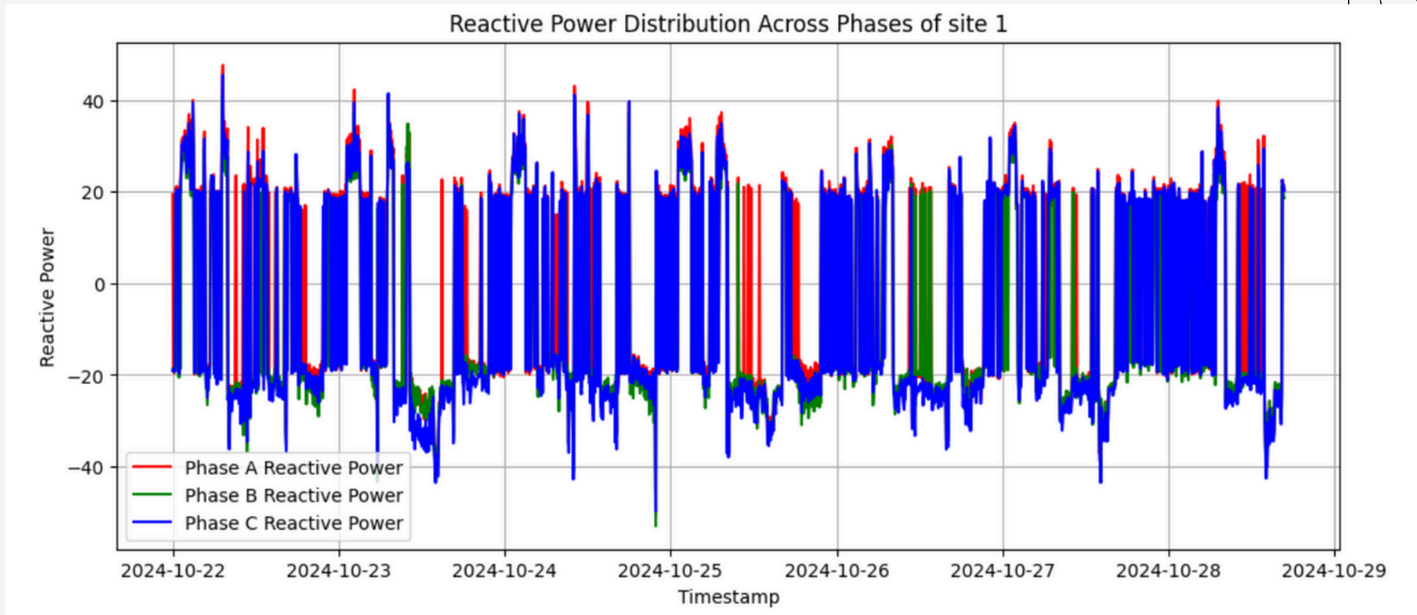
Voltage Stability Over Time

- The graph titled "Voltage Stability Over Time" illustrates the voltage fluctuations over a period from October 22nd to 29th, 2024. The voltage fluctuates around a mean voltage level indicated by the red dashed line.
- The voltage remains relatively stable within a certain range, with occasional spikes and dips. These fluctuations could be attributed to factors such as changes in load, grid conditions, or equipment issues. It’s same for all sites data.



Reactive Power Distribution Across Phases

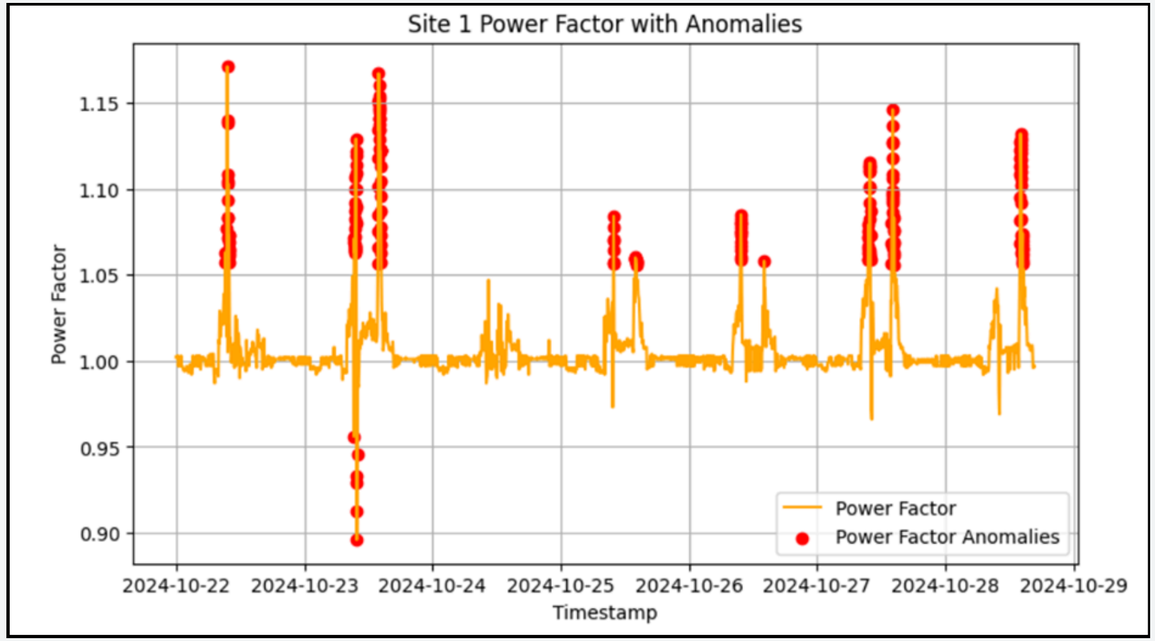
- The graph indicates that the reactive power distribution across the three phases is dynamic and fluctuates significantly over time.
- The phase-wise differences in the patterns suggest variations in the load characteristics or system conditions.



