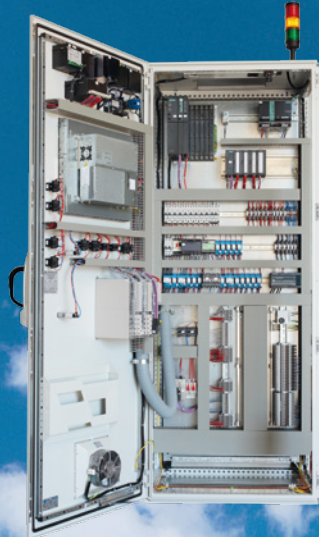


# Power Station Solutions

Overview | SYSTEM SOLUTIONS  
FOR YOUR APPLICATIONS

POWER SOLUTIONS

Controlling the Power of Energy



# Optimized Solutions | OUR APPLICATIONS

## ENERGY – THAT’S OUR PROFESSION

Power stations and systems for power generation and distribution is your business?

Woodward Power Solutions is an experienced manufacturer of control-, supervision and protection solutions – and does not only offer the technical equipment for increased availability but also provide you with an overall system solution and service package for complete power stations.

Due to our project experience in the power business for more than 40 years and the application of state of the art methods and technology, we are a reliable partner for our customers. Right from the initial tender stage, our customers will be consulted by experienced people to ensure you best possible solutions. No matter what – combined heat and power plant or HFO power station – our engineering departments will always provide a customer-oriented solution that is individually tailored to your specific application.



Dual-Fuel Power Station Applications



Genset Control System Applications



Turbine Generator Control Applications



Smart Grid Applications

# Overview

## References | OUR SATISFIED CUSTOMERS

### **Turnkey Power Stations:** more than 200 power stations worldwide, e.g.

Sri Lanka	14 Gensets with a total approx. 100 MW, incl. power control room
Monte Rio, Dominican Republic	13 Gensets with a total approx. 100 MW
Liztex / Bluref, Guatemala	17 Gensets with a total approx. 120 MW
Cebu, Philippines	10 Gensets with a total approx. 100 MW
Pakistan (HUBCO)	11 Gensets with a total approx. 200 MW
Islands:	Cape Verde Islands, the Azores, Faroe Islands, the Seychelles, the Fiji Islands, Samoa

### **Turbine Applications** for steam-, gas- and hydro power stations

### **Marine / Offshore Applications** for on-board power supply, shaft generation systems, FPSO Ships and power barges, e.g.

FPSO ship, China	5 Gensets of total approx. 35 MW
Power Barges, Turkey	12 Gensets of total approx. 100 MW, for global use
Power Barge, Singapore	Gensets of total approx. , for global use

### **AMF and CHP Applications,** more than 5000 applications worldwide, e.g.

Bank Computing Centre Deutsche Bank, Germany
Deutsche Telekom, Germany
EADS (European Aeronautic Defence and Space Company), Europe
ESA (European Space Agency), worldwide
Forschungszentrum Juelich, Germany
Hospitals, hotels and palaces, worldwide as for example in the Middle East
Chip Factory AMD, Germany
Automobile Factories, e.g. Mercedes, BMW, Porsche, General Motors

### **Frequency Converters** for shore-to-ship connections ("Cold Ironing") and industrial applications, e.g.

Marmaris, Turkey (50/60 Hz)
Naval Base, Malaysia (50/60 Hz)
Railway applications (16 2/3 Hz)
Machine Tool Manufacturers (200 Hz)
Computing (400 Hz)
Nuclear Power Plants (50/50 Hz)

### **Renewable Energy Applications,** e.g.

Novatec Biosol, Spain, solar-thermal power plant
Landfill Gas-, Sewage Gas-, Mine Gas- , and Biogas installations
Solar Chimney Power Station, Manzanares, Spain
Stirling Motor, Kingdom of Saudi Arabia

### **Special Applications,** e.g.

Diesel UPS
Test Bays for Engines, Transformers, Machine Manufacturers
Containerized Modular Electrical Annexes (PCR), e.g. for seismic zone 4

### **Current Highlights**

Control and SCADA System for the world's tallest building "Burj Khalifa"
Turnkey electrical equipment for Copper Mine Collahuasi, Chile (altitude approx 4000m asl)
Control and SCADA System and Electrical Plant Engineering for the World's biggest HFO fired Power Station, Brazil (120 Gensets of each 9 MW)

Extended country or application related reference information will be provided on request.

