

# Grid feed-in at high-voltage level: a case study



Midden-Groningen © Goldbeck Solar

Grid integration is a key issue in the expansion of renewable energies throughout Europe. The requirements for power generation plants at all voltage levels have changed significantly with the pan-European harmonisation of grid connection requirements and the resulting adaptations to the national foundations. The aim of the EU regulation is to create a stable electricity grid throughout Europe in order to further increase the share of renewable energies with respect to climate goals.





These new regulations close the gap, particularly in the area of verification, which previously presented a grey area at the project level: manufacturers attested themselves with a manufacturer's declaration that ensured that their power plant controllers fulfilled the necessary requirements. Project-specific uncertainties during commissioning were the result. With the new network code throughout Europe a new step has been made.

Creating a solar power plant in the three-digit megawatt range such as Midden-Groningen with feed-in at the high voltage level is a challenge that is unparalleled in its

complexity and scope. The requirements for power plant control, especially for voltage and reactive power control, were high and the verification process to ensure grid code compliance was comprehensive.

With the pan-European harmonisation of grid connection conditions in accordance with EU Regulation 2016/631 Requirements for Generators (RfG) and the national implementations, the requirements for grid integration of renewable generation plants have increased. Even though both the technical requirements and the compliance verification procedure were already at a very high level in the grid area of the Dutch

transmission system operator TenneT TSO B.V.

#### **Case study: Zonnepark Midden-Groningen**

The 103 MWp solar park 'Zonnepark Midden-Groningen' near Sappemeer is the first solar park in the Netherlands to be directly connected to the national transmission network. It covers an area of approximately 116 hectares in the north-east of the Netherlands. Its total capacity of 103 MWp can cover the annual electricity consumption of around 32,000 households.

The solar power is fed in at a high-voltage level (110 kV), while the point of common





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coupling is located about five kilometres from the power plant. From the very beginning, the project team coordinated with the transmission system operator TenneT TSO B. V. to ensure the best possible project-specific implementation of the power plant control.

#### Joining forces for success

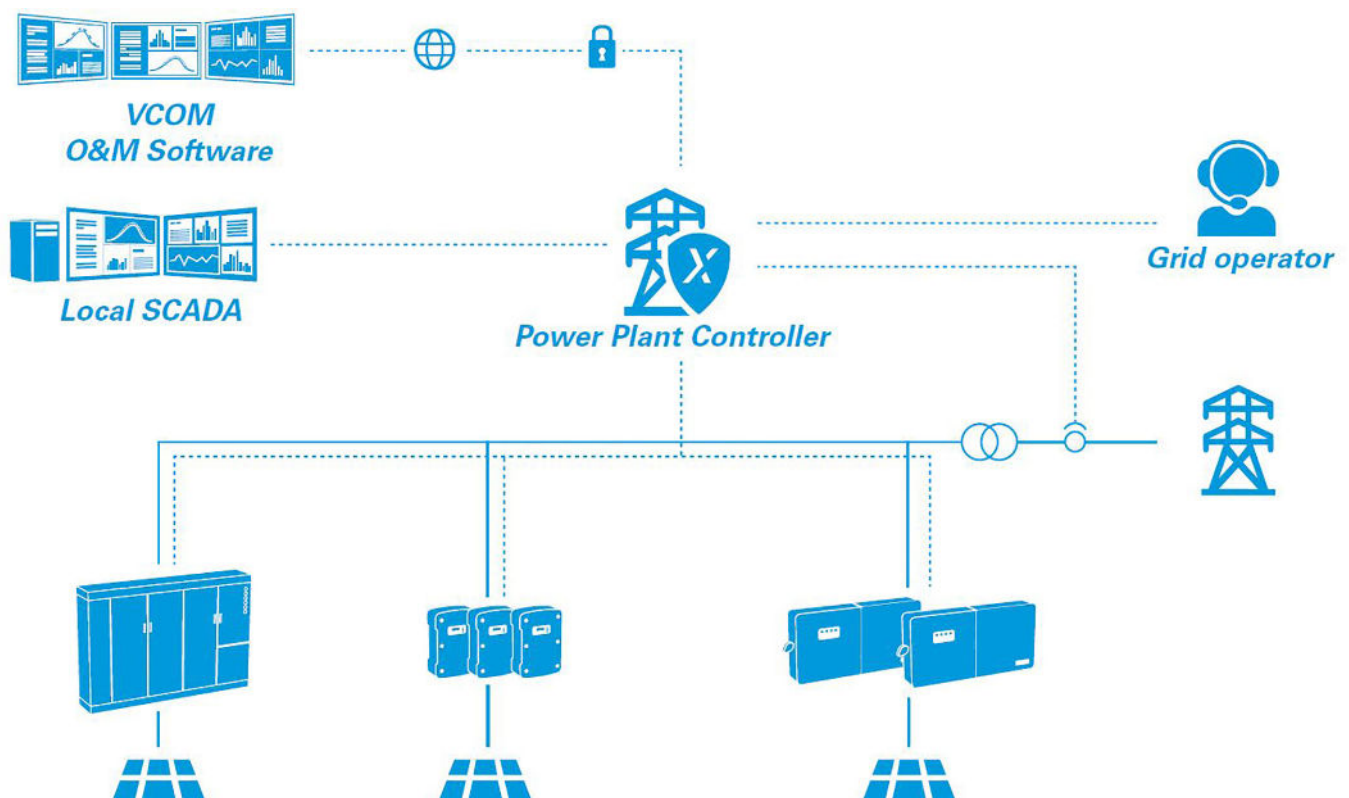
The ‘Zonnepark Midden-Groningen’ project was a milestone in terms of size and requirements for all the companies involved.

