



SMA Grid Forming Solutions

Emerging technologies need pioneers who set the standards.

Enabling clean energy and stable grids
for future generations



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Grid Forming is a fundamental technology for the future of the energy sector

The urgent task of integrating renewables into pre-existing grids requires flexible and resilient solutions. Grid Forming is the answer, as it increases grid stability and security of supply.

A high-quality grid that is fully powered by clean energy has been one of the founding visions of our company. With more than 40 years of experience

working toward this goal, we are deeply committed to making your energy project a success story: reliable, profitable, and future proof. A true asset for today's market and coming generations.

SMA has what it takes to assure grid stability for all types of energy projects in every location across the globe.

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The rise of Grid Forming and SMA's role

Grid Forming technology is the latest necessary development as the energy transition progresses. If we look back at history, we can distinguish between two previous milestones in which SMA played a pioneering role.

Grid Following

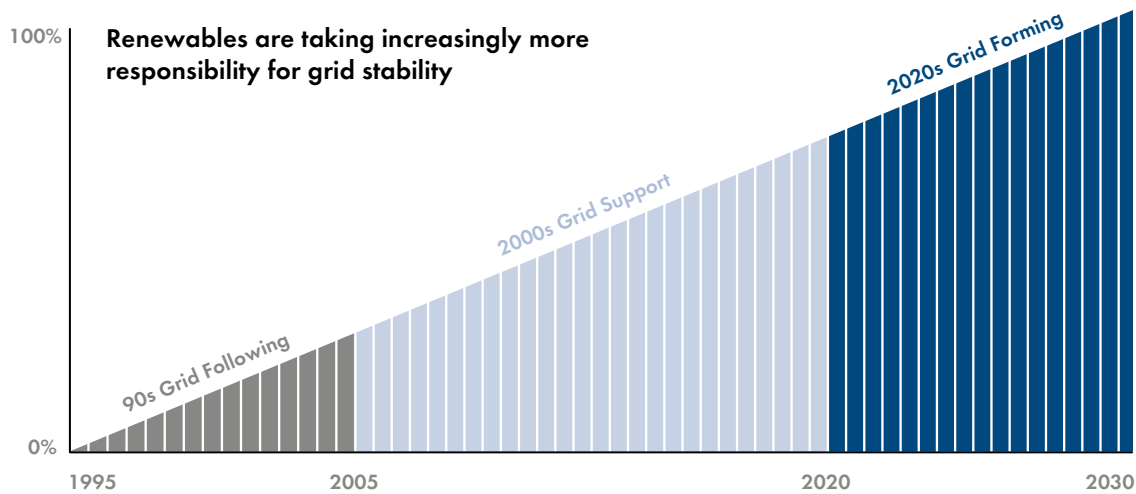
The 90s were the early days of renewables. Their role was limited to grid feed-in and they were given little to no responsibility for the grid, instead merely following it.

Grid Support

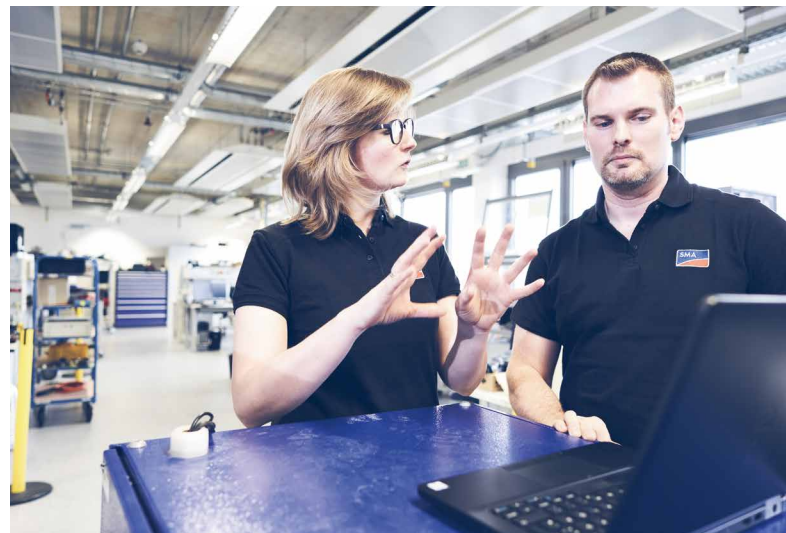
In the first decade of the millennium grid supporting functionalities have been introduced worldwide able to support the power system and taking a modest amount of responsibility.

