LOCATION ESSEN

Energy Industry 2008/09

ESSEN

ESSENER
WIRTSCHAFTSFÖRDERUNGS
GESELLSCHAFT MBH

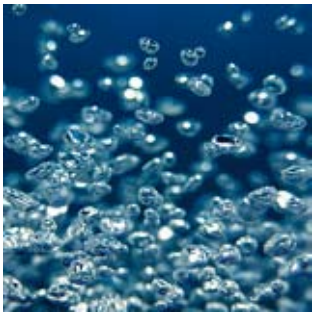
Education

Design

Energy Industry

Healthcare Industry

Information and
Communication Sector



Environmental Protection and
Water Industry

The energy industry in Essen

The energy industry has decisively shaped the development of the corporate city of Essen, where it is a major economic factor. More than 28,000 employees are active in this sector. They work in such fields as power generation and supply, power management and power technology (e.g. burner technology, turbine engineering, power plant technology, fuel cells, multi-utility solutions, regenerative energies and many more). The large number of employees and the high turnovers in the sector have pushed Essen up to the number 1 power industry location in Germany and Europe.

Essen is thus able to offer many advantages to the power industry. The companies in the sector benefit from the short routes to customers and clients, and from rapid access to new research results and qualified personnel. The structures on site ensure easy access to networks, uncomplicated transfer of knowledge and effective communicative exchange.

Essen, the home of international energy groups

Strategic decisions are made in Essen regarding the energy mix and power generation technologies used; renowned internationally active groups have their headquarters in Essen. They occupy leading positions in the European markets for electricity, gas and coal, and make the city a hub of the European energy industry, the „powerhouse of Europe". Essen is home to RWE AG, which holds leading positions in the European electricity market and the German gas market. The number 1 in the German gas market, E.ON Ruhrgas AG, also has its group headquarters in Essen. As one of the biggest German electricity generators, Evonik Industries AG is resident in Essen, and is the market and technology leader in the field of planning, building and operating high-efficiency hard coal and biomass power plants.

The group headquarters buildings of the major energy companies shape the skyline of Essen, which is a visible symbol of the economic power of the location.

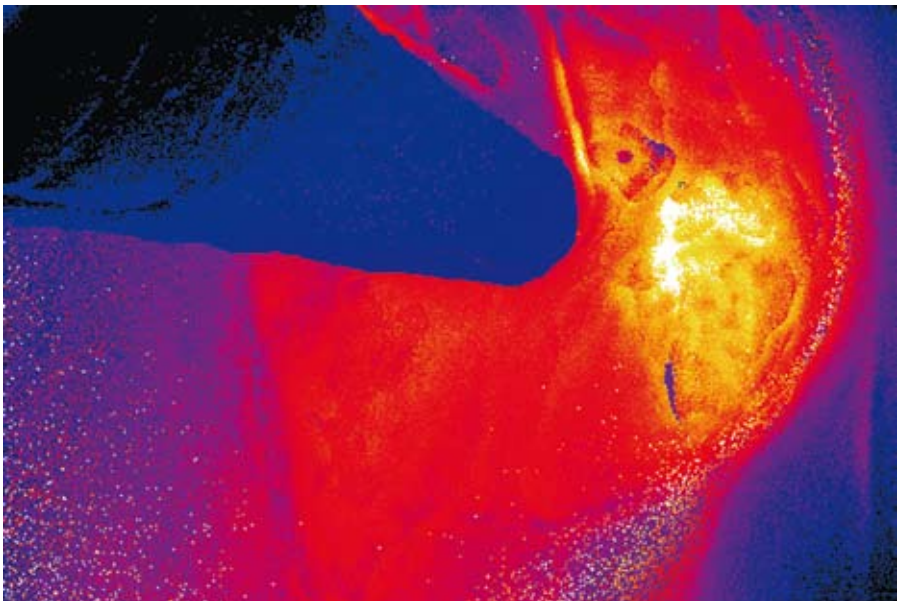
Dynamic middle-sized companies shape the sector

A substantial part of the Essen power industry is made up of small and medium-sized companies. Taken as a whole, these often highly specialised production and service companies compose the most important elements of the value creation chain for power. This is how Powitec GmbH from Essen develops and produces innovative information systems for optimising the control of complex industrial production processes. A software/hardware offers the combination that allows the combustion process in coal-fired power stations to be optimised and CO_2 emissions to be reduced. A further key competence of Powitec GmbH is digital image processing (pattern recognition), especially in thermal processes.

