



SUNNY ISLAND System Guide



System Solutions for Reliable Off-Grid Power Supply



Energy Supply for Off-Grid Areas

Simple system design with system solutions from SMA

With the Sunny Island battery inverters developed by SMA, off-grid systems can easily be set up, making a reliable energy supply possible even for off-grid areas.

At first glance, off-grid systems are as diverse as the landscapes in which they are installed. This is because the ambient conditions determine which renewable energy source can be best used in each individual case. However, the experience we have gained from installing more than 10,000 off-grid systems worldwide has shown us that certain combinations of components can be easily integrated to form a solid basis for more complex systems.

Taking into consideration the size of each individual system and their specific ambient conditions, the Sunny Island System Guide provides a compilation of typical fields of application for solar energy, battery storage systems and diesel gensets. With these system solutions we hope to facilitate your first steps into a self-sufficient energy supply and offer you concrete support for designing your off-grid system.



Benefits at a glance

- All components perfectly align with each other
- System design in accordance with current technical regulations
- Easily expandable into large-scale energy supply systems
- Customizable to meet your needs
- Worldwide SMA Service for energy supply systems

Easy to plan

The system solutions presented in this brochure offer you the basis for an off-grid power system design for a diverse range of power classes. Whether for freestanding vacation homes, remote farms or entire villages, the proposed configurations ensure a simple system design and straightforward system installation.

Perfectly aligned

The individual components are perfectly aligned with each other and together with the battery inverter ensure a reliable power supply. Of course, always adjusted in accordance with your local regulations.

Maximum flexibility

Furthermore, the configuration proposals lay the foundation for more complex systems. The modular design provides maximum flexibility, allowing additional components to be integrated into the system at any time, step by step according to the energy demand.

SUNNY ISLAND – The Island Manager

A key component of your off-grid power supply

Together with a battery unit, the Sunny Island battery inverter forms an AC voltage grid into which all components – from electrical appliances to electricity generators – can be integrated. As manager of this AC coupled grid, Sunny Island takes over all control processes and thus ensures a continuous power supply.

You can apply the Sunny Island in both single- and three-phase off-grids as well as upgrade the systems at any time. State-of-the-art and economical battery management guarantees maximum service life of the batteries. Due to their high IP54 protection class, temperature management and excellent overload characteristics, the devices have proven especially resistant to extreme climatic conditions.

The following pages show examples of Sunny Island inverters designed for the AC power for 30 minutes. The AC power for 30 minutes takes better into account the needs of critical loads, such as the dishwasher, washing machine, dryer and electric stove, than the nominal power does.

A smart device

All Sunny Island inverters can be easily combined with components for use of renewable energy and diesel gensets for an emergency supply. For this purpose, your first choice are the Sunny Boy and Sunny Tripower inverters that convince with highest efficiency and reliability, and as a result they have received numerous awards.





Sunny Island advantages

- Off-grid systems from 2 kW to 300 kW
- AC and DC coupling of energy sources
- Single- and three-phase parallel connections
- Modularly extendable
- Can be used anywhere thanks to IP54 and a wide temperature range
- Low energy consumption
- Maximum battery life span due to intelligent off-grid management
- Easy commissioning

SUNNY ISLAND

Harness the sun's energy

Because solar energy is available all over the world, all Sunny Island system solutions are primarily based on the use of photovoltaics. Additionally, PV systems are highly adjustable and stand up to typical wear and tear.

Examples of individual systems

More than simply offer you some standard solution, with the systems described we provide you with a solid basis for designing your own system. All systems can easily be expanded and adjusted to meet your individual needs.

Over 30 years of experience

With more than 10,000 off-grid systems installed worldwide and 30 years of experience in developing grid-tied PV systems, SMA is the right partner to meet your needs. All examples are based on comprehensive research in each specific field of application and respective energy consumption.

The right system configuration

The best configuration for you primarily depends on the existing power connection and required amount of energy. Be it for a single- or three-phase connection, system design plays an

important role. With the Sunny Island System Guide you can benefit from our experience with modern energy supply systems.