Grid Forming

We are at the beginning of a new era in which renewables are taking the leading role for stability and system strength. SMA is again pioneering this development with the introduction of Grid Forming Solutions for energy storage plants.



« Energy storage plants with SMA Grid Forming Solutions are now becoming major contributors to system stability. We see increasing demand for applications that add stability services to the portfolio of energy storage plants. Let your investment contribute to resilient supply and increased profitability. »





Ecologically smart, economically sound.

Energy storage plants with SMA 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 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.

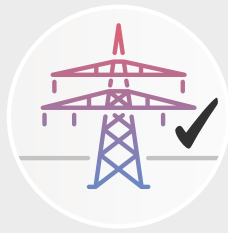
Benefits



Enable reliable cross-continent energy exchange



Reduce the need for network reinforcement and redispatch measures



Provide stable grids powered by 100% clean energy



Guarantee security of supply

Stabilization sells.

SMA Grid Forming provides stability for power systems to ensure the supply of electricity from entirely carbon-free sources.

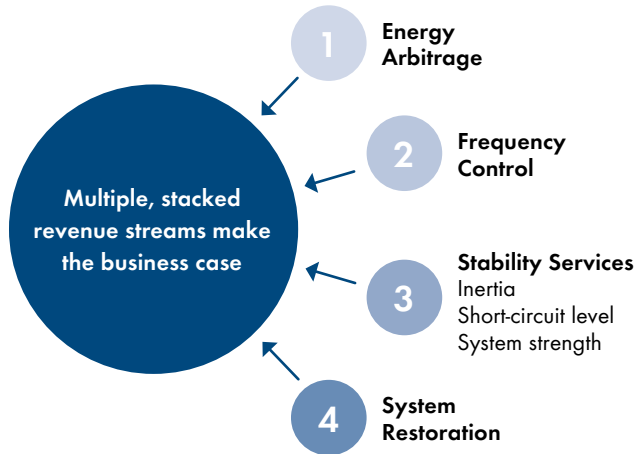
Energy storage plants can now provide new stability-related ancillary services in place of conventional power plants. This opens up attractive business models for investors and alternative investment options for transmission system operators.

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





Stability Use Cases.

Inertia

With synchronous generators being phased out, inertia will be provided by inverter-based resources such as energy storage plants. To achieve frequency stability, a sufficient amount of inertia is strictly required, making sure that system blackouts can be avoided.

Energy storage plants with SMA Grid Forming Solutions provide inertia and thereby ensure that the power system is robust and secure during disturbances.

System Strength, Short-Circuit Level, Power System Stabilizer and Power Quality

System strength and short-circuit level are measures of the strength of voltage and stability in case of faults like short-circuits. Grid Forming increases system strength and increases short-circuit ratios, thus enabling a resilient power system. This enables even higher levels of renewable generation and ensures reliable transport of energy.

Grid Forming furthermore ensures a firm voltage waveform and high power quality as well as mitigation of inter-area and local oscillation.



Grid Booster

Gridbooster systems of large-scale energy storage plants are placed at strategic locations in the transmission grid. They add flexibility to existing transmission systems and relieve constraints while reducing the need for costly redispatch measures.

The planning and construction of energy storage plants is relatively quick, as it increases transmission capacity much faster than traditional network expansion does. Equipping grid boosters with Grid Forming technology addresses all other stability needs of the power system – all in one asset.

System Restoration

Our digital world makes the potential risk of power failure more problematic than ever.

A further use case that requires Grid Forming technology is large-scale system restoration in case of blackouts. Energy Storage plants with SMA Grid Forming Solutions can initiate a decentralized “black start” of its local grid rapidly and safely. Market models are evolving to enable monetization for this crucial ability of energy storage plants.

Global Track Record.

/ West Murray, Australia: SMA solution secures energy yields

The Australian Energy Market Operator (AEMO) has finally lifted the generation caps imposed on five PV farms in West Murray with a total output of more than 350 MWp. And this is all thanks to an innovative control software installed on all the inverters in the PV farms. The software was developed by SMA experts. Until SMA found a solution, the PV farms were permitted to generate only half of their maximum output.

