

Green power

Energy efficiency and sustainability studies in power systems

At a glance

For many years, the protection of the environment has become a major topic. Driven by the scenarios of global warming, the reduction of CO₂ emissions and other greenhouse gases, as well as resource efficiency in total, is a clear target.

At the same time, the standard of living and the security of electricity supply are important assets. Reliable, high-quality supply of electric power is a key foundation of modern societies.

Increasing the efficiency of energy use in the actual processes such as drives, lighting or heating is a key requirement to achieve these contradicting targets. Also, the integration of renewable energy resources and the efficiency increase of power supply equipment and systems support these targets.

Siemens Power Technologies International (Siemens PTI) offers green power studies for overall solutions to convert existing power generation and supply systems into sustainable and future-orientated, environmentally friendly systems.

The challenge

Existing power supply systems are traditionally driven by top down electricity distribution from central power plants to the distributed consumers – and, of course, by cost optimization.

In order to reach the new targets it will be essential to integrate renewable

power, to reduce transmission and distribution losses, and to increase overall efficiency (e.g. fuel resources and land use for substations) while keeping an eye on the cost structure.

A big challenge is the balancing of generation and demand. In the past, generation was scheduled ahead to meet the expected demand – with load forecasts achieving remarkable accuracy.

However, with increasing energy production from renewable energy sources, a new and much harder predictable variable enters, and very often already dominates, the system. In consequence, load has to adapt more and more to the available generation level.

Only the detailed knowledge of possible generation profiles, storage capabilities, and load shaping options (both decreasing and also increasing demand) that will not impair the performance of the customer's processes will allow the mitigation process.

Our solution

We start to analyze the given situation based on the actual setup, location and processes. In a kick-off meeting the key performance indicators for the project will be selected and ranked with respect to the defined targets.

A site visit will reveal the local conditions with regard to age and condition of existing equipment. Based on the single line diagram for electric power

supply, the different infeed scenarios and the geographic layout options will be developed.

In the frame of technical feasibility the environmental and the financial options will be investigated. This has to include CAPEX and OPEX, possible future scenarios based on load development or energy price development as well as the sequence of modification.

For industrial applications, in many cases, a close cooperation with further specialists having specific plant process knowledge is necessary.

For the commercial building environment, the overall optimization can only be achieved by an advanced energy management, which has to include building technology driven issues like cooling, heating and ventilation.

After the selection of the preferred option a roadmap for the conversion will be developed and given as a rollout plan.

Application examples

Microgrid solution

Microgrids are geographically limited energy systems with distributed energy resources, loads and preferably storage capabilities. Based on the specific condition, microgrids may be capable to operate in an island mode, thus requiring load frequency control, reactive power management and the functionality to change over from interconnected to island mode. Special attention is necessary to reconnect the system by synchronizing the island system to the main grid.

