

greentech case study

Replacement of central inverters by string inverters for 2.6 MWp rooftop PV system in Germany

In order to extend the lifetime of an older plant portfolio beyond the feed-in subsidy period, the customer decided to replace the inverters of a large part of his photovoltaic plants with new ones. The plants are predominantly rooftop systems with outputs between 241 kWp and 4.0 MWp. In total, the program consists of 18 revamping projects within the portfolio.

In the plants of the respective portfolio, central inverters of two manufacturers are installed, who are not active on the market anymore. For this reason, it is not possible to fulfill the conditions of normative guidelines for continued operation, for example the VDE-AR-N 4105 or 4110, or to upgrade the existing inverters by the manufacturer.

In addition, the procurement of spare parts in case of defects or wear due to non-availability is a major challenge, which often leads to long downtimes of the inverters and a correspondingly reduced feed-in power. The idea was to equip all plants of the portfolio with inverter models from one manufacturer and to keep a few replacement components for each model on stock, which can be used later and universally on the various plants, if necessary. Since the portfolio also includes smaller plants, a manufacturer was sought whose product range of inverters would best meet the overall needs of the portfolio. In this case, greentech decided to use Huawei products, since the company's product range covers all the required power classes.

Due to the higher efficiency of newer inverter models and simultaneously decreasing costs for PV components, revamping measures usually pay for themselves after a short time. Especially with older systems, the relatively high feed-in tariff can compensate for the investment costs in most cases. In addition, the system is optimally prepared for continued operation after the end of the subsidy phase. The new warranty periods for the replaced components are also an advantage for further operation.

Initial situation

The PV plant from the portfolio considered here in detail is a rooftop plant built in 2004 with an output of 2.6 MWp in the City of Homburg, Germany. In this plant, a total of 13 central inverters are currently installed in two inverter stations, 9 of them with an output of 225 kW each, two with an output of 90 kW and one inverter each with 72 and 36 kW. They will be replaced by 22 Huawei string inverters SUN2000-100KTL-M1, each with an output of 100kW. The costs for the retrofit are expected to be amortized after 3 years at the latest, assuming an additional yield of about 5 percent.

Reasons for inverter repowering

- Long downtimes / reduced feed-in power and correspondingly high downtime costs in the event of defects.
- No spare parts or successor models available
- No modification of existing inverters according to current standards possible for continued operation after expiration of FIT
- Higher efficiency of new inverter models
- Decreasing costs for PV components
- New warranty periods for newly installed inverters
- Decreasing repair costs due to lower fault susceptibility of new components



Challenge

Originally, the modules of the plant are connected to generator junction boxes on the roof, which are connected to ground-level group collectors via DC cables. From the group collectors, the cables run underground via an increase in cross-section to the inverter stations, where one group collector each is connected to a central inverter.

When switching to the new string inverters, the existing plant design must be adapted so that in the future the generated power is distributed as evenly as possible to the individual connections of the 22 new inverters.



Picture: Roof system to be converted on an industrial company in Homburg, Germany

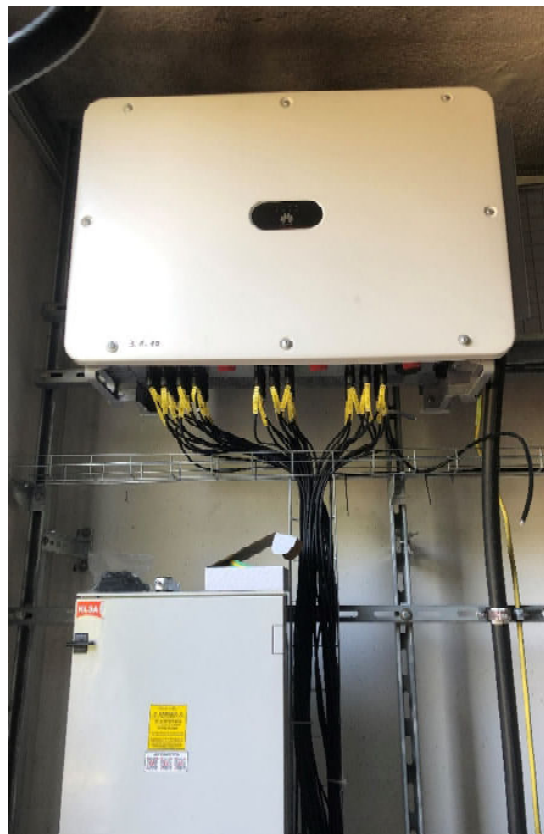
Solution

For the rebuild, the main DC cable pairs coming from the roof and connected together in the group collectors must be split with cross-sections of 50, 70 and 95 mm². This also means that some generator junction boxes on the roofs must be redirected at specific points in order to homogeneously distribute the connected load to the new SUN2000-100KTL inverters. For this purpose, a separate concept for the new cabling and the adaptation of the group collectors including the calculation of ampacity and voltage drop of the new setup was created during the planning.

To achieve the even distribution and the associated usability of the new inverters, the group collectors are converted: Circuit breakers are mounted so that the parallel DC main cables to the inverter station are now electrically separated from each other. A total of 49 circuit breakers are used in 9 group collectors protecting the main DC cables. The cables with cross-sections of 150 mm² and 300 mm² that run from there to the station are connected directly to busbars.

In the stations, up to three "inverted" DC distributors are connected to the new inverters, depending on the size of the cable cross-section. They distribute the current via solar DC cables with a cross-section of 6 mm² to the connections of the new inverters. A total of 26 DC distributors are assigned to the 22 inverters.

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Pictures: new string inverters, on the left and in the middle with one "inverted" DC distributor, on the right with two distributors

Inside the station the new inverters are installed at the positions of the old inverters. For ventilation reasons, a rack system is built that takes the distances between each inverter and to the walls and ceiling of the station into account. The old ventilation system for the central inverters will also continue to be used. An advantage in this project is that the inverters selected can be installed with less distance between them than comparable products from other manufacturers. Due to the limited space available in the stations, greater spacing requirements would only have been feasible with considerable additional expense, such as reconstruction work on the station.

In the future, the data communication and the load management of the plant will be carried out via the data logger Huawei Smartlogger 3000 EUA01. This is configured in advance by greentech and connected to the plant according to the local conditions.

Advantages of the inverter replacement for this PV project

- Continued operation only possible with use of new inverters
- Relatively fast amortization of the project due to high feed-in tariff and higher efficiency of the new inverter models as well as reduced maintenance efforts
- Different inverter models of one manufacturer can be used for the overall portfolio
- Lower distance requirements of the inverters, compared to similar products of other manufacturers
- good price-performance ratio of the inverters



You have questions? Please contact us!

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