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European Association
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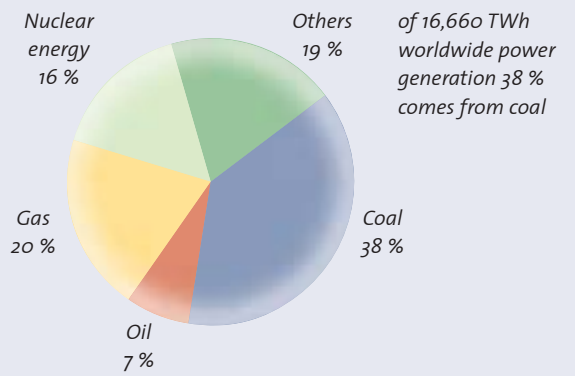
Coal industry

across Europe 2005

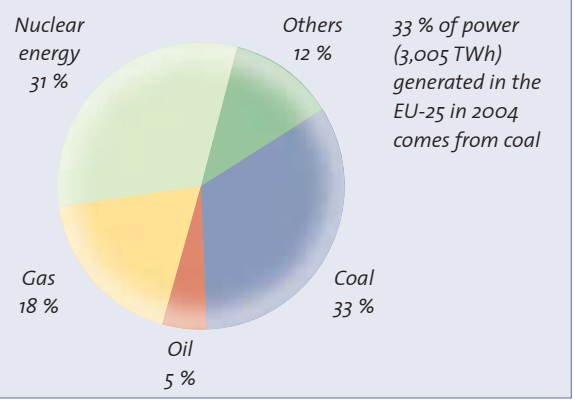
Coal industry across Europe 2005

Coal in global power generation



Source: IEA, 2004

Coal in EU-25`s power generation



Source: EUROSTAT, Verein der Kohlenimporteure, EURACOAL member states

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Contents

Europe and the Coal Industry

Energy is an important issue for policy-makers both nationally and at European level. Policies need to support energy supply and energy use that is economic, thus ensuring that European business remains competitive in a global context. They must also ensure security of supply, and be consistent with environmental objectives. Coal, both hard coal and lignite, makes a major contribution to the energy mix in Europe as well as worldwide. This also holds true for the future, although coal is all too often associated in people's minds with the past – with the industrial revolution and the creation of the European institutions in the 50s.

Europe is one of the world's largest markets for coal and coal production is also considerable. Within the EU, hard coal is produced mainly in Poland, the UK, Germany, the Czech Republic and Spain. Lignite is produced mainly in Germany, Greece, Poland, the Czech Republic, Hungary, Spain and Slovenia. Candidate countries including Bulgaria and Romania also produce and use significant amounts of lignite and hard coal.

In recent times, events in the geo-political landscape and trends on world energy markets have again clearly brought the advantages of coal to the forefront:

- Coal supply is especially secure because coal is mined in many countries throughout the world and trade is not controlled by states but operates in accordance with free market principles
- Coal is offered on international markets at relatively stable prices
- The use of indigenous coal, but also of imported coal, in a balanced energy mix for steel production and transformation is a means to maintain and reinforce Europe as a location for industry. This also contributes to the economic policy objectives of Member States.

The European Union has recently repeatedly stressed the positive role of coal for security of energy supply and stable prices. The environmental acceptability of coal production and utilisation is already improving, but further efforts are required to enable coal use in the longer term to be consistent with environmental objectives, particularly on climate change. EURACOAL has developed a three-stage Clean Coal concept:

- Emission reduction in existing plants
- Efficiency improvement in new and existing plants
- As a long-term vision, near-zero emission coal power generation with CO_2 capture and storage.

The first two stages have the potential to significantly improve efficiency. They would economically combine reduced utilisation of resources with CO_2 reductions, thus making it easier for the EU Member States to reach their emission targets. With ever-increasing coal use in rapidly growing economies such as China and India, highly developed coal technologies have first class export potential for European industries. Research, development and, most importantly, demonstration of such projects must therefore also be promoted within the European Framework Programmes.

Nigel Yaxley
President of EURACOAL

European Coal and Economics

Introduction

The geopolitical events of 2003 – 2004 highlight the fragility of the world's energy supply system. They once more pose concerns over energy supply disruptions and price volatility. Coal can make a crucial contribution to energy security. Therefore the positive effect of coal use in relation to security of supply, price and added value must also be taken into account in the political decision-making process. The energy mix must be maintained as a strategy of risk management and as a sustainable option.

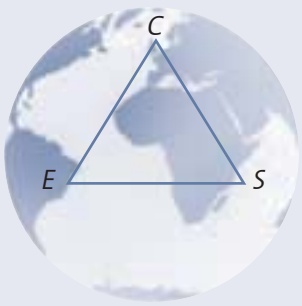
Coal and Sustainable Energy Supply

The European coal industry believes that the three energy sustainability objectives – security of supply, competitiveness and environmental compatibility – must be pursued with equal intensity. Europe's energy sector is going to face considerable challenges to ensure security of energy supplies and invest in the necessary replacement power plants and new plants, and in transmission and distribution systems. Conventional power generation on the basis of nuclear energy and, to an even greater extent, on the basis of hard coal and lignite, using Clean Coal Technologies, will continue to form the backbone of Europe's sustainable electricity supply.

One of the key requirements for the development of sustainable energy supply in Europe is competitiveness. A cost-efficient energy supply at favourable prices must be ensured on a permanent basis. This will help to maintain the competitiveness of European industry as a whole.
The risks for energy supply in the EU have increased significantly in recent years, according to the Commission in its recently published progress report on the Green Paper "Towards a European Strategy for the Security of Energy Supply" originally submitted in late 2000. Deviating from the Green Paper, the progress report gives coal a much stronger role in safeguarding European energy supply. The Commission sees benefits in its abundant reserves, the favourable distribution of resources and the international coal market with its stable and comparably low prices. As a result, the Commission advocates the continuation of coal mining in the EU but also the promotion of environmentally compatible coal use.

Other essential elements of future security of supply are broad-based mixes of energy sources and technologies. A wide energy mix comprising in particular domestic energy sources, i.e. hard coal and lignite, will limit the present high level of import-dependency in the EU-25, which amounts to some 50 % in the case of fossil energy sources.

Key Demands for a Sustainable Energy Supply



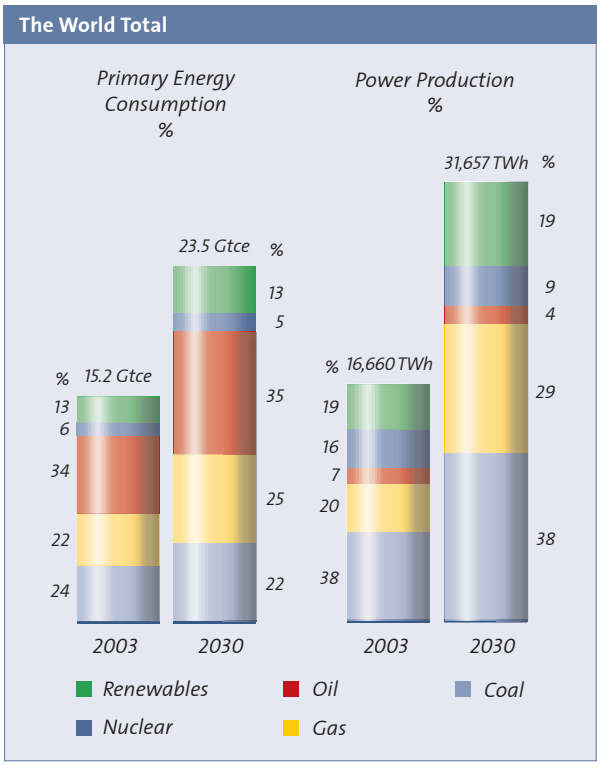
C: Competitiveness
- *Underpin a cost-efficient European energy supply*
- *Strengthen the leading role of the European power plant industry*

E: Environmental compatibility
- *Minimisation of classic emissions*
- *CO_2 reduction*
- *Preservation of resources*

S: Security of supply
- *Wide energy mix*
- *Wide range of technologies*

The well-balanced application of target criteria ensures sustainable, pro-active climate protection and CO_2 reduction.

