SMA Sunbelt Energy GmbH

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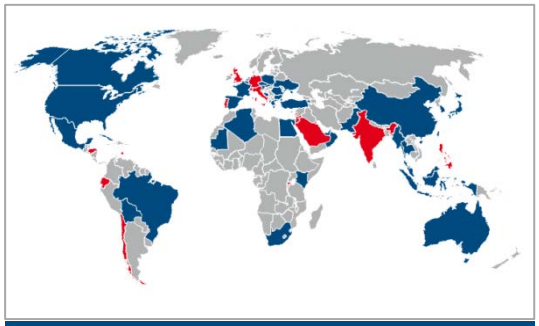
Rely on **35 years of experience** in PV and storage system technology

Rely on system solutions from the market leader



Count on a track record of 95,000 MW installed base

Count on German Engineering & comprehensive testing

Benefit from full service portfollio including O&M

Calculate with renowned bankability

Profit from reliable performance and maximum yields

› SMA is the world's most experienced PCS provider and system solution expert for

SMA Group and SMA Sunbelt in a nutshell

Highlights

SMA is the leading specialist for PV and storage technology

- Founded in 1981
- >95 GW installed base
- Complete portfolio to serve all PV and storage segments
- 20 subsidiaries with strong service capabilities and access to all channels
- Award-winning 20 GW production to achieve scale
- First company to deliver >1GW of storage PCS

Sunbelt is the off-grid, hybrid and storage specialist @ SMA

- 100% subsidiary of SMA Solar Technology AG
- Focus on off-grid, hybrid and battery based solar projects in the sunbelt region
- Business model covers component and solution sales, system integration and EPCm of battery projects
- Executed >125 MW of hybrid & storage projects as integrator/EPC
- Currently delivering aprox. 100 MW of storage projects
- More than 200 MW of contracted BESS projects for 2020

Key Figures SMA Group

Sales:	891 Mio. Euro
EBITDA :	97,3 Mio. Euro
Inverter output sold:	11,5 GW
Employees:	> 3.000
O&M portfolio:	4,5 GW
Patents and utility models:	>1.000

Product Innovations

> SMA has know-how & products to benefit from strong growth in the field of battery storage.

There are multiple storage applications in private/public grids

SMA

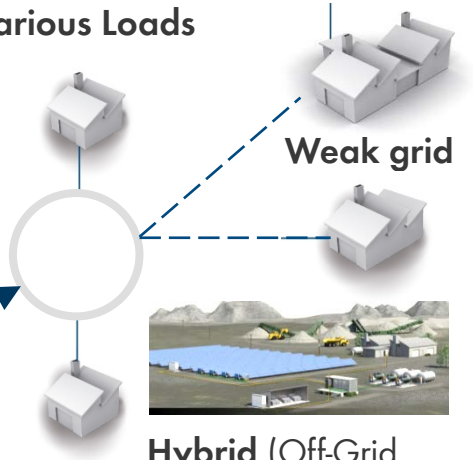
Conventional Power Plants

- VPP operation
- Blackstart
- Re-synchronization
- Frequency Control P(f)

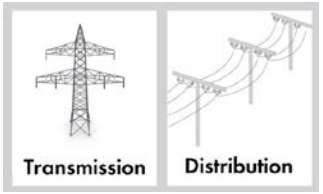
Ancillary Services

- Scheduling & Dispatch (arbitrage) and short time balancing
- Reactive Power supply

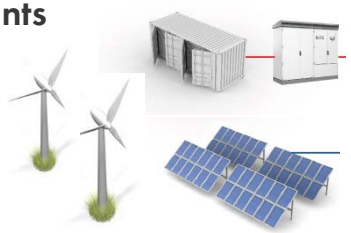
Various Loads



Power Grid



Renewable Power Plants

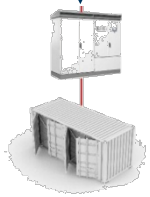


Renewable Integration

- Ramp-Rate Control
- Frequency Control P(f)
- Peak shifting and shaving
- DC coupling incl. controlled dispatch

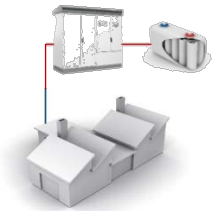
Ancillary Services

- Frequency control P(f)



Hybrid (Off-Grid or grid-connected)

- All grid applications and grid forming
- Optimized Genset Operation
- Energy shifting
- Blackstart & resynchronisation