Also active in the field of energy technology is Gleitlagertechnik Essen GmbH, a company that has specialised in manufacturing plain bearings, and Energietechnik Essen GmbH, which produces cap rings for turbo generators.

Other medium-sized companies in Essen support firms with energy industry services, such as NGT - Neue Gebäudetechnik GmbH, which provides contracting solutions for energy efficiency e.g. in hospitals, or GERTEC GmbH, which produces tailored power supply concepts from its offices right by the World Cultural Heritage site.

Ista GmbH and Stadtwerke Essen AG, both resident in Essen, offer efficient measurement and accounting systems.



▲ The Powitec company from Essen uses PIT systems in firing mechanisms, which learn independently to control the online optimisation of the production processes.

Essen's con|energy AG, which numbers amongst the 100 best employers in the German middle-sized company market, supports energy industry companies with services in the fields of corporate consulting, education, training, information and communication.

This small selection of energy industry companies already demonstrates the specialist competence available locally, and the significant network of economic relationships between groups of companies, their suppliers, developers and consultants.

Dense research and academic landscape

▲ Reactor for the biological production of hydrogen.

Numerous excellent R&D institutions and academic facilities in Essen ensure that the companies located there have no problem finding highly qualified personnel, and that they can make use of the results of fundamental and application-based research. This becomes clear from the following selection of research, development and academic facilities in Essen for the field of energy:

Research and Development

- **University of Duisburg-Essen**
  At the Essen campus, the Faculty of Engineering Sciences alone has six professorships for mechanical engineering, a professorship for power industry in the field of economic sciences, a professorship for environmental process technology and plant technology, and a chair for municipal water and waste facility management in the special area of construction sciences, and all of these guarantee qualified new personnel locally.

- **Research projects at the University of Duisburg-Essen**
  Two research projects at the University of Duisburg-Essen are making an important contribution on the path to a low-CO_2 power plant. Within the framework of the project entitled „Analysis of the refitting of coal-fired power stations with CO_2 retention systems", the Department of Environmental Process Technology and Plant Technology is investigating what can be done now in coal-fired power stations to separate the greenhouse gas CO_2 from the flue gas. The North Rhine-Westphalian Ministry of the Economy, E.ON Engineering GmbH and RWE Power AG are involved in financing the research project.

  In another project entitled „Chemical absorption processes for CO_2 separation from flue gases", specific cleaning agents such as amine and carbonate solutions are being tested in power plants for their suitability. This involves both chemistry and the necessary process and equipment technology. The big energy suppliers and one plant engineering company are helping to finance the project, which the Federal Ministry of the Economy is supporting within the framework of the COORETEC joint venture project (CO_2 reduction technology).

  The chair for municipal water and waste facility management has been researching the field of regenerative energy generation for a number of years. The idea of using waste and sewage as a source of energy, instead of disposing of them at a high energy cost, led to a patent for biological hydrogen production from sewage that breaks down easily. Further research will be carried out here in the coming years, and there are plans to create a pilot plant at a sewage treatment facility in cooperation with the Emschergenossenschaft, an Essen-based water association with more than 300 water management plants, and other partners.

- **The simulation centre**
  The simulation centre trains the responsible operating personnel of almost all German nuclear power stations and one Dutch one using simulators. For operational purposes, two companies were founded in 1987: KSG-Kraftwerk-Simulator-Gesellschaft mbH, which provides the simulators and other infrastructure, and GfS Gesellschaft für Simulatorforschung mbH, which carries out the training courses. There are 13 simulators available in the simulation centre which are used every year for training purposes. In a total of 500 to 600 courses per year, over 2,000 participants from 17 nuclear power stations learn to operate and understand their nuclear power stations under all conceivable operating conditions. As such, the Essen simulation centre of KSG/GfS is the largest of its kind in the world.

