Enabling efficient management for Angolan solar initiative

Gantner has supplied its advanced monitoring solutions to one of the largest solar projects in Africa. This massive initiative involves seven solar power plants in Angola, boasting a total capacity of 370 MWp. These plants are set to significantly enhance the region's electricity supply, facilitate the country's transition to renewable energy, and reduce its reliance on fossil fuels. Official estimates suggest that over 1.2 million families will benefit from this transformative solar project.

The project was developed by Sun Africa and constructed by the Portuguese EPC company MCA Group. It is financially backed by the Swedish Export Credit Corporation (SEK), which provided an export credit of €560 million, guaranteed by the Swedish Export Credit Agency (EKN). International trade company Elof Hansson Group played a crucial role in sourcing and coordinating with suitable Swedish suppliers for the project.

Gantner, through its Swedish subsidiary Gantner Instruments Nordic AB, delivered a state-of-the-art monitoring solution for solar plants. This solution comprises around 1,400 string combiner boxes and nearly 100 DAQ cabinets, assembled by Gantner's local partner in Sweden. Key components such

as stainless steel cabinets and DC combiner main switches were also sourced locally, ensuring 75% of Gantner's project content is 'Made in Sweden'.

Technological advancements

The heart of Gantner's monitoring system is the Q.reader datalogger, which captures real time data from all string combiner boxes, approximately 12,000 trackers, 66 central inverters, and 21 meteorological stations. This system processes data from about 100,000 measured channels, enriched with numerous calculated channels.

The comprehensive data acquisition and analysis provided by Gantner's solution form an essential foundation for addressing

the diverse needs of project stakeholders, including investors, operation and maintenance teams, and distribution network operators.

Gantner's cutting edge monitoring technology not only enhances operational efficiency but also ensures optimal performance and reliability of solar plants. By providing detailed insights and analytics, the system supports informed decision making and proactive maintenance, ultimately contributing to the sustainable growth of renewable energy in Angola.

The benefits of Gantner's monitoring solution for Angola's largest solar project include enhanced operational efficiency. By providing real time data on energy production, performance indicators, irradiation, weather conditions, and other key parameters, the system enables operators to identify potential issues before they become major problems.

Optimal performance is another advantage. Detailed analytics of the provided data help optimize power plant performance by identifying areas for improvement and fine tuning settings accordingly.

Proactive maintenance is a further benefit. Early detection of anomalies and predictive maintenance capabilities reduce downtime and increase overall efficiency, ensuring the long term reliability of the solar plants.

Finally, the system enhances decision making capabilities. Gantner's monitoring solution supplies comprehensive data, facilitating informed decisions at every level, from investors to operation and maintenance teams.

Conclusion

Gantner's involvement in Angola's largest solar project underscores the company's leadership in delivering innovative and reliable monitoring solutions. This project exemplifies a successful collaboration between global and local partners, paving the way for a sustainable energy future in this part of Africa.

In a talk with PES, Jörg Scholz discusses how providing clean, renewable energy through monitoring solutions for PV plants helps Angola reduce fossil fuel dependence and increase energy independence. We also look at plans for future expansions, including four off grid PV plants with a total capacity of 122 MW.

PES: In what ways does the project align with Angola's national energy policy and goals, and what future expansions or projects are planned as a result?

Jörg Scholz: The project provides clean, renewable energy to the country, reducing dependence on fossil fuels, and promoting sustainable development. By supplying monitoring solutions for seven large PV

plants, we're contributing to Angola's efforts to diversify its energy mix and increase energy independence.

Regarding future expansions or projects, our company has already been chosen as a supplier for the next stage of prestigious projects in Angola, a cluster of four off grid PV plants with a total installed capacity of 122 MW.

PES: How have advancements in monitoring technology, such as Gantner's Q.reader datalogger, impacted the efficiency and performance of utility scale PV plants?

JS: Such advancements have significantly impacted the efficiency and performance of utility scale PV plants by providing real time data acquisition, accurate measurements, and comprehensive analysis.

They enable operators to identify issues promptly, optimize system performance, and implement predictive maintenance strategies. This leads to increased energy output, reduced downtime and maintenance costs as well as overall improved plant efficiency.

Precise string measurement with Gantner string.bloxx enables faults to be pinpointed down to the affected string, enabling more targeted deployment of service personnel. For example, in a 370 MW plant with approximately 33,000 strings, this results in significant time and cost savings due to reduced service times.

Measuring parameters on the DC side of inverters allows for much more accurate monitoring and identification of issues such as shading, module degradation (PID), and problems with inverters temperature degradation and system design. This is especially beneficial for tracked systems, providing much more precise monitoring of tracking system efficiency.

Variance calculations of normalized string currents allow for the quick detection of faulty or underperforming strings, even among thousands of strings. This leads to rapid and effective troubleshooting and improvement of plant yield. Power losses and varying degradation within the PV park can be detected and monitored. Inverter efficiency, calculated from both accurate DC and AC parameters, aids in the preventive detection of inverter failures.