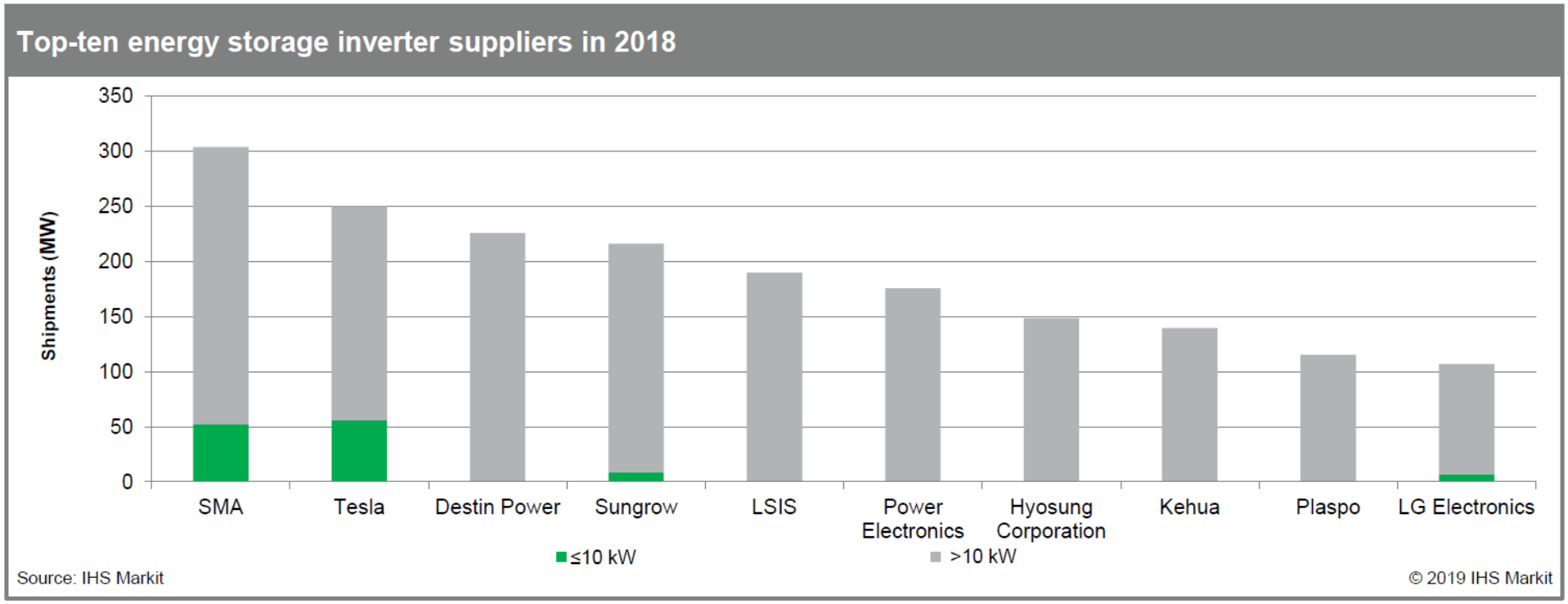


Commercial & Industrial Loads

- Energy shifting
- Power capping
- UPS
- Power quality

> SMA has references in all applications listed here being the market leader for storage

SMA lead again the storage market in 2018



> **SMA is clearly the leading supplier in the storage market**

SMA Sunbelt: Integrated solutions from one single source

Inverter and MV solutions

2000 to 6000 kW

MVPS 20 ft.

MVPS 40 ft. [1]

Battery Inverters

2000 to 4000 kW

- Battery inverters with high power density and wide battery voltage range.
- DC coupling ready for colocation of renewables

Battery containers

- Specially designed and optimized for each project to the customer needs
- Cost effective E-houses or standard ISO containers

Control and Monitoring Systems

- Grid Controller for utility and micro-grid applications for reliable control
- Battery monitoring and EMS

Engineering and Project Management

Battery Storage design

Project management

Detail engineering

Grid studies

Remote Service and O&M

Ext. Warranties **Spare parts** **O+M** **Repowering** **Response time** **24/7** **Remote**

More power, less specific costs with the Sunny Central Storage

High power density

- High power density leads to lower specific costs (per watt)
- Build large scale storage plants with less system complexity
- Highest security during operation

Wide battery voltage range

- Operating DC voltage range from <500 V up to 1425 V
- High compatibility to available battery types and technology

Ready for global deployment

- Easy and fast installation and commissioning
- worldwide acceptance due to certified global standards
- Protection class for harsh environment conditions

Perfectly fits SMA system solutions

- Ready for integration into the SMA Medium Voltage Power Station, Medium Voltage switchgear and Hybrid Plant Controller

> Built on the proven Sunny Central platform with >15 GW of references

SMA can provide AC and DC coupled BESS solutions allowing for cost-effective integration of renewable energy

PV + Storage Solutions

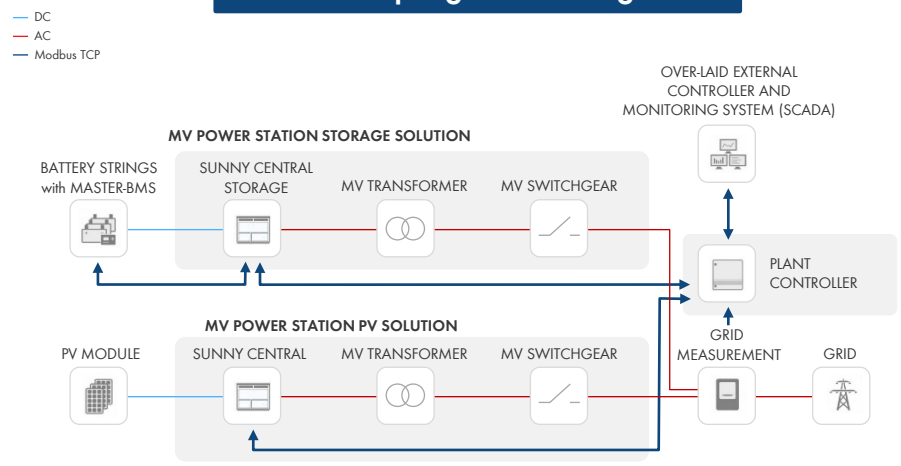
DC- & AC-Coupled

- Depending on project needs, one or even both can be selected

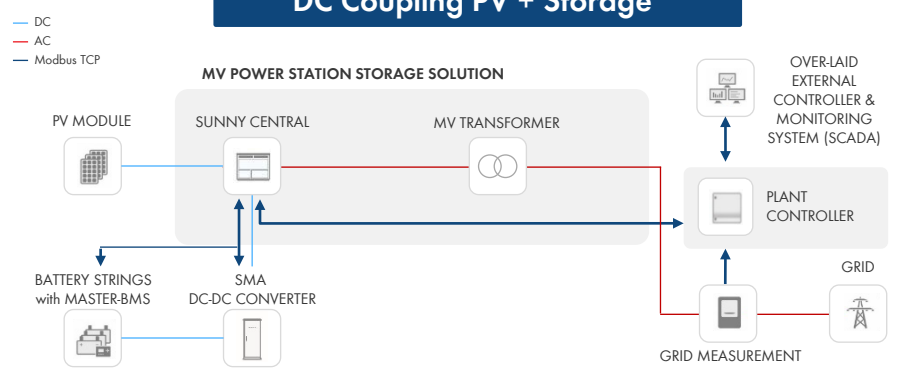
Add storage today or later

- Add AC-coupled storage at PCC (consider spare MV-feeder today)
- Buy SC EV or SC UP with DC-Coupling ready option today and add storage later