# Power Solutions



## Protection | INCREASING AVAILABILITY OF YOUR INSTALLATION

The prime mover and the generator build a perfect match. Local data are acquired and processed locally not only for securing the long-term operability of the system but also for a quick adaption to the set values.

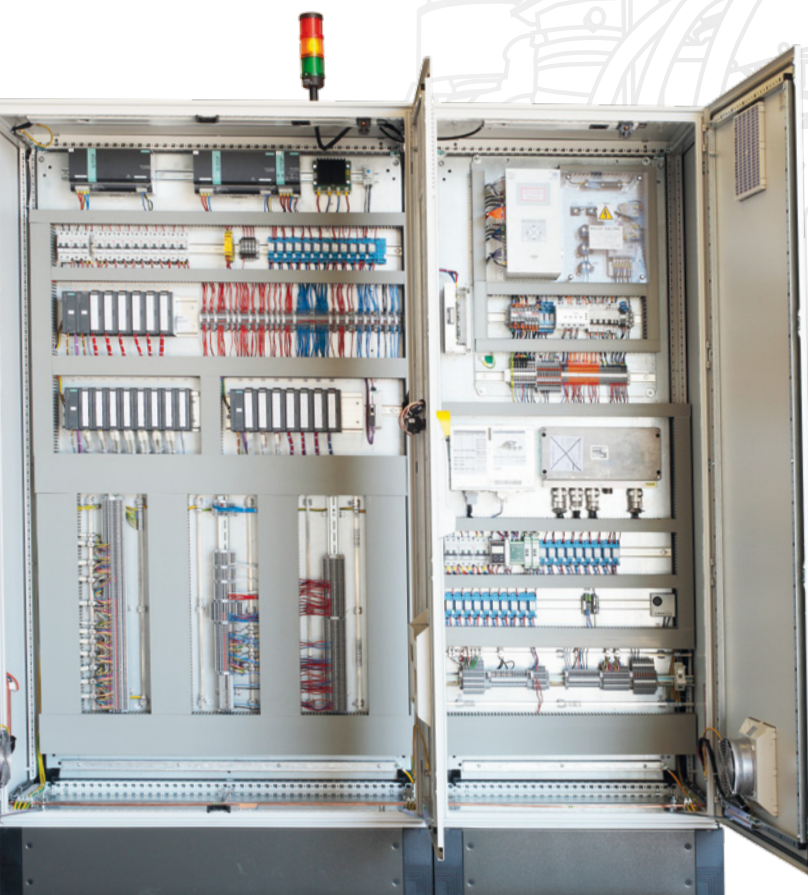
For best performance, we use state-of-the-art regulator concepts individually adapted to the utilized alternators. Via the established communication protocols CAN, Modbus, Profibus, Ethernet or IEC 60870-5, the collected data are transferred to the central control room where each Genset has its own monitoring and operation board for the generator and engine control. This well-balanced power train can immediately follow the demand from the grid, whether it is stand-by, load sharing or peak-shaving operation.