Figure 1: The targets of sustainable development
Source: RWE



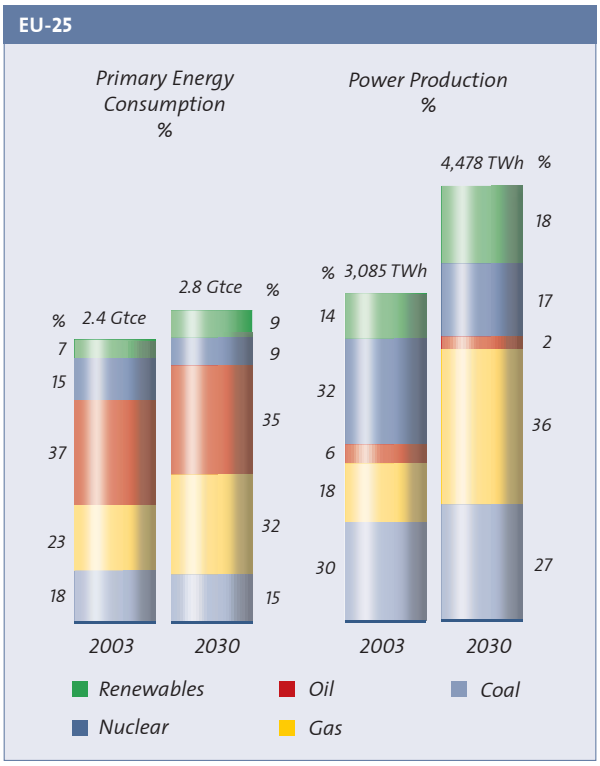


Figure 2: EU-25 primary energy consumption and power production in 2003 and 2030
Source: European Commission

Energy Mix and Coal

World total primary energy consumption in 2003 was based on the following contributions: 6 % nuclear, 13 % renewables, 22 % natural gas, 24 % coal and 34 % oil. Of 15.2 Gtce of world total primary energy consumption, 5.4 Gtce were used for power generation and heating plant. Coal is of particular significance for the power-generating sector. Some 38 % of global power production, and 30 % of the EU-25's power output in 2003 was based on coal (Figure 2).

In the EU-25, some 980 TWh was produced on the basis of coal (630 TWh from hard coal, 350 TWh from lignite). Power plant capacities are distributed accordingly: while the installed capacity at hard coal-fired power plants amounted to 231 GW, there was 40 GW available at lignite-based power stations.

The individual member states clearly have quite different energy supply structures, with coal being indispensable for many countries in the EU.

The availability of coal reduces the region's dependence on energy imports. Fuel switching from coal and nuclear energy to gas in the power sector would shift energy consumption towards these scarce resources.

World coal deposits

Reserves of coal are abundant. The total resources of coal are estimated at 4,773 billion tce, of which only some 3 % have been extracted so far. Reserves amount to 670 billion tce and are substantially greater than those of oil and natural gas, even if one includes the non-conventional reserves of the latter. The coal reserves are distributed more favourably than those of natural gas and oil.
The world coal market is a free commodity market, which – in contrast to oil and also to natural gas – is barely influenced by politics or cartel formation. The long-term marginal costs of provision in the regional markets thus determine the long-term price trend. As enough stocks with favourable production conditions exist and productivity continues to improve, no strong increase in marginal costs is to be expected in the next two decades.

EU coal deposits

The availability of coal resources in Europe and around the world, combined with the high European fuel production levels and the supply of imports from stable regions, guarantee a very high degree of security of supply and price predictability. Indigenous energy production, diversified sources of supply and the storage capacities of the major consumers will ensure a stable supply structure. Coal does not require a strategic reserve as a safeguard against political risks, as the EU has proposed for oil and gas.

Challenges to the European Energy Market

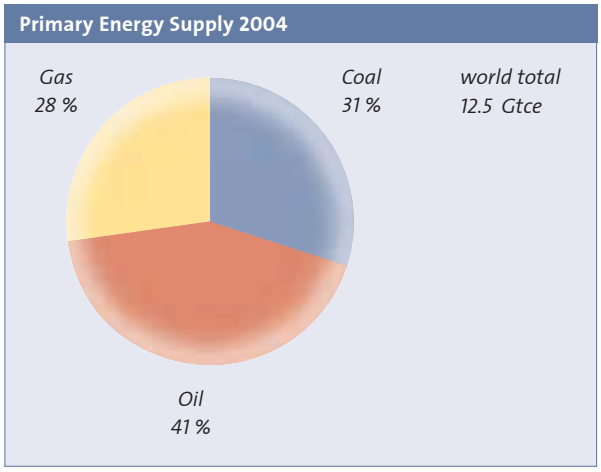
The European energy industry is faced with great challenges. In essence, these are threefold, as follows:

1. Security of supply must be underpinned in Europe in the long term.
2. Efficient action must be taken to prevent climate change (see Chapter III Coal and Climate Protection).
3. Investment in replacement and new generating plant and grid installations must be made (see Chapter II Clean Coal Concept and Technologies for Coal-based Power Generation).

Such an investment programme can only be implemented if the boundary conditions guarantee the investors the necessary yield and planning certainty. In the selection of the possible technologies, attention has to be paid in particular to their sustainability. This also applies to energy research.

In order to meet the EU's electricity needs, recent decades have seen the construction of production capacities totalling nearly 700 GW on the basis of coal, nuclear, oil, gas and hydro. One of the future challenges facing us is the replacement of ageing power plants. EU-25-wide, by 2020 over 200 GW of replacement capacity must be built, along with more than 100 GW of new power plant capacity, in order to cover the demand.

The future development of world energy markets has been studied by several independent institutions. The scenarios of the EIA, IEA and EC for 2030 show a marked increase in world total primary energy consumption, with more or less similar proportions of oil, coal and gas in the energy mix.



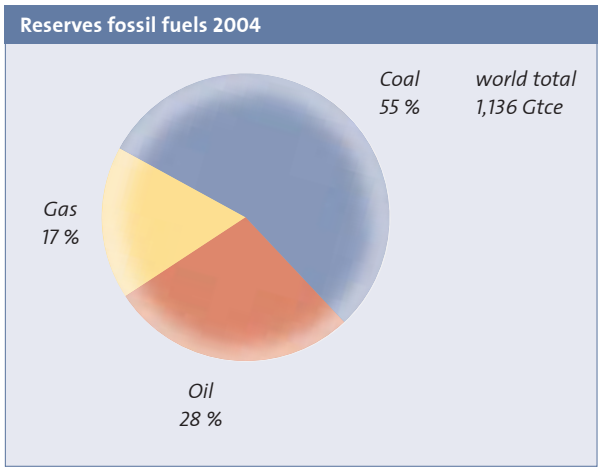


Figure 3: Primary energy supply and world reserves fossil fuels 2004
Source: BGR, BP 2005