Remote Unattended Installations

German Lifeguard Association station, Graal-Müritz

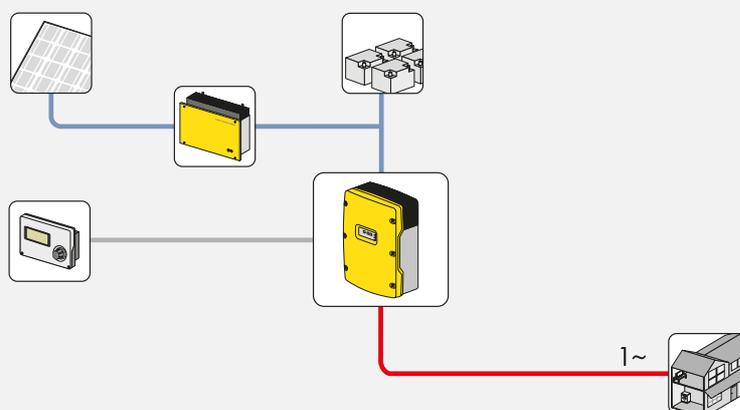


Sunny Island:	SI 3.0M
Sunny Island Charger:	SIC-50-MPT
Solar power:	2.4 kWp
Battery inverter power:	3.0 kW
Energy consumption per year:	1,500 kWh
Battery storage system:	12 kWh
Autonomous time:	3 days

According to our experience, off-grid systems with a performance range between 2 and 3 kW are, in particular, required for remote installations which are left unattended for long periods of time. In such cases, the system must not only be reliable but also resistant to extreme climatic conditions.

Temperature variations, high levels of humidity and a high salt content in the air are all reasons for careful consideration when selecting the appropriate components.

Typical applications of this power class are, among others, telecommunication stations which rarely require maintenance work.



Single Family Home in Southern Europe

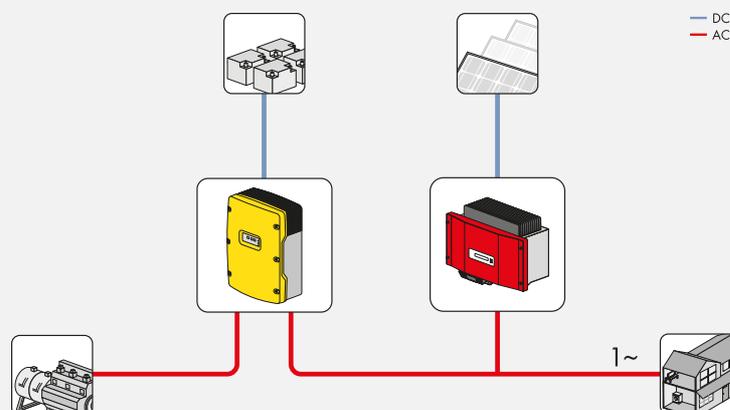
Family home, Spain



Sunny Island:	SI 4.4M
Sunny Boy:	SB 2100TL
Solar power:	2.5 kWp
Battery inverter power:	4.4 kW
Energy consumption per year:	3,000 kWh
Battery storage system:	16 kWh
Autonomous time:	2 days
Diesel generator:	3 kW

The system presented here is located on a private property on the island of Tenerife.

Sunny Island is ideal for providing energy to remote single family homes in Southern Europe. Because the amount of sunlight remains relatively high throughout the year, the PV system can thus ensure a sufficient energy yield. Even in the event of severe storms, the off-grid system also guarantees an exceptionally reliable power supply.



Single Family Home in Central Europe

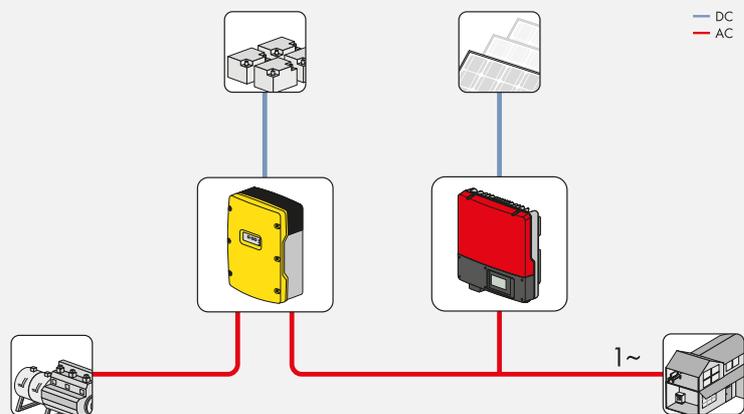
Rooftop system, Germany



Sunny Island:	SI 6.0H
Sunny Boy:	1 x SB 5000TL-21
Solar power:	5.0 kWp
Battery inverter power:	6.0 kW
Available energy per year:	4,500 kWh
Battery storage system:	25 kWh
Diesel generator:	4 kW
Autonomous time:	2 days