AC-Coupling PV + Storage



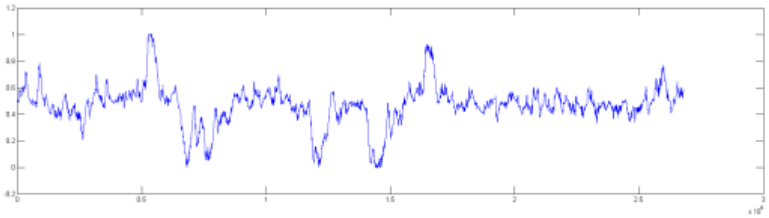
DC Coupling PV + Storage

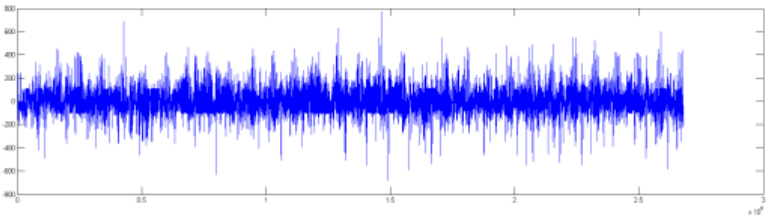


SMA provides sizing of the complete battery system and detailed engineering in-house

Sizing

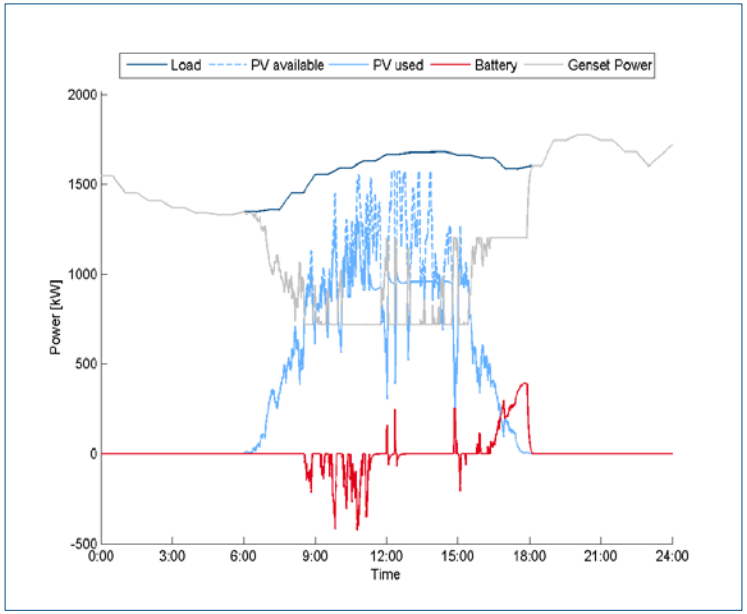
- With proprietary software we simulate the output of the battery and can have a detailed load profile for battery degradation
- We design the battery specifically for the project and simulate the output and savings





Engineering

- We can take standard containers, perform own adaptations or design complete DC system as well on a building
- We provide the complete detail engineering including electrical and mechanical



SMA has established already strong relationships with tier 1 battery manufacturers

Prequalified battery technologies

Battery supply

Containerized solution battery solution (integrated at the factory or on-site) or in-house building depending on local requirements and regulations

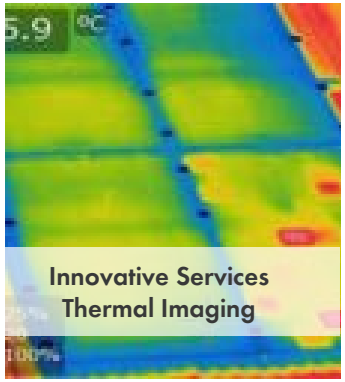
SMA offers full suite of multi-vendor Operation&Maintenance services for PV and BESS

Multi-Vendor O&M Services

+98%

+99%

Plant Performance Guarantees



Segment Focus:

- Full Suite & multi-vendor O&M services
- Commercial and Utility PV plants

Regional Focus:

- EMEA: GER, UK, France, Spain, Italy
- Americas: U.S., Canada, Mexico, Chile
- APAC: Australia and Japan

> With more than 4 GW under O&M contracts, SMA is a globally leading O&M provider.

SMA Sunbelt business model is providing integration and EPC for large scale BESS

Components

- Supply of SMA's off-grid portfolio
- Additional services (engineering, training, commissioning support, etc.)
- Dedicated to off-grid customers

Solutions

- Engineering and supply of Battery Storage solutions
- Battery Containerization
- Development of battery monitoring and EMS

Project Integration

- Support through the entire project value chain of hybrid and storage projects
- Modular approach (development, engineering, procurement, construction, service)

> **SMA Sunbelt is a one-stop-shop for off-grid, hybrid and large-scale storage projects.**

Frequency response services – grid connected battery
Pelham, United Kingdom

The main application of the project is the capacity market and frequency response services but also features other applications like Triads management and reactive power provision.

This project is the largest battery project in the European Union in a single location till date.

The complete project timeline from contract signature till commissioning was reached within 5,5 months