- **GWI Gaswärme-Institut e. V. Essen**
  With its testing laboratories, the institute has one of the largest certification centres for gas burners in Germany. In addition to training engineers and tradesman, the institute involves itself in research projects. With the support of the GWI competency sector Firing Technology R&D, the development of the GlasFlox® burner has made it possible to reduce emissions of pollutants during production by around 50 percent. In further research projects, the Firing Technology R&D department occupies itself with process optimisation for various branches of industry such as steel, ceramic, glass and aluminium.

- **DMT GmbH & Co. KG**
  This internationally active, independent engineering and consulting company is involved in research and development in the field of plant technology and control systems. DMT GmbH & Co. KG is also a pioneer in mining and coking plant technology.

Trade fairs and conventions

Numerous events make Essen a meeting place for national and international energy companies. With the leading annual convention for the sector, "E-world energy & water", and with the "Internationaler Deutscher Wasserstoff-Energietag" (International German Hydrogen Energy Conference), Essen is a player in the international concert of energy. The 18th World Hydrogen Energy Conference, WHEC 2010, likewise does credit to the technological potential of the Essen power industry, internationally, in the year Essen receives the title of European Capital of Culture. Together with the technical convention for IT-Trends "Energie", these events ensure the transfer of knowledge, communicative exchange and the corresponding networks.

▲ The con|energy AG company from Essen yearly organises the successful international industry trade fair E-world energy & water in cooperation with the Messe Essen.

- **E-world energy & water**

  The premier international trade fair of the energy industry has taken place at the Messe Essen every spring since 2000. The numbers of exhibitors and specialist visitors have risen continuously since then. There are now 460 exhibitors from 21 countries; in 2008 almost 16,000 visitors came to Essen from over 30 countries for this leading trade fair for the energy idustry. E-world energy & water is the central platform for the integrated presentation of all products and service ranges along the energy industry value creation chain. The convention events that take place parallel to the trade fair ensure transfer of knowledge at the highest level.

- **World Hydrogen Energy Conference WHEC**

  From 16 to 21 May 2010, the Messe Essen will be hosting the 18th World Hydrogen Energy Conference. The power industry agency EnergieAgentur.NRW is organising the conference at the Messe Essen in cooperation with national and international technical organisations. The organisers expect around 2,000 experts from around the world, who will visit the keynote and surrounding events, as well as the 12 parallel conventions. The event concept also covers an accompanying exhibition for companies, institutions and associations in the industry.

- **IT-Trends „Energy"**

  The Essen specialist convention and its accompanying exhibition take place in autumn every year. The event combines recent requirements of the power industry with new developments in information technology. Together with experts from politics and associations, practitioners discuss their current projects and their experience with the latest IT solutions for the power industry.

- **International German Hydrogen Energy Conference**

  Parallel to the E-world trade fair, this convention has been taking place in Essen since 2002 and dedicates itself intensively to the fuel of the future. Central questions are discussed here regarding the energy of the future, hydrogen, the current worldwide research situation, and industrial utilisation.

Networks and Institutions

Essen is the shared location for both the energy generation companies and for the major energy customers. Both can profit in many respects from their membership of two energy industry associations that have their headquarters in Essen. The institutions advise the member companies in all matters relating to energy and associated environmental and water-related issues, and represent the common interests of their members in matters of politics, administration, economics and jurisprudence, both in Germany and in the European Union.

One important power industry association is VGB Powertech e.V., an international union of companies and institutions in the heat generation and power plant industry. A further important institution in Essen is VIK - Verband der industriellen Energie- und Kraftwirtschaft e.V. as a solidarity association for the industries that use energy and water and for the electricity generators.