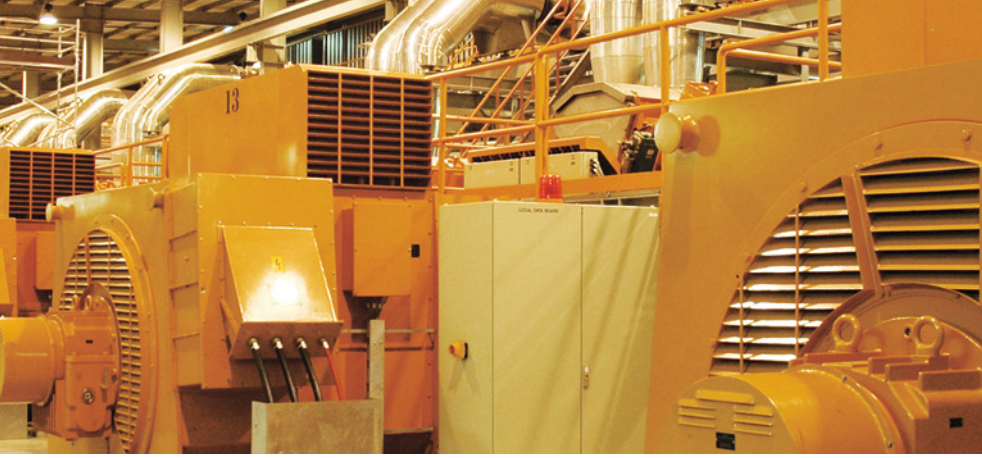
That is smart (power) generation!

### ALL INCLUSIVE

For all solutions we rely on approved components from our long standing relationship with our suppliers in order to offer the highest degree of reliability.

- Genset Control Systems
- Engine Control Systems
- Turbine Control Systems
- Generator Control Systems
- Generator Protection Systems
- Genset Aux Control Systems
- Engine Safety Systems





Thanks to our close collaboration over decades with engine and turbine manufacturers, we have acquired a profound knowledge of the requirements to be met by control systems.

## Customized Solutions | INNOVATIVE TECHNOLOGIES

Would you like to have approved technologies and approved front ends? We can supply this and it is also possible to customize solutions based on your individual specifications. Our skilled engineering team is always available to you to assist you during all project phases to find the best solution. Make use of our expertise.

### YOUR ADVANTAGES

- Consultancy, mains studies and integration of industrial distribution systems
- Medium voltage systems for generator/mains supply respectively for outgoing feeders
- Power plant generators and step up transformers as well as station transformers
- High voltage substations up to 138 KV
- Engine-/genset-management systems with start/stop and supervision functions
- Control and instrumentation technology with automatic control of measurement, protection, synchronization and active and reactive power
- Cable engineering
- Latest technology process visualization and control systems
- Low voltage systems for the power station's requirements and for auxiliary drives
- Installation planning
- Supply and assembly of the electrical installation material
- Installation supervision and commissioning
- Customer training and support operation of power plant
- Maintenance/customer support service
- Electrical annex (control and power room), also available as containerized solution for seismic zone 4



For the controlling and supervision of the prime mover, we use state-of-the-art control technology and wherever required with redundancy according to world wide valid safety standards.



# Energy Management | CONTROL SYSTEMS FOR POWER GENERATION

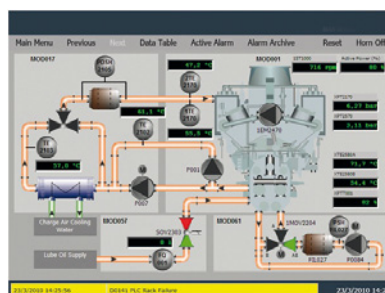
The efficient use of the primary energy source regardless of whether it is diesel, HFO or gas, is an important factor for the overall efficiency of the installation. The essential values of the prime mover are monitored, sampled and transmitted to the data based visualization system for continuous screening. Thus, you have a complete overview on the performance of your installation.

