STEAG Energy Services
Energy in good hands!
**Power Plant Sites**

Based on decades of experience...

<table>
<thead>
<tr>
<th>Plant</th>
<th>Capacity</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weiher</td>
<td>724 MW</td>
<td></td>
</tr>
<tr>
<td>Fenne</td>
<td>466 MW</td>
<td></td>
</tr>
<tr>
<td>Walsum 9</td>
<td>560 MW</td>
<td></td>
</tr>
<tr>
<td>Lünen</td>
<td>507 MW</td>
<td></td>
</tr>
<tr>
<td>Herne</td>
<td>960 MW</td>
<td></td>
</tr>
<tr>
<td>Vöerde</td>
<td>2,234 MW</td>
<td></td>
</tr>
<tr>
<td>Bergkamen</td>
<td>780 MW</td>
<td></td>
</tr>
<tr>
<td>Bexbach</td>
<td>773 MW</td>
<td></td>
</tr>
</tbody>
</table>

... treading new paths in the energy business.

<table>
<thead>
<tr>
<th>Plant</th>
<th>Capacity</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leuna</td>
<td>162 MW&lt;sub&gt;equ&lt;/sub&gt;</td>
<td>1996</td>
</tr>
<tr>
<td>Köln-Godorf</td>
<td>211 MW&lt;sub&gt;equ&lt;/sub&gt;</td>
<td>2004</td>
</tr>
<tr>
<td>Termopaipa</td>
<td>165 MW</td>
<td>1999</td>
</tr>
<tr>
<td>Iskenderun</td>
<td>1,320 MW</td>
<td>2003</td>
</tr>
<tr>
<td>Mindanao</td>
<td>232 MW</td>
<td>2006</td>
</tr>
<tr>
<td>Walsum 10</td>
<td>790 MW</td>
<td>2013</td>
</tr>
</tbody>
</table>
Overview of STEAG Energy Services Group

Subsidiary company

Headquarters

Site or branch office

Permanent establishment

STEAG Energy Services GmbH
Essen, Germany

OPUS Personaldienstleistungen GmbH
Essen, Germany

STEAG Energy Services Schweiz GmbH
Zurich, Switzerland

STEAG SCR-Tech, Inc.
Kings Mountain, Steele Creek and Grover, USA

STEAG Powitec GmbH
Essen, Germany

STEAG Energy Services do Brasil Ltda.
Rio de Janeiro, Brazil

STEAG Energy Services (India) Pvt Ltd.
Noida, India

STEAG Ensida Energy Services Ltd.
Ankara, Turkey

STEAG Energy Services Botswana (PTY) Ltd.
Gaborone, Botswana

STEAG Energy Services (Solar S.L.U.)
Sevilla, Spain

STEAG Energy Services iiG
Johannesburg, South Africa

Short description: Energy Services
STEAG Energy Services Group

Revenue € 167 million
(consolidated)
Employees 1,615
(consolidated)
data 2015

STEAG Energy Services

Energy Technologies
- Design, site supervision and commissioning of power plants

Plant Services
- Operation & Maintenance, catalyst management and regeneration, personnel services

Nuclear Technologies
- Decommissioning and dismantling of nuclear plants, safety, radiation protection and realization of final disposal sites

System Technologies
- Energy Management Systems, IT solutions for monitoring, optimization and advanced process control

Information Technologies
- Operation Management Systems, Communication Technologies, Site IT
Energy Services

Engineering

Energy Technologies
- Plant and Process Engineering
- Civil Engineering
- Electrical
- QA / QC
- Project Realization & Plant Control

Nuclear Technologies
- Nuclear Engineering
- Nuclear I&C / Electrical Systems
- Nuclear Physics
- Nuclear International / Decommissioning & Dismantling
- Sales & Business Development

Concepts, studies
- Basic engineering

General contractor, supply of components
- Site supervision
- Tendering, permitting management

Commissioning

Short description Energy Services
Projects of Energy Technologies

Modernization of I&C equipment and control room at Voerde power plant

Project management of modernizing the I&C systems in several plant sectors and upgrading of the control room of Unit B. Supervision of construction and commissioning and cost control.

Wind energy project Crucea North, Romania

At this project we provided the overall project management, the development of an O&M concept and the drawing up of technical tender documents. Furthermore we provided the technical evaluation and comparison of tenders, the preparation and conduct of technical contract award talks, and the complete planning of the grid connection.
Projects of Energy Technologies

**Construction of a new combined-cycle power plant for the Stadtwerke Düsseldorf**

Assistance by preparation of the European call for tenders and the permit application. Engineering services for the plant construction planning. Furnishing of engineering services for the plant construction as project management, quality control and construction supervision.

**New-build coal-fired power station Medupi in South Africa**

Support and advise in all matters relating to the power plant process, with special emphasis on interdisciplinary engineering. At the moment the expertise is required to implement the instrumentation and control system for the power plant process. We also handle various duties in project management, for example in Engineering Management, and engages in strategic and organizational consulting.
Projects of Nuclear Technologies

Construction of an active storage building at the Leibstadt nuclear power plant (Switzerland)
As general planner we are charged with handling the overall management, project planning and call for tenders for this active storage building. In the implementation phase, we will handle the management of construction and field erection up until commissioning is complete.

Vitrification Plant China (VPC)
Consortium leader; planning of the interim storage facility for the canisters as well as for the planning and delivery of key mechanical components such as crane systems, remote handling manipulators, rail-bound transport systems, shielding gates, etc.
Plant Services

Operation & Maintenance
SCR Management & Catalyst Testing
OPUS Personaldienstleistungen GmbH
STEAG Energy Services Solar S.L.U.
Comprehensive catalyst service

Catalysts serve to reduce the nitrogen oxide from the flue gas of the combustion processes. In the course of use, catalysts lose their capacity to convert the flue gas components into natural components of air. For efficient and therefore cost-effective operation of the DeNO\textsubscript{x} catalysts, it is important for the operator to know when the time is right for regeneration or replacement of catalyst elements. This can be determined by catalyst management, by measurement of the activity of catalyst samples in a bench reactor.