Coal production in selected countries 2004

	Hard Coal	Lignite and Brown Coal	Total
Austria	–	0.2	0.2
Bosnia	–	8.7	8.7
Bulgaria	3.2	23.7	26.9
Czech Republic	13.3	48.8	62.1
France	0.2	–	0.2
Germany	29.2	181.9	211.1
Greece	–	71.9	71.9
Hungary	0.3	11.8	12.1
Poland	99.2	61.1	160.3
Romania	3.7	31.6	35.3
Serbia	–	33.9	33.9
Slovak Republic	–	3.0	3.0
Slovenia	–	4.8	4.8
Spain	12.3	8.2	20.5
Turkey	2.9	67	69.9
UK	25.1	–	25.1

Table 1: Coal production in selected countries 2004 (Mt)
Source: EURACOAL

Renewables and energy conservation alone cannot overcome the challenges facing us; nor will power be generated in future using only gas, coal and nuclear energy. Promoting new energies requires after all a reliable supply of conventional energies. The more conventional energy can be used at a high level of environmental acceptability and with economic efficiency, the greater will be the scope for developing and implementing renewable energy sources. The key to Europe's future power generation lies in a broad mix of all energy sources, so that supply risks can be minimised, low-cost power generation ensured, and further progress made in environmental protection. Efficient coal-fired power plants will play a crucial role here.

Moreover, power generation from coal has an outstanding potential for increasing efficiencies, with a prospect of less fuel input and lower emissions, but with the same power generated. Further R & D activities to exploit the potential of coal as an energy source look promising. A realistic estimate of the required capital investment and fuel costs will put coal in a strong competitive position, and this will be a significant boost to further development. However, this would presuppose that there will be no political discrimination against solid fuels.

Power Plant Renewals in EU-25

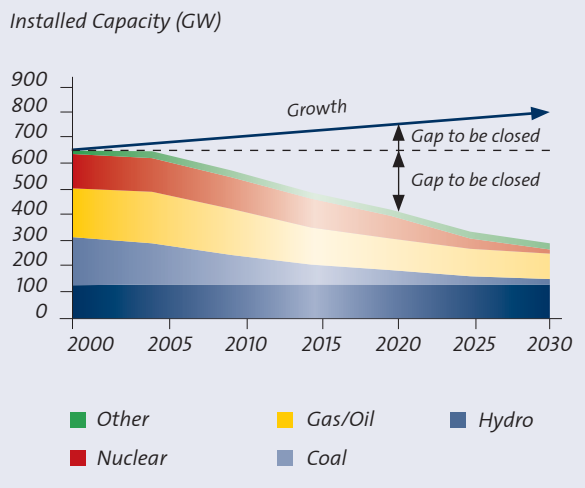


Figure 4: Plant renewals in EU-25
Source: VGB PowerTech

Scenarios and forecasts – world fuel share up to 2030

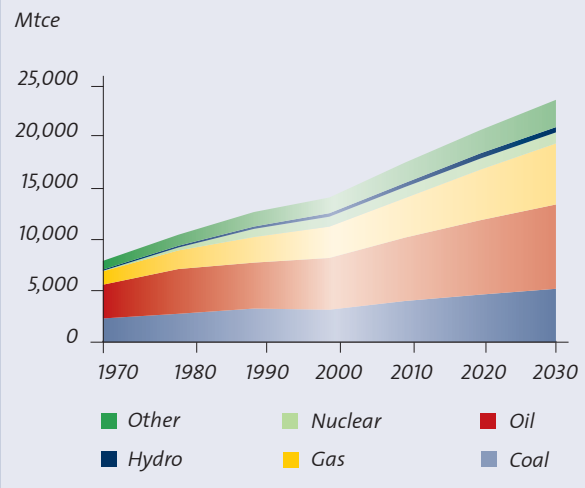


Figure 5: Scenarios and forecasts – world fuel share up to 2030
Source: IEA, 2004

In the EU alone, estimates put the need for investment in power plants and grids at €900 billion over the next 25 years (Source: IEA). Such sums can only be mobilised by capital markets if the underlying conditions give investors the requisite certainty in their returns and planning.

From a climate-protection point of view, CO_2 avoidance costs are a measure of efficient CO_2 mitigation. They are calculated from the difference between the full costs of power generation and the reference power plant as regards the difference in CO_2 output. RWE's BoA-Plus power plant would already be competitive today. This being so, RWE has initiated the approval planning process to build a prototype drying plant at the BoA unit in Niederaussem. Among the coal processes with CO_2 capture, the IGCC and Oxyfuel processes have the advantage.

In the case of the natural gas-fired CCGT plant, avoidance costs are high because, in this case, the CO_2 reduction potential is relatively low. By comparison with renewable resources, the coal processes prove to be the most efficient lever of CO_2 reduction in cost terms. At the same time, coal offers the greatest use potential for the power supply and permits the greatest CO_2 reduction by far.

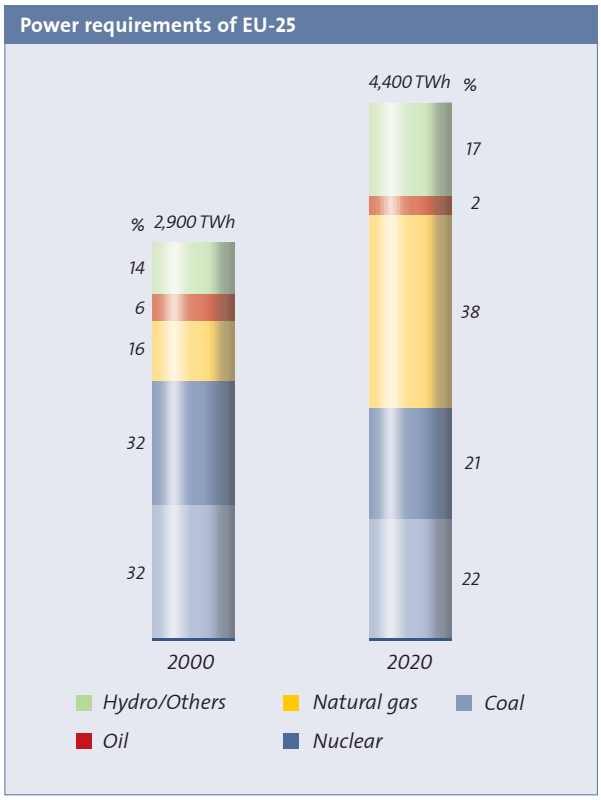


Figure 6: Power requirements of EU-25
Source: EU Commission, European Energy and Transport Trends to 2030, Brussels 2003

