

Turn Up Upgrade for Siemens Gas Turbines

Performance Enhancement – Gas Turbine

The global energy market is no longer a homogeneous field. The increase in renewable power generation has led to higher operational flexibility requirements for many fossil powered simple and combined cycle power plants.

To answer this demand, Siemens has developed hardware and software solutions as part of Siemens' Flex-Power Services™. Flex-Power Services™ offers solutions for all aspects of the changed operational requirements, e.g. power on demand and grid services.

One product specifically designed to address your demands regarding the grid services is the Turn Up upgrade.

Our product

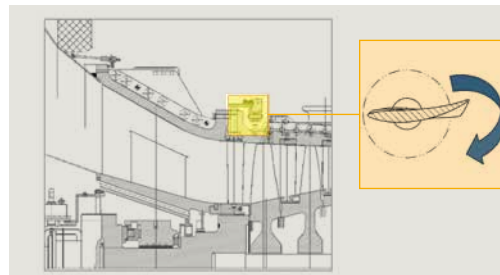
The Turn Up upgrade is part of the Siemens Energy strategy to support peak load operation.

The Turn Up upgrade provides significant performance advantages and offers attractive financial payback options.

Your benefits

The Turn Up upgrade can offer you a quantifiable benefit that entails opening the compressor inlet guide vane beyond the standard position. This leads to an increased compressor mass flow, which can increase gas turbine power output.

With Turn Up, Siemens offers a SGT5-4000F (V94.3A) upgrade designed to provide power above base load. Therefore a closer operation to the maximum efficiency point can be realized while the whole primary frequency response reserve is preserved. Consequently, the gas turbine can operate at higher part load and therefore



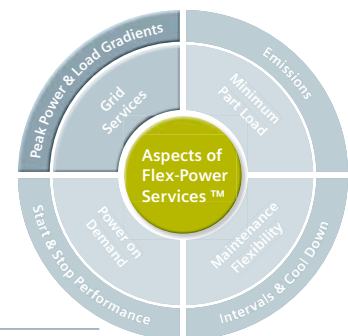
Opened compressor inlet guide vane

at a higher efficiency level. The average power output of the plant can increase; a minor increase in average combined cycle efficiency may also be possible.

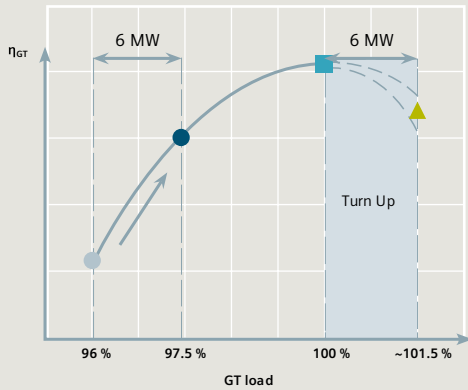
Benefits may include*:

- Improved gas turbine power output up to 6 MW in simple cycle units
- Up to 9 MW higher combined cycle power output as a result of the increased exhaust mass flow
- Compressor mass flow increase of up to 2,7 %
- Primary and secondary frequency reserve above 100 % power output
- Support for peak load operation

* Subject to specific technical plant evaluation



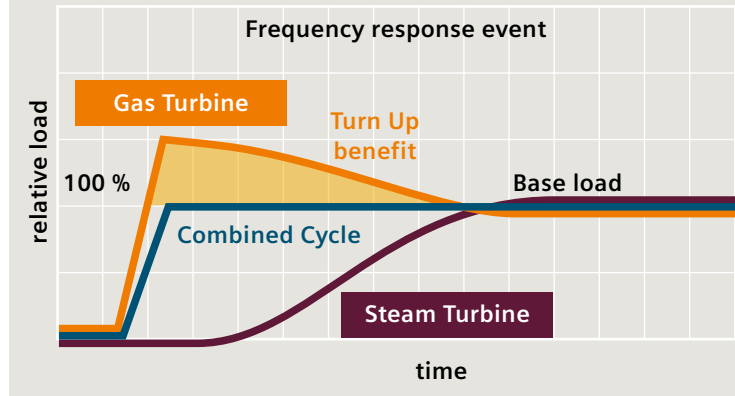
Flex-Power Services™



Potential upgrade benefit

- Starting point with standard onfiguration
- Starting point with Turn Up
- Base load
- ▲ Maximal load with Turn Up

Potential upgrade benefit: gas turbine operation closer to base load*



Frequency response event*

Scope of supply

The Turn Up upgrade is just one of the many innovative modernization packages available.

The scope of this upgrade includes:

- Modification of inlet guide vane
- Modification of Instrumentation and Control

The Turn Up upgrade with the above mentioned scope of supply is applicable for the SGT5-4000F (V94.3A).

To further enhance your power plant, you may combine this upgrade with one of the following other Siemens' modernization products:

- Turn Down
- Advanced Stability Margin Controller (aSMC)

We recommend the installation of this upgrade at a major outage.

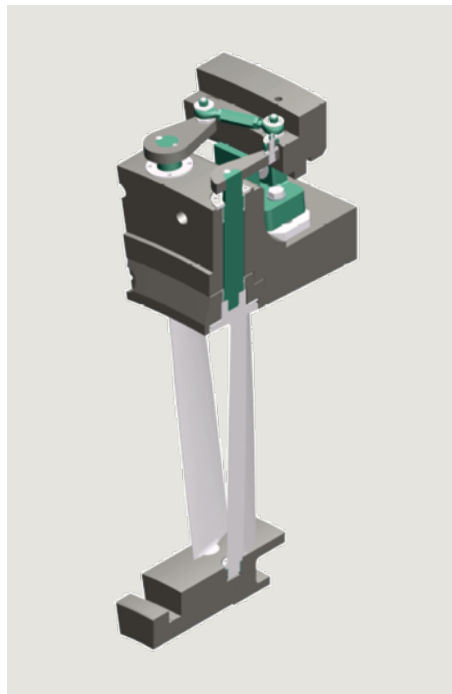
Siemens Field Service offers a full range of field service capabilities to help you manage your maintenance and outage schedules.

References

The development of the Turn Up upgrade is based on Siemens' extensive knowledge and experience as the Original Equipment Manufacturer and forms part of the Flex-Power Services™.

As of April 2013, seven units are in operation worldwide:

- One unit is located in Germany
- Two units in Italy
- Four units in the United Kingdom



Modified inlet guide vane

We provide products and services to support your goal of maximizing your return on investment.

* conceptual illustration only – actual performance and results may vary

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