Deniz Urla, Head of Engineering & Design at Astronergy points out: ‘The multi-stage compliance verification procedure for obtaining the final operational notification from the grid operator was very comprehensive and complex in this project. We are glad to have found a competent and very experienced partner for power plant control in meteocontrol.’

Project success relies on innovative solutions and project-specific engineering. The

extensive verification through project-specific simulation and measurement of the power plant control not only confirmed once again, the high quality of meteocontrol’s controller simulation model, but also showed how crucial project-specific Grid Code Compliance (GCC) services are for the success of the project.

The possibility of adding project-specific functions to the meteocontrol Power Plant Controller (PPC) based on the standardised





controller blue'Log® XC also provides customers with the advantage of a reliable and flexible system.

The Power Plant Controller (PPC) enables the comprehensive and precise control of active and reactive power as well as the voltage of heterogeneous PV power plants.

A high-precision power analyser records all grid parameters during operation. This enables fast and stable control at the point of common coupling and continuous measurement of the power quality.

The flexible, modular and scalable features offer various advantages.

Export limitation for avoiding grid bottlenecks, demand-based reactive power control according to characteristic curve, highly dynamic frequency stability and process data exchange in real-time with the grid operator - the Power Plant Controller offers a wide range of functions for reliable grid integration of PV power plants. The range of functions can be flexibly expanded and adapted to any system topology on a project-specific basis. All interfaces have a modular design and thus allow for high scalability.

Regardless of whether it is a mixed park or a heterogeneous portfolio, the all-in-one

driver of the blue'Log® X-Series, meets the requirements of high protocol variety with a maximum level of flexibility. Regular updates continuously expand the compatibility of the system for a sustainable, future-proof solution. The graphical user interface allows easy and efficient commissioning.

meteocontrol has already had a power-generating system (PGS) controller with the component certificate required for German medium (VDE-AR-N 4110) and high voltage (VDE-AR-N 4120) since May 2019.

Functions can be added to the standardised power plant controller on a project-specific basis. Thus, enabling the development of a tailor-made power plant controller system for any international PV project. Simulation models, which can be provided for the Power Plant Controller in common development environments, such as DiGSILENT PowerFactory and PSS/E, are becoming increasingly important, especially for large solar power plants. In order to be able to evaluate the control behaviour of the active and reactive power control as early as in the planning phase, the simulation model validated to FGW TG4 can be used for system certification purposes.

The meteocontrol team was very happy to be part of this project and about the positive

feedback, such as that received from Luca Simonetti, who was the senior project manager at Goldbeck Solar: 'A successful project of this magnitude again confirms our confidence in meteocontrol when it comes to grid integration and grid code compliance of large solar parks.'

Solutions for complex issues and changing market conditions help to ensure reliable and practicable implementation in large-scale projects even in difficult circumstances. The products and services of meteocontrol can be a decisive factor for a successful grid connection.

'The extensive verification through project-specific simulation and measurement of the power plant control confirms the high quality of our simulation model. The simulated control behaviour reflects the real characteristics of the plant control very well. When our customers receive a Power Plant Controller, they are receiving a reliable, future-proof and extremely maintenance-friendly system,' states Markus Holzapfel, Product Manager at meteocontrol.

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