Project

- Location: Pelham, UK
- Commissioning: November 2017

Plant information

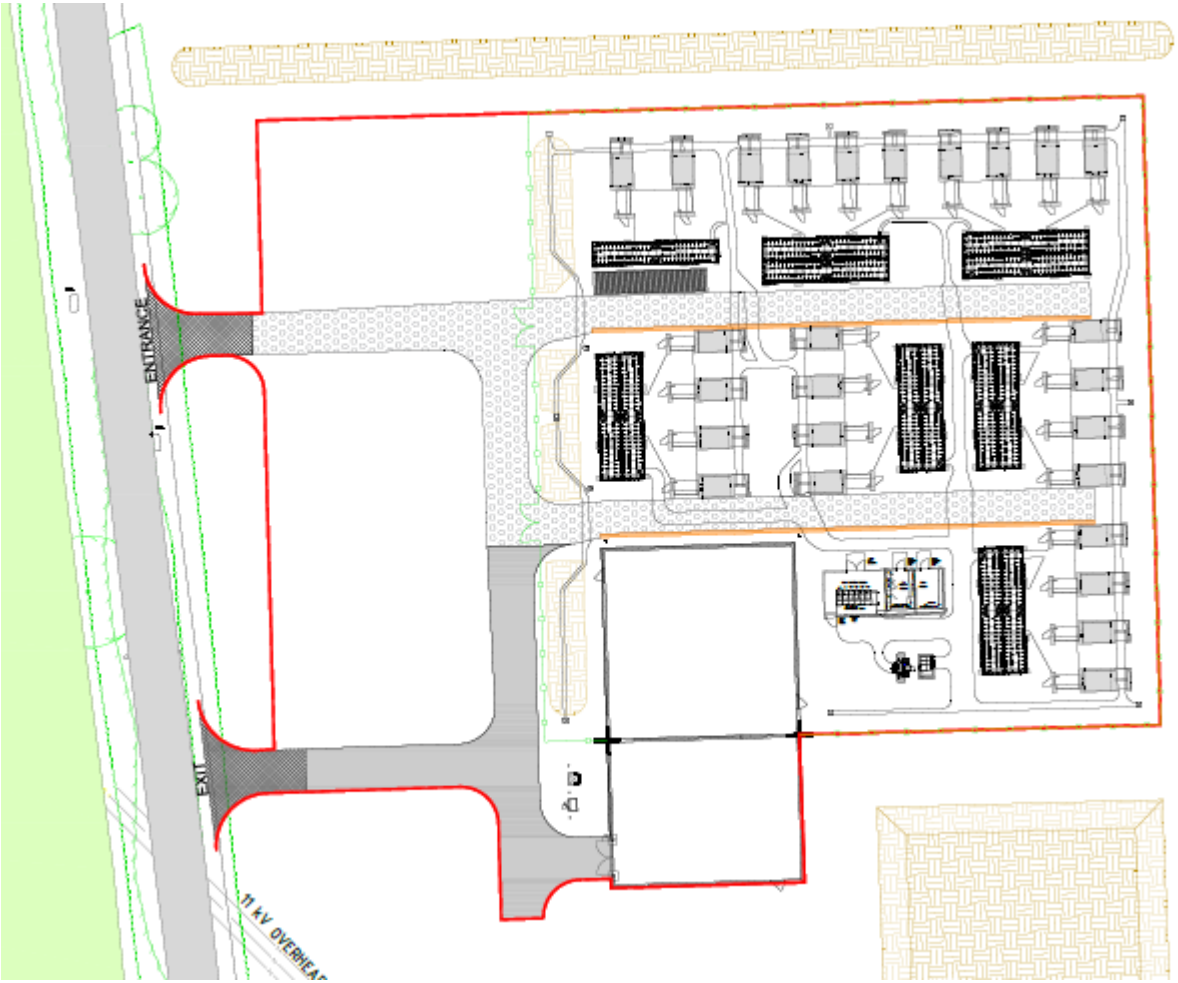
- Installed battery power: 64 MVA
- Installed battery storage: 50 MWh of Li-Ion NMC batteries for frequency regulation
- Batteries installed in customized containers
- Connected at 132 kV

SMA System Technology

- 26 SMA Sunny Central Storage 2475 with noise reduction packages
- 26 Medium Voltage Block 2475
- 7 Customized SMA E-houses
- SMA Power Plant Controller
- EMS

SMA system solutions for grid-connected systems

Frequency response services – grid connected battery
Pelham, United Kingdom



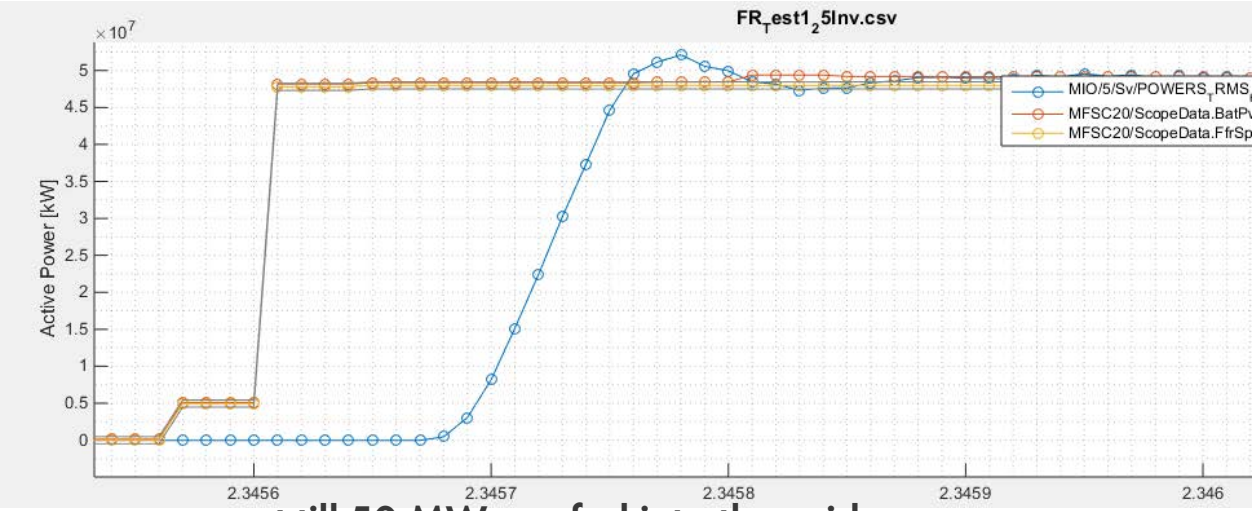
Battery Storage Facility

- 6,578 lithium-ion battery modules
- 7 x Battery containers
- 26 x Sunny Central Storage battery inverters
- 26 x 33 kV MV Blocks
- 1 x Auxiliary 850kVA Transformer
- PMS
- CCTV, security fencing
- Storage Container

Customer Substation

- 33kV Switchgear
- 33/132kV Transformer

Grid Frequency Regulation
Pelham, United Kingdom



› **250 ms from measurement till 50 MW are fed into the grid**

SMA system solutions for grid-connected systems

Frequency response services and blackstart
Schwarze Pumpe, Germany – commissioning ongoing

This project is collocated with one of the biggest coal fired power stations in Germany featuring 1,6 GW of power. The battery will be used for frequency response services as well as to blackstart the power station.

