



SMA LARGE SCALE ENERGY SOLUTIONS

My Investment. Our Grids. Our Climate.

Make your energy investment ready
for the grids of the future.



Generate solar power
and use it effectively



Store energy and
use it broadly



Manage and
connect energy



Achieve 100%
grid independence



Safe and stable grids



Power conversion for
hydrogen applications

Large Scale Energy Solutions by SMA

Clean energy and stable grids for future generations

The world of energy is changing. Diverse interconnected power plants are driving the energy transition forward. Digital technologies are creating completely new opportunities and possibilities for market participants to shape the energy transition. With over 40 years of energy experience, SMA is uniquely qualified to navigate and shape this complex landscape. Let's partner up and achieve your investment and sustainability goals together.



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Why SMA?

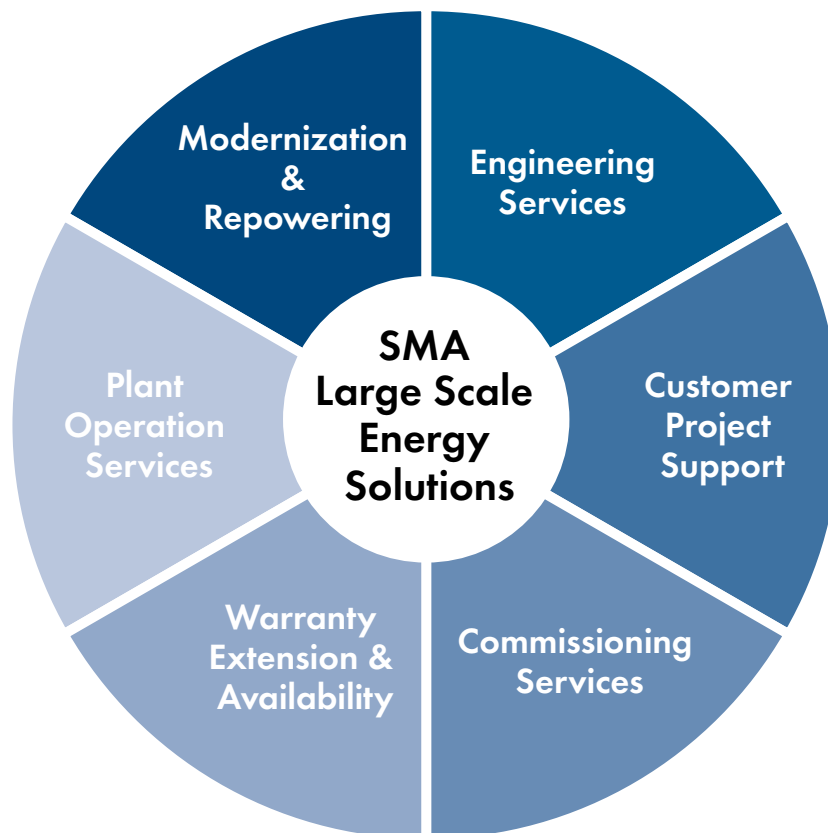
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New business models require new applications

As the energy market becomes more and more complex, it also becomes vital to anticipate future developments, needs and functionalities. One thing is certain: in the highly dynamic energy market of the future, seamless integration of different systems will be crucial. Whether you want to form grids, facilitate black starts or ensure an uninterrupted power supply, system integration will play a major role.*

Everything from a single source

With a SMA Large Scale Energy Solution you receive a customized offering for your specific investment objectives: optimize energy yields, link energy sectors and manage them intelligently. The portfolio is supplemented by convenient service solutions. Best of all, the longevity of our equipment ensures the sustainability of your investment over a long period of time and equips you for future requirements.



*Product and service availability may differ by country.



Flexibility for all use cases.

THIS IS NEXT LEVEL ENERGY – Sunny Central FLEX

Sunny Central FLEX is a modular large scale power conversion solution that enables you to design, build and adapt all existing and upcoming power plant use cases. This flexible, single supplier solution enhanced with SMA's leading edge Grid Forming technology and project specific support seamlessly integrates into current and future power grids. Sunny Central FLEX easily meets the demands of your most challenging energy projects.



With its flexible platform, you can design, build and adapt it to suit a large variety of applications ranging from solar, energy storage and power to gas.*

The possibilities are endless with these significant features:

- Fully integrated AC/DC and DC/DC converter, and energy storage retrofit options
- Medium Voltage transformer and medium-voltage switchgear
- Comprehensive plant and data management system
- Grid forming capabilities
- Full life cycle project assistance

With its industry-standard 40-foot-high cube platform including CSC-certified transportation frame, Sunny Central FLEX is easy to transport and quick to commission.

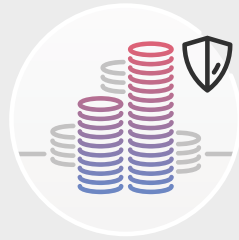
Built today to meet the clean energy needs of the future.