## FEATURE OVERVIEW

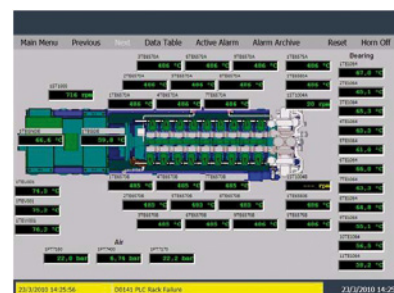
- **SCADA** – Monitoring of actual values and their display on the screens in the control room, at any time. The operators have a complete view on the scanned values. Alarming if a value exceeds the limits is no problem via SMS, or E-mail based on the latest communication methods.
- **Web based** – Do you want to see all relevant values any time at any place? The data is stored on a server and is accessible from anywhere. In addition, you can save money by making use of this modern visualization method.
- **Cable Engineering** – Bringing the parts together, whether pipe installation, civil part or automation, the different works go together and share the planning information from the scratch. Working together and avoiding collisions means saving money.
- **Remote diagnostics** – Is something not interpretable? Then connect your control room to our maintenance network and allow access. Our skilled specialists are at your service around the clock and are pleased to help you with root failure analysis in order to increase the availability of your installations.
- **Smart Grid** – Smart grid, a modern phenomenon? By no means – the interoperability of peak load power stations and energy sources from renewable energies create the perfect match. We offer a wide variety of options to extend the power generation to wind power, solar power and energy storages. If you want to learn more, then please see Woodward's PowerConnect brochure.



**Total control:**  
Controlling the Start/Stop sequences of the engine from remote.



**„Health Care“ for the Engine:**  
Highest durability through secured and monitored lube oil supply.



**All values at a glance:**  
Genset values are logged for diagnostic and proactive maintenance.



## Service | MATCHING OUR CUSTOMERS REQUIREMENTS

Before a switchboard leaves our company, its design and function have been thoroughly tested. As far as possible, the quality and functions of the switchboard components are checked by our qualified staff and documented in a manufacturer's test certificate. This factory test guarantees the successful commissioning of the system.

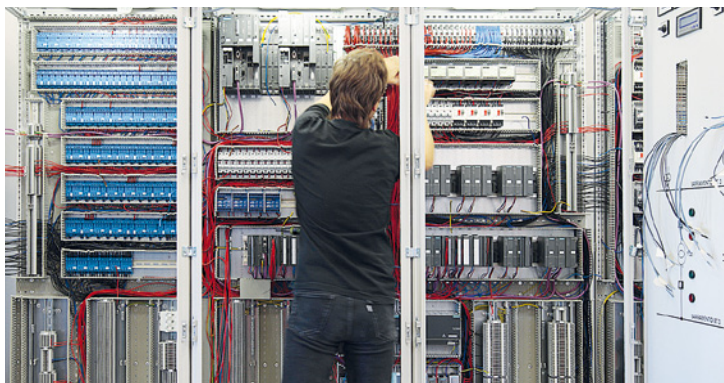
### YOUR BENEFITS

If you need consulting and engineering for installation or commissioning, which is especially advisable for large and complex power stations, we will be glad to place our experienced and skilled personnel at your disposal.

For construction sites all over the world, it is common practice to carry out installation work using local personnel. In this case, you will be supported by one of our supervising engineers who will arrange for a smooth commissioning of the plant. Furthermore, we offer training courses either in our factory or at site and can assist you during initial start-up of your system.

Last but not least, you can have your switchboard system maintained by us. This maintenance is either based on a contract or on demand. For the selection of spare parts, our advisory service will be at your disposal and enable you to quickly restart operation in case of a fault. Within this scope of a maintenance contract you will be able to call on our 24 hours service whenever required.

The before mentioned services show that we will do our very best to make our customers even more than satisfied.





Enabling Electrical Power Systems Integration

## ENABLING ELECTRICAL POWER SYSTEMS INTEGRATION

The shift to distributed generation is changing long-established concepts about how electricity should be produced, transmitted, and used. Power flow through the grid is becoming more decentralized and bi-directional. Local measurement, fault detection and remote control are now essential for stability and intelligent load management. A new approach is needed: one that encourages increased use of renewable sources and that facilitates the interconnection of distributed power generation by using advanced monitoring, communication and control. Woodward is recognized as a leader in the field of advanced power generation and distribution control products. We continue to build on our legacy by creating cutting edge control and protection devices, designed to work in complex systems to meet the needs of tomorrow's smart grids. Our global strategy for melding all aspects of power generation and distribution to enable electrical power systems integration is called PowerConnect.



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