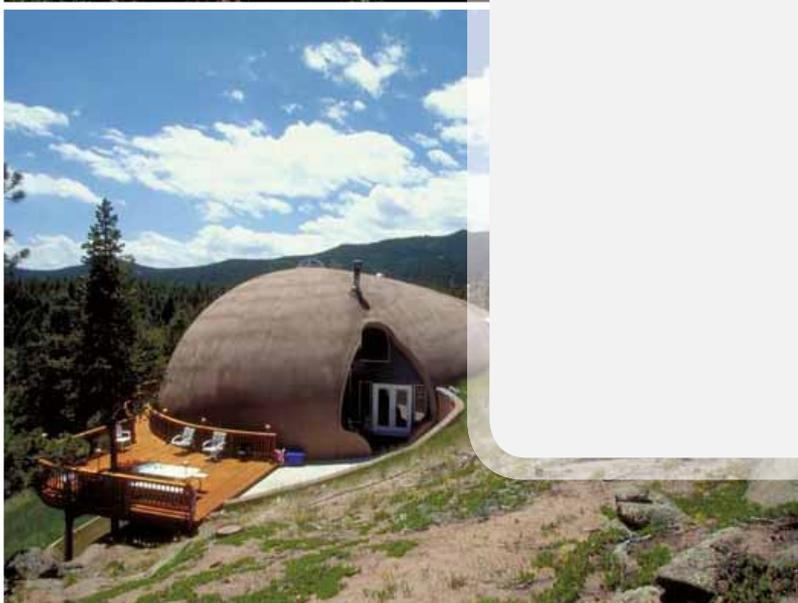
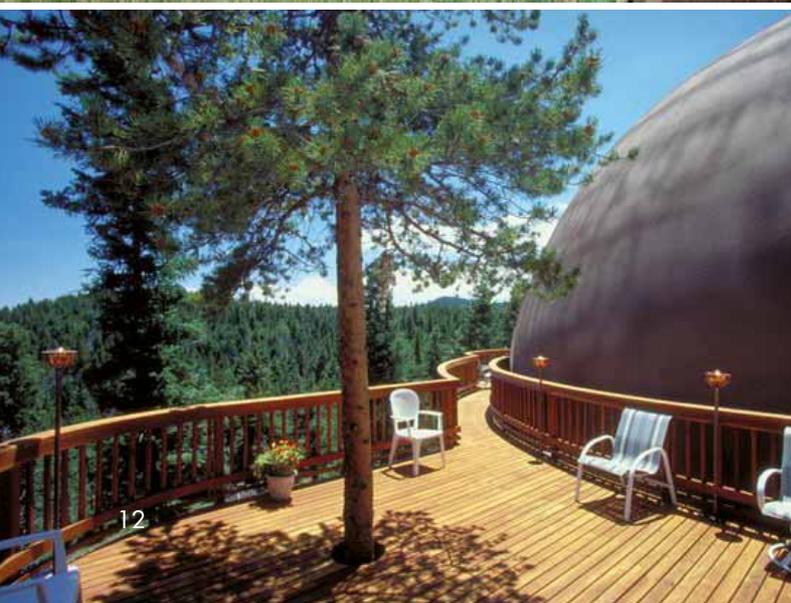
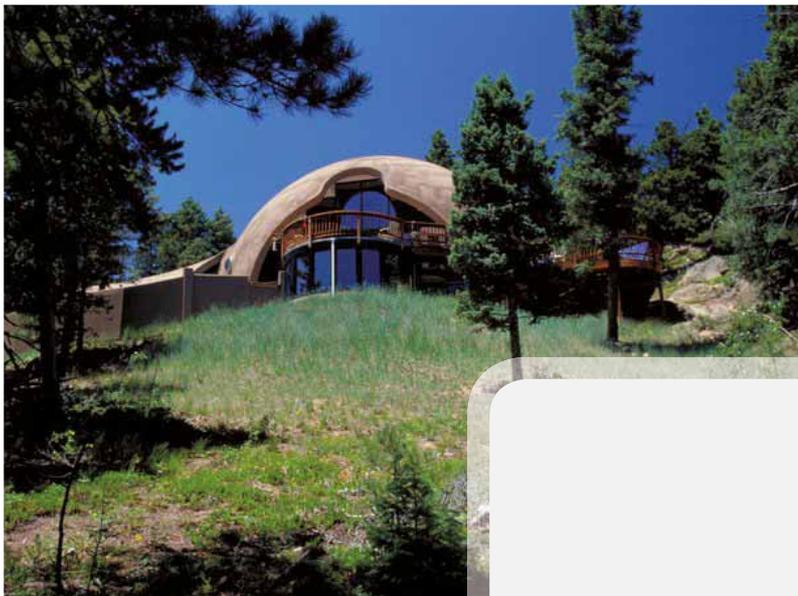
The sun is a great source of energy, even in Central Europe. Here, average annual solar irradiation is approximately 1,000 kWh/m². This is equivalent to approximately 50 percent of the radiation intensity of the Sahara.

