

# Instant performance at the push of a button

Boost the opportunities of your plant with SIESTART™ hybrid solutions





Renewable generation providing increasingly more power without emissions, but highly volatile.  
**not dependable**





Conventional generation economically  
providing dispatchable and reliable power,  
but with technical limitations.  
**not instantaneous**







Battery storage systems providing instantly available, environmentally friendly power, but timely limited.  
**not permanent**





Continuous reduction of emissions  
enforced by law, but only possible  
with increasing technical effort.  
**high costs**





Feed prices urging conventional power producers to find additional business opportunities, but with limited invest. **short amortization**





Re-starting power plants or providing grid services require autonomous power supply, but conventional plants are mostly dependent from external sources.  
**not capable for black start**





# SIESTART™ hybrid solutions integrate the benefits of conventional power generation with battery storage systems

**SIEMENS**  
*Ingenuity for life*



## Fast and efficient

Combining the high performance of a conventional power plant with the instantaneous response of a battery storage system



## Reliable solutions from a reliable partner

Siemens is the world leader in flexible power generation for the changing demands of the grid



## Future-proof design

Modular, expandable, cutting edge solutions available for fast delivery

**Instant performance at the push of a button:  
Boost your plant's opportunities with SIESTART™**



**SIESTART™ – Perfect solutions to master the increased requirements for efficient and reliable power generation**



**SIESTART™ enables ...