Scope of services:

• Determination of the catalyst activity in a bench reactor
• Catalyst services (catalyst management and regeneration)
• Performance of NO\textsubscript{x} distribution measurements in the flue-gas path (with adjustment of the ammonia injection grid)
• Preparation of status reports (including service life prognosis and catalyst replacement concept) for DeNO\textsubscript{x} reactors
OPUS
Personaldienstleistungen GmbH

Portfolio:
- Temporary placement / hiring-out of personnel
- Personnel Recruiting
- Qualification / Education and Training

OPUS has the permission of Labour Leasing according to the Employee Lending Law (AÜG)!

Operating staff
- Plant operator
- Power plant people
- Supply and disposal

Repair personnel
- Technicians
- Master
- Craftsmen

Technical support
- Engineers
- Master
- Technicians
- Craftsmen
- Commercial advisors

Training
- Power plant people
Energy Services

- System Technologies
  - Energy Management Systems
  - Product Development
  - Sales
  - STEAG Powitec GmbH

- Monitoring and optimization of operating procedures
- User training
- Process optimization by sensor-based solutions
- Early damage recognition
Energy Management Systems
EBSILON®

Cycle calculation program

500 licences worldwide in 19 countries
Statistical Process Control

Analysis of operational measurements to detect imminent damage to components or losses of process quality.

Example: Unbalance of a forced-draft fan
Information Technologies

- Application Services
- Infrastructure Services
- Customer Service

Support and optimization of management
Maintenance of technical installations
IT security
Radio relay and digital PMR
Optimal support of operation management by networks processes with SI

Activation and recurring methods with RFID
seNet® - the private mobile radio

Our digital seNet® private mobile radio network is the first digital radio network in the Ruhr district that provides reliable, high-performance radio communication to professional users. seNet® combines the advantages of modern voice and data communication with the specific functions of private mobile radio and security systems.

(300 internal user - 1,400 external user)

- Operation of the transmission of radio relay systems
- Operation of the telephone system
- Telephone support
STEAG Energy Services (India) offers engineering services for modernization and construction of power plants. It also provides operation and maintenance services for thermal power plants and waste treatment plants. The subsidiary develops specific software solutions for energy management systems partnering with the System Technologies division.

**Scope of services:**
- Engineering
  - Engineering services for modernization and construction of power plants
- Plant Services
  - Operation and Maintenance
  - Testing Services
  - Training
- System Technologies
  - Development of specific software solutions for energy management systems, configuration of and service for such systems; training of users.
Subsidiaries
STEAG SCR-Tech, Inc., USA

Registered Office: Kings Mountain, Grover and Steele Creek, North Carolina

In the US, Energy Services is active in marketing the business lines’ environmental capabilities, offers SCR (Selective Catalytic Reduction) catalyst management and runs the world’s most modern catalyst regeneration facility. Additionally, the services include consulting as well as plant optimization and retrofitting.

Scope of services:
Regeneration of catalysts
Basic idea of Power Inland
  - License from Integral
  - Own deployment
Popcorn Ash Screens
Patented filter, developed in the Voerde power plant
Engineering
Marketing of environmental know-how
Growing industrial production and increasing prosperity have caused energy needs to rise sharply. This is where STEAG Energy Services do Brasil comes in, which has been present in Brazil since 1974. STEAG Energy Services is offering O&M and engineering services. From conceptual work to site management and subsequent operation, we make an important contribution to enable Brazil’s energy balance to keep pace with the demands of a rapidly growing economic power.

**Scope of Services:**
- Operation and maintenance
- Services in core areas of engineering
Subsidiaries
STEAG Ensida Energy Services, Turkey

Registered Office: Ankara

STEAG Ensida Energy Services, Turkey offers engineering services for the construction, modernization and operation of power plants. A 90%-share in the company was acquired in 2011.

Scope of services:
Engineering
• Coal- and gas-fired power plants: Feasibility studies, owner’s engineering, asset evaluation
• Wind energy power plants: Grid connection, owner’s engineering

Plant Services
• Operation and Maintenance
• Testing Services

System Technologies
• Specific software solutions for energy management systems, configuration of and service for such systems; user training
STEAG Energy Services, South Africa offers engineering services for the development, project execution, modernization and operation of power plants.

**Scope of services:**

**Engineering**
- Coal- and gas-fired power plants: Feasibility studies, owner’s engineering, asset evaluation / management
- Industrial power plants: Feasibility studies, owner’s engineering, asset evaluation
- Flue Gas Cleaning, biomass and solar-thermal power plants, wind farms, energy efficiency

**Plant Services**
- Operation & Maintenance
- Training

**System Technologies**
- Specific software solutions for energy management systems, configuration of and service for such systems; user training
STEAG Powitec develops, sells and implements sensor-based control systems for the automation of production processes, primarily used in power plants, waste incineration facilities, cement plants and lime works. The solutions by Powitec complement the existing portfolio of System Technologies optimal in particular with the core product of combustion optimization.

**Scope of Services:**

System solutions out of combination most modern Software (based on neuronal networks / artificial intelligence / CFD applications) for Advanced Process Control (APC) under involvement of hardware sensors.

**Scope of application:**
- Combustion optimization
- Denitrogenation with SNCR
- sustained improvements in energy efficiency, emissions, production and process stability