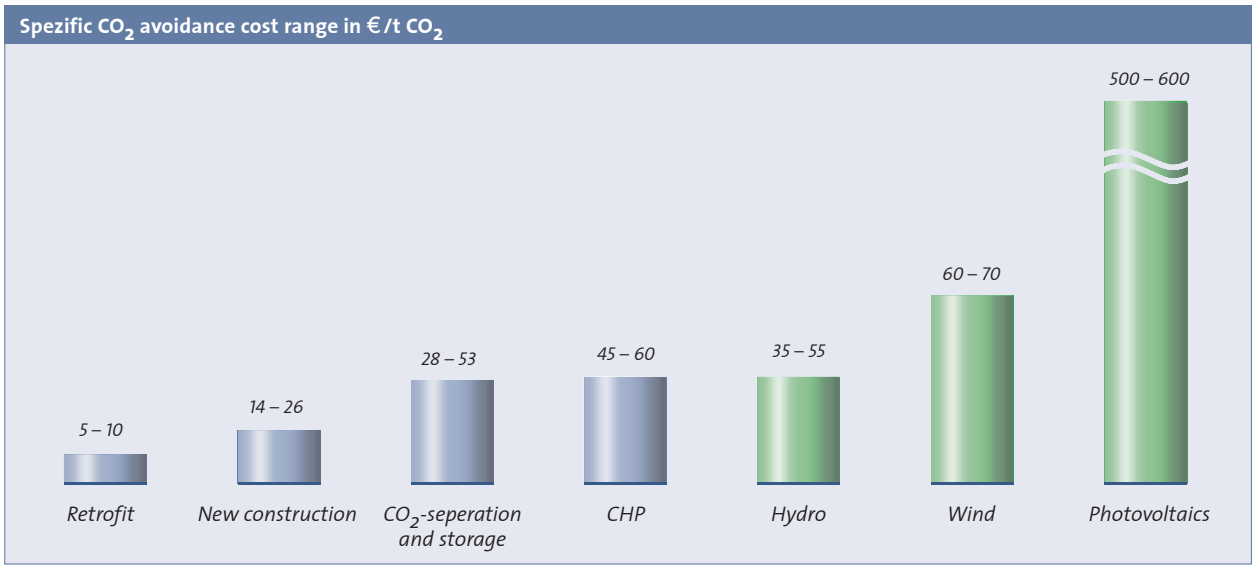


Figure 7: CO_2 avoidance cost range
Source: RWE

Utilising this potential is not merely a question of technical development, but presumes in principle:

1. that the resulting drastic rise in the costs of electricity, the basic substance for any competitive economy in a situation of worldwide competition will be feasible at all and
2. that CO_2 storage will not only be technically feasible, but also find socio-ecological acceptance.

Conventional power generation on the basis of nuclear energy, in particular, and, to an even greater extent, on the basis of hard coal and lignite will continue to form the backbone of Europe's electricity supply.

Coal – Employment Factor

The coal and power generating industries provided some 330,000 jobs in the EU-25 in 2004. The total production value of power generated from coal amounts to almost € 30 billion/a. Coal extraction and utilisation guarantee, over a long time-period, large amounts of jobs in and around the mining. Coal industry suppliers are mainly medium-sized companies and the contracts between these firms and the mining industry are often based on long-term contracts. Sectors benefiting most from coal mining include the building industry, the distributive trade and other services. A considerable proportion of these services are rendered by suppliers of capital goods and raw materials.

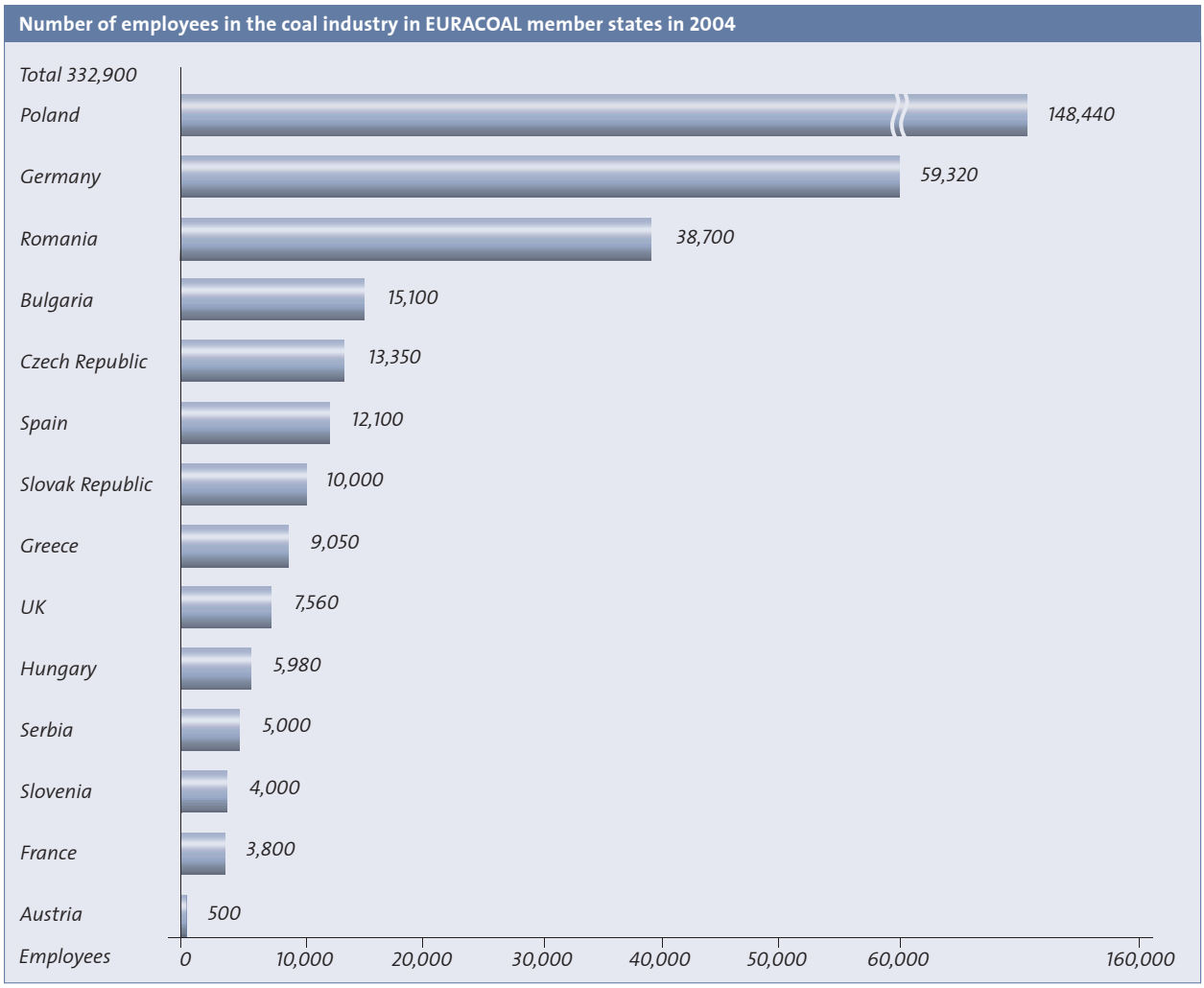


Figure 8: Number of employees in the coal industry in EURACOAL member states in 2004
Source: EURACOAL

The Clean Coal Concept and technologies for coal-based power generation

Introduction

In Europe coal is one of the central pillars that support the balanced energy mix. While in the EU-15 coal made up 26 % of the power market, this figure rose to 33 % in the EU-25 (as at 2004). Solid fuel's share of the power market varies significantly from one member state to the next (Figure 9).

EURACOAL, in concert with the coal-fired power station operators, is pursuing a "Clean Coal" policy that seeks to promote the progressive introduction of a series of technologies designed to reduce CO_2 emissions from electricity generating plants. The main focus of the first two phases of this programme is to increase efficiency levels – as this is a cost-effective road to both a cleaner climate and to better protection of resources. Clean Coal is therefore part of a long-term strategy that will provide the economic and ecological basis needed to safeguard future coal utilisation.

