

POWER SYSTEM CONSULTING FOR INDUSTRIAL GRIDS IN TRANSFORMING ENVIRONMENTS

Industrial **Power Supply** Concepts

At a glance

Siemens Power Technologies International (Siemens PTI) is a world leader in distribution and industry system analysis and has performed extensive studies in key power system disciplines. Our staff has provided services to a diverse client base that includes electric power utilities, as well as industrial customers around the globe.

Siemens' key services for operators of industrial power grids include:

- System expansion planning and analysis to improve the plant's grid
- Classical industrial grid studies, like protection, power quality, stability, captive power generation
- Analysis and design of industrial island grids and microgrids
- Integration studies of new loads, drives and storage systems
- Techno-economical optimization of energy supply and network tariff

The challenge

For decades the typical challenges of industrial grids – stress resulting from high load densities, diversity of components and operational process dependent flexibility – have been recognized. Dismantling of ageing installations or rise in process production are leading to a stronger load of remaining components. A rise of electronic drives is reducing the power quality. Weaker grid connections are putting the risk to lower the level of redundancy and stability limits. Decreasing short-circuit levels may influence the installed protection concepts,

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and new standards are forcing investigations related to safety issues.

Besides these technically justified challenges, several economy related topics are becoming increasingly relevant. As energy prices are constantly rising, energy expenditures play an important role for sustainable competitiveness in the industrial sector. Therefore, new supply concepts, such as decentralized energy systems and even industrial microgrids, are increasingly recognized as a complementing concept of future energy supply systems to act more independently from market prices.

As example, industrial power networks with unreliable grid connection or networks on small islands are often powered by diesel fueled generators, or at least use them as a backup power source. These diesel generators have to follow the load and therefore rarely operate at their optimal working point. As the existing principles of an efficient, economic and sustainable supply remain as important as ever, innovative, integrated infrastructure and energy supply planning becomes increasingly important. Industries need reliable, economic and safe power to supply their process loads.



Figure 1: Rooftop solar PV

Our solution

Siemens PTI provides independent technical consulting services for the industrial and distribution power sectors worldwide. Our comprehensive expertise combines hands-on field experience with the most advanced software tools and provides analytical capabilities that can address any client problem or issue. Siemens PTI can assess the economic viability of a distribution project in a competitive environment and its technical feasibility.

Siemens PTI supplements its independent consulting services with PSS®SINCAL, a power system simulator that can be used to study all aspects of electric power systems for utilities and industries as they exist today or as they are expected to be tomorrow. To satisfy specific needs of our clients, we have the expertise required to use any software tool available in the market, including other industry-leading Siemens products such as PSS®E.

Exemplary services for industrial supply system optimization

Siemens PTI can support the industrial sector with comprehensive analyses, including the services highlighted below.

Energy supply studies

The combination of distributed energy sources, electrical storage and/or diesel generators can enable a more efficient energy supply and operation of the installed generation and lead to a reduction in the required diesel capacity. As there are often contradictory factors which influence the decision, there are no ready-made solutions to define planning criteria and the individual trade-off has to be developed (see Figure 2). Therefore the experience of the grid planner is very important to reach the desired results.

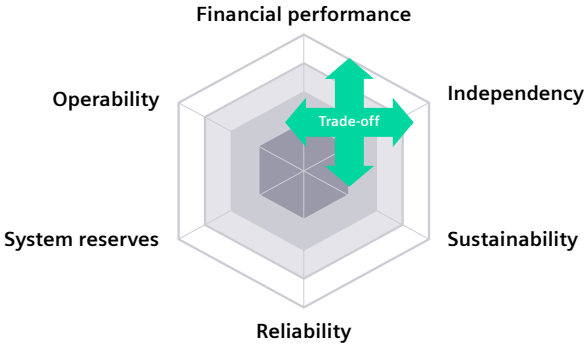


Figure 2: Conflict of objectives within industrial supply systems

For example, the substitution of the installed diesel capacity within industrial or island networks with decentralized energy systems and storage systems requires specific studies concerning critical factors like load profiles, energy infeed/profiles, demand management, communication and control.