The project uses 58 MWh of NMC batteries housed in 13 battery containers

Project

- Location: Power Station Schwarze Pumpe, Germany
- Commissioning: Q2 2020

Plant information

- 73 MW/58 MWh frequency response battery system in Germany
- Serves for frequency regulation at the grid via demand power/storage supply and provision of reactive power
- Provides blackstart capabilities for the power plant

SMA System Technology

- 26 x SCS 2900 and 13 x MVPS 1900
- Plant Control and SCADA System
- Engineering, Technical Design, Consulting, Simulation and Sizing

SMA system solutions for grid-connected systems

Frequency response services – grid connected battery
Langenreichenbach, Germany

SMA's large scale on-grid project is a 16 MW prequalified PRL (Primärregelleistung – Frequency response) system. The system is installed within a substation and connected at 33 kV to provide grid stability.

The project uses 25 MWh of batteries and is the second of a series of project of the same type.

Project

- Location: Langenreichenbach, Germany
- Commissioning: June 2018

Plant information

- 16 MW/25 MWh frequency response battery system in Germany
- Serves for frequency regulation at the grid via demand power/storage supply and provision of reactive power

SMA System Technology

- 9 x SCS 1900 and 9 x MVPS 1900
- Plant Control and SCADA System
- Engineering, Technical Design, Consulting, Simulation and Sizing

SMA system solutions for grid-connected systems

Frequency response services – grid connected battery
Bennewitz, Germany

SMA's large scale on-grid project is a 16 MW prequalified PRL (Primärregelleistung – Frequency response) system. The system is installed within a substation and connected at 33 kV to provide grid stability.

The project uses 25 MWh of batteries and is the second of a series of project of the same type.

Project

- Location: Bennewitz, Germany
- Commissioning: November 2018

Plant information

- 16 MW/25 MWh frequency response battery system in Germany
- Serves for frequency regulation at the grid via demand power/storage supply and provision of reactive power

SMA System Technology

- 9 x SCS 1900 and 9 x MVPS 1900
- Plant Control and SCADA System
- Engineering, Technical Design, Consulting, Simulation and Sizing

SMA system solutions for grid-connected systems

Frequency response services – grid connected battery
Groitzsch, Germany

SMA's large scale on-grid project is a 16 MW prequalified PRL (Primärregelleistung – Frequency response) system. The system is installed within a substation and connected at 33 kV to provide grid stability.

The project uses 25 MWh of batteries and is the third of a series of project of the same type.

Project

- Location: Groitzsch, Germany
- Commissioning: July 2019

Plant information

- 16 MW/25 MWh frequency response battery system in Germany
- Serves for frequency regulation at the grid via demand power/storage supply and provision of reactive power

SMA System Technology

- 9 x SCS 1900 and 9 x MVPS 1900
- Plant Control and SCADA System
- Engineering, Technical Design, Consulting, Simulation and Sizing

SMA system solutions for grid-connected systems

Large Scale BESS Blackstart and reconnection system
Bordersholm, Germany

Made possible with a storage system from SMA, Bordesholm became the first ever town in Germany to be disconnected from the utility grid and supplied exclusively with renewable energy (solar, wind, biomass) for an hour, before being discreetly reconnected to the transmission line.In addition to a grid formation function, the SMA battery inverters are also equipped with an optional "black start" function, which allows the entire electricity supply to be restarted after a power outage.

Project

- Location: Bordersholm, Germany
- Commissioning: May 2019
- Requirements: Design study, retrofit, resilience, grid quality improvement, automation, integration to existing infrastructure, respecting logistic limitations

Plant information

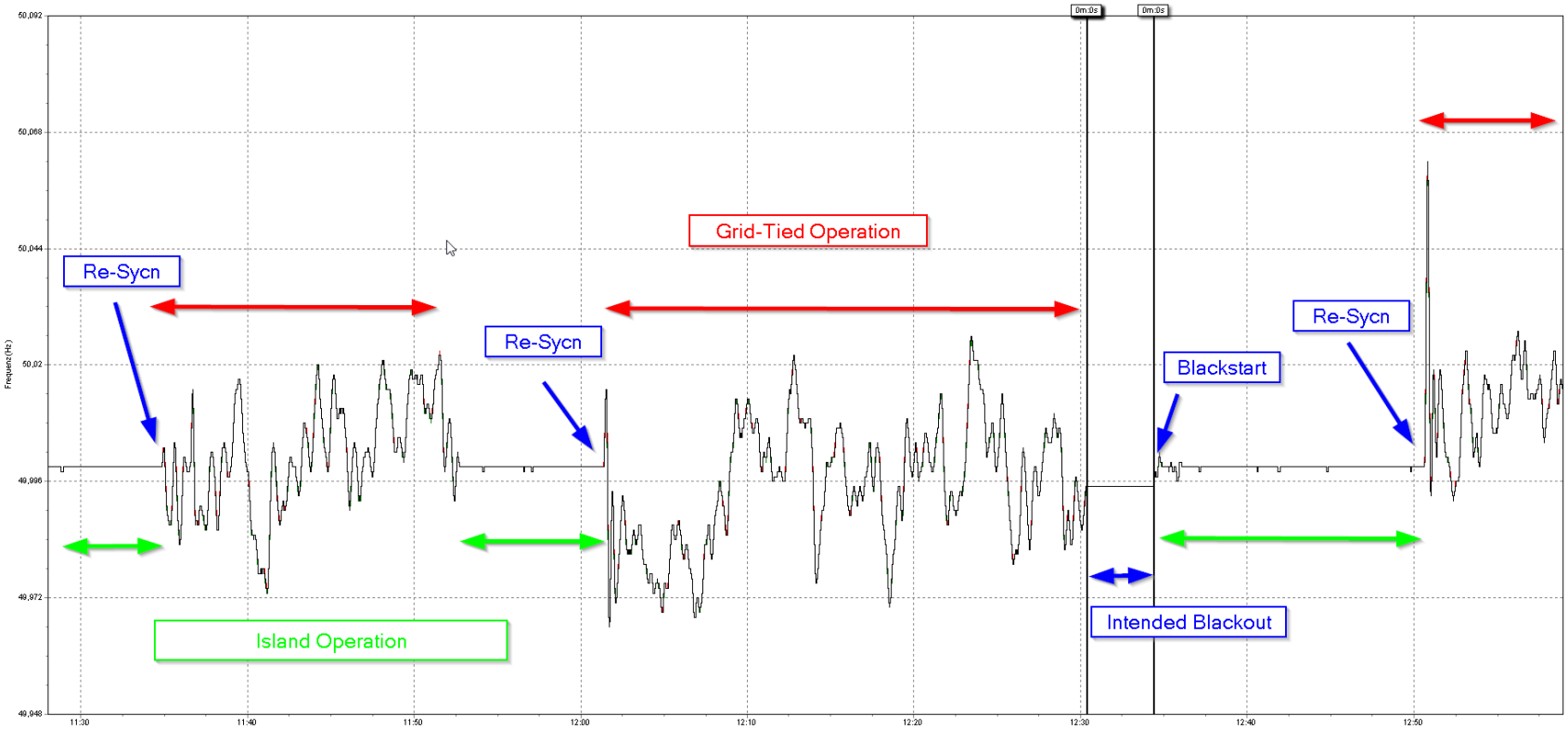
- Installed Storage capacity: 15 MWh
- The storage system supplies primary control energy or energy for intraday trading or direct marketing. In addition, it secures the power supply in the event of power outages.