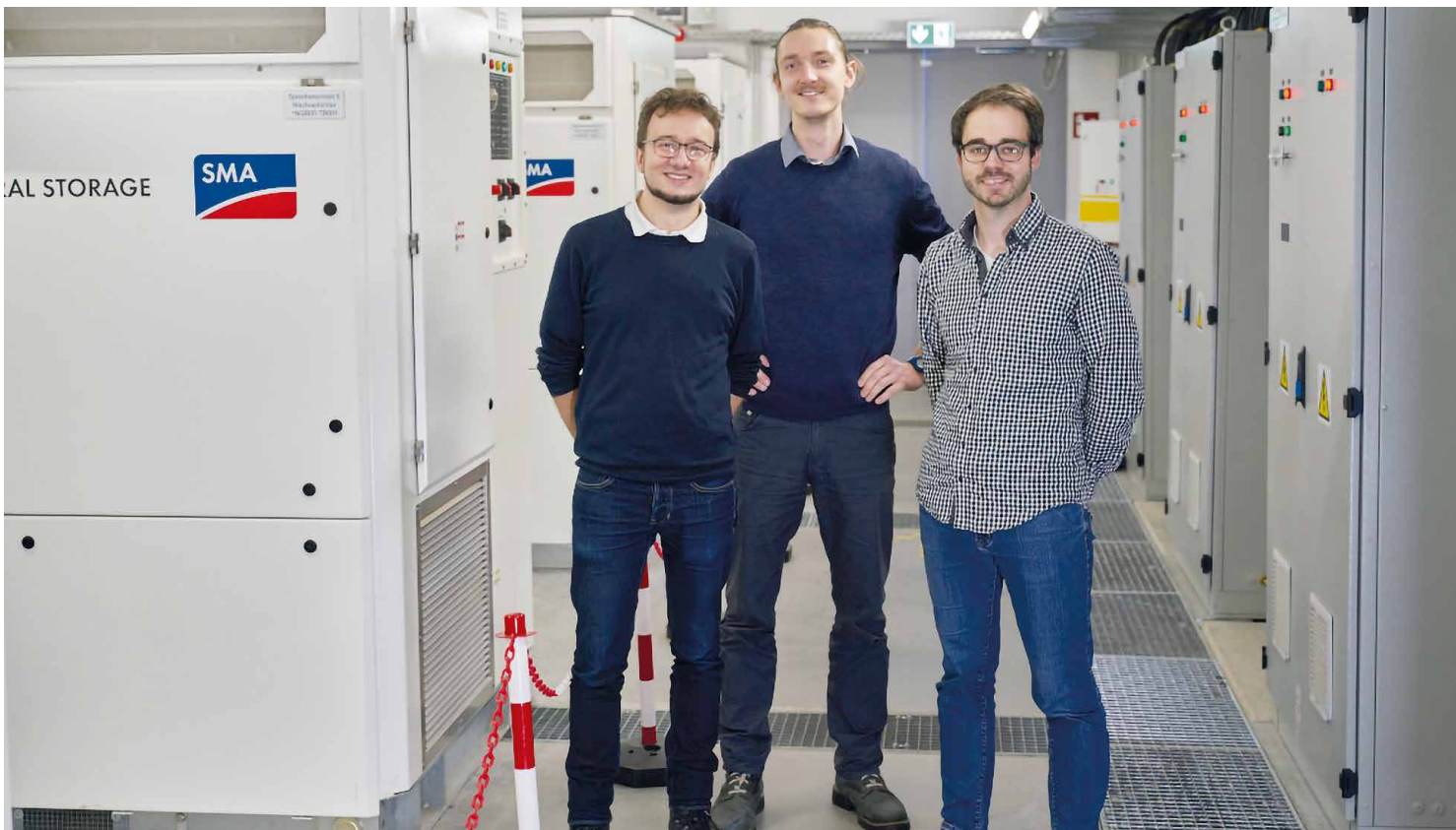
« Where we started to work really intensively with SMA was when we tried to find a solution to the West Murray issue (...) an area with beautiful solar resources but very low levels of system strength. Together we were able to solve a major system security issue, and frankly, also a major commercial issue. »

**Dr. Alex Wonhas,
Chief for System Design, AEMO**

« We found SMA a very good partner. Across a range of manufacturers, they generally performed the best. (...) They definitely pass the bankability test. One of the reasons (...) we chose their equipment as the heart of the power plant is for its longevity. »

**John Cole CEO & Founder,
Edify Energy**





/ Bordesholm, Germany: A city with balanced energy – on and off grid

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 the Cologne University of Applied Sciences in Germany proved that the entire region could be supplied with electricity produced from 100 percent renewable energies. This set a milestone for the energy transition.

