

# WHITEPAPER AVAILABILITY

## AVAILABILITY IS THE KEY TO SUCCESSFUL PV PROJECTS

The high quality of SMA inverters guarantees profitability and quick amortization



**PV power plant projects in the megawatt and gigawatt range are long-term capital investments, operators and investors rely on their profitability. The investment pays off only if these multi-megawatt projects reliably generate the calculated yields over decades.**

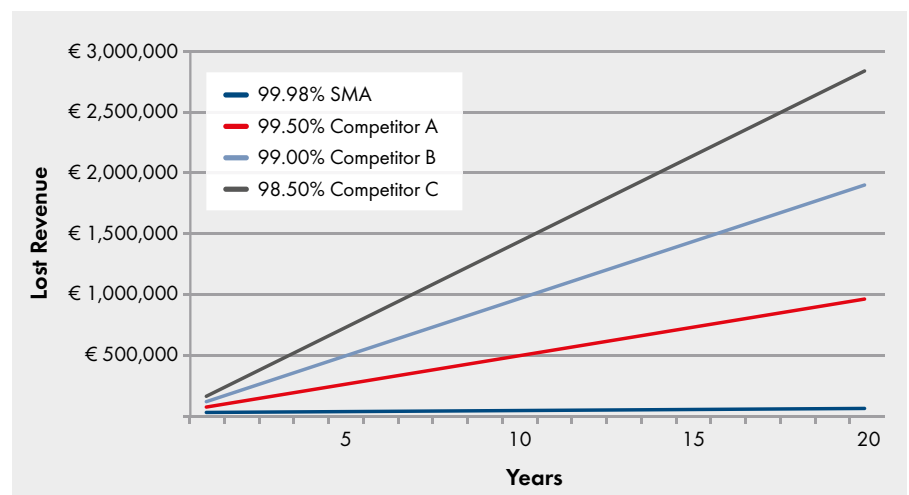
The key word here is availability. Only consistently reliable rates of availability can guarantee optimum yields, maximum returns and quick amortization of the project. Even with slightly reduced availability of a PV power plant, OPEX costs and overall operating costs increase. The situation becomes particularly critical if guarantees of availability have been concluded with the electric utility company. In this case, high penalty payments can also significantly compromise a power plant's profitability.

PV power plants with solutions from SMA have availability rates of up to 99.98

percent.\* The basis for this availability is technically sophisticated, state-of-the-art solutions that are subjected to the highest quality measures as early as the design phase and during the production process. Demanding tests in SMA's unique test center also ensure maximum availability rates and extremely long service

lives—backed up by perfectly coordinated services and comprehensive O&M benefits.

*\*Source: system under SMA service contract*



**Assumptions:** PPA rate: 5.5 Euro cents, kWh/kWp: 1300, plant service contract term: 20 years  
DC/AC ratio: 130%, plant size: 100 MW<sub>ac</sub>



## 1. UNIQUE STACK DESIGN AND INNOVATIVE CONCEPTS

SMA is the only inverter manufacturer and system solution provider with more than 35 years of experience, a total installed capacity of over 55 gigawatts worldwide and unique experience in the development, design and engineering of inverters and complete solutions for every requirement and need.

Technological developments with positive effects on power plant performance are

responsible for the success of PV power plants throughout the world. Among other solutions, SMA has developed the intelligent cooling system OptiCool, which guarantees successful outdoor installation of SMA inverters in all climatic conditions. It is based on a stack topology with a design reserve of 38 percent for all 1500-volt central inverters.



## 2. DEMANDING TESTS FOR OUTSTANDING PRODUCTS AND SOLUTIONS



From a single screw to the finished device: At SMA, all the components of an inverter as well as the various components of a complete solution, such as the Medium Voltage Power Stations, are subjected to rigorous qualification and test procedures prior to and during the production phase. Other essential tests for all Sunny Central inverters take place in the Test Center. Every day, in this building of some 1,400 m<sup>2</sup>, extremely qualified testing and development engineers test central inverters for compliance with SMA's high qual-

ity standards as well as all relevant grid codes, statutes and directives. In seven test chambers, the test area, and at 12 system and development test positions, state-of-the-art measuring techniques are used to determine, among others, voltage, current, performance, temperature, humidity and electromagnetic compatibility.