Integrated System Technology

- 7 x SMA SCS 2200 Blackstart Grid Forming MVPS
- Battery storage with 15 MWh Li-Ion (NCM) cells from Samsung SDI (48.000 cells)
- Energy and Power Management System with SMA's Hybrid Controller

SMA System Solutions for hybrid applications

Switching between grid operation to island operation and viceversa in Bordersholm



- During on-grid operation, SCS follows the grid frequency and if parametrized accordingly, it can provide grid support either as current source (reactive power provision) or as voltage source
- During island operation the voltage and frequency are controlled via battery inverters and the Hybrid Controller

Large scale island electrification with PV, diesel and storage
St. Eustatius, NL Antilles

Today the solar plant covers 23% of the island's total energy requirement. The main challenge was the grid stability due to fast power fluctuations related to cloud movement. SMA Sunbelt integrated a Li-Ion storage facility to absorb such fluctuations, provide energy shifting and frequency stability functionalities also at night time.

The observed solar fraction reaches 88% at midday.

Project

- Location: Dutch Caribbean, Island of St. Eustatius
- Commissioning: 2016
- Specific requirements: Exposure to salty air and hurricanes, fast cloud movement

Plant information

- Installed PV power: 1,89 MWp
- Installed Storage: 1 MW, 570kWh
- Diesel Capacity: 4 MVA
- Annual energy yield: 3.200 MWh
- Reduction in CO2 2.240 to
- Annual diesel savings: > 850.000 liters

SMA Sunbelt Energy GmbH

- System design, simulation and engineering
- Procurement and delivery of entire control and storage system
- Training
- Commissioning and consulting during operation

SMA system solutions for hybrid applications

Expansion of island electrification
St. Eustatius Phase 2, NL Antilles

An expansion of the first phase has been commissioned in 2017. The feature of the project is the diesel-off operation, which allows the island to switch off the generators during the day and run completely on the solar energy.

The system also included additional 2,15 MWp and 4,4 MW of grid forming battery inverters with 5,35 MWh of batteries

Project

- Location: St. Eustatius, NL Antilles
- Commissioning: October 2017

Plant information

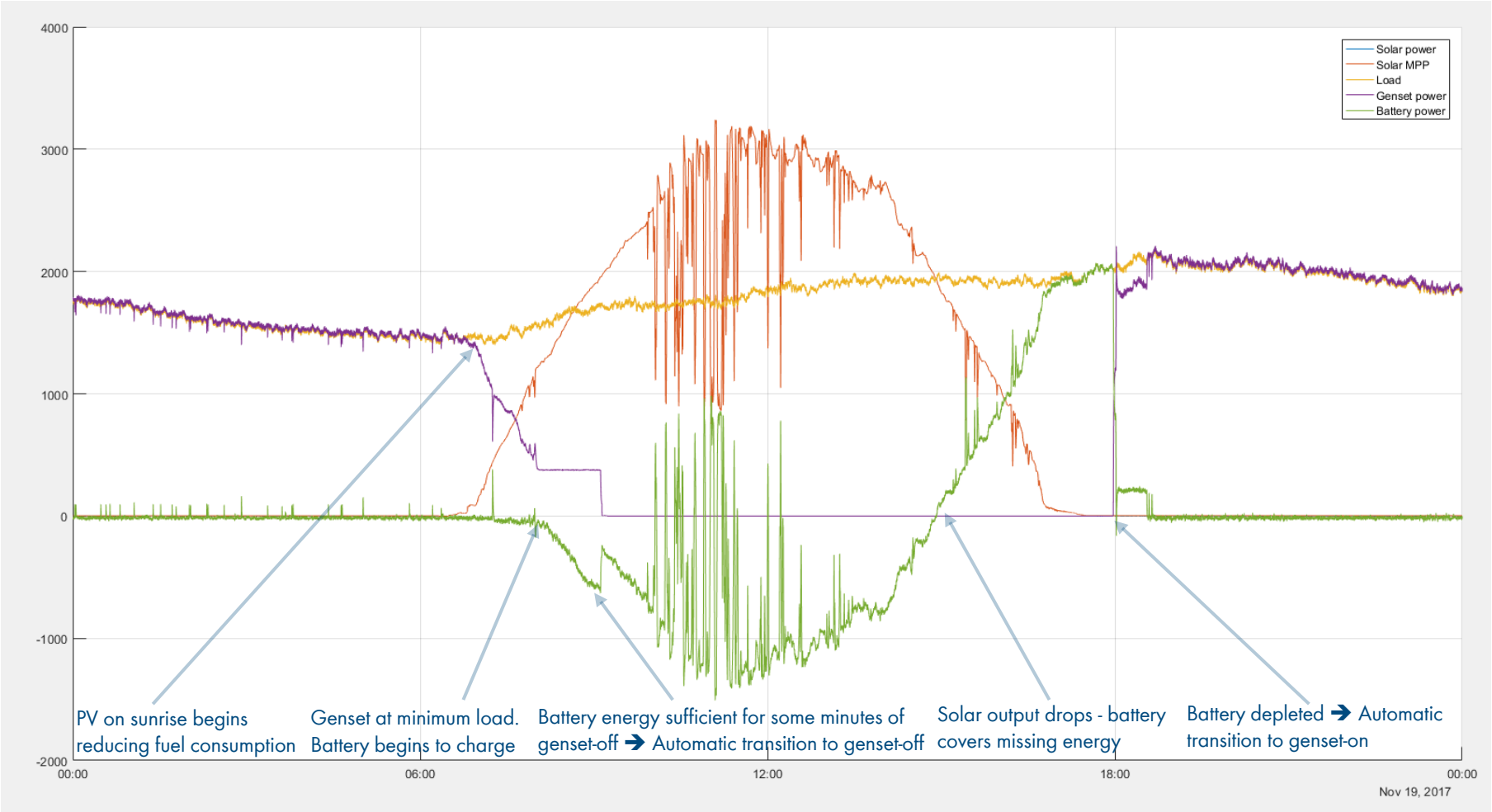
- Installed PV power: 2,15 MWp (in Phase 2)
- Installed battery power: 4 MW/ 5357 kWh
- Diesel generator rating: 4 MVA
- Renewable penetration: 47%