The associations perform valuable networking functions and help to successfully build up and expand power industry companies in Essen. Essen is also the seat of the GDBM - Gesamtverband des Deutschen Brennstoff- und Mineralölhandels Region West e.V., an association of companies which deal in the field of fuels and mineral oil.

Into the future with energy

Whether in fuel cells, biomass, wind power plants or methane, Essen also occupies a leading position in future energies. This is also ensured by the power industry companies in this sector resident in Essen. Like PlanET Biogastechnik GmbH, they have consciously selected Essen for its proximity to the major energy suppliers, in order to shape the energy mix of tomorrow through short communications channels.

The Essen branch of PlanET Biogastechnik GmbH, one of the leading biogas plant engineering companies in the world, designs and realises projects in Essen that point the way to the future, such as treating biomethane and feeding it into the natural gas network. The range of services at the Essen location is completed by the work of bionamic energy GmbH, which designs energy concepts, feasibility studies, optimised forms of financing and participation models.

In the dynamic market for regenerative energies, another company from Essen confidently asserts itself. Westmontage Kabel- und Netzwerk GmbH, originally active amongst other activities as a service provider for the IT and telecommunications industry, has been recording impressive successes for a number of years now with its new field of business, photovoltaics. Westmontage GmbH sets up and operates medium-sized and large photovoltaic facilities both domestically and abroad. The portfolio of the company also includes contracting models.

RWE AG has also greatly expanded its renewable energies sector, and founded „RWE Innogy", the new leading company for renewable energies. RWE plans to invest at least a billion euros a year with the aim of rapidly expanding the use of renewable energy sources in Europe. The focus there is particularly on wind power projects in the European onshore and offshore sectors. The fields of hydroelectric and biomass, solar and geothermal energy, and wave and tide power will also be intensively worked on by RWE. The company will not be focussing solely on classical research and development here, but will also be investing in certain promising companies, in order to drive forward the technology of the future in Germany.

Essen also contains an extensive range of plants and projects that are driving up the efficiency of energy transformation processes and advancing the progress of renewable sources of energy. The range is aimed at industry and medium-sized companies, tradesmen and construction engineers, energy generators and plant engineers, researchers and scientists, consultancy companies and engineering offices, architects and the residential housing industry. These companies profit in many ways: They can follow the development, demonstration and market launch of renewable energies, can help to implement these, and can make use of them.

▲ Mobile solutions in the PlanET plant control system ensure that all components of the biogas plant are under control at all times.

Selected plants and projects in Essen

- **Competence centre for gas technology**

  E.ON Ruhrgas AG has ensured that Essen possesses a unique competence centre for gas technology. The Altenessen site employs over 360 highly qualified employees in the fields of gas quality, energy measurement technology and gas application technology. Scientists, technicians and tradesmen form a team whose physical proximity and communicative atmosphere creates synergies and stimulates thought. At the same site, in cooperation with the Federal Institute for Physics and Technology, the most precise calorimeter in the world is being created.

- **Primary Energy Building of GWI Gaswärme-Institut e.V. Essen**

  In the form of Essen's Primary Energy Building, GWI and partner companies from the power industry have found a forum in which the latest technological developments can be demonstrated, tested and developed further under real-life conditions. Companies from other sectors then benefit from this specialist knowledge in turn, e.g. the real property industry, when it adapts its stocks to the requirements of the German Energy Saving Directive.

- **Gaseum**

  As a leading gas company, E.ON Ruhrgas AG and its subsidiaries provide a comprehensive range of services and products for the transportation, storage, marketing and utilisation of natural gas. The growth energy of today has tradition, such that E.ON Ruhrgas AG has set up the Gaseum in Essen, a museum to the history of gas. The Gaseum follows the 350-year development of natural gas, from the first tentative experiments to the introduction of natural gas into the energy supply system.

- **Hydrogen pipeline**

  The longest hydrogen pipeline network in Germany, 240 km long, runs straight through Essen. Companies that are located on the Econova industrial estate, for example, can profit from the advantages of the pipeline. Essen's energy companies, but also transportation, chemical and industrial companies, are thus able to make use of the rising energy source of the future, hydrogen.