Using statistics, it is very simple to calculate the average energy consumption of a single family home in Central Europe. Consequently, it is easy to compile the appropriate system which includes a backup diesel system which includes a backup diesel generator. In Germany, the average annual energy consumption of a family of four is between 4,000 and 5,000 kWh.



Single Family Home in the U.S.

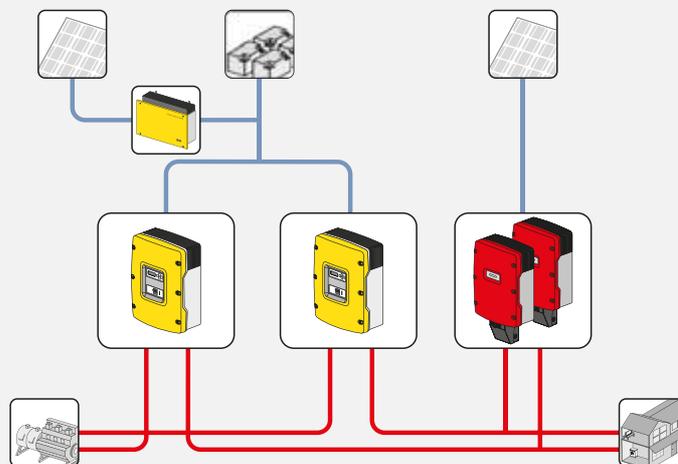
"Dome Home," U.S.



Sunny Island:	2 x SI 4548-US
Sunny Boy:	2 x SB 7000TL-US
Solar power:	15 kWp
Battery inverter power:	10.6 kW
Available energy per year:	18,000 kWh
Battery storage system:	48 kWh
Autonomous time:	1 day

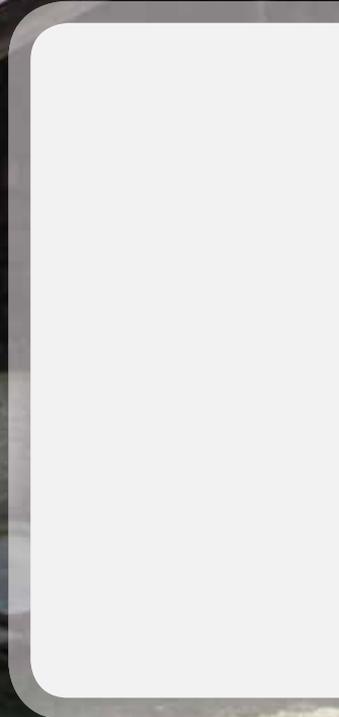
Planned as a single family home, the approximately 6,000 square meter large “cupola house” in the Rocky Mountains Foothills, Colorado, was built in 1996. The new owners transformed the building into a test and training center for charitable education purposes. This building serves as a training room, showing the advantages of life with renewable energy. Integration into the mountains and the arrangement of doors, walls and windows benefit the energy concept in achieving the maximum efficiency. The building is comfortably warm in the winter and pleasantly air-conditioned in the summer.

At the same time, the owners have expanded the PV system from 9 kW to 15 kW to demonstrate the possibilities in becoming independent from energy suppliers. The building completely generates its own energy and can also charge both electrical cars with its excess solar energy.