TIMESERIES GRAPHS WITH ANOMALIES

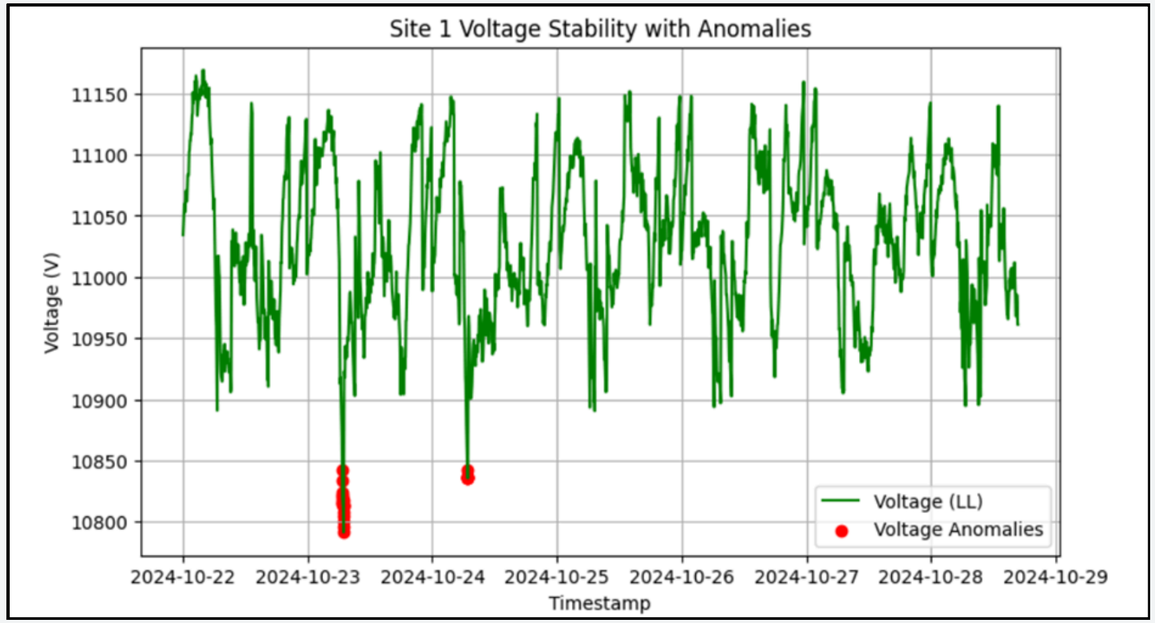
Power Factor with Anomalies

- This graph is also same for all sites. The chart shows the power factor for "Site 1" from October 22 to 29, 2024.
- While the power factor is generally stable around 1.0, significant anomalies appear on October 23, 26, and 28, indicating potential issues like load changes or equipment problems.