*Solar standalone available now, other modules will follow the release schedule

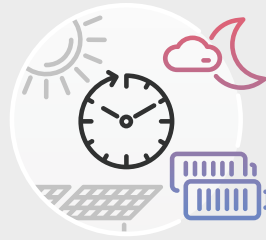
Benefits



Maximum energy yield



Faster time to market

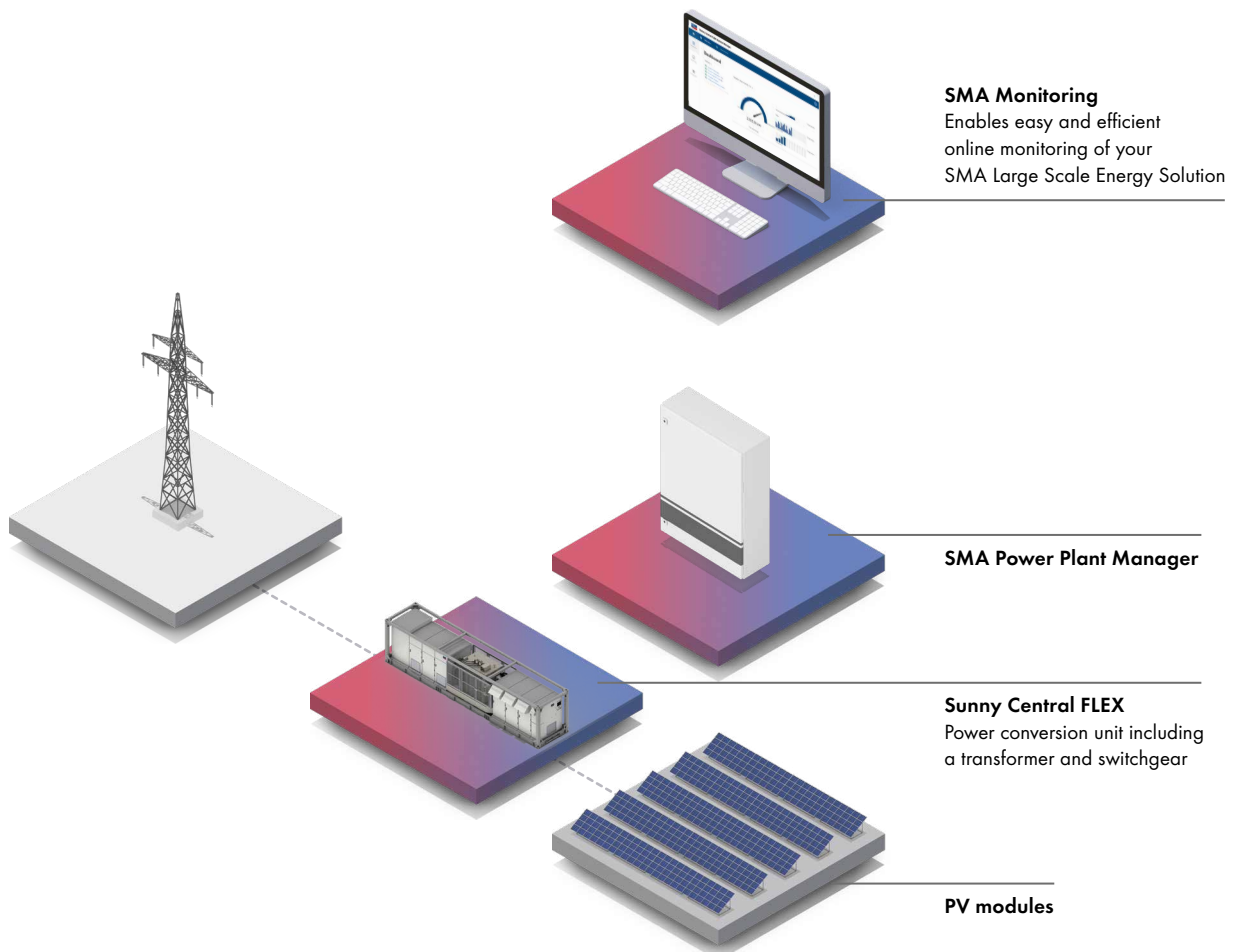


Modular design enables flexible project sizing options



High performance and reliability

Sunny Central FLEX rigorous quality control testing including accelerated lifetime tests and its decentralized cooling, enable it to withstand the harshest of environments.





Generate solar power and use it effectively.

Sustainable investing and maximum profit

Every SMA Large Scale Energy Solution stands for longevity, maximum performance and top quality. Highly integrated solutions for PV power plants with varying system structures provide you with maximum flexibility in implementation and options for expansion at all times. That gives you the highest possible yields for over 20 years and a maximum return on investment.

Medium Voltage Power Station UP



A truly global solution

The SMA Medium Voltage Power Station (MVPS) offers the highest power density in a plug and play design, which is suitable for global use. Rely on the most robust, technically advanced and internationally certified hardware for power conversion in any climate. As one of the first truly global systems, it is the ideal choice for next-generation PV power plants operating at 1,500 VDC.

- Sunny Central UP, our most powerful inverter with up to 4,600 kVA, is the heart of the MVPS UP
- Easy transport with a CSC-compliant container
- Pre-installed components
- Minimum O&M requirements
- Integrated switchgear and transformer
- Maximum design flexibility

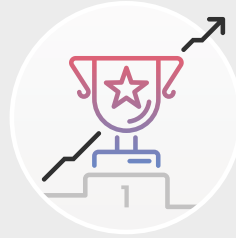
Benefits



Maximum energy yield



Quick profit



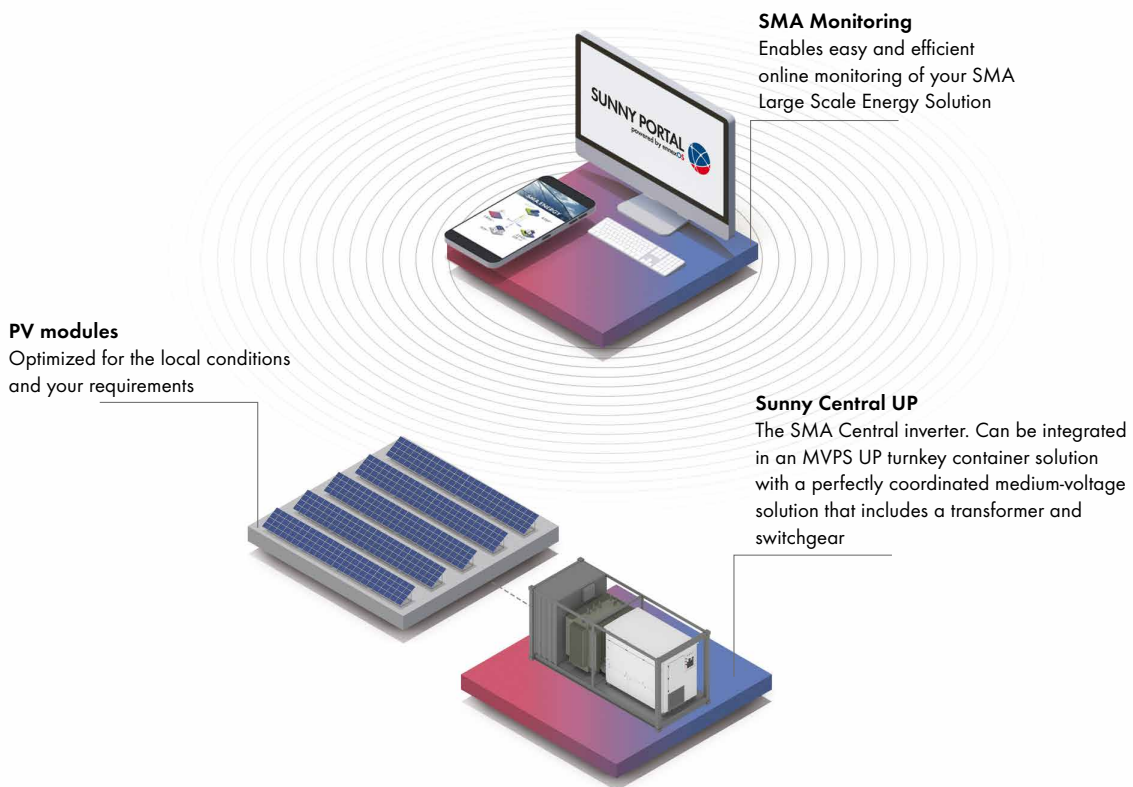
Increased competitiveness



No commodity price risk

SMA offers a fitting solution for every project

A centralized solution layout is the ideal choice for large-scale, ground-mounted PV projects.





Generate solar power and use it effectively.

System architectures tailored to your project's needs

Which setup is the right one for your project – a few large central inverters or several smaller string inverters? Well, it all depends on your project requirements and your investment objectives. In any case, you can rest assured that SMA offers the right solution for your needs. Moreover, we'll work with you and advise you in the decision-making process, setting up your project for success from the get-go.

Sunny Highpower PEAK3

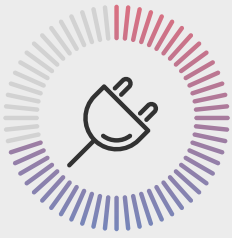
Compact string solution

PEAK3 stands for pure power. With its compact design, the inverter offers the highest power density per device and is ideally suited for different layouts, floating applications and repowering projects.

- Powerful 100 to 180 kW decentralized inverter offering 100% power up to 50°C
- Quick and safe installation
- Increased yield at the plant level by reducing AC cabling losses
- OptiCool, an intelligent temperature management system, increases inverter life
- Single MPP tracker for a lower failure rate
- SMA Smart Connected reduces revenue losses and downtime thanks to AI and predictive maintenance
- Extra high design life and warranty extensions up to 25 years
- Compatible with AC voltages down to 200V for flexible repowering solutions



