Success Story:
sia energy / Buck Solar

Markets Served
Photovoltaics

We have high confidence in the DC24 with Eaton's PLC. The solution is future-proof and we see good opportunities for integration into building automation systems overall.

Chris Wägerle, technical manager at Buck Solar

Autonomy in Solar Power

Location:
Germany

Segment:
Renewable energy

Problem:
Automation of an energy storage device

Solution:
XV102 HMI/PLC with SmartWire-DT, easy500 control relay, SmartWire-DT I/O modules

Results:
Powerful, compact, flexible and reliable monitoring and control of an innovative battery storage concept

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Background

Nowadays, the feed-in tariff for solar electricity is no longer a major incentive for the installation of a photovoltaic (PV) installation. However, the fact that electricity prices will continue to rise in future is nevertheless obvious. For the operators of PV installations, the use of self-generated solar power for one's own consumption it is increasingly becoming worthwhile.

Energy storage devices are some of the great beacons of hope in the industry, since they enable the user to increase the share of self-generated electricity consumption and thus become less dependent on the energy supplier and their price policy. Battery storage devices in particular are ideal for private households and smaller companies and have been eligible for state subsidies in Germany since May 2013.

The company sia energy, based in Lindenberg in the Allgäu region, has made a name for itself as a specialist in all issues related to photovoltaics. The origins of the company are based on the rental of extensive roof space for their own energy requirements. Drawing on their own personal experience with a wide range of products and technologies, the sia team was able to grow into becoming expert advisors and consultants on the subject. For many years, sia energy focused on the design engineering and installation of complete systems – from small applications for private households, right through to large-scale installations for industrial plants. Their recipe for success is based on individual and continuous customer support as well as the use of field-proven products.

The need for an effective energy storage device and the fact that there was nothing of this kind adequate on the market became clear to these experts already a few years ago. Together with a partner that had decades of experience in the battery and energy storage field, the company decided to develop an innovative, high quality and effective battery solution.

Challenges

Due to their good knowledge of customer requirements and their practical experience, two issues became top priorities: The storage device had to operate as loss-free as possible and had to be flexible enough to support the expansion or modification of PV installations. The two previous concepts available on the market had not been able to combine these two features.

The most common type of storage device available operates on the consumer side of the power inverter and converts the direct current (DC) generated by the solar modules into alternating current (AC). Battery storage therefore needed two further transformations (AC-DC & DC-AC). These AC systems therefore involve considerable losses (approx. 20-30%). DC systems with a storage device that is charged directly with DC

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current directly from the solar modules have to date been difficult to use. This is because the battery voltage has to be adjusted precisely to the module voltage, so that only a very specific number of modules can be connected, thus also preventing a later retrofitting of the systems.

sia energy therefore took up these challenges and developed a new solution that stores the solar electricity directly on the DC side virtually loss-free with an efficiency of 93%, and at the same time allows the flexible connection of string voltages between 200 and 1,000 V. The company decided to use Eaton technology for monitoring and controlling the demanding system.

Solution

"For our new DC24 storage device it was important for us to use proven automation technology," comments Thilo Andonovic, responsible for technology at sia energy. At the same time, the controller had to be compact, modular and flexible. Designed for visualization and for PLC functions for controlling small to complex machines and plants, the XV102 touch display PLCs were selected. The programming and visualization here is based on CoDeSys in accordance with IEC61131-3. "Thanks to the use of CoDeSys, we and our partners don't have to acquire any complicated software licenses or programming devices – in our view a considerable benefit," the engineer explains.

Unlike many other solutions, the DC24 is now already available for delivery and is field tested. sia energy is currently having the system patented, but around 50 units have already been successfully in operation at end customers. One of the first applications to be installed at the beginning of 2013 was in a private home in Vaihingen/Enz, which was built in compliance with the latest energy standards. As the heat pumps for the ventilation system operate round the clock, the architect and owner Thomas Gutjahr soon agreed that the PV installation had to be equipped with an energy storage device.

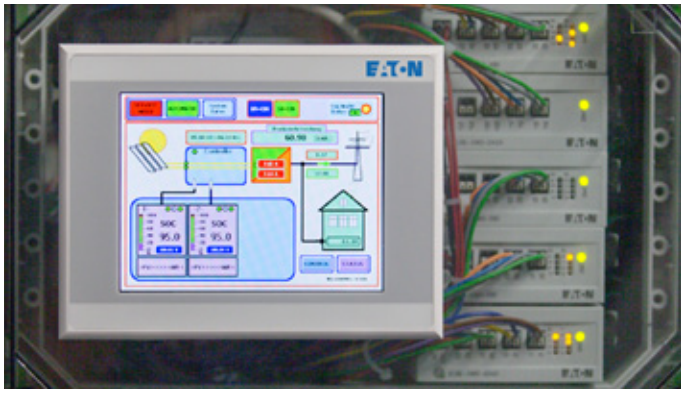
The PV specialists Buck Solar GmbH & Co. KG, based in Markgröningen, are important partners in the dealership network of sia energy. Buck Solar installed the PV installation with an output of almost 8 kWp and helped the operator to become "price autonomous" so to speak. At night the battery storage device provides enough power to the heat pumps in the home so that hardly any additional electricity has to be purchased.

Thomas Gutjahr can view all actual values at a glance on the Eaton HMI/PLC: his generated solar power output to date, the electricity purchased, the electricity sold, as well as the total consumption of the building. He does not have to do anything else with the controller. This is delivered to the dealer pre-programmed by sia energy. The dealer just has to configure on the touch panel some important basic settings for the installation as well information about the power inverter.

Results

"In our view, the DC24 is the leading product on the market and is around one year ahead of the competition – in terms of technology and in terms of its availability," stresses Chris Wägerle, technical manager at Buck Solar. "The system works, and the customer soon realizes that this is really something different to the products of the competition. Having this unique selling point means a great deal to us." He is currently retrofitting energy storage devices in the PV installations of many of his customers. For him, the fact that the energy storage device is maintenance free, has a long lifespan and that the integrated components are available at any time are important factors. "Eaton's HMI/PLC is industry-proven and I always get spares very quickly if any replacements are necessary. It is also useful that we can easily upload the software and updates quickly via a USB interface." He also sees a great benefit in the fact that the XV102 can be operated completely via the touch screen, and that he can save a lot of time for any fine tuning because he never requires a laptop at the installation.

The XV102 HMI/PLC can be operated easily via the touch screen, a laptop is not needed for the configuration.



The Eaton HMI/PLC comes with several interfaces and the SmartWire-DT connection technology simplifies the wiring.

One standout feature of the DC24 is the fact that the PLC monitors every single battery cell in real time. A data logging of the cell temperature here is particularly useful for warranty issues. If a cell can no longer produce the necessary capacity, the entire battery bank switches off and an error message is output. In this way, it can never occur that a "bad" cell infects the other cells in the battery bank. The error message of the system enables the installer to make a targeted replacement of the faulty cell.

In future sia energy plans to provide an app to make the data of the energy storage device also available on a smartphone. "We are also very impressed by the DC24 and the Eaton HMI/PLC as this solution is really future-proof," says Chris Wägerle gladly. "After all, we see good opportunities to generally integrate the system in the building automation system and the management of other consumers. Thanks to the various interfaces on the XV102 and the modular design, this can be done easily at any time."

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