Alpine Hut / Guest House

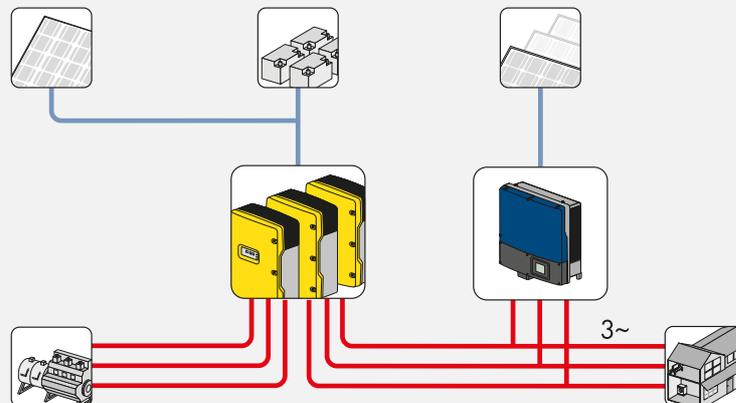
Schneetalalm, Austria



Sunny Island:	3 x SI 8.0H
Sunny Tripower:	1 x STP 8000
Solar power:	9 kWp
Battery inverter power:	24 kW
Available energy per year:	25,000 kWh
Battery storage system:	70 kWh
Diesel generator:	22 kW el., 47.8 kW th.
Autonomous time:	1 day

Each year, an increasing number of hikers enjoy the beauty of the mountains. Subsequently, over the last few decades a large number of small alpine huts have been transformed into real guest houses such as Schneetalalm in Tannheimer valley, Austria. During the main season, some of these huts can house up to 100 guests; quite a challenge for an energy supply system.

Until recently, the only source of energy was a diesel generator. However, increasingly a number of diverse renewable energy sources are now being used in mountain resorts, depending on the local conditions. Advantageously for both mankind and nature, they are clean and make little noise. Furthermore, they are perfect for supplying reliable lighting and for operating electronic devices in off-grid areas.



Research Facility

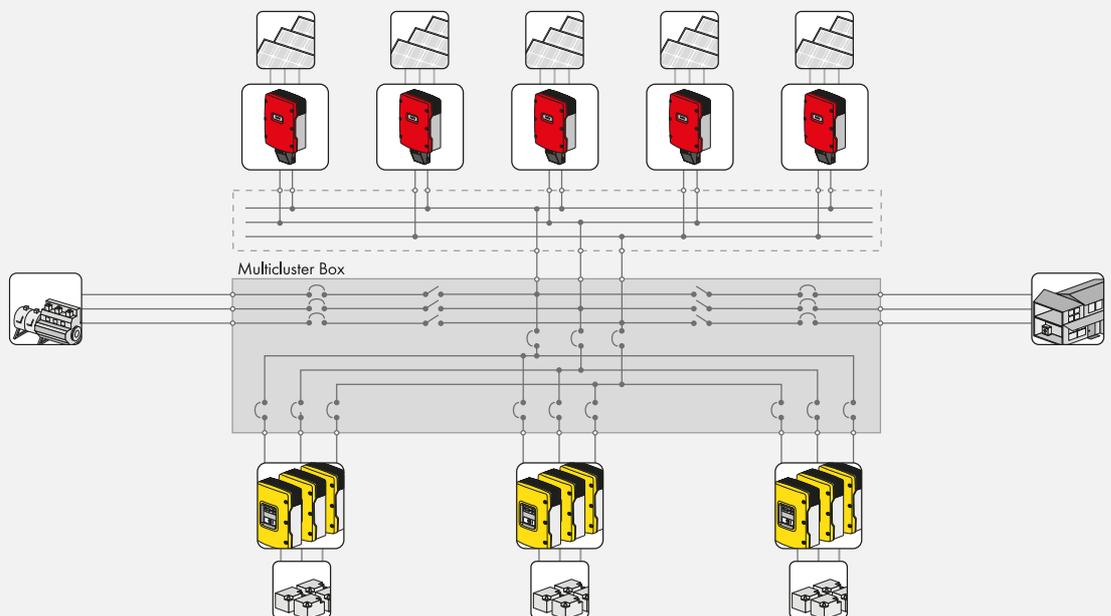
Hakai Beach, Canada



Multicluster Box:	1 x MCB-12U
Sunny Island:	9 x SI 6048-US
Sunny Boy:	6 x SB 5000-US
Solar power:	30 kWp
Battery inverter power:	63 kW
Available energy per year:	90,000 kWh
Battery storage system:	250 kWh
Diesel generator:	55 kW
Autonomous time:	1 day

The Hakai Beach Institute is nestled among vast forests and pristine nature on Calvert Island, British Columbia, Canada. The research facility has no access to the utility grid and supplies itself with everything it needs, from water treatment and trash disposal to an energy supply based on renewable energy sources.