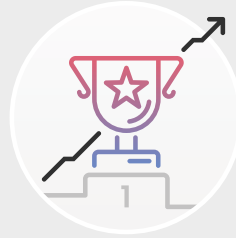
Benefits



Maximum energy yield



Quick profit

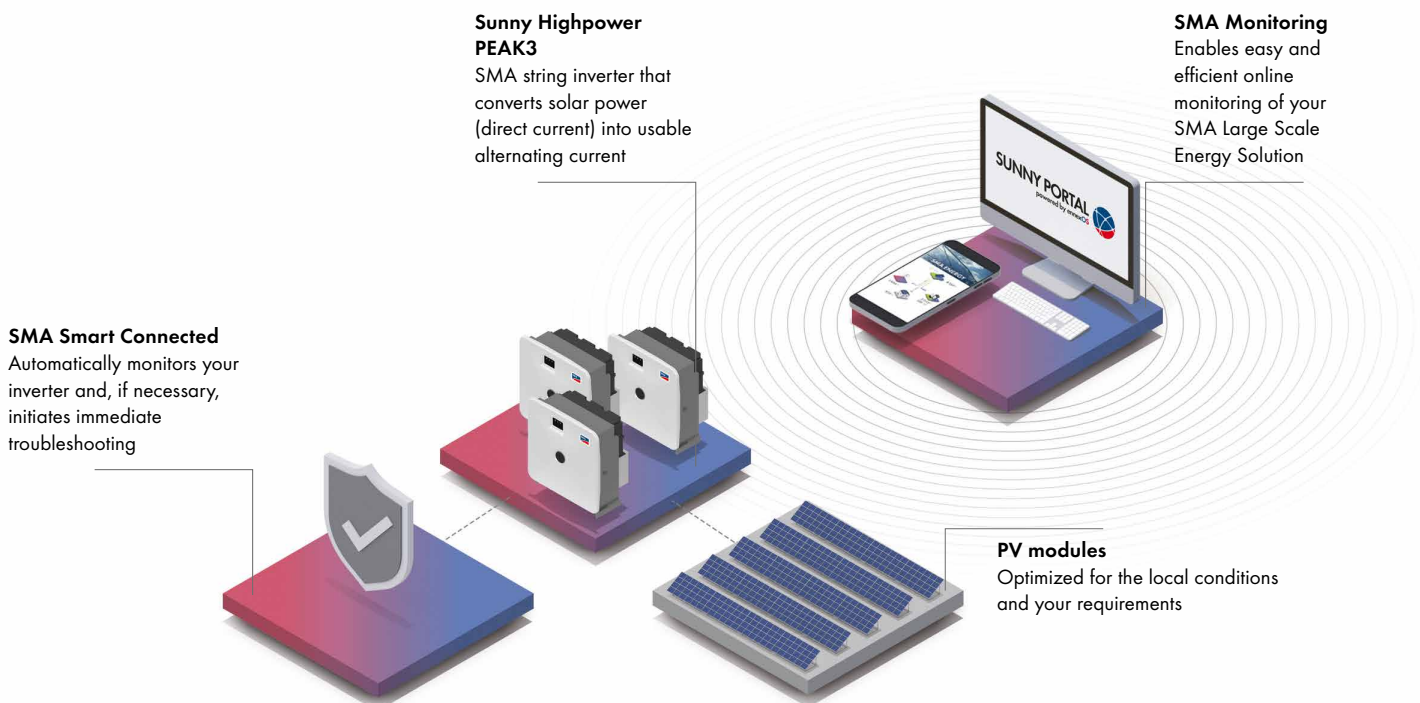


Increased competitiveness



No commodity price risk

For diverse project requirements, several smaller and easier-to-handle inverters can be used.





Store energy and use it broadly.

Secure investment in emerging technology

The SMA Sunny Central Storage UP battery storage solution allows you to store and use energy flexibly. This enables you to manage peaks in demand, stabilize grid voltage and reduce energy costs considerably. The battery storage solutions increase the efficiency of your power plant and perform important grid management functions. Grid frequency fluctuations are avoided thanks to smart plant control with the SMA Power Plant Manager and grid voltage is restored in seconds.



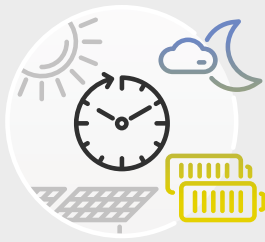
SMA Sunny Central Storage UP battery inverter

Solar power available day and night

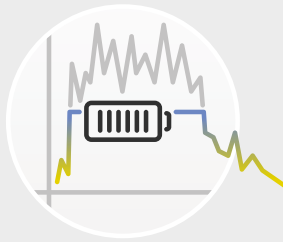
The Sunny Central Storage UP battery inverter is made for large scale storage systems. It stores energy in high-voltage batteries and makes it available as required. It can be used flexibly in both PV and hybrid systems. The SMA intelligent temperature management system OptiCool, ensures smooth operation, even in extreme ambient temperatures.

- Extremely efficient with a power output of up to 4,600 kVA
- Can store and discharge energy within milliseconds
- Suitable for continuous power in power plants in any climate
- Enables dynamic grid support

Benefits



Supplies renewable energy
24/7



Compensates for load
peaks with stored power



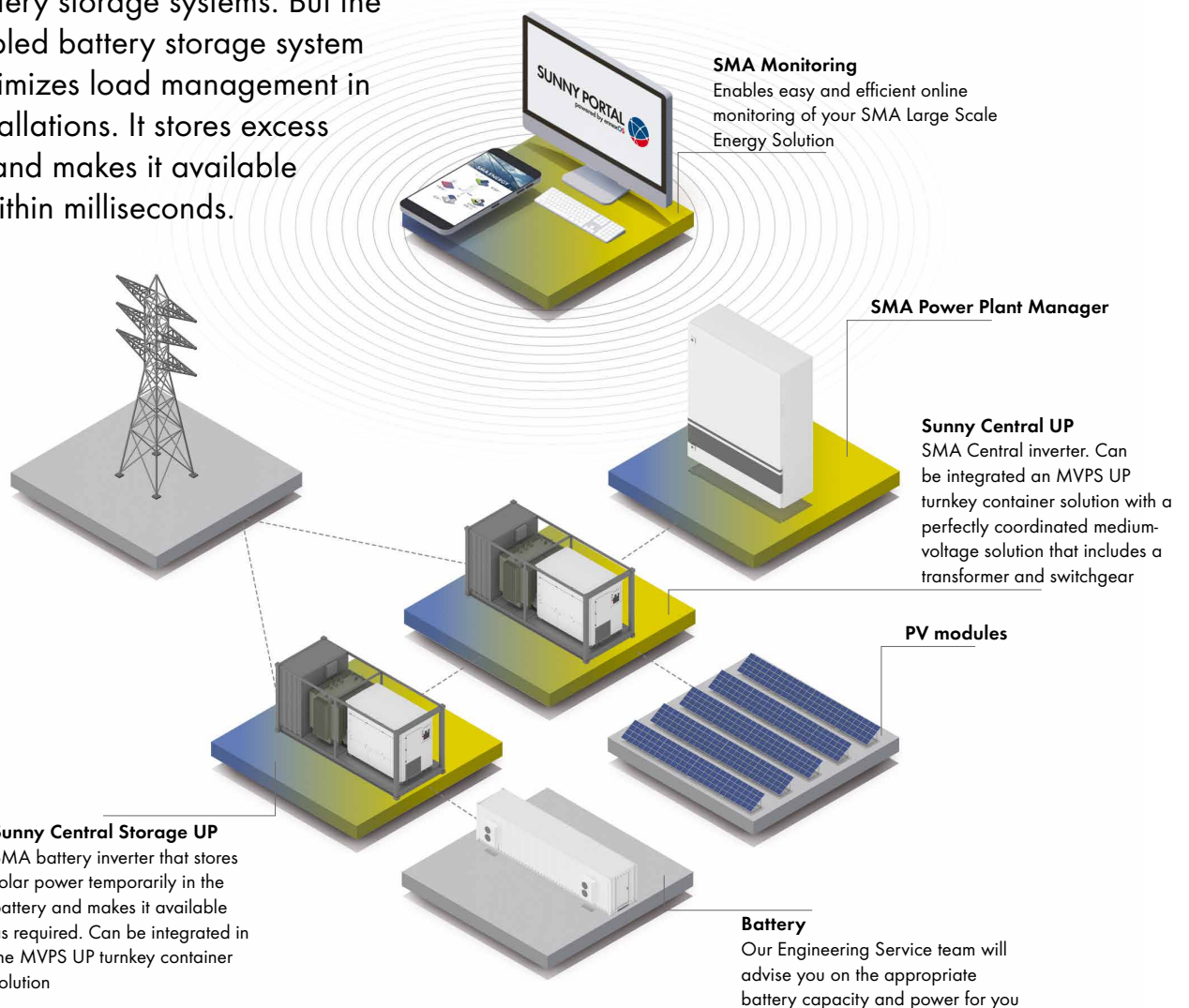
High flexibility through
extremely fast charging/
discharging



Additional profit maximization

AC coupled systems

AC coupled systems are ideal when existing power plants are retrofitted with battery storage systems. But the AC coupled battery storage system also optimizes load management in new installations. It stores excess energy and makes it available again within milliseconds.