Coal`share of the power market in selected countries in 2004

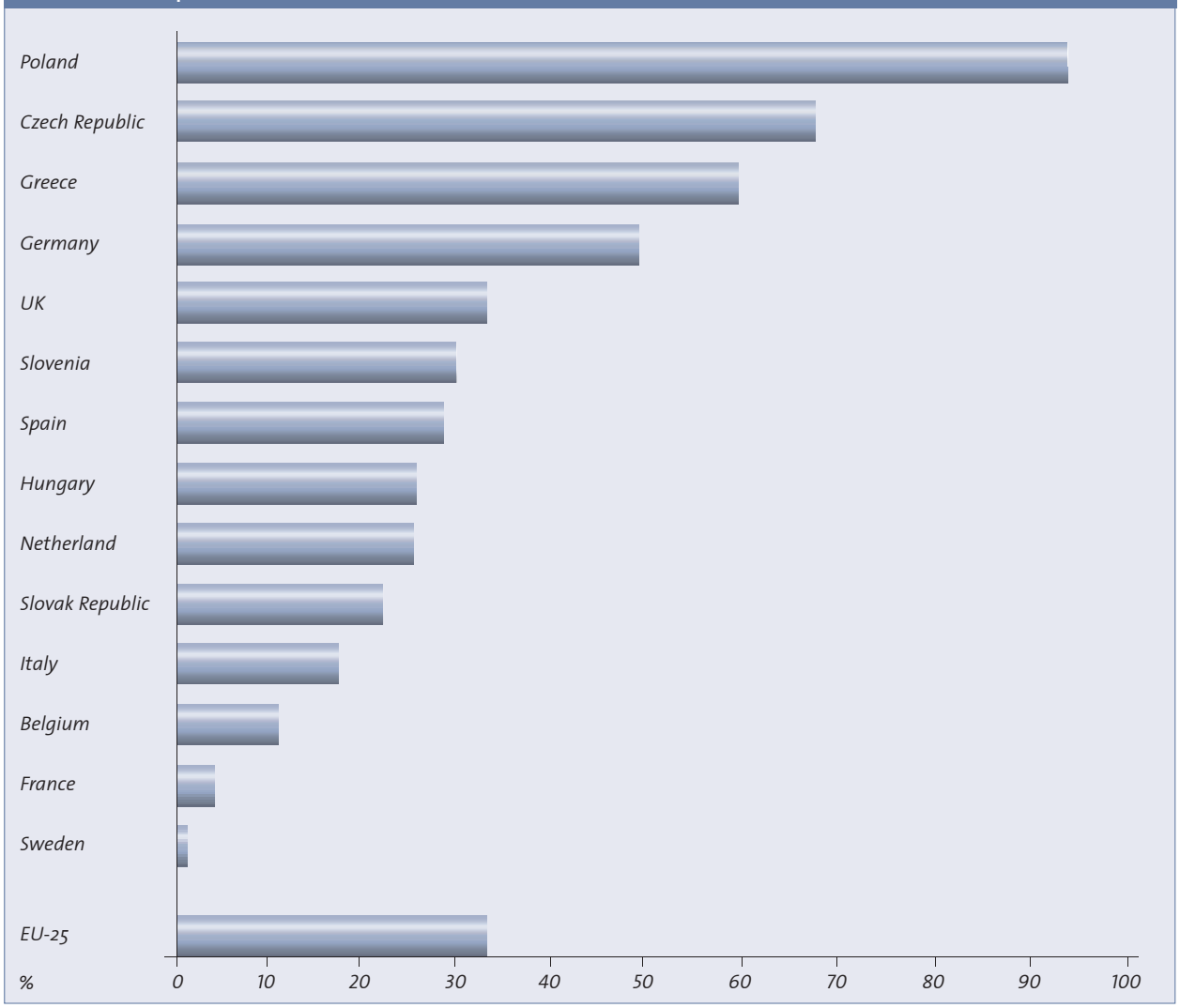


Figure 9: Coal`s share of the power market in selected countries in 2004
Source: EURACOAL member states, Verein der Kohlenimporteure, EUROSTAT

Concept

The concept of Clean Coal embraces all currently available technologies and strategies designed to minimise the impact of coal utilisation on our climate and environment. What makes Clean Coal special is that it is a dynamic process. Clean Coal continuously assimilates and develops new technologies, but it also allows coal industries to pursue different objectives for environmentally friendly coal utilisation according to their situational framework and to tap into this potential in a series of stages using the technology that is currently available.

Phase I of the Clean Coal concept seeks to promote the introduction of state-of-the-art technology for the eco-friendly combustion of coal and lignite on a Europe-wide basis. This means reducing emissions of dust, NO_X and CO_2 as well as increasing power station performance levels. There are many excellent examples of Phase I to be seen in action around Europe, including the systematic replacement of older plants by state-of-the-art facilities in Germany.

Phase II provides for a series of pragmatic developments based on the continuous improvement of power-station efficiency levels. The construction of highly efficient power installations is another step along the road to meeting the increased demand for electricity. There is real global potential for further increasing the efficiency of the power generation process and the resulting capacity for CO_2 reduction would be sufficient to realise a large percentage of the CO_2 savings that have been agreed or are considered necessary at international level.

There are three main paths to follow in order to increase efficiency as the priority target:

- raising steam parameters
- pre-drying of raw lignite
- combined-cycle gas turbine plants.

If the technology proves attractive to investors, and if the regulatory framework in place provides sufficient security, then it will be possible to reduce pollutant emissions and to make efficient use of our dwindling resources in a way that is in line with market economy conditions.

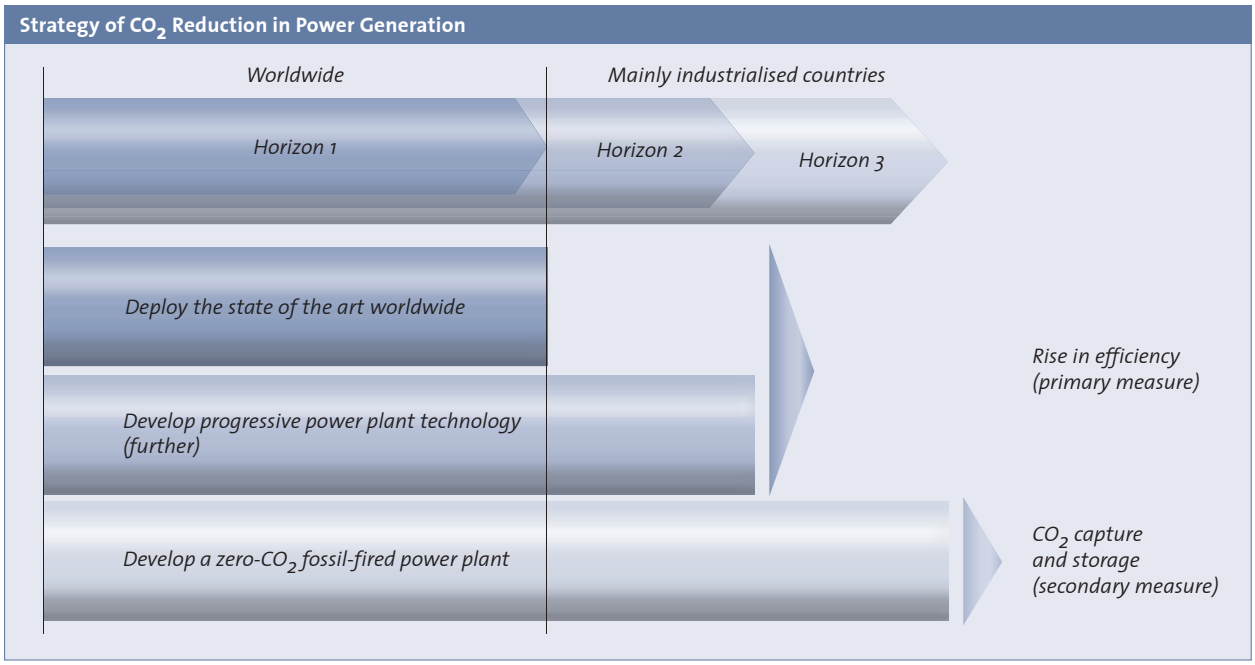


Figure 10: Strategy for CO_2 reduction in electricity generation
Source: RWE

Phase III of the concept takes Clean Coal well into the future with the visionary concept of the low- to zero-CO_2 power station. The technical and economic challenges that have to be overcome to develop the concept of CO_2 capture and storage include the key question of how CO_2 can be safely stored in suitable underground deposits. The last phase of the concept has a high potential for CO_2 reduction, but can only be achieved at the expense of cost, efficiency and resource consumption.