SMA System Technology

- SMA Fuel Save Controller
- 2 SMA Sunny Central Storage 2200 grid forming
- 2 SMA Sunny Central CP 1000 XT

SMA system solutions for hybrid applications

Expansion of island electrification – complete off-grid in MW class with solar + storage St. Eustatius II, NL Antilles



SMA system solutions for hybrid applications

Island electrification by combining PV, batteries & diesel
The Brando - French Polynesia

SMA Sunbelt has been contracted to provide a PV-Diesel-Battery plant on an Island in the French Polynesia.

The plant features the grid forming SMA battery inverters to allow diesel-off operation during the day time. The project aims to achieve a renewable fraction of over 60% on a 24h basis.

The control and battery inverter system allows for grid forming and blackstart of diesel generators in the island.

Project

- Location: French Polynesia
- Commissioning: August 2018

Plant information

- Installed PV power: 1,3 MW
- Installed battery power: 2 MW
- Installed battery storage: 2,7 MWh
- Diesel Generator: 6X 160 kW
- Renewable Fraction: 62%

SMA System Technology

- 1 SMA Sunny Central Storage 2200
- 16 Sunny Tripower 60
- 6 Sunny Tripower 25000TL-30
- 1 SMA designed battery container
- SMA Fuel Save Controller

SMA system solutions for hybrid applications

Island electrification by combining PV, batteries and diesel
Saba, NL Antilles

The PV-diesel-battery plant is presently in its final stages on the island of Saba, located in the Caribbean. The power application battery plant is designed for the ramp rate control for the 1,142 MWp PV plant.

The battery system has been designed to allow for a second phase expected for 2018.

Project

- Location: Saba, Caribbean NL
- Commissioning: November 2017

Plant information

- Installed PV power: 1,142 MWp
- Installed battery power: 800 kW
- Installed battery storage: 393 kWh

SMA System Technology

- SMA Fuel Save Controller
- 1 SMA Sunny Central Storage 800
- 34 Sunny Tripower 25000TL-30

SMA system solutions for hybrid applications

Expansion Island electrification
Saba Phase 2, NL Antilles

The battery energy storage system has been designed and implemented by SMA Sunbelt Energy GmbH in two phases.

In total a 2.3MWh Li-Ion storage facility has been integrated for energy shifting and grid services.

Thanks to the SMA Hybrid Solution about 1 million liters diesel and 2,600 tons CO2 per year can be saved.

The entire island's power consumption is covered by 100% Solar Energy for 8 to 10 hours per day.

Project

- Location: Saba, Dutch Caribbean
- Commissioning: February 2019
- Requirements: Grid Forming Inverter, overall power and energy management system

Plant information

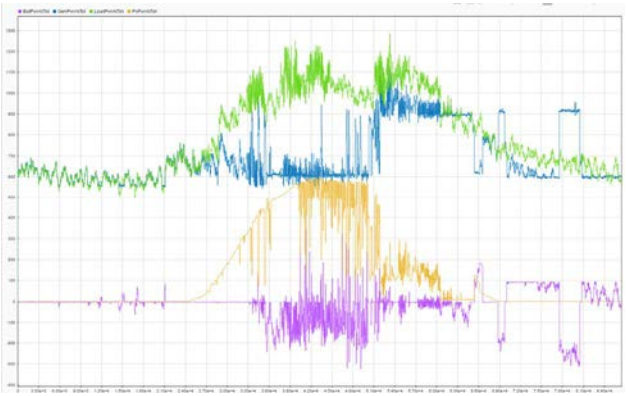
- Installed PV power: 2 MWp
- Installed Storage capacity: 2.3 MWh
- Diesel capacity: 4 MVA
- Annual diesel savings: ~ 1,000,000 liters
- Island Load: ~ 1.2MW

System Technology

- Battery: 1 x SCS 2200 Grid Forming in 1 x MVPS 2200 and 1xCP 800 in MVPS 800
- PV: 64 SMA Sunny Tripower 25000TL-30
- Control: HyC with Automatic Genset Shutdown

SMA system solutions for hybrid applications

Island electrification stability support
Confidential, USA



The battery energy storage system has been designed and implemented by SMA Sunbelt Energy GmbH in combination with a US based contractor.