■ Non-SMA components



Greater efficiency for large PV power plants.

DC coupled systems are ideally suited for the new installation of large PV power plants with Sunny Central 1,500 V technology. The battery and PV array are connected to the central inverter on the DC side, and excess solar energy is fed directly into the battery in a particularly efficient manner.



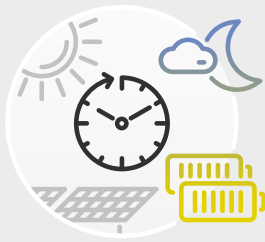
SMA DC-DC Converter

DC coupled systems

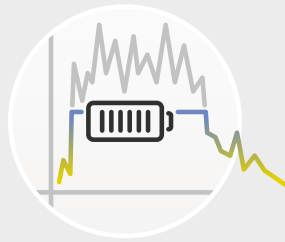
The SMA DC-DC Converter allows designers to increase their PV power plant's yields by oversizing the DC array without compromising energy losses. The inverter can intelligently control the flow of power for many different use cases. The stored energy can be fed in at attractive times, for example, in the morning or at night, to achieve a better price point for the energy.

- Up to six DC-DC converters can be connected and operated simultaneously with the Sunny Central inverter
- Intelligent power flow control of the system in the Sunny Central
- Step-up/step-down converter with battery charge/discharge function
- Enables new business models with stacked revenue streams

Benefits



Supplies renewable energy
24/7



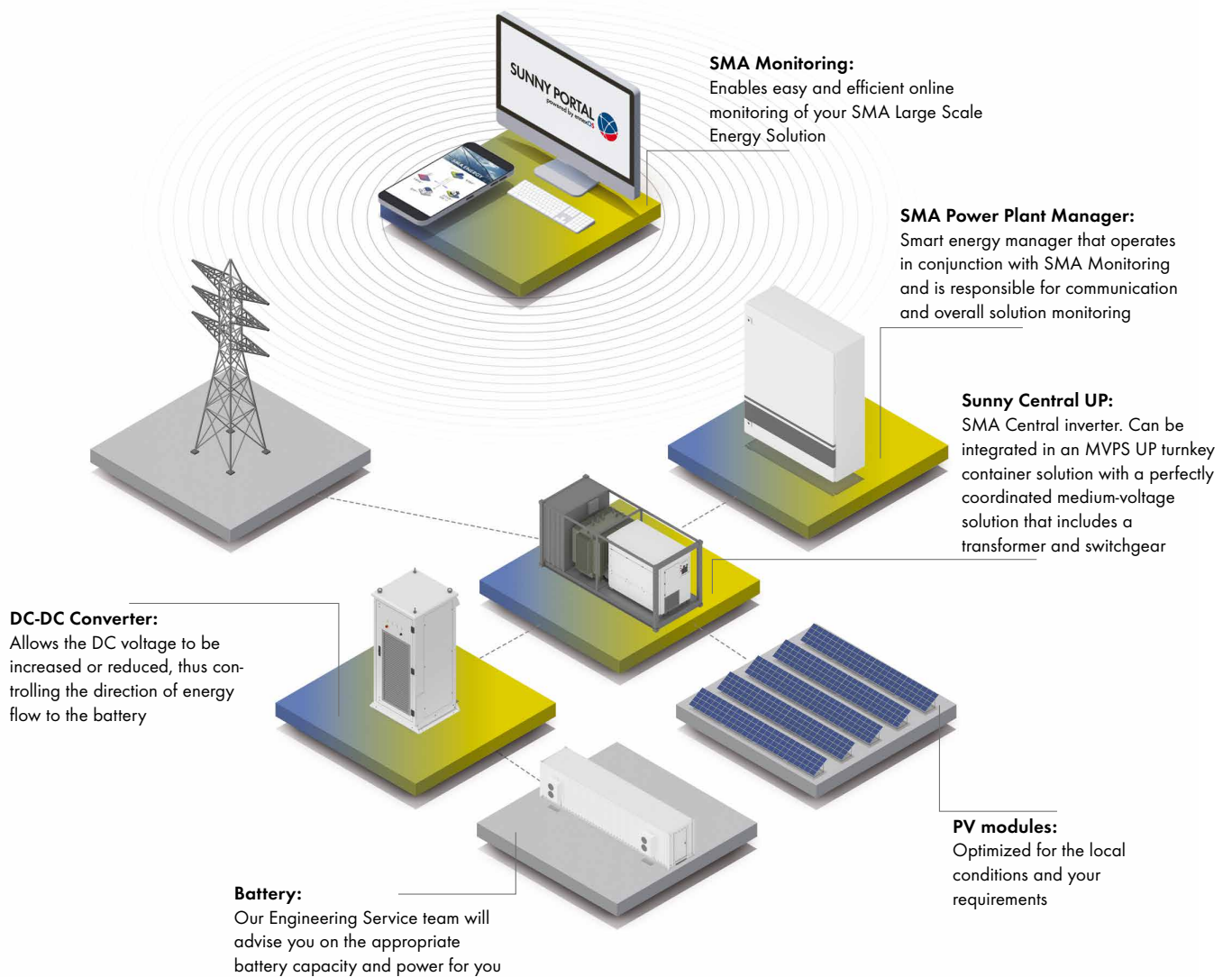
Compensates for load
peaks with stored power



High flexibility through
extremely fast charging
and discharging



Additional
profit maximization





Manage and connect energy.

Intelligent use of solar power and energy management

The SMA Power Plant Manager combines all the energy flows and system components in your PV power plant to create a single, all-encompassing solution. It not only monitors and controls grid-compliant energy generation, but also enables the digitalization of power plants and participation in the energy market of the future.



SMA Power Plant Manager

The brain of your SMA Large Scale Energy Solution

Together with Sunny Portal, SMA's monitoring and management platform, the SMA Power Plant Manager is the central system of your SMA Large Scale Energy Solution and intelligently manages all energy flows.