Since 2011, an off-grid system has been supplying the institute with energy. Excess energy is temporarily stored in batteries and, for example, can also be used at night after sunset. A diesel generator serves as a backup and can be switched on during rainy periods or in case of high loads. The off-grid system reduces CO₂ emissions by 1,517 tons every year.



Independent Training Center

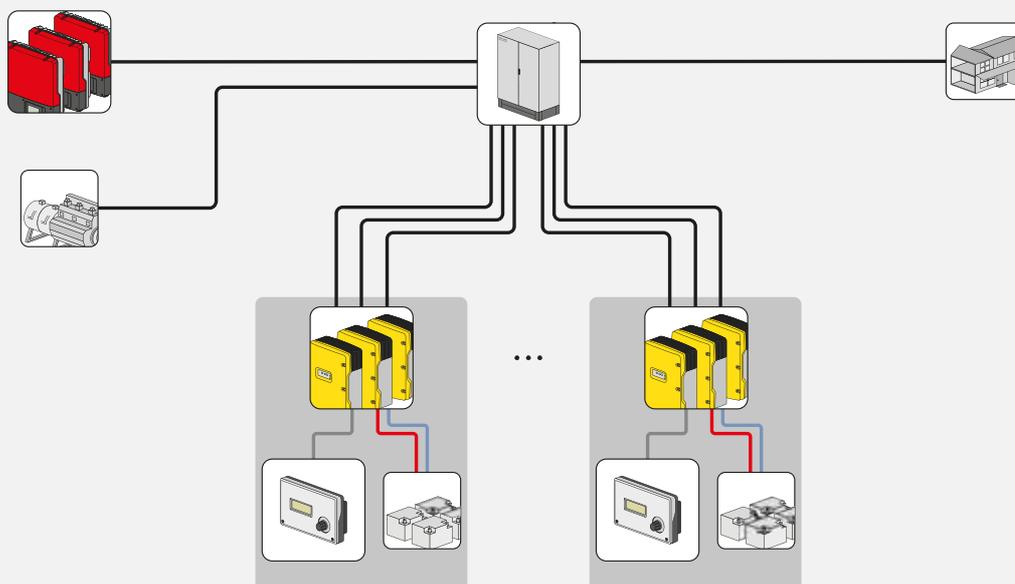
SMA Solar Academy, Germany



Multicluste r Box:	1 x MC-Box-12.3
Sunny Boy:	15 x SB 5000TL-21
Sunny Tripower:	1 x STP 15000TL-10
Solar power:	90 kWp
Battery inverter power:	78 kW
Available energy per year:	84,000 kWh
Battery storage system:	230 kWh
Combined heat and power plant:	70 kW therm. / electr., each
Autonomous time:	1 day

The SMA Solar Academy training center is close to the SMA headquarters in Niestetal, near Kassel, Germany. The building, which provides space for up to 500 people is supplied with electricity using an off-grid system. The majority of electricity required is supplied by the PV modules in the facade and on the building's roof.

A network of battery inverters and a battery unit ensure a stable off-grid, which is capable of supplying the connected power consumers at all times. In conjunction with the variable-speed combined heat and power plant and the heat storage tank, the building's energy equilibrium can always be maintained.