The BESS provides additional system stability and ramp-rate control to the genset operator due to the critical location and application of this island.

Project

- Location: Confidential, USA Pacific
- Commissioning: February 2018
- Requirements: Ramp-rate control, grid stability support

Plant information

- Installed PV power: 850 MWp
- Installed Storage capacity: 571 kWh
- Diesel capacity: 4 MVA
- Island Load: ~ 1.4 MW

System Technology

- Battery: 1 x SCS 900 in 1 x MVPS 900
- PV: SMA Sunny Tripower 24000TL-30 US
- Control: Fuel Save Controller with genset control interaction

SMA system solutions for hybrid applications

Hybrid energy supply for an industrial application
Malindi, Kenya

Krystaline Salt's factory is supplied by 25% of solar energy in grid parallel and in Diesel mode. Following their ambitious energy management, the company took solar to a professional scale and safes expenditures for electricity supply.

SMA Sunbelt Energy GmbH as EPC in cooperation with its local construction partner Harmonic Systems build and commissioned the project within 5,5 months.

Project

- Location: Malindi, Kenya
- Commissioning: December 2016
- Specific requirements: Co-generation with generators and grid. Costal conditions.

Plant information

- Installed PV power: 991 kWp
- Diesel Capacity: 4 MVA
- Annual energy yield: 1600 MWh
- 25 % savings on electricity costs
- CO2 savings: 982 t/year

SMA System Technology

- 1 Fuel Save Controller 2.0
- 35 Sunny Tripower 25000TL-30

SMA system solutions for hybrid applications

Hybridization of power generation of a city
Maevatanana, Madagascar

Maevatanana had a very unstable grid supply with multihourly and scheduled grid outages. Thanks to the installation of new gensets and the PV installation, the system operates with only one genset and over 60% of the energy is provided by the PV system during daytime.

After the installation of the system, the local load consumption has increased by over 20% and an increase up to 30% is increased in the next months.

Project

- Location: Maevatananana, Madagascar
- Commissioning: October 2016
- Specific requirements: Co-generation with generators

.

Plant information

- Installed PV power: 386 kWp
- Diesel Capacity: 3 x 150 kVA
- Running with only 1 genset it reaches >80 % penetration on power generation during daytime

SMA System Technology

- 1 Fuel Save Controller 2.0
- 16 Sunny Tripower 25000TL-30

SMA system solutions for hybrid applications

Electrification of a hospital
Mirebalais, Haiti

With 700 employees (300 nurses / 50 doctors / 350 staff) and 350 beds the hospital provides care services for 3 communities in the rural area of Haiti –over 700 patients per day have access to professional health care. The pediatric department delivers 30 babies per day.

Reducing the costs for the electrical consumption by approx. 30 % using the SMA Fuel saver controlling the 509,5 kWp system give room the for further needed expansion of the hospital, being able to serve the Haitian residents even better.

Project

- Location: Mirebalais, Haiti
- Commissioning: November 2016

Build Health International

Partners In Health

Plant information

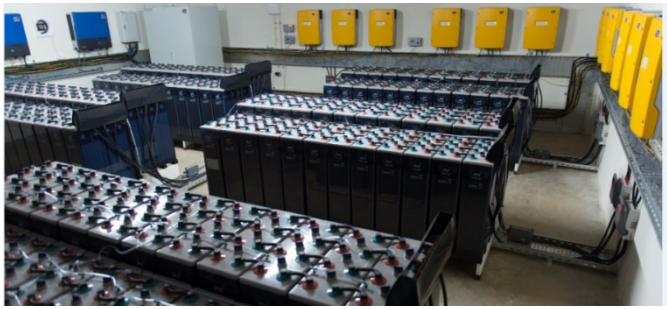
- Installed PV power: 509 kWp
- Diesel Generator: 2 X 800 kW
  1 x 300 kW
- Annual diesel savings 25.000 L

SMA System Technology

- 20 Sunny Tripower
- SMA Fuel Save Controller
- EPC: SMA Sunbelt Energy GmbH
- Operator Build Health International

SMA system solutions for hybrid applications

Hybrid energy supply
Serengeti, Tanzania



The camp in the Serengeti was supplied by two 100kWp diesel generators running nonstop day and night at a high cost per month. With the newly installed Solar System, which was designed, installed and commissioned by **Harmonic Systems Ltd**, the camp saves up 85% of its diesel costs. The 133kWp solar array and 900 kWh battery bank with the SMA Multicluster System with Sunny Island runs the camp during the day and night. During prolonged period of days with cloud cover the diesel generators work as a backup, charging the batteries and simultaneously providing the camp with power. SMA Multicluster System with Sunny Island was the obvious choice for this system due to the reliability of the products given the remote location in Tanzania.

Project

- Location: Tourist Ressort, Tanzania
- Commissioning: 2016
- Specific requirements: High battery storage capacity due "silent night" operation strategy

Plant information

- Installed PV power: 133 kWp
- Annual energy yield: 206,000 kWh
- Reduction in CO2 168 tons
- Annual diesel savings: 85%

SMA System Technology

- 15 Sunny Island 8.0H-11
- 6 SMA Sunny TriPower 20000TL-30
- 1 Multicluster Box 36

SMA system solutions for hybrid applications

Commercial operation of a Resort in an island
Bastimento, Panama

The Red Frog luxury resort is located on the Isla Bastimentos.
With the integration of a 196 kWp PV system, controlled by the SMA Fuel Saver, onto their electrical production, the emissions are reduced by approx. 50 % at daytime.

Project

- Location: Isla Bastimentos,
- Commissioning: February 2016
- Specific requirements: Co-generation with generators.

Plant information

- Installed PV power: 196 kWp
- Diesel Capacity: 3 x 455 kVA
- Annual diesel savings: 50.000 liters

SMA System Technology

- 1 Fuel Save Controller 2.0
- 8 Sunny Tripower 20000TL-30

SMA system solutions for hybrid applications

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