▲ The Gaseum documents the development of gas production, from the very beginnings to the high-tech applications of today.

Locations for the energy industry and the energy quarter in Essen

The Essen location is also equipped for global power industry companies to move in, and has special sites reserved that are tailored to the requirement profile of the sector.

The M1 industrial park is just such a location for power industry companies. This is where e.g. MEWTEK GmbH has set up operations, a company that builds wind power plants both in Germany and abroad; or Westmontage Kabel und Netzwerk GmbH, which specialises in the construction of large photovoltaic systems.

▲ Wind power is a successful field of business for companies from Essen.

LOI Thermoprocess GmbH, a former subsidiary of E.ON Ruhrgas AG, is also successfully using the excellent infrastructure of the high-quality industrial park.

In Essen's Econova industrial park, Stork Turbo Service GmbH has taken up residence as a member of the Stork Power Services group, and is successfully continuing the tradition of turbine construction and service built up by AEG Kanis, GE Power Systems, Alstom Power and Siemens Power Generation. Stork Turbo Service GmbH develops special service modules that simplify the maintenance of turbo machines or provide innovative support. The turbo machinery centre located in the Econova industrial park, "Competence Center Turbomaschinen, Deutschland", specialises in retrofitting, and can not only repair machines, but can also modernise and optimise them. Due to its classification as an industrial reservation, Econova allows the companies located here to operate 24 hours a day, i.e. production „around the clock".

▲ The centrepiece of the new, energy-efficient RWE building in Essen will be the largest trading floor of its kind in Europe, where the pulse of the international markets for sourcing, trading and major distribution customers of the RWE group will beat.

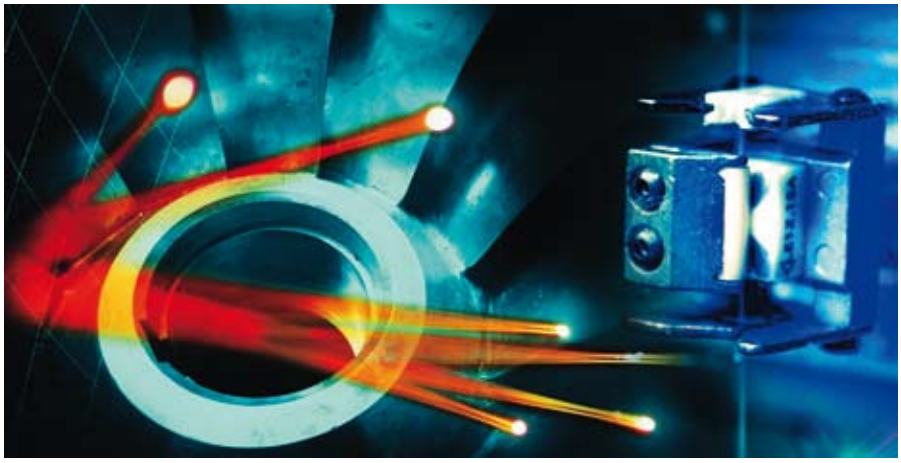
▲ The new headquarter of E.ON Ruhrgas AG is designed for up to 2,000 employees and represents a widely visible symbol of Essen as a power industry location.

On the Ernestine industrial estate on the East side of Essen is the Atlas Copco site. As a market leader in the compressed air sector, the Atlas Copco group has approx. 26,000 employees and achieves an annual turnover of over 5 billion euros. The product range of Atlas Copco Kompressoren und Drucklufttechnik GmbH Essen includes oil-free and oil-injection compressors, products for compressed air conditioning, condensate technology, and many services associated with compressed air. After already investing around 30 million euros in the North Rhine-Westphalian sites of Cologne and Essen in 2007, the Swedish mechanical engineering group Atlas Copco AG now plans to invest over 20 million euros in the two sites by 2009.