100 Percent Solar Power Supply for Island Nation

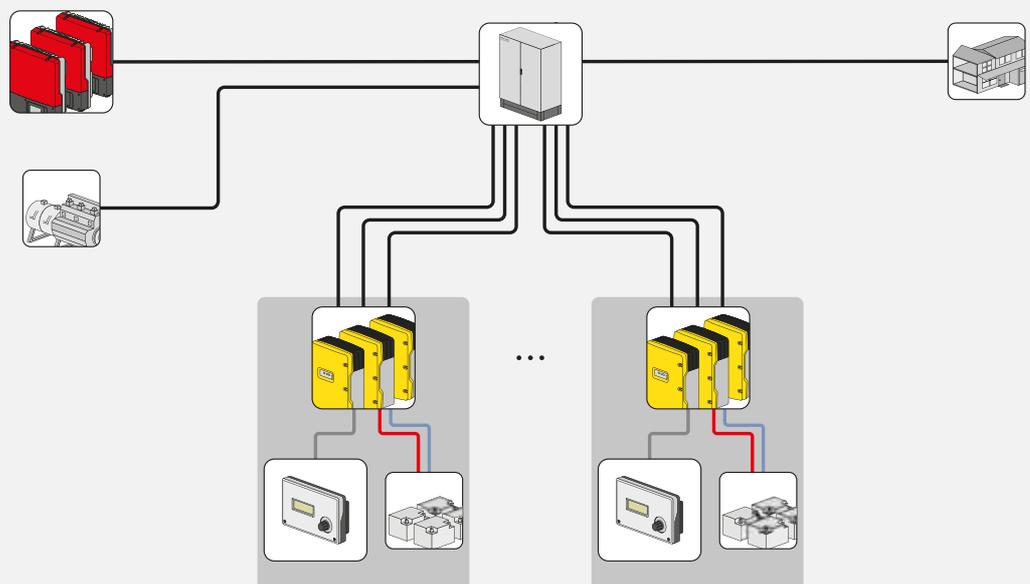
Fakaofu, Tokelau, South Pacific



Multicluster Box:	1 x MC-Box-36.3
Sunny Boy:	56 x SB 3000TL
Sunny Island Charger:	32 x SIC50-MPT
Solar power:	260 kWp
Battery inverter power:	156 kW
Available energy per year:	390,000 kWh
Battery storage system:	2,300 kWh
Diesel generator:	60 kW
Autonomous time:	1.5-2 days

Tokelau lies in the South Pacific, north of Samoa. The territory consists of three atolls that can be reached only by boat. The previous power supply based on diesel fuel was expensive and damaging to the environment. In October 2012, Tokelau became the first place on earth fully powered by photovoltaics.

The entire system with an output of approximately 1 megawatt is made up of three photovoltaic diesel hybrid systems (the system described above is an example of one of three systems). Because more energy is needed than is available, excess energy is temporarily stored in batteries. Thus, Tokelau has become independent of fossil fuels and saves up to 200 liters of diesel fuel per day.





Solar Power for Everyone and Everywhere

Off-grid systems for a reliable energy supply

Our vision for more than 30 years has been to provide people all over the world with safe and affordable access to electricity. After all, electricity is the key to clean water, education and health – and it enables greater prosperity for everyone. For this purpose, we at SMA develop integrated and regenerative energy supply systems, which are environmentally friendly, efficient and individually adapted to local conditions.

The right system for every capacity

The foundation of our flexible systems is PV energy. Depending upon which additional energy sources are available, small wind turbine systems or hydroelectric power plants can be integrated into an off-grid.

Worldwide application

SMA off-grid systems are easy to install, modularly expandable and available worldwide. They are the economical alternative to laborious and expensive diesel



Example of an off-grid system

- ① **Sunny Island**
Robust and flexible. Sunny Island is a grid and battery manager that controls the off-grid system. The devices can be installed indoors and outdoors.
- ② **Multicuster Box**
Modular. Off-grid systems with up to 300 kW can be quickly and easily implemented with the fully pre-configured AC distribution board.
- ③ **System house**
Central. The off-grid inverters, the batteries for temporary storage and the Multicuster Box are housed here.
- ④ **Sunny Boy**
Reliable. The PV inverter converts the solar energy and feeds it into the system.
- ⑤ **PV array**
Direct. The PV module generates energy precisely where it is needed.
- ⑥ **Hydroelectric power plant**
Fluent. New or existing hydroelectric power plants are a smart addition to the off-grid system.
- ⑦ **Wind turbine system**
Complementary. Depending on the site, the integration of wind turbine systems can serve as an additional intelligent energy source.
- ⑧ **Diesel generator**
Fail-safe. The rapeseed-oil-powered generator secures the system through long periods of drought, calm winds or low solar irradiation.

systems. Whether it is current for the weekend home, or the supply of entire villages and islands – our products electrify rural regions and provide a reliable electricity supply where utility grids are unstable.

Competent system partner

At SMA, quality is both a product feature and an expression of our daily work. SMA is your capable system partner – from the very start. We assist our customers in planning, commissioning and throughout the entire service life of the system. In addition,

we make an energy supply truly sustainable because we offer people the necessary conditions to develop their economic power locally. Everywhere. Please feel free to contact us.