The battery storage system is considered one of the most state-of-the-art balancing energy power plants in the world. If there are sensitive frequency fluctuations in the utility grid, the SMA system supplies energy from the battery storage system within a fraction of a second.

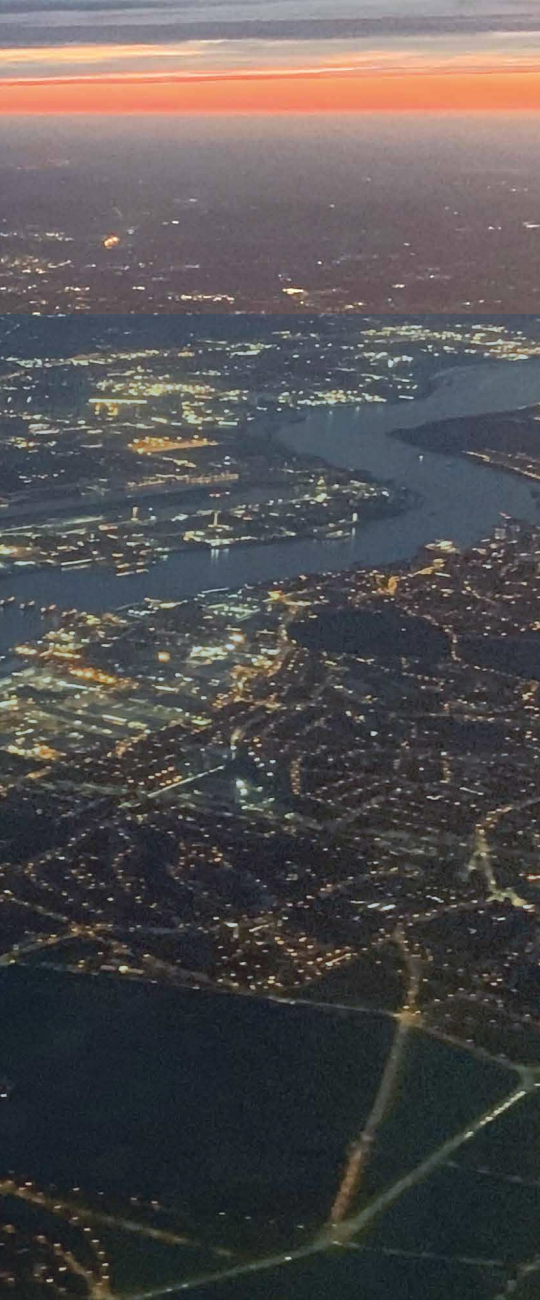
The electric utility company is thus helping to ensure a stable utility frequency of exactly 50 Hertz – and participation in the primary control energy market is opening up lucrative business opportunities.

« With SMA, we have a reliable and experienced German partner on our side. Together, we have written a piece of energy history. We are helping pioneer energy transition reliability on the way to exclusively renewable sources. »

**Dr. Jörg Niedersberg,
Chairman of the Supervisory Board of
Versorgungsbetriebe Bordesholm GmbH**



**We Pioneer
New Standards.**



The complexities of tomorrow demand the right partner today

Grid Forming is key to combining a 100% green power supply with grid stability and resilience. Operators of energy storage plants with SMA Grid Forming Solutions have the opportunity to become important players in the market with additional revenue streams through stability services.

To truly profit from the unique opportunities in this early phase, it is crucial to work with experts who are leading this development and setting industry standards. With a global track record of completed Grid Forming plants high in ROI, SMA is your ideal partner for challenging grid integration projects.

We are deeply committed to making sure your energy project can participate in new developments. Unique regulatory requirements can be met flexibly so that asset owners and operators benefit from additional revenue opportunities in the energy market.

The focus on modularity and expandability is foundational to our design philosophy.

Find out how your energy project can benefit from SMA Grid Forming technology. Contact our Large Scale specialist near you today.



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