Feasibility studies for the development of zero-CO_2 power plants have again highlighted three main areas of research:

- post-combustion technology with CO_2 scrubbing
- IGCC technology with favourable, integrated CO_2 capture
- the oxyfuel steam power plant.

CO_2 capture and storage are two developments that have to be pursued simultaneously. In the field of CO_2 storage many issues still remain to be resolved, including:

- the technical, environmental and economic feasibility of long-term storage
- investigation of all potential storage systems
- the resolution of approval and legal issues
- the acceptance of CO_2 storage and capture.

The capture and storage of carbon dioxide is an option for the future and, together with the efficient production of hydrogen, is a development that provides a long-term vision for coal. Europe needs to take effective steps to develop these options by creating a technology platform in the Seventh R&D Framework Programme.

Under the Seventh Research Framework Programme the EU Commission intends to make available €2.96bn for projects in the energy field. Included in this research programme are advanced power plant technology and carbon capture and storage. This means that energy comes after the fields of information and communications (€12.7 bn), health (€8.4 bn), transport (€5.9 bn) and nanoscience (€4 bn) but before the field of environment and climate that will receive funding of €2.5 bn. All in all, the Commission proposes to spend more than €71 bn on research and development during the period 2007 to 2013. Four programme focuses are to give new impetus to fundamental and innovative research. The specific shape of the programme and the final level of research funds are subject to the adoption of the EU budget, however, and hence still uncertain.

Efficiency

As a result of national emission controls, public health concerns and global climate constraints there is now increasing pressure on all coal users to introduce Clean Coal Technologies based – in the first two phases – on improving efficiency levels.

According to the Lisbon Strategy, which was adopted in 2000, economic performance in the EU is to be increased by 3 % a year until 2020. Optimum energy supplies will be needed to achieve this target and, inevitably, this will mean a significant growth in electricity demand.

Within the Clean Coal concept an option is to increase the efficiency of existing and newly constructed installations. Coal-fired power stations have already benefited from a one-third improvement in efficiency over the last 30 years. Modern installations are now capable of running at 40 – 45 % efficiency, yet there is still plenty of scope for further development in this area.

Efficiency of different power plant processes

The efficiency of the power plant process is basically determined by the upper process temperature, which is in turn limited by the type of process used and by the materials available. New materials are being tested that will permit higher boiler temperatures and steam pressures. The concept of the "700 °C power station" (375 bar/ 700 °C with an efficiency level of over 50 %) promises to bring another dramatic improvement in power station

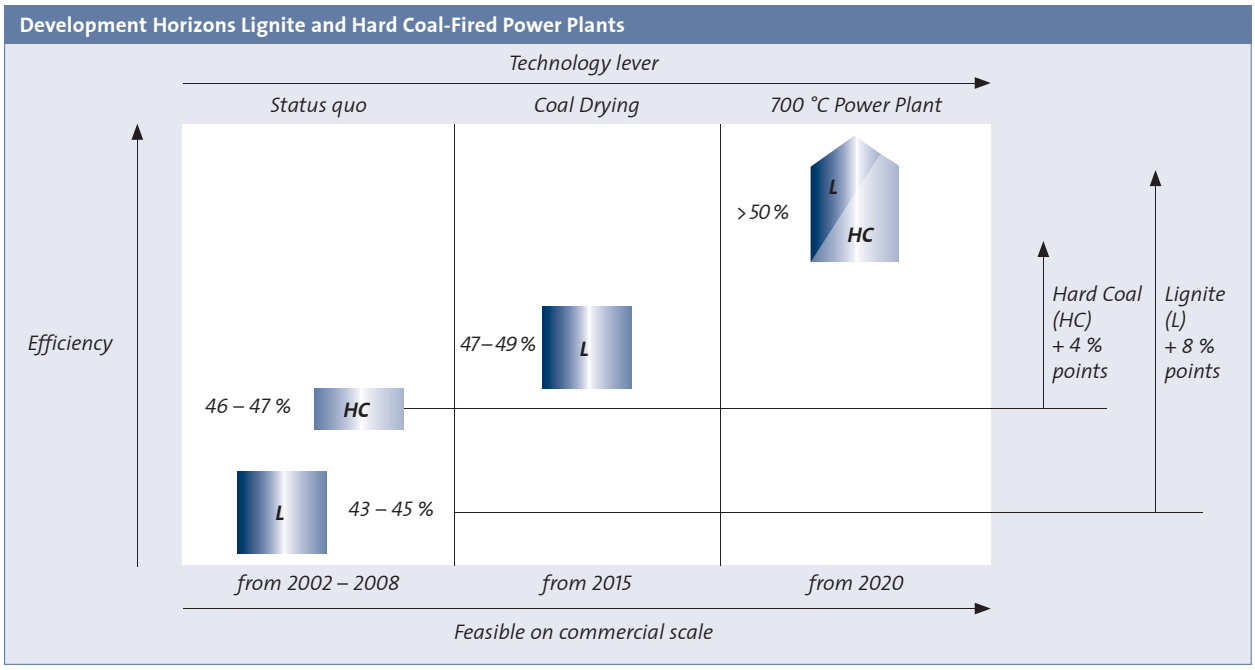


Figure 11: Continuous technological improvement increases the efficiency of power plants
Source: RWE

efficiency within the next decade. The advantage of this line of development is that the overall process remains the same and can benefit from many years of operational experience with plants of this type. Progress is concentrating on developing and testing new materials for a few critical power plant elements.

A milestone in the development of 700 °C technology is the trialling of critical power plant components for this temperature bracket at the Scholven F plant belonging to E.ON Kraftwerke. The project is known by the acronym COMTES 700. In this project, heating surface sections, thick-walled components, piping and fittings are being tested at an existing hard coal-fired 750 MW power plant in the course of power plant operations at 700 °C for a period of over three years. At such high temperatures, the use of nickel-based materials is necessary. Their manufacture on a commercial scale is proving to be a particularly sophisticated task. In addition, operational experience will be gained on expansion, steam oxidation and flue gas corrosion behaviour for the critical power plant components.

Any further efficiency improvement at conventional power plants can mainly be achieved by increasing the steam parameters. In the case of the highly efficient combined-cycle gas turbine process the upper limit temperature is determined by the gas turbine blade temperature, while in lignite-fired power stations the pre-drying of raw lignite is an additional option.

Examples

The modern power plant process is based on pulverised fuel (PF) firing, supercritical boilers and advanced flue gas treatment. The driving force behind all development efforts in power plant technology is the desire to achieve high thermal efficiencies together with low emission levels. This minimises CO_2 output, saves limited resources and is economically sound. On a long-term basis new technologies, such as ultra-low or even zero-emission processes, have the potential to make additional contributions to the emission control targets to which all countries are committed under the Kyoto Protocol. However, this development will have an adverse impact on the efficiency of fossil fuel use.

A wide range of clean coal technologies is currently being discussed. This includes coal gasification and liquefaction. The latter is of no major economic significance today, but remains an option in the event of a further dramatic rise in oil and gas prices and may be a limiting factor against excessive price increases for oil or transport fuels. Producing hydrogen from coal is only a viable option in the event of supply shortages in the gas industry.