- Controls generation power and optimizes energy flow
- Controls active and reactive power as necessary
- Supports voltage and frequency control
- Records, analyzes and visualizes relevant data in Sunny Portal

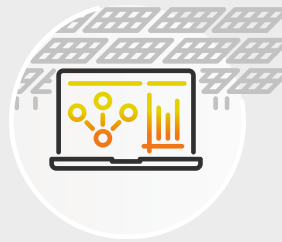
Benefits



Save on generator and diesel costs



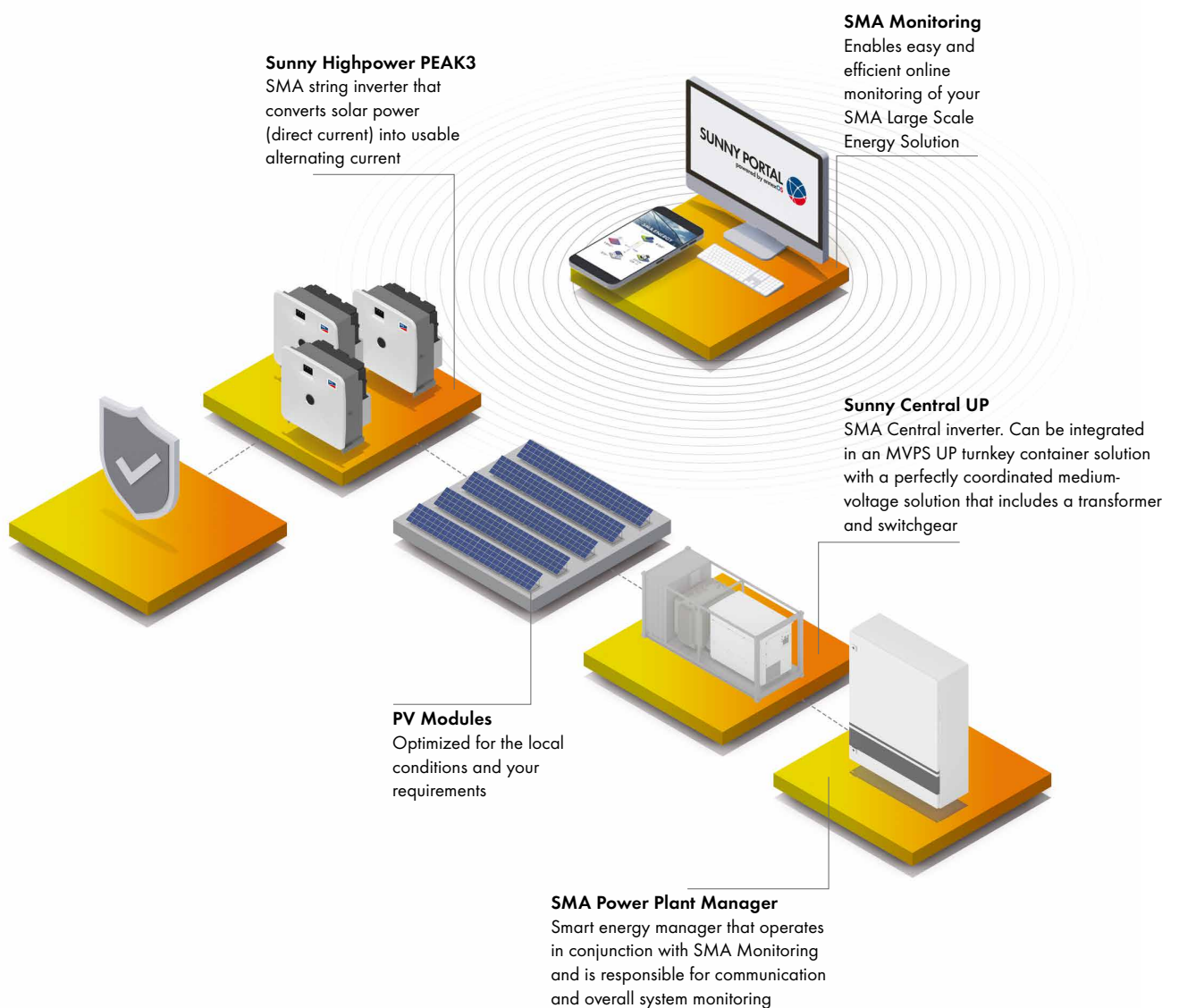
Central interface for data overview and analysis: Sunny Portal



Easy monitoring and control of large-scale PV power plants



Remote access: reduced service costs and increased security





Grid independence with solar power.

Off-grid energy worldwide

Battery storage systems provide remote regions with a reliable supply, covering up to 100% of their needs with sustainable energy and reducing harmful emissions. With their grid-forming properties, the SMA Sunny Central Storage battery inverter and the intelligent SMA Power Plant Manager ensure that utility grids are 100% stable and provide an all-round supply that conserves resources.

SMA Power Plant Manager



Manage energy and digitalize power plants

By intelligently managing all energy flows within a micro-grid, the SMA Power Plant Manager enables a 100% renewable energy supply.

- Keeps reserve power available
- Establishes grid-forming operation including black start in the event of utility grid failure
- Secures a back-up power supply
- Controls power generation and optimizes energy flow

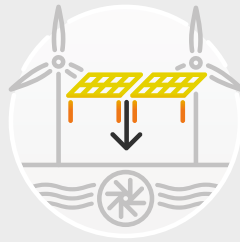
Benefits



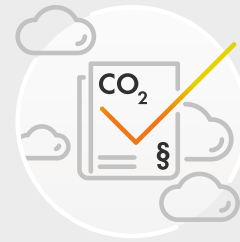
Green energy supply 24/7 anywhere in the world



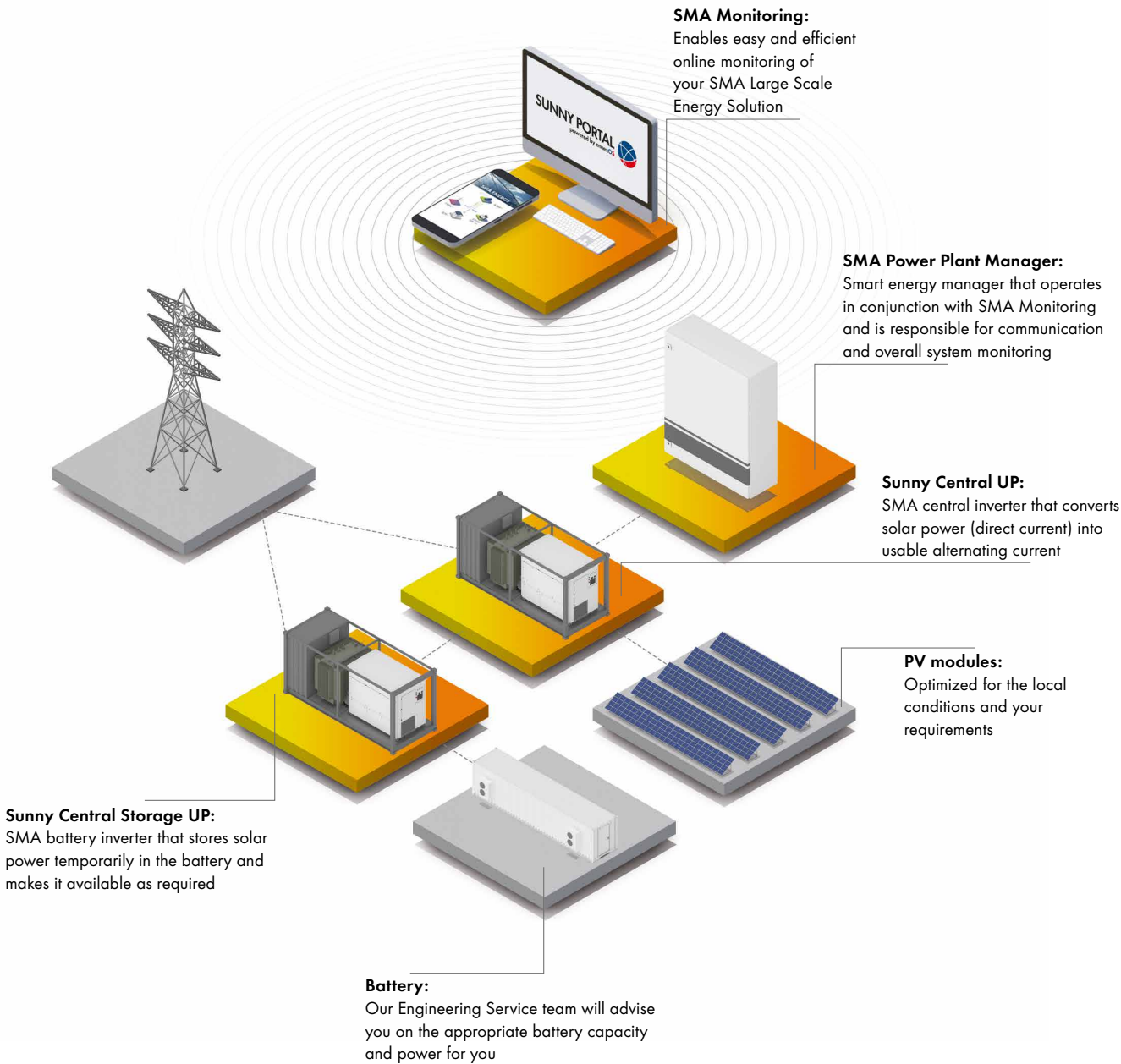
Save on generator and diesel costs



Integrate solar energy optimally into existing infrastructures



Reliably comply with CO2 and other environmental regulations



■ Non-SMA components



Stabilize grids and generate revenue.

