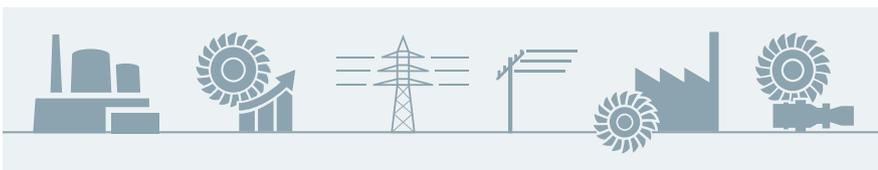# Enhancing gas turbine power generation with battery storage

Higher operational flexibility with SIESTART

Conventional power plants (heavy-duty as well as industrial-scale) need to ensure grid stability
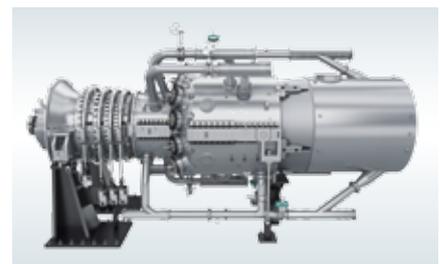

Gas turbine SGT6-8000H

Today's challenges in the grid

The energy transition puts grid systems under growing pressure, because greater utilization of renewable sources doesn't provide sufficient inertia to support stabilizing the grid frequency. To ensure grid stabilization, large centralized fossil power plants that were originally designed for baseload operation now need to ramp much faster and more frequently, and provide highly flexible spinning reserve. Traditionally, maintaining frequency and voltage stability relies on gas turbine power generation. However, sometimes the power generated is not sufficient to allow the gas turbine to reconnect, resulting in a partial or total blackout.
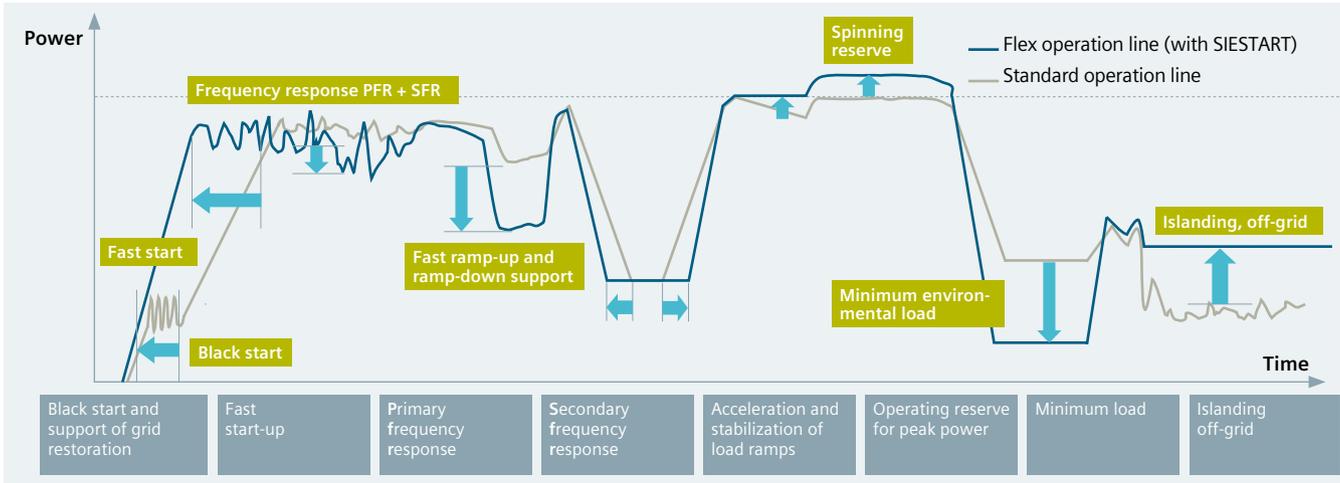
Stability of the grid and secure supply of power

Power producers need to broaden their capabilities to ensure grid stability when power system operation is under threat. They must:

- Accelerate load ramping for fast compensation of imbalances in the grid
- Provide spinning reserve as an additional power reserve to stabilize the grid
- Provide islanding and off-grid services (especially for industrial power plants)
- Provide black start capability in the event of a grid failure

siemens.com/SIESTART

Power

Frequency response PFR + SFR

Spinning reserve

— Flex operation line (with SIESTART)
— Standard operation line

Fast start

Black start

Fast ramp-up and ramp-down support

Minimum environ-mental load

Islanding, off-grid

Time

| Black start and support of grid restoration | Fast start-up | Primary frequency response | Secondary frequency response | Acceleration and stabilization of load ramps | Operating reserve for peak power | Minimum load | Islanding off-grid |

SIESTART: optimized performance and new opportunities – for grid services and gas turbine operation

The solution: SIESTART

The solution combines the performance of a gas turbine with a battery energy storage system (BESS) like Siemens' SIESTORAGE. The system comprises very fast and reliably responding Lithium-ion battery technology combined with cutting-edge power electronics and control for the fast and accurate response required by ancillary services. Because it is designed with both active and reactive power components, it can offer reliable black start functionality in the event of grid collapse. This collocation of gas turbine and batteries can also be used for ramping up and down faster, which ensures flexible operation to provide and sell ancillary services.

Optimized OPEX

The SIESTART solution can be installed as a retrofit in existing power plants or as added value for new installations. SIESTART is also a reliable power supply alternative to gensets, as it's both eco-friendly and resource-efficient.

Cutting-edge technological portfolio
- Gas turbines from 4 to 425 MW
- Steam turbines from 2 to 1,900 MW
- Generators
- Electrical components
- Instrumentation and control solutions for all types of plants
- Modular battery storage system
- Turnkey industrial or heavy-duty power plant solutions (simple cycle, combined cycle, cogeneration) from 14 to 1,250 MW

## Comprehensive portfolio of experience and expertise
- Consulting
- Project development
- Financing
- Engineering
- Procurement
- Construction
- Commissioning
- Operation and maintenance
- Optimization

SIESTART combines the performance of a gas turbine with the Li-ion battery energy storage system SIESTORAGE

Use cases
- Black start
- Grid restoration
- Frequency control
- Stabilization of voltage – critical power
- Stabilization of electrical island mode
- Ramping control and acceleration
- Decrease GT minimum load by time shifting
- Spinning reserve

Power ▶   ◀ Power

Power ▶

Black start in the event of grid collapse (blackout)
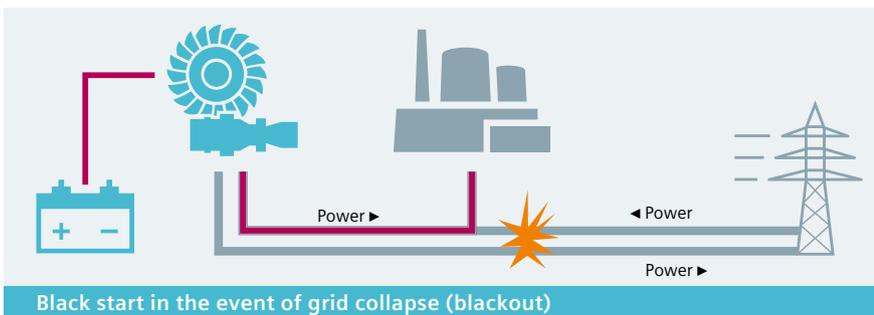
Enhancing gas turbine operation with SIESTORAGE battery storage system