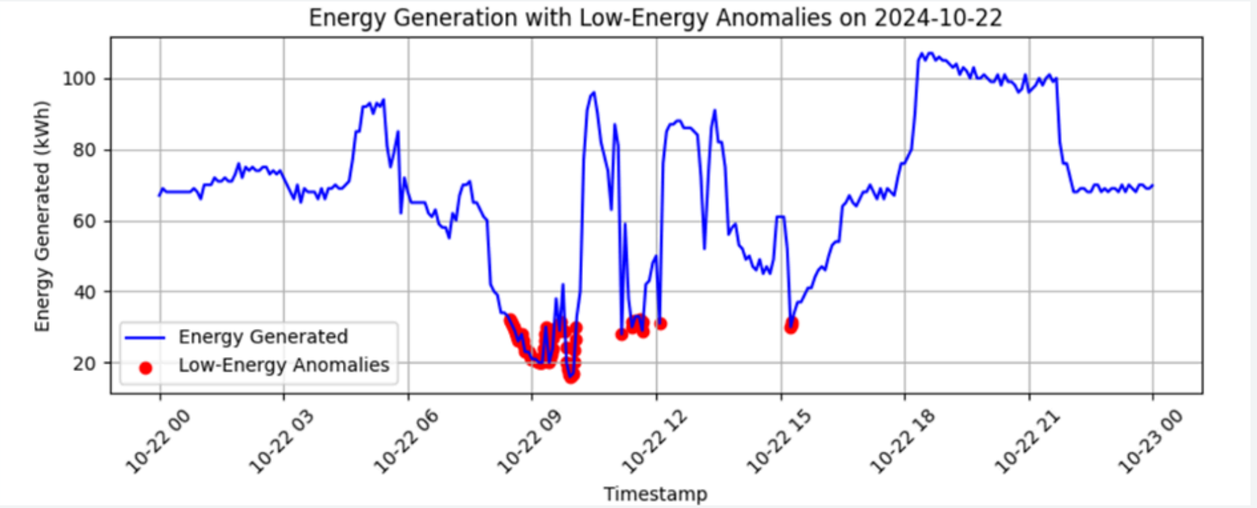
Power Factor with Anomalies

- The graph shows voltage fluctuations at Site 1 over time. The green line represents the voltage, and the red dots indicate anomalies where the voltage deviates significantly from the normal range. These anomalies could be due to various factors like sudden load changes, grid disturbances, or equipment issues.
- Total 26 anomalies are detected



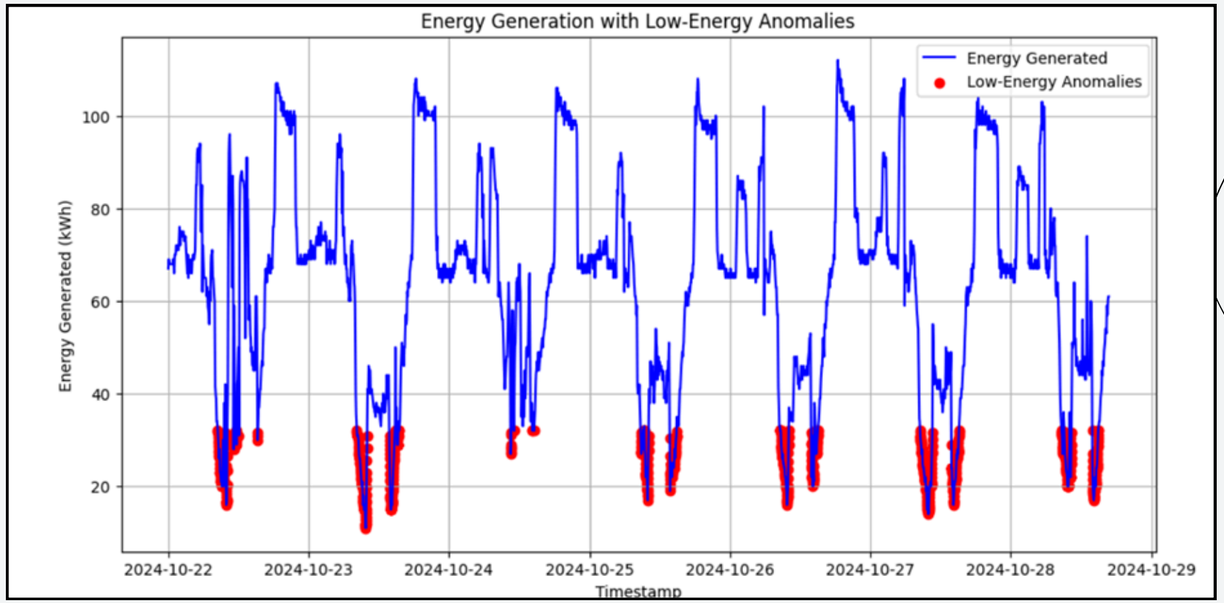
Energy generation with anomalies of a single day

- The graph shows energy generation on October 22, 2024. The blue line represents energy generated in kWh, fluctuating throughout the day.
- Red dots indicate anomalies, concentrated during morning dips and evening declines, likely due to weather conditions, equipment issues, or grid problems.



Anomalies in Energy Generation

- The graph shows energy generation over time. The blue line represents the energy generated in kWh, which fluctuates throughout the period. Red dots indicate anomalies, which are points of significantly lower energy generation.
- These anomalies could be due to factors like weather conditions, equipment malfunctions, or grid issues.



RECOMMENDATIONS

1. **Enhance Voltage Stability**
   - To improve voltage stability, we recommend installing advanced voltage regulation equipment. Additionally, optimizing grid connection and load-sharing mechanisms can help reduce voltage anomalies.
2. **Optimize Power Factor**
   - To enhance power factor, we suggest implementing load balancing strategies during peak and off-peak hours. Regular equipment inspections, particularly on days with detected anomalies (e.g., October 23, 26, 28), are also crucial.
3. **Balance Phase Currents**
   - To balance phase currents, regular monitoring and adjustment of load distribution is essential. Utilizing automated load-balancing tools can provide real-time corrections.
4. **Implement Predictive Maintenance**
   - By leveraging historical anomaly data to build predictive maintenance models, we can schedule proactive inspections for voltage and power factor issues, especially during critical periods like early mornings and evenings.
5. **Address Energy Generation Patterns**
   - Optimize Panel Orientation: Ensure optimal panel orientation and tilt to maximize sunlight absorption throughout the day.
   - Implement Advanced Monitoring Systems: Monitor real-time weather conditions and adjust system operations accordingly to mitigate the impact of cloud cover and fog.