The established office centre axis of Essen, running through the southern districts of Rüt-

tenscheid/Bredeney, is shaped by the presence of a major power company. The new administrative headquarters of E.ON Ruhrgas AG are being built here on the 12.4-hectare grounds of the GRUGACARREE. The attractive, particularly energy efficient and environmentally friendly building contains around 48,500 m² of floor space and will represent a further visible symbol of Essen as a power industry location.

A physical concentration of companies in the sector marks the energy quarter in Essen. The internationally active energy group RWE chose the city as its location, and thus made Essen one of the biggest trading floors in Europe. The new RWE building, "Plan H", with more than 12,000 m² of useable office space, is within view of Victoria Mathias, the historical core of the RWE group. This is where the group gathers all the employees in Essen who work in energy trading, energy procurement and marketing to major clients. The trading floor is the heart of the new building, "Plan H". Around 7 m high and with an area of 2,900 m², it provides space for around 250 traders.



▲ Power technology is a core competence of the internationally active company Atlas Copco AG.

Energy industry know-how for companies

Taken as a whole, the power industry companies located in Essen offer the specialist competence of the entire power industry value creation chain, and with it solutions for a multitude of energy industry problems. The power industry know-how accumulated in Essen has positive consequences for numerous other sectors. The companies in these sectors are able to make use of this competence, and benefit from doing so.

For this reason, Essen is not just a suitable location for the power industry; companies that make use of the synergy effects with the local power industry sector are also successful. Those from the busy corporate landscape particularly able to profit from this are the real property and construction industries, companies in the transportation and mobility sector, plant and mechanical engineers, the environmental sector and the IT industry.

▲ Corporations work hand in hand with small and medium-sized companies in Essen.

Research, develop and academic facilities in the energy sector in Metropolitan Ruhr (selection):

- Universitäten Bochum, Dortmund und Duisburg-Essen
- Fachhochschulen Bochum, Dortmund und Gelsenkirchen
- Technische Fachhochschule Georg Agricola für Rohstoff, Energie und Umwelt, Bochum
- Fraunhofer-Institut Umwelt, Sicherheits- und Energietechnik UMSICHT, Oberhausen
- Fraunhofer-Institut für Solare Energiesysteme, Labor- und Servicecenter, Gelsenkirchen
- MPI Max-Planck-Institut für Kohlenforschung, Mülheim an der Ruhr
- ZBT – Zentrum für Brennstoffzellen-Technik GmbH, Duisburg

Links to metropolis Essen (selection):

- Energy industry:
  www.conenergy.com
  www.eon-ruhrgas.de
  www.evonik.de
  www.rwe.com
  www.stadtwerke-essen.de
- Trade fairs & conventions:
  www.e-world-2009.com
  www.h2congress.de
  www.it-trends-energie.de
  www.whec2010.com
- R&D, education:
  www.dmt.de
  www.gwi-essen.de
  www.hdt-essen.de
  www.rwi-essen.de
  www.uni-essen.de
  www.simulatorzentrum.de
- Networks and institutions:
  www.brennstoffzelle-nrw.de
  www.ea-nrw.de
  www.ef-ruhr.de
  www.energieland.nrw.de
  www.vgb.org
  www.vik.de
- Energy metropolis Essen:
  www.essen.de
  www.essen.ihk.24.de
  www.ewg.de
  www.gruendungsnetzwerk-essen.de

Infrastructure Data

Essen's population of 582,000 makes it the second largest city in North-Rhine-Westphalia (NRW) and it is also the geographical centre of the Ruhr region. The Ruhr region also lives up to its new name – Metropole Ruhr (Metropolitan Ruhr) – due to its 5.3 million inhabitants spread out across 4,435 square kilometres. The population and population density of the Ruhr region, makes it and especially its leading city Essen, one of the most attractive business locations anywhere. Energy companies based in Essen benefit from the enormous customer and sales potential.

Essen is not only a mark of quality due to its size, but also a market of quality. The gross domestic product and gross added valuation per employed individual is not just the highest in NRW, but also well above the national average. Furthermore, Essen has the largest number of university graduates in the Ruhr region (BKR Essen). Essen also boasts the highest proportion of service sectors in the Metropole Ruhr at 81.5 percent.

