Spotlight on: Integration of Energy Storage Solutions in Thermal Power Generation

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The integration of energy storage into thermal power plants can greatly contribute to flexibility and efficiency improvements and, therefore, emission reductions as well as increased overall plant performance, leading to cost reductions. It will be an important contributor in the future energy system, with an ever-increasing share of variable renewable energy sources and higher flexibility demand. Read on to understand the important role of the integration of storage options into thermal power plants.

The benefits of integration of energy storage

Flexibility becomes an integral part of energy security. When there is a high level of variable renewable power, the stability of the grid can be maintained thanks to flexible and dispatchable thermal power generation. The integration of energy storage in thermal power plants can greatly contribute to further increasing their flexibility, storing excess power at times of low demand to be used later when needed – both in the short-term and the long-term.

To be more concrete, storage can help thermal power generation optimise its operation by bridging between stop and restart of a generator or by providing the needed time to achieve optimal ramp-up/-down, so that fast load changes can be met.

These solutions will also contribute to increase the efficiency of thermal power plants – including fuel efficiency, which will be translated into a reduction of CO2 emissions and a decrease in costs.

Energy storage in Thermal Power Plants

In the context of thermal power generation, we may distinguish between 4 main types of energy storage:

(1) Electrochemical storage,
(2) Mechanical storage,
(3) Chemical storage,
(4) Thermal storage.

Each of the 4 storage options is on a different level of development, hence further research is required to fully explore the potential of those possibilities and apply them optimally.

EUTurbines

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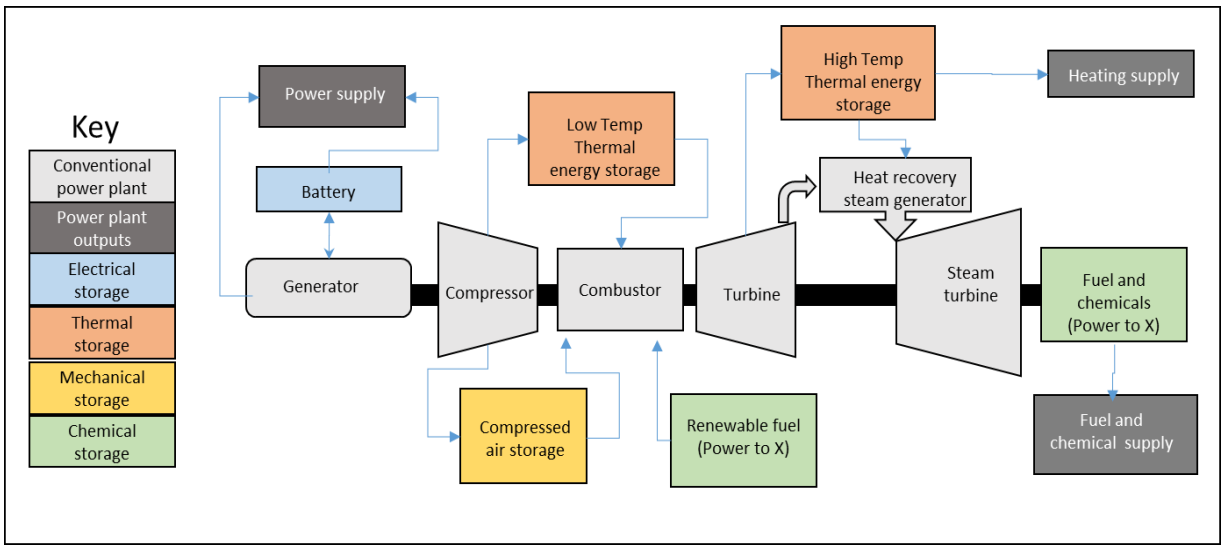
The following graph and elaborations illustrate at which moment in the process of a combined cycle gas turbine power plant, the integration of energy storage would be beneficial:



Electrical storage	Thermal storage	Mechanical storage	Chemical storage
A battery added to a gas turbine can be recharged from the available generator when less power is supplied to the grid – to later bridge between the generator's stop and restart.	Stored thermal energy can be used to heat thermal plants to enable faster response rates without damaging components; Thermal storage can use the steam turbine in a combine cycle power plant to extract power	The expander of a gas turbine driven by an external pressurised air can reduce the compressor work and increase the power plant output above the plant maximum; The compressor and expander of a gas turbine can be used both for compressed air energy storage as well as for the gas turbine. Maintaining rotating energy by adding a flywheel to the shaft of the gas turbine.	The fuel generated using renewable energy (Power-to-X) can be used in thermal power plants (X-to-Power) - if the fuel is compatible with the combustion system - contributing to the decarbonisation of thermal power plants.

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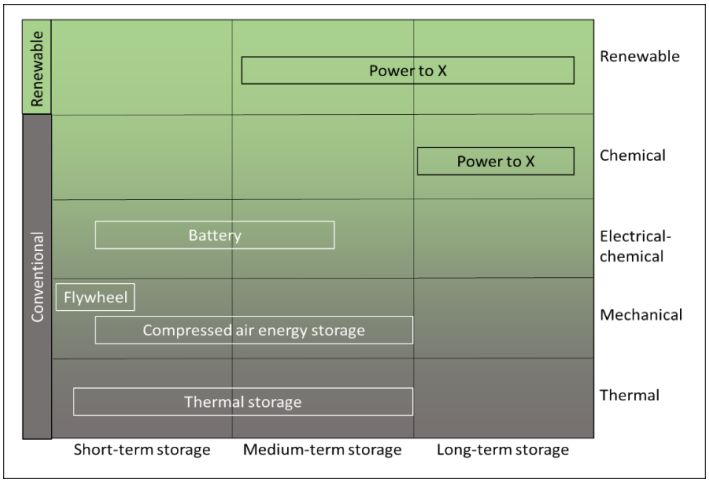
Energy storage options horizon



The graphic illustrates visually how these storage solutions deliver in the short, medium- and long-term, depending on the technology used.

The cost and efficiency to transform between the energy forms is determined by the available technology. The size and duration of the storage also has a large impact on the cost and performance. These factors combine to determine if storage options are available and economically viable to meet power management requirements.

The reality of a changing energy system

The EU's long-term energy strategy is drawing the picture of a decarbonised, green and reliable energy system across Europe. Turbines and thermal power generation are an integral part of this vision. The sustainable long-term target will be to develop gas-fired power plants that operate flexibly and efficiently thanks to the support of integrated storage solutions – and that are adapted to use renewable gases (such as hydrogen, produced methane, biogas and other chemicals), contributing to their decarbonisation.

About EUTurbines

EUTurbines is the only association of European gas and steam turbine manufactures. Its members are Ansaldo Energia, Doosan Skoda Power, GE Power, MAN Energy Solutions, Mitsubishi Hitachi Power Systems Europe, Siemens and Solar Turbines.

EUTurbines advocates an economic and legislative environment for European turbine manufacturers to develop and grow R&I and manufacturing in Europe.

EUTurbines promotes the role of turbine-based power generation in a sustainable, decarbonised European and global energy mix and contributes to the political and regulatory discussions by continuous exchanges with the European institutions and other stakeholders.

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