**

**power plant black start**

**grid restorage**

**frequency control**

**synthetic inertia**

**spinning reserve**

**renewable energy stabilization**

**faster load ramping**

**load range extension**

**island operation**

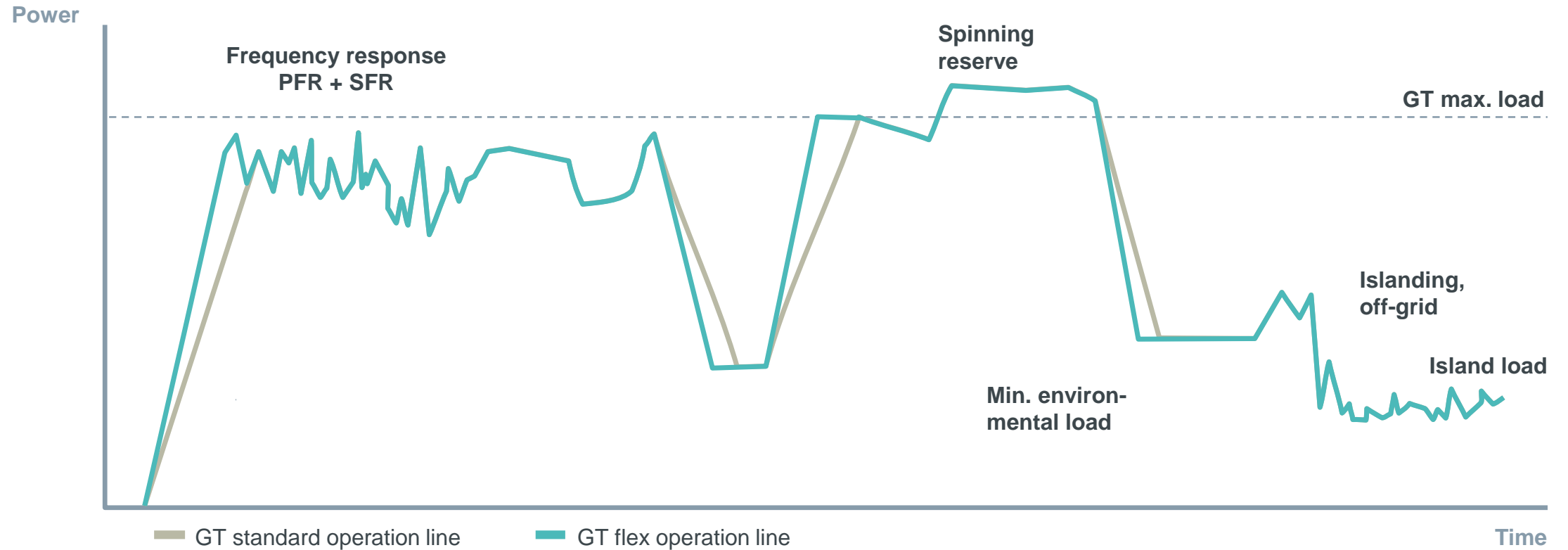
**ancillary services**

**immediate backup power**

**immediate startup bridge**



# SIESTART™: Optimized performance and new opportunities – for grid and ancillary services and turbine operation



Black start and support of grid restorage

Fast start-up

Primary frequency response

Secondary frequency response

Acceleration & stabilization of load ramps

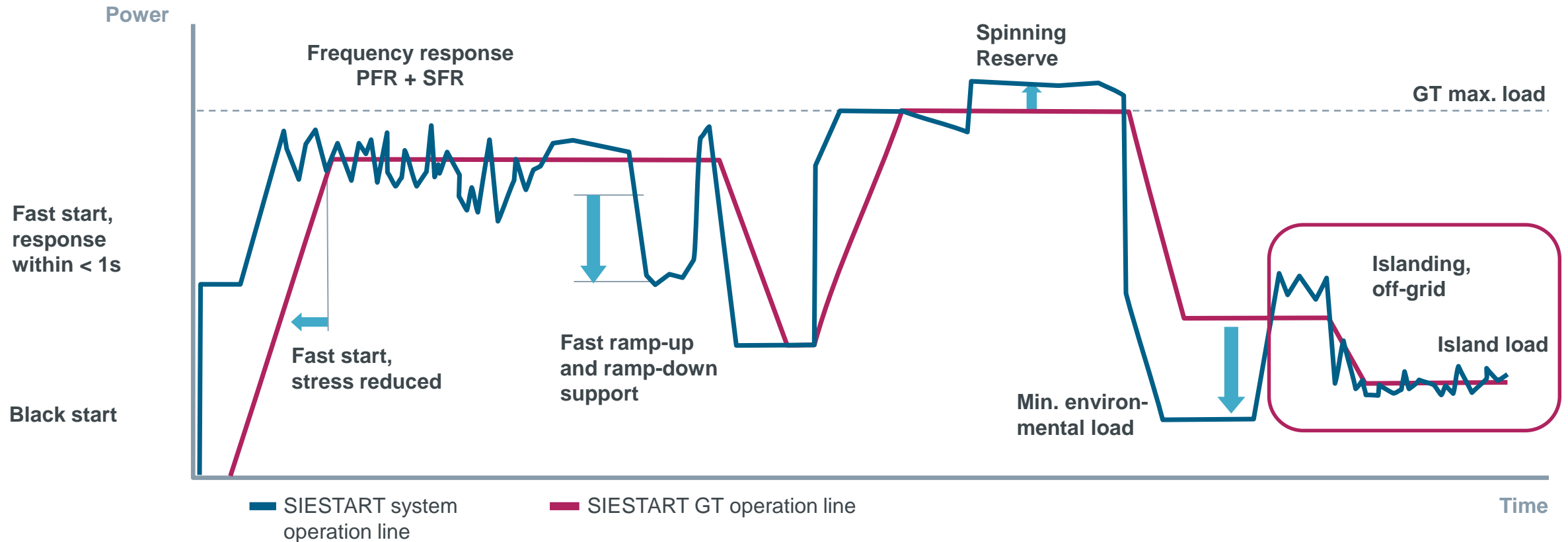
Operating reserve for peak power

Minimum load

Islanding off-grid



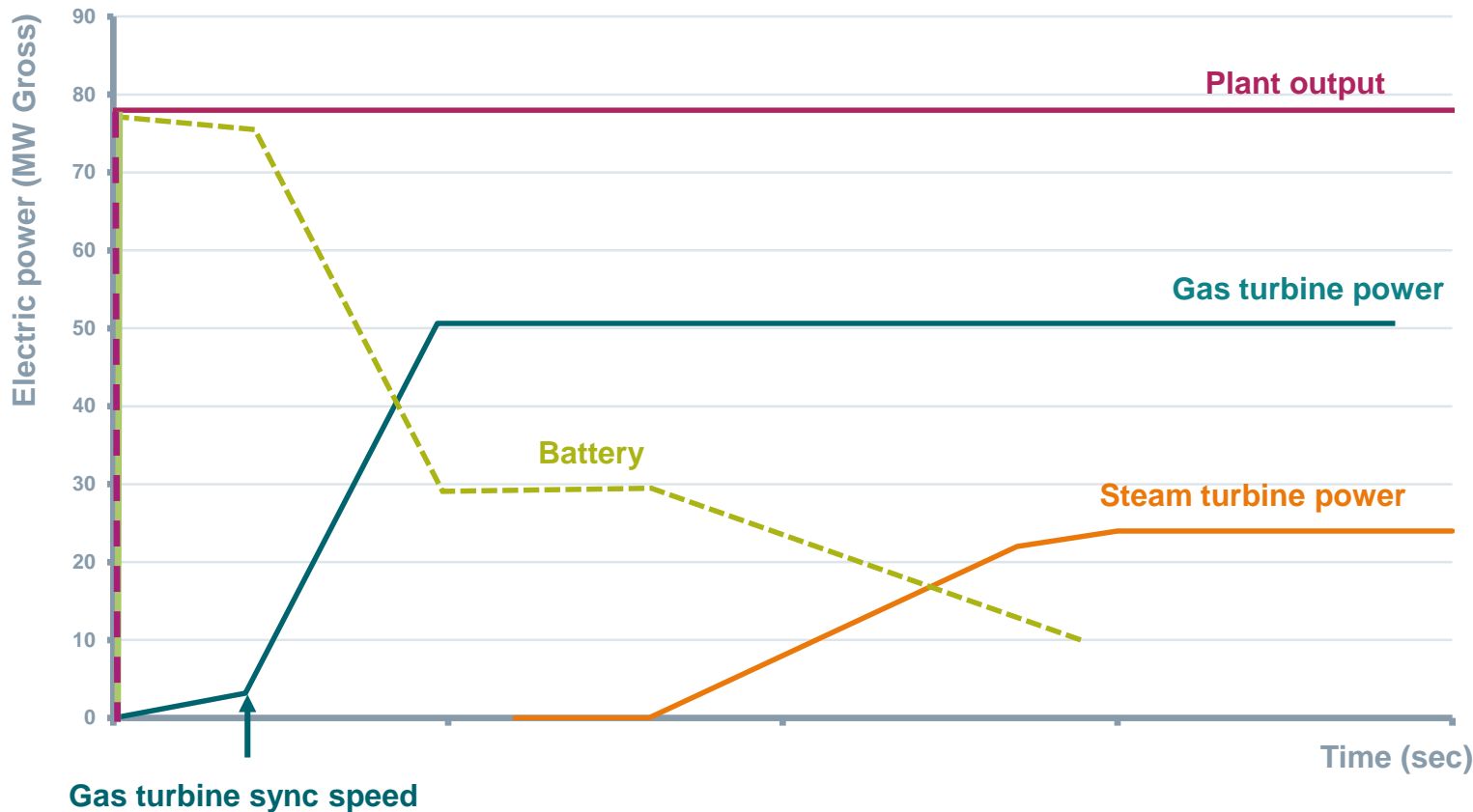
# SIESTART™: Optimized performance and new opportunities – for grid and ancillary services and turbine operation