Even with a 5% fault in all 24 strings of a DC combiner, it is not possible to detect this error with zone monitoring. It is highly recommended to use DC string combiners with string monitoring. String currents measured in Gantner DC combiner boxes with shunts offer the best accuracy, approximately 0.5%, compared to Hall effect based systems, which typically have up to 7% error due to temperature influence.

PES: Can you discuss the importance of real time data acquisition in the management and optimization of large scale solar projects?

JS: Real time data acquisition is vital for large scale solar project management. It enables operators to monitor system performance, detect issues before they become critical, and make informed decisions about maintenance and upgrades. This leads to improved energy output, reduced downtime, and increased efficiency. Real time data also allows for predictive maintenance, reducing unplanned downtime and extending equipment lifespan.

Overall, it ensures smooth, efficient, and cost effective solar project operation, maximizing ROI.

Standardized PV data acquisition by Gantner Q.reader and normalized calculations enable reproducible analyses and services.

Structured data import with measurement rates up to 1 Hz and 1 minute resolution, including normalization, allows for quick and precise comparisons and benchmarks of plants and sub areas. Temperature and irradiation corrected data enable efficient troubleshooting and automatic detection of deviations.

Energetic losses, such as soiling and degradation, can be easily identified and verified. Precise, detailed data acquisition down to the string level forms the basis for an accurate digital twin and for future machine learning models.

The digital twin, based on the Gantner Mechanistic Performance Model (MPM), offers exceptional accuracy for short term forecasts during grid integration. It effectively identifies quality issues with components and unexpected yield losses. The model ensures precision up to +/- 2.5% for all components, from the string level to the grid connection point. Any deviations can be directly converted into losses, measured in either kWh or EUR.

PES: What trends are you seeing in the integration of predictive maintenance features in PV plant monitoring solutions, and how do these features enhance plant reliability?

JS: Predictive maintenance is becoming increasingly integral to PV plant monitoring solutions, driven by advancements in machine learning and data analytics. Trends indicate a shift towards more sophisticated algorithms that can accurately predict equipment failures based on historical and real time data. Additionally, these models can forecast energy production, predicting how much energy will be harnessed from the sun over the next few days, which is crucial when unexpected component failures occur.

These features enhance plant reliability by allowing operators to perform maintenance activities proactively, rather than reactively. This proactive maintenance approach prevents unexpected equipment failures, reduces downtime, and optimizes maintenance schedules. By accurately predicting when and where issues are likely to occur, predictive maintenance minimizes the risk of significant disruptions and ensures continuous, reliable plant operation. This not only extends the lifespan of plant assets but also improves overall energy production efficiency.

Moreover, our predictive models for consumption, or load forecasting, have already demonstrated promising results. Regarding energy generation, our aforementioned Mechanistic Performance Model (MPM), which integrates satellite data for forecasting, has been a long standing component of our solution, providing both forecast and real time data. This integration of predictive maintenance and forecasting capabilities ensures that PV plants can operate at peak efficiency and reliability, even in the face of unforeseen challenges.

PES: How does Gantner ensure the scalability and adaptability of its monitoring solutions to meet the needs of various utility scale PV projects globally?

JS: We achieve this by certifying our Power Plant Controller (PPC) according to grid code standards in numerous countries. We are globally present in various markets and continuously work on acquiring new certifications to meet the evolving standards. For example, we are currently obtaining certification for Spain's NTS standards. Our PPC is worldwide certified, including standards such as VDE- AR-N 4110, 4120, 4130, NTS 2.1, P.O.12.2 SENP, and EU 2016/631 RfG.

Jörg Scholz

This extensive certification process guarantees that our solutions are adaptable to different regulatory environments, ensuring compliance and optimal performance across diverse utility scale PV projects. Our commitment to global certification and compliance ensures that our monitoring solutions can be effectively scaled and adapted to meet the specific needs of various projects worldwide.

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About Gantner

Gantner Instruments Environment Solutions (GIES) is the Renewable Energy subsidiary of Austrian headquartered Gantner Instruments Group.

The company was founded in 2010 and is located in Germany.

GIES is a market leading full service PV monitoring and control supplier for utility scale PV and hybrid power plants with a combination of PV, wind, BESS and other energy sources.

The portfolio includes string monitoring devices, DC and AC combiner boxes, weather stations, power quality meters, data loggers, and the power plant controller 'Q. reader'.

To analyze the vast amounts of daily data as well as all historical data over the plant's lifetime, a cloud based SaaS solution called 'Gantner.webportal' was developed.

This solution is also applicable for optimizing the operation and maintenance (O&M) activities for PV plants.

All these solutions are provided to projects in 48 countries across five continents, with support from local teams and partners worldwide.