Ecologically smart, economically sound

Energy storage plants with SMA Large Scale Grid Forming Solutions enable the energy transition and are multi-purpose assets for future generations. They are taking a leading role in grid stabilization as conventional power plants are increasingly phased out.

Grid Forming Energy Storage

In a power system that is 100% powered by renewable energy, grid forming will be the hallmark of grid quality and stability by contributing to

- Inertia
- System strength
- Short circuit level
- System restoration
- Power system stabilizer
- Power quality

SMA offers solutions that enable innovative business cases for these new stability related ancillary services. They can be used in various applications as well as stacked with other services such as energy arbitrage and traditional ancillary services such as frequency control.

SMA Large Scale Grid Forming Solutions also constitute an alternative to installing new transmission lines, as they enable existing power lines to be utilized more efficiently. This application is called Grid Booster. It offers public policymakers and network operators a remarkable way to cut costs and save time by eliminating the need to build time-intensive and expensive new transmission lines.

In this decade, energy storage plants will be deployed at a large scale to ensure a cost efficient and secure supply of renewable energy to the world.

Owners of such assets have a lucrative business case and can enable the supply of electricity with low carbon emissions and low cost.

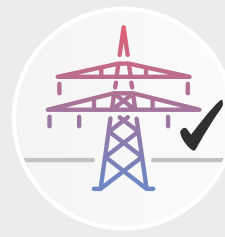
Benefits



Enable reliable cross-continental energy exchange



Reduce the need for network reinforcement and redispatch measures



Provide stable grids powered by 100% clean energy



Enables security of supply

Stabilization sells.

SMA Large Scale Grid Forming Solutions provides stability for power systems to ensure the future supply of energy from entirely carbon-free sources.

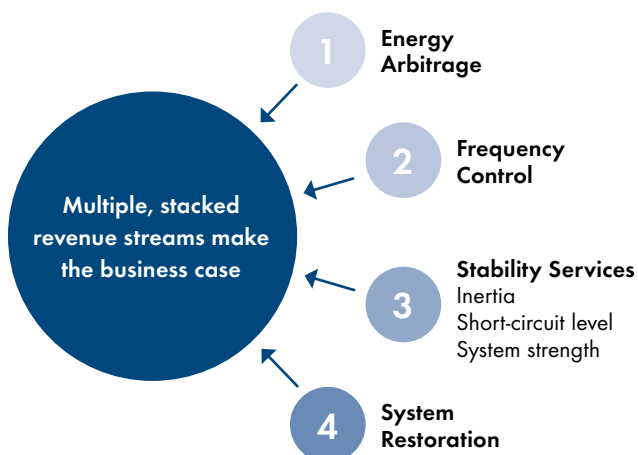
Energy storage plants can now provide new stability-related ancillary services in place of conventional power plants. This opens up attractive business models for investors and alternative investment options for transmission system operators.

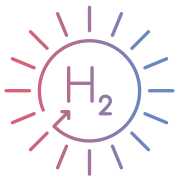
These stability services are inertia and system strength/short circuit current. The first major advantage is that these two services can be performed simultaneously. On top of that, the previous revenue streams of energy trading or frequency control can continue to run while the stability services are active.

The ability to stabilize power systems adds a lucrative new revenue stream for your project and further increases the return on investment.

Early adopters will in addition gain a favorable position in the network. The time to invest is now.

Multi-use of battery storage





Power conversion for hydrogen applications.

Green hydrogen – new market meets proven technology

The world's supply of energy is facing two major sustainability challenges: The increasing proportion of fluctuating renewable energies and reducing global CO₂ emissions in the industrial, mobility and energy sectors. The simple solution is green hydrogen.

Green hydrogen produced by electrolysis and renewable energy is 100 % CO₂ free, it can be stored and is key to de-carbonisation in major industrial processes such as refining, ammonia production, steel making and other chemical industries. Green hydrogen production with SMA Power Conversion Solutions is the key to sustainable energy management of your hydrogen application.

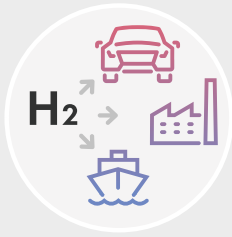


SMA Electrolyzer Converter

The core of the SMA Large Scale Energy Solutions for hydrogen applications

- With a capacity of up to 4.6 MW
- SMA intelligent temperature management system OptiCool
- Pre-commissioned plug and play solution including MV transformer and switchgear, auxiliary transformer for easy commissioning available
- Integrated IGBT technology makes harmonic filters or compensation units superfluous
- Electrolyzer type agnostic (PEM, Alkaline, SOEC)

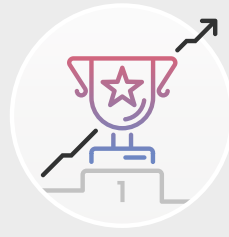
Benefits



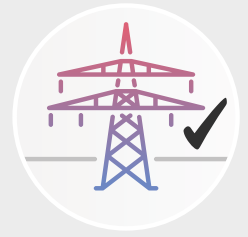
Modular design enables flexible project sizing