# SIESTART – 80 MW BESS – SCC-800 peaking plant

## Immediate firming capacity with high efficiency combined cycle



### Customer benefits:

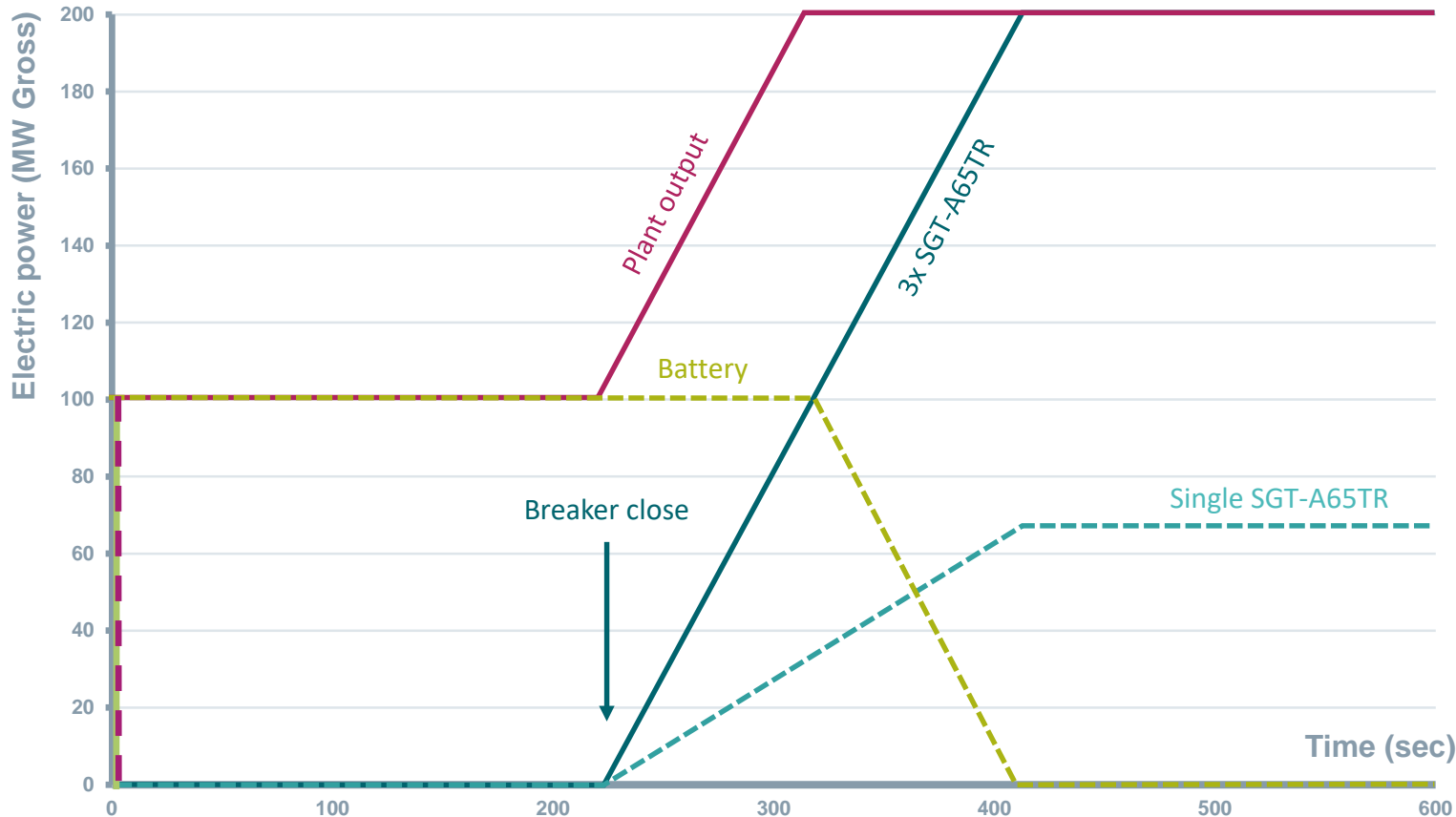
- Provides 100% of the plant's output (80 MW) within milliseconds (<1 sec)
- Provides black start power to gas turbines
- Battery output tapers off as turbines come online and ramp up
- **Full plant output - *immediately and continuously***

Full plant response within 1 second – from a high efficiency combined cycle plant



# SIESTART – Peaking Plant

## 100 MW BESS combined with 3x SGT-A65TR



### Customer benefits:

- Provides 50% of the plant's output (100 MW) **within milliseconds (< 1sec)**
- Battery and gas turbines combine to deliver 100 % of the plant's output (200 MW) in **5 minutes**
- Battery output tapers off as gas turbines ramp up to maintain **constant plant output**

SIESTART can be customized to deliver critical power immediately



# Modular power supply: The Battery Energy Storage System SIESTORAGE



**Modular energy storage system based on cutting-edge power electronics and Li-ion batteries:**

- Instantly available, reliable and flexible power
- Fast and accurate response time to consume and discharge energy
- Assured power quality
- Flexible and scalable design - various sizes and configurations up to e.g. 25 MW and beyond possible
- Nominal capacity up to 1 MWh in one standard container

**Designed for improved asset performance.**



# An advanced upgrade for existing plants and major added value to new build power generation units



## Advanced upgrade of existing power plants:

Enriching existing power plants with new features, extended performance and new business opportunities



## Major added value for new power plants:

e.g. Siemens combined cycle power plant SCC-800 with 10 MW SIESTORAGE electrical energy storage system

**SIESTART: Suitable for existing and new plants – independent from the OEM technology\*!**

\* The SPPA-T3000 control system allows for integrating SIESTORAGE in fossil power generation units with gas or steam turbines of all manufacturers, sizes, types and makes.