Major commercial manufacturing, and especially a wide range of business and services, are a distinguishing feature of Essen as a business location. The accessibility of Essen is also virtually unparalleled. The analysis conducted for NRW's integrated transportation planning shows that Essen's inner city area is by far easier to access by public transport than that of the cities of Dortmund and Düsseldorf. Essen fares equally well when assessing private transportation. About 5.1 million people can reach downtown Essen by car within one hour, that is 300,000 more than Düsseldorf.

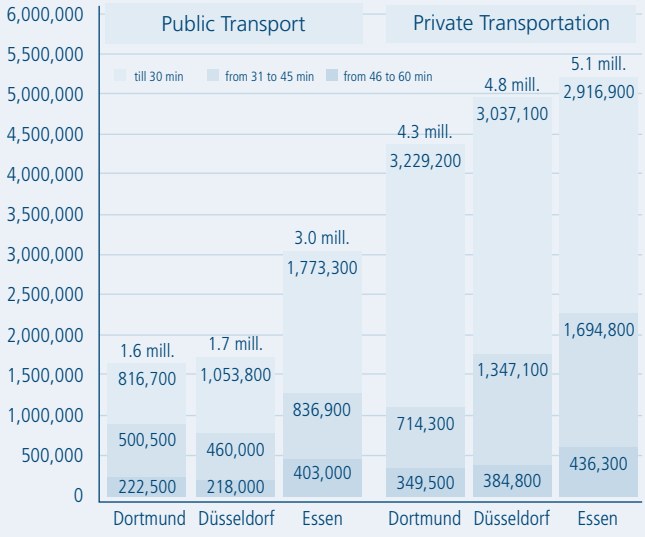
Essen can offer a broad spectrum of locational advantages – especially for companies in the energy industry. In Essen, you will find the conditions fulfilled for successful corporate activity.

Population (30.09.2007)	582,505
Area	210.3 km²
Population Density / sq. km	2,770
Population in the Rhine Ruhr Region	11.3 mill.

Interregional & International Train Connections
> 175 per day (ICE, Eurocity, Intercity)

Net Commuter Balance	
(incoming vs. outgoing employees with social insurance)	37,248

Accessibility – Public Transport / Private Transportation



Employee Qualifications

Essen	12.2%	University diploma
NRW	9.1%	University diploma
Secondary education diploma (Abitur) each year	37.5%	

Gross Domestic Product at Market Prices

	Total	per employee
Essen	**€ 19,579 mill.**	**€ 65,232**
Dortmund	€ 16,933 mill.	€ 58,547
Duisburg	€ 13,717 mill.	€ 63,079
Bochum	€ 11,005 mill.	€ 59,711
Ruhrgebiet	€ 128,157 mill.	€ 57,007
NRW	€ 487,123 mill.	€ 57,807
Bundesgebiet	€ 2,241,000 mill.	€ 57,724

Disposable Income in Key Ruhr Region Centers

	per resident
Essen	**€ 18,281**
Bochum	€ 17,539
Dortmund	€ 16,400
Duisburg	€ 15,412
Ruhr region	€ 17,299
NRW	€ 18,724

Tax rates

Trade Tax	470 %
Property Tax A	255 %
Property Tax B	510 %

Trade Fairs Essen

Turnover	€ 63.9 mill.
Speciality Fairs	37
Leading international Fairs	15
Exhibitors	approx.13,000
Visitors (in millions)	1.5
Exhibition Space	110,000 m²
Trade fair days	114

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Editorial Staff

Dr. Erich Bauch

Design & Cartography

herold & schönsteiner
design & kommunikation

Contacts

Energy Industry

EWG – Essener Wirtschaftsförderungs-
gesellschaft mbH
Lindenallee 55
45127 Essen

Dr. Erich Bauch

Phone: +49(0)201 – 8202422
Fax: +49(0)201 – 8202495
E-Mail: erich.bauch@ewg.de

Internet: www.ewg.de
www.essen.de

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