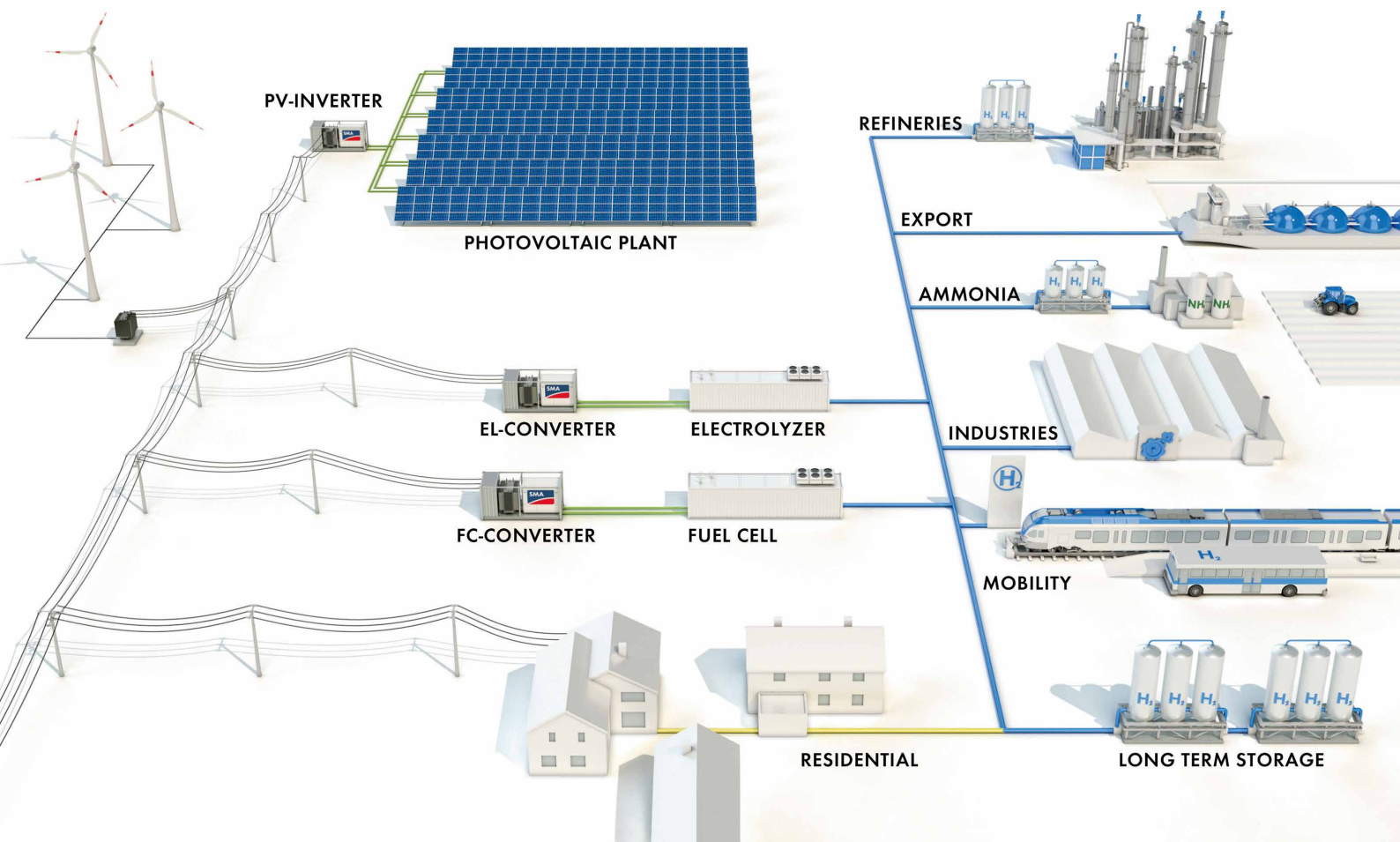
Low OPEX due to very high converter and connected transformer efficiency



Based on a technology platform with >30 GW global track record



Integrated IGBT technology enables high grid compliance and a lean plant design without additional filters or compensation units

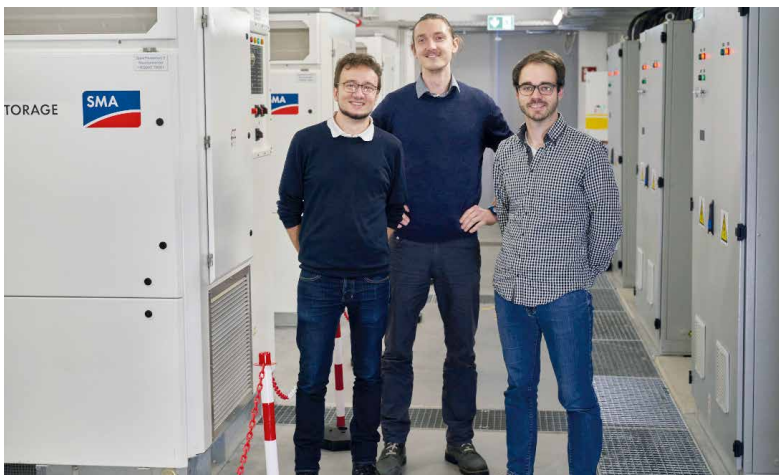




/ Grid Forming Case Study

The Bordesholm stand-alone grid ensures the supply of electricity even in the event of a grid failure.

With a large scale battery storage system, the public utility company Versorgungsbetriebe Bordesholm in Northern Germany is able to supply the European utility grid with balancing energy – a lucrative business model. In a unique experiment, the electric utility company and TH Köln, University of Applied Sciences in Germany, proved that the entire region can be supplied 100 percent with electricity from renewable energies.



The municipality of Bordesholm is located in the northern German state of Schleswig-Holstein, between Kiel and Neumünster. The name means “at the shore of the island.” Thanks to SMA Large Scale Energy Solutions, Bordesholm is living up to its name and is literally heading for new shores with a 15 MW storage system. The SMA storage system has a capacity of 15 megawatt hours and, in off-grid operation, ensures the supply of electricity for the entire Bordesholm region in the event of grid failure.

The objectives

To provide a primary control reserve and ensure a reliable electricity supply at all times.

The solution

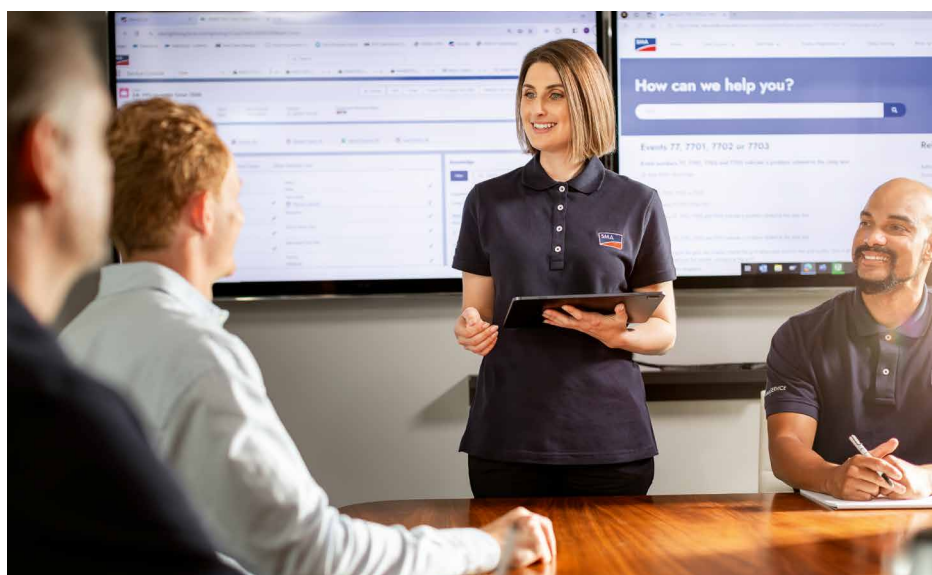
To use a SMA Large Scale Energy Solution to generate and store clean energy, and to optimally control and monitor energy flows both in the utility grid and in stand-alone mode.

The outcome

1. A contribution to stable grid frequency in the European utility grid
2. A lucrative business model through the primary control reserve
3. Stand-alone mode and black-start function ensure the supply of electricity 24/7
4. 100 percent electricity supply from renewable energy

« With this SMA Large Scale Energy Solution, we are proving that it is possible to run a public electricity grid on fully renewable energy and maintain stable frequencies. In doing so, we have created a starting point for the development of largely self-sufficient electricity grids. On a larger scale, the world could one day have an energy supply that is not dependent whatsoever on fossil fuels or nuclear power. »

Frank Günther, General Manager of Versorgungsbetriebe Bordesholm GmbH





/ Grid Forming Case Study

Blackhillock – utilizing cutting-edge inverter technology to enhance grid stability.

Blackhillock's impact extends beyond innovation; it aligns with Scotland and the UK's net-zero objectives, aiming to achieve zero-carbon power by 2025 as part of the broader 2050 net-zero-economy goal. As part of the National Grid Electricity System Operator's (NGESO) Stability Pathfinder project, Blackhillock's contribution to grid stability services is pivotal. Through the Pathfinder program, NGESO purchases grid-stability services from different asset classes including Blackhillock. Initially, only synchronous condensers were part of phase 1. However, phase 2 has expanded to include grid-forming inverter assets, diversifying the range of grid stabilization solutions.