# Instant performance at the push of a button: Boost your plant's opportunities with SIESTART



## Instantly more flexibility

**SIESTART enables you to run your plant exactly in the required mode:**

- Individually scalable
- Higher flexibility and instantaneous reaction
- Reduced emissions

## Instantly new opportunities

**SIESTART boosts your business:**

- Immediate OPEX improvement
- Ancillary services provide additional business cases
- Reduced feed consumption, lower costs

## Instantly black start capable

**SIESTART brings your plant faster on-grid:**

- Instant availability in case of grid failures
- Secure power supply, even in island mode
- Immediate, stable load changes even with instable or no transmission grid connection

## Instantly higher reliability

**With SIESTART you can always rely on instant performance of your plant:**

- Continuously high quality of power supply
- Low material stress for life cycle extension
- Integrated solution from power plant experts





# Reliable power supply for sustainable steel plant operation incl. black start capability

Customer

**Vulkan Energiewirtschaft  
Oderbrücke GmbH**

Location

**Eisenhüttenstadt, Germany**

Date

**2013**

**Secure  
power supply  
(on- and off-grid)**

## Challenges

- Black start capability for an industrial gas turbine
- Grid stability (frequency, voltage)
- Islanding and off-grid services
- Smart peak load management

## Solution

- Existing GE gas turbine and generator
- SIESTORAGE Li-Ion battery storage system (2,8 MVA / 1,2 MW, 1,080 kWh)
- Integration of components to existing unit control system

## Customer benefits

- Siemens turnkey solution with 57 MW<sub>el</sub> and steam generation of 180 t/h, 120 bar, 540° Celsius
- Secure power supply through black start capability for sustainable steel and rolling mill operation



**Independence from  
public power grid**

**Grid services  
(frequency, voltage)**



# Reliable power supply for an off-grid island in Italy



Customer  
**ENEL**  
Location  
**Ventotene, Italy**  
Date  
**2016**

**Secure  
power supply  
(on- and off-grid)**

## Challenges

- Off-grid electrification of a geographical island
- Black start capability in case of a power outage
- Primary and secondary frequency regulation
- Flexible management of users and renewables power input

## Solution

- SIESTORAGE Li-Ion battery storage system (500 kW / 600 kWh)
- Microgrid Controller
- Integration with four existing diesel generators (480 kW each)

## Customer benefits

- Up to 15% diesel fuel savings
- Approx. 55% savings in diesel generator operating hours
- Reduction of CO<sub>2</sub> emissions and maintenance costs
- Improved grid stability



**Grid services  
(frequency, voltage)**

**Turnkey solution  
(one-stop-shop)**



# SIESTART™ – The performance of conventional power plants combined with instant & reliable Battery Energy Storage Systems



## Siemens Power Generation

- Over 600 GW of installed capacity since 1960
- More than 25,000 Siemens gas and steam turbines in commercial operation
- I&C solutions for all types of plants

**SIESTART**

## Siemens BESS (SIESTORAGE)

- Cutting-edge power electronics, automation, and state-of-the-art Li-ion battery technology
- Modular battery storage concept with flexible and scalable design
- 20 battery storage projects – eight regions, seven use cases

**Siemens Control Systems: More than 2,700 power plant projects with Siemens I&C**



# Siemens Power and Gas: close to customers all over the world



more than  
**6,900**  
gas turbines

more than  
**20,000**  
steam turbines

more than  
**5,500**  
generators

more than  
**2,700**  
power plant projects

Numbers of sold units in commercial operation (April 2017)



# Get in touch with us!



Dipl.-Ing. (TH)  
**Stefan Alwers**

Siemens AG  
Power and Gas Division  
Diversified Power Solutions  
SIESTART Business Owner

Phone: +49 69 807-4036  
Mobile: +49 173 3671 636  
[stefan.alwers@siemens.com](mailto:stefan.alwers@siemens.com)

[siemens.com/powerplants](https://siemens.com/powerplants)

Dipl.-Ing. (TH), MBA  
**Uwe Fuchs**

Siemens AG  
Energy Management  
Medium Voltage  
Advanced Power Systems  
and Storage

Phone: +49 621 456-3283  
Mobile: +49 173 7193 451  
[fuchs.uwe@siemens.com](mailto:fuchs.uwe@siemens.com)

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# Merging of Technologies: conventional power generation units with battery storage



**SIESTART combines multiple independent technologies into a novel solution**