Siemens PTI offers detailed system analyses including the dimensioning of generation and storage units and analyses of the grid structure. Our solutions aim at ensuring the grid's resilience and at achieving optimal costs of energy and network tariffs. The analyses include identifying local stakeholder and possible value streams and developing a roadmap towards a cleaner ecosystem with improved efficiency.

Energy storage concepts

Energy storage systems in industrial power grids offer a wide spectrum of possible storage applications. Depending on the charging and discharging efficiency of the storage system, its application allows savings in electricity and fuel costs, as well as greenhouse gas emissions.

Increased utilization of volatile distributed energy sources

Besides the technical challenges caused by the fluctuating character of distributed energy systems, economical aspects might lead to the idea of installing a storage system. For consumers for which the electricity production is located at or near to the demand, for example owners of solar panels on the roofs of their buildings, it might be reasonable that they consume the locally produced electricity instead of solely covering their load from the grid (grid parity of PV).

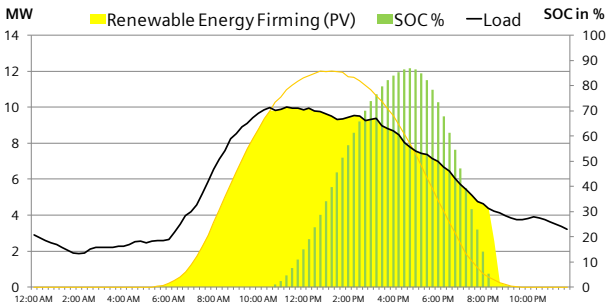


Figure 3: Increased utilization of PV energy

Peak shaving for industrial loads

Industrial and commercial customers with high energy consumption pay a price depending on their metered peak load within a certain billing period (month, quarter, year). The implementation of a storage system to "buffer" the energy consumption allows for a reduction of the peak consumption, and thereby flattens the load curve.

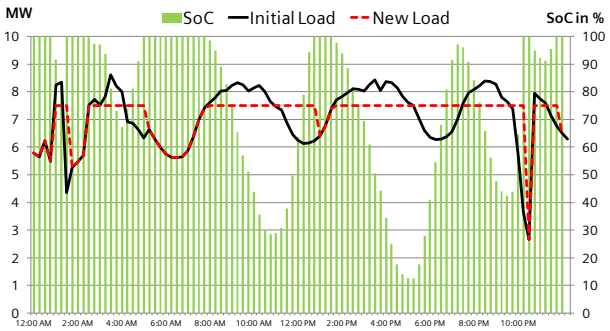


Figure 4: Peak shaving via storage system

Further applications include

- optimization of grid and equipment utilization,
- reserve power for frequency control,
- operation of island-based networks.

We support our customers with techno-economic storage integration studies to identify the optimal energy storage solution, i.e., combination of storage applications. Our solutions ensure optimal storage operation, usage and accurate dimensioning, and evaluate the economic potential of energy storage.

Industrial grid assessments

Industrial loads often include large motors, non-linear devices (such as arc furnaces, rectifiers, etc.) and critical manufacturing processes that are sensitive to power disturbances. Power systems serving industrial loads deal with conditions that are more extreme than those serving other types of loads.

Siemens PTI has a broad range of experience to analyze all the issues that pertain to industrial systems, such as arc flash, motor starting, harmonic resonance (through our three-phase unbalanced harmonic load flow), shunt compensation, series compensation, power quality, voltage flicker, stability and efficiency studies.

How you can benefit

With our consulting services we can provide expert advice to help our industrial customers to

- reduce energy costs and losses as well as penalty fees by optimizing the size and operation of electrical, equipment while complying with local standards
- ensure system availability and increase system resilience with optimized grid concepts and
- increase independency from price developments and grid impacts.

With our industry leading expertise and software we offer a broad spectrum of studies that base on a thorough understanding of the processes and alignment with the need for enhanced planning capabilities. In consequence, we can provide concrete impact to improve the performance of our customer's grids.

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