SMA delivered an innovative solution that played a pivotal role in the success of the project. By providing 62 medium voltage power stations equipped with advanced grid-forming inverters, SMA ensured the project could deliver critical stability services, including 370 MW of inertia and 116 MVA of short-circuit level. It will be the first to provide a full suite of energy, ancillary and stability services in the world. The additional renewable energy resources and increased efficiency will accelerate energy independence and lower consumer bills by over £170 million over 15 years.

Building on the success achieved at Blackhillock, Zenobē has once again forged partnerships with SMA and Wärtsilä for a comparable project located in Kilmarnock, Scotland

Challenges

Lack of stability due to retirement of conventional synchronous generation and increase of inverter based resource (IBR) power generation

Outcomes

1. Created a stable grid
2. Multi-purpose assets based on BESS shown (energy arbitrage, ancillary service, stability services)
3. Implemented grid forming controls in the inverters
4. Improved thermal management
5. Inherently provide ultra-fast active and reactive power after grid disturbances
6. Increased inertia in Scotland
7. Increased short circuit ratio (SCR) in interconnection nodes

«Our battery at Blackhillock will use cutting edge technology to provide essential services needed to lower consumer bills and bring more renewable energy onto the grid. By partnering with experts at Wärtsilä, H&MV, SMA Solar Technology AG and GE Grid Solutions, we look forward to bringing this project to fruition and accelerating the UK towards a zero-carbon energy system. This is one of several major battery flexibility projects we're working on in Scotland at the moment, shaping the future for how grid scale battery projects will work on grids across the globe.»

James Basden, Co-founder and director of Zenobē

Pioneering Compliance – SMA successfully completed the first-ever compliance process for Great Britain's new grid code (GC0137), including Grid Forming requirements.



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SMA Service

More power and more profit for your energy asset

A successful renewable energy project does not end when the commissioning phase is completed. Profitable projects begin as early as the first planning steps and ensure maximum availability over their entire life cycle. With our SMA 360° Professional Support, we make life easy for you – from planning, engineering, installation and commissioning to targeted modernization.

Engineering Services – success right from the outset

SMA Engineering Services is designed to optimize power plants around the world in line with individual needs – right from the planning phase. The Engineering Services experts ensure that all components, services and software solutions are customized to the specific power plant and ambient conditions. Country-specific requirements of grid operators are also taken into account.

Commissioning Services – for perfect installation

SMA's Commissioning Services package ensures that your devices are properly installed electrically and mechanically by experienced service technicians. We test everything by the book and work through an extensive checklist – from monitoring AC and DC power output to updating firmware. This gives you the confidence that your plant has been properly connected and optimized in line with your specific requirements.

Greater availability, greater profits

Thanks to SMA solutions, you can achieve availability rates as high as 99.98 percent and ensure project success over the entire system lifetime. To be eligible for our inverter availability service, the inverter you have installed must be covered by the SMA Factory Warranty or SMA Extended Warranty. Our portfolio for maximum availability and quality encompasses a wide range of customized solutions – for applications worldwide.

Maximize your returns with preventative maintenance

Take advantage of SMA's Preventative Maintenance Services and optimize your device's performance to maximize your returns. SMA inspects and tests your device for wear and tear and checks that the device is working properly. We conduct a range of checks, carry out cleaning, update the firmware and supply detailed maintenance reports. This is the only way to ensure that your device continues to operate properly long term and that you comply with the terms of your warranty.

Make sure your energy project is fit for the future – with an extended warranty

Under the terms of your factory warranty, our service team is at your service 24/7. If the problem in your system can't be fixed by remote analysis, our service experts will come to you and fix the problem on-site. If a component needs replacing, you will get it free of charge and as quickly possible. An extended warranty is both sensible and extremely worthwhile because it allows you to take advantage of this full service even after the five-year factory warranty ends. The service scope includes a 100 percent guarantee on all replacement parts* and diagnostic and repair services rendered on-site or remotely.

Ready for the future with SMA Repowering

Availability is one of the most important factors determining the profitability of your project. The rapid pace of technological development in the solar industry means that taking deliberate steps to modernize your system is the only way to ensure the continued profitability of your project. SMA Repowering offers a range of customized solutions designed to enhance the performance and yield of your system and equip your power plant with innovative functions and storage integration interfaces – all in line with the latest cybersecurity standards.

Whatever direction you take, SMA enables you to respond to changing market requirements so that you are ready for the future.

* Medium-voltage components are excluded from the extended warranty.





SMA Repowering focuses on innovation and reliability.

SMA Repowering packages: as unique as your system

Modernizing outdated PV systems and storage systems offers a number of advantages: Enjoy the benefits of the SMA warranty and additional future-proof storage solutions.

Our flexible repowering packages are designed to impress thanks to their highly efficient technology and comprehensive range of services – from low-cost assembly and inverter replacement to

installation of additional state-of-the-art energy management and storage solutions.



Extended warranty: an investment in the future

Protect your system outside the factory warranty with Extended Warranty Flex. If you choose "Active," we will cover the hardware costs. With "Comfort," we'll cover the costs arising during field work performed on customer premises; and with "Extended warranty Flex," you can terminate the warranty contract on an annual basis as needed.

Benefits at a glance:

- Minimal, calculable downtime
- Immediate installation of a compatible replacement device
- Smooth, end-to-end device replacement directly on-site
- No hidden costs
- Cost-effective peace of mind over the entire system life cycle



More specialist knowledge. More success.

Expand your professional expertise profitably – with the SMA Solar Academy

Achieve greater success by enhancing your know-how: The SMA Solar Academy provides expertise and targeted, highly skilled, hands-on training in SMA products and photovoltaics. This will equip you with all the skills you need for long-term success in the fast-paced solar industry. Whether you are an installer, sales representative or system designer, we offer the right training course or webinar to suit any level or field.





Why SMA?

Dedicated support every step of the way



SMA is with you every step of the way. A dedicated and local team of engineers will be by your side to design and plan your installation. We also offer several service solutions that will ensure maximum operational reliability and profitability for your project. From preventive maintenance to quick mobilization of local engineers in the event of failure, SMA offers peace of mind to all its customers thanks to tailor-made maintenance and warranty contracts.

We also go the extra mile. Take our repowering service, for example. Our engineers optimize your plant architecture to make use of the latest technological possibilities, thereby ensuring your return on investment reaches its full potential.

At SMA, we design for life



Our inverters are designed to last for 20 to 30 years. How do we achieve this kind of longevity? It starts with selecting the right components. The most critical ones are produced in-house, other components are rigorously tested and selected. We only use the cream of the crop. Moreover, we also take good care of our (or your) electronics. With the SMA OptiCool system, temperature variation within our inverters is reduced to an absolute minimum, which increases lifespan.

But sometimes less is more. We aim to reduce the number of components in our installations, which means less opportunity for component failure and thus less downtime and lower maintenance costs. When we design our systems, we also take into account the increasing importance of cybersecurity in the energy market. Rest assured that, as energy systems increasingly become information systems, SMA is always thinking about the best way to keep its clients and their power plants safe.



Sustainability at SMA – Shaping a better future

For more than 40 years, solutions from SMA have been helping to realize a sustainable, secure and cost-effective energy supply for all people worldwide. We firmly believed right from the outset that it is not enough to develop innovative technologies for climate-friendly energy generation. Rather, it is also important how these are created. That is why the goal of holistic sustainability in all areas of the company is at the heart of our corporate strategy.



70 million

Solar inverters from SMA with a total output of around 132 GW contribute to the avoidance of over 70 million tons of CO₂e annually.



100%
**electricity from
renewable energies**

Since 2023, we have been supplying ourselves entirely with electricity from renewable energies worldwide.



96.8%
climate neutral supply

We are making steady progress towards our goal of a Group-wide climate-neutral electricity and heat supply by 2025: since 2020, we have increased the ratio from 82.2% to 96.8%.



sma.de/en