## 3. PIONEERING PRODUCTION PROCESSES



Our inverters are produced in production halls organized using the latest standards. All the data required for the long-term, high availability of the inverters is documented during production to ensure that SMA's high quality standards can always be tracked in every individual production step. As a result, the highest

safety standards are complied with and error risks minimized. At the same time, each inverter becomes "transparent" during the production process. This simplifies subsequent maintenance and repair work and saves time and money. The exceptional quality of SMA central inverters is also ensured by state-of-the-art production methods and forward-looking standards. This includes the modern "Worker Information System" (WIS), which always ensures and checks that, based on the selected option code, all required components are correctly provided.

An intelligent, electronically controlled screw system makes certain that all high voltage connections meet all applicable safety requirements. Furthermore, pre-programmed torques for every bolted

connection guarantee the highest level of safety at all other critical connections.

During production of SMA central inverters, components are already checked for accuracy and correct functioning before being installed in the inverter. Ready-to-use modules, such as the DC ANSI module and the stack, are automatically tested using state-of-the-art series testing equipment before they can be installed in the inverters. This prevents errors and lays the foundation for a perfectly functioning finished inverter.



### STACK TESTING

In contrast to other manufacturers, SMA develops and produces numerous modules itself. This includes printed circuit boards (PCBs), DC and AC modules and inverter stacks. SMA tests the functionality of these components before they are installed in the inverter to obtain precise information about their functionality in the same position they will be later in the inverter.

- Tests at 100% power
- Electronic documentation of stack behavior to gather information on how the stack behaves in the inverter
- Individual test chambers for 1000-volt and 1500-volt AC modules



### SERIES END TEST

At the end of the production process, every Sunny Central inverter is intensively and comprehensively tested to ensure optimal functionality. The series end test consists of the protective conductor HV test, a function test and the performance end test.

- Tests meet all required standards and certifications
- Manual tests for special customer communication or technology packages and special versions
- Full grid function test including AC voltage and AC frequency
- Electronic storage and provision of all documentation, including digital
- Electronic goods issue inspection



### PERFORMANCE END TEST

In the performance end test chambers, the inverters are tested in the effective V-loop procedure at 100% power.

Two central inverters alternate between inverter and rectifier operation so that only the power loss of both systems must be fed in.

In addition, high temperatures caused by waste heat provide an opportunity to test the inverters' thermal properties. A precise analysis of the equipment behavior in the field is therefore possible in advance.



## 4. GLOBAL SMA SERVICE GUARANTEES YIELDS AND INVESTMENTS

In PV power plants around the world, Sunny Central inverters and medium-voltage solutions from SMA with a capacity of over 25 gigawatts guarantee the highest level of availability. With a range of services offered, SMA Service ensures the long-term efficiency and profitability of large PV power plants. This ensures optimal and reliable system performance with maximum yields of over 25 years and beyond.



### “THE FOCUS IS ON RELIABILITY AND QUALITY”

Three questions for Boris Wolff, Executive Vice President of the Utility business unit at SMA



#### 1. What makes a PV power plant a successful project for all shareholders?

A PV power plant is successful if it consistently generates maximum energy yields over the entire lifetime of the system of 25 years or more, thereby securing the return on investment. Here, integrated solutions play a central role, such as the SMA Medium Voltage Power Station with perfectly coordinated components that reliably generate power from the DC side up to grid feed-in.

#### 2. Is the focus still on the efficiency of the inverters?

It is true that for a long time the competition between inverter manufacturers was primarily concerned with increasing efficiency to achieve even higher yields. Those days are over. Over the past few years, PV equipment has offered increasingly better performance. This means that now, for example, all central inverters almost always operate at the same level of efficiency. Today, the focus is increasingly on the issues of availability and reliability.

#### 3. How can inverters ensure that PV projects are reliable long term?

If you consider that when an inverter breaks down for one day this corresponds to a loss in efficiency of 0.72 percent, then it quickly becomes clear that successful PV projects are dependent on the reliability of the inverters or solutions. For this reason, we are also specifically focusing on inverter quality. This begins in the design phase for both the inverter and the individual components from which the inverter is composed. During the manufacturing process, state-of-the-art production processes with regular, automatic test and control stages constantly ensure that error risks are already ruled out in this phase. Final series tests and demanding performance end tests complement these processes.