Conventional clean coal processes based on supercritical **PF** boilers are capable of achieving an efficiency level of about 45 %, depending on plant location (e.g. sea water cooling). Similar developments are also being proposed for lignite-fired installations.

The lignite-fuelled power station with optimised plant technology (known as the **BoA** system in Germany) has an operating efficiency of over 43 %. The next development phase will include optional lignite pre-drying. By using low-pressure steam to dry the raw lignite in a fluidised bed it is possible to achieve the required drying effect at a low energy level without having to make direct use

Power generating structure of selected European countries in 2004

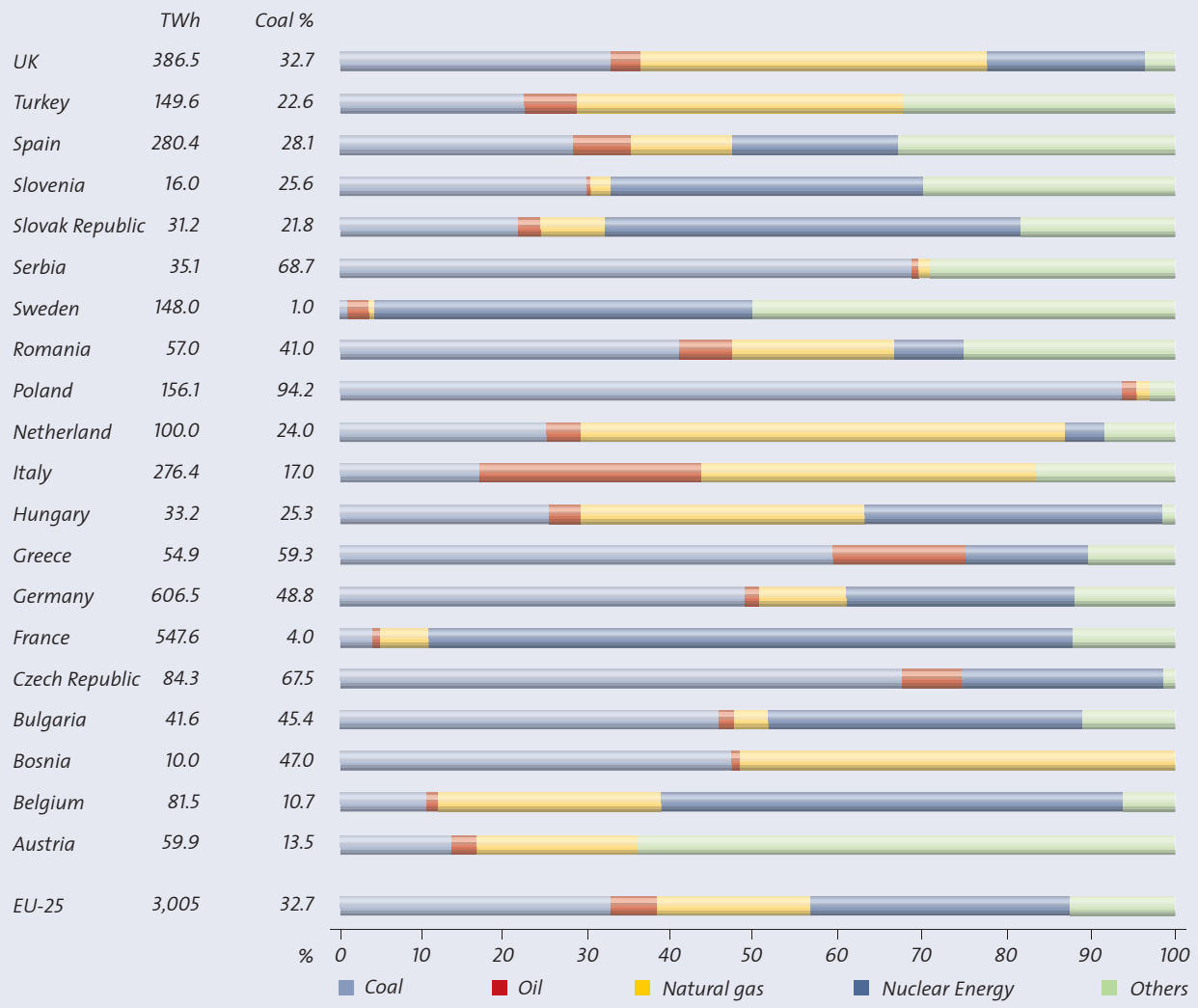


Figure 12: Power generating structure of selected European countries in 2004, estimates
Source: Verein der Kohlenimporteure, Jahresbericht 2004; EUROSTAT, EURACOAL member states

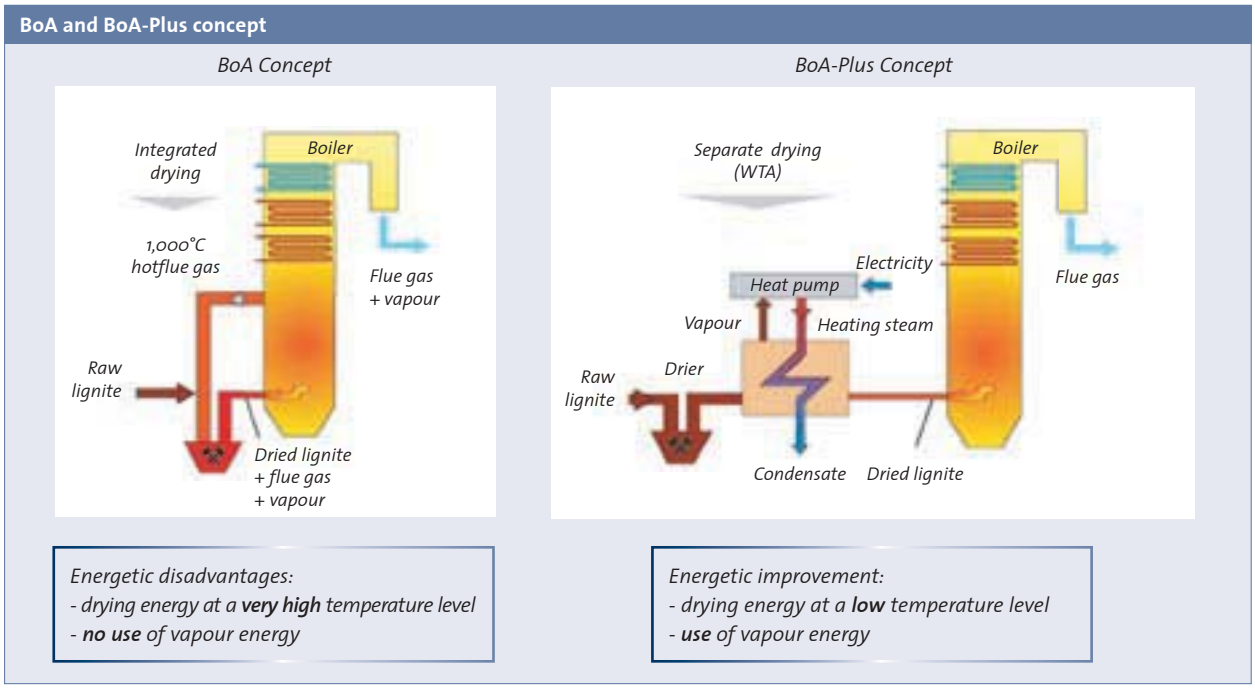


Figure 13: Lignite – drying, BoA and BoA-Plus concept
Source: RWE

of the fuel heat. At the same time the energy contained in the vapours released can be used internally as part of the plant process. Over the course of the last ten years RWE has systematically developed its own fluidised-bed drying technology (**WTA**) specifically for this purpose. When fitted with such a system this **BoA-Plus installation** is expected to achieve 47 % efficiency.

The fluidised-bed combustion (**FBC**) system employs the same steam cycle as the conventional PF-fired boiler. FBC operates at a lower temperature level, which results in fewer emissions without the need for secondary measures such as catalysts or desulphurisation units, and also benefits from high fuel flexibility. Both stationary (**SFBC**) and circulating (**CFBC**) versions of the FBC system are now commercially available.
The advantages of FBC include a very high exchange of media and heat, low combustion temperatures, a long residence time in the combustion zone and the ability to operate without FGD (limestone, ammonia, seawater) and $DeNO_X$ units.

Pressure elevation can also be used to boost the efficiency of FBC technology. This combination of gas and steam turbine power plants with pressurised fluidised bed combustion is known by the abbreviation **PFBC**. The PFBC power generating system promises an alternative concept for the efficient and low-emission generation of electricity from coal and lignite. The PFBC concept also offers the possibility of using primary fossil fuels (coal) directly in the gas turbine without the need for intermediate gasification. Heat is transferred to the water steam cycle in the fluidised bed in order to reduce the combustion temperature. However, even in this variation the efficiency potential is fully exhausted at around 42 to 45 %.

The first installations of this kind are now up and running. As well as assessing the benefits of the process used, planning has to take account of intended use and local conditions. PFBC, for example, is especially relevant for plants with a capacity of < 200 MW, since higher levels of efficiency cannot be achieved by way of higher steam parameters.

Similar efforts have been made to develop the pressurised pulverised coal combustion (**PPCC**) process. This system seeks to burn coal in a pressurised environment and can step up net efficiency to above 50 % when designed as a combined cycle power plant process. To achieve this result the coal must be combusted at high temperatures and at a pressure of about 16 bar. The present target is to achieve a gas turbine temperature of 1,250 °C, which fully exploits the efficiency of current turbines. Moreover, the high combustion chamber temperature promotes the formation of molten ash particles and like the alkalis these too must be removed before the flue gas enters the gas turbine. The problem of cleaning the flue gas has still not been completely solved.

Tests are under way on other variations of the process that allow the use of conventional filter technology for dust separation. The aim is to bring the flue gas to a temperature of 800 °C to 900 °C with a minimum loss of energy. Integrated gasification combined cycle (**IGCC**) technology is based on the gasification of coal with oxygen (or air) to produce fuel gas, which predominantly consists of hydrogen and carbon monoxide. After treatment and cleaning to produce a high-quality fuel the gas is used in a conventional combined cycle system consisting of gas and steam turbines. The exhaust gases are fed into a heat recovery boiler which produces steam for use in a steam turbine.

There is real potential for a further boost in efficiency, particularly if higher gas turbine inlet temperatures can be achieved using purified coal gas. IGCC plants are now capable of achieving efficiency levels of around 45 %. Demonstration plants are currently operating at industrial scale in the Netherlands and in Spain. Recent investigations have sought to demonstrate the possibilities of improving the IGCC process in order to achieve higher efficiency levels and raise plant capacity – and in this way to reduce operating costs. Plant availability is another area in need of improvement. The consequence of all this is that investment costs are still significantly higher than those for conventional coal-fired power stations.

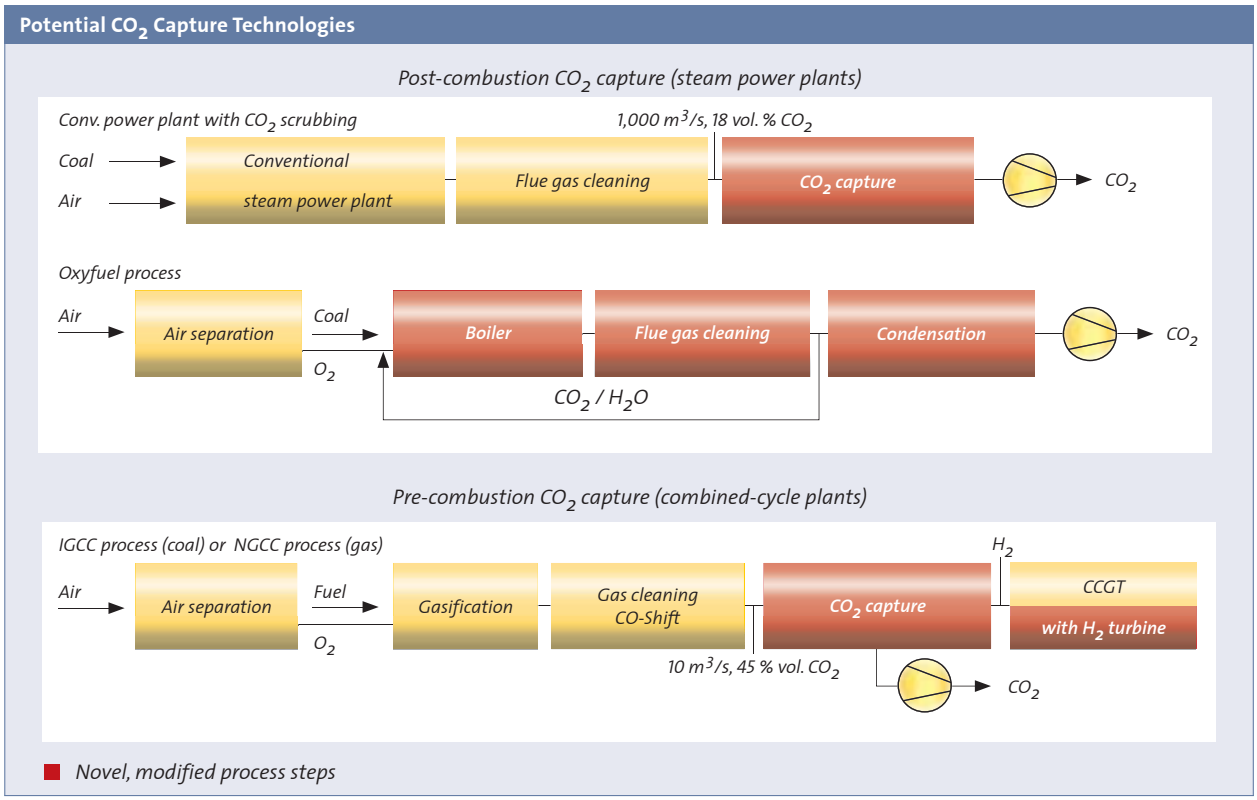


Figure 14: CO_2 capture at conventional power plants and combined-cycle facilities

Ultra-low CO_2 emission and sequestration for coal-fired power plants

EURACOAL advocates a facts-driven examination of the options for CO_2 capture and storage within the scope of the Seventh Framework Programme for Research. The Association is also calling for increased plant efficiency to be made a priority target within the Framework Programme and to be recognised as the key development objective for power plant technology.

CO_2 capture

Three basic technology routes can be pursued for the separation of CO_2 from fossil-fired power plants:

- Conventional steam power plant process with CO_2 capture from the flue gas
- Steam power plant process with oxygen combustion and flue gas recirculation (Oxyfuel process)
- IGCC power plant with CO_2 capture from the fuel gas

Compared with processes without CO_2 capture, systems of this type are generally associated with considerable extra cost and additional energy consumption. When examined in detail, however, the distinct features of each process can result in a differentiated appraisal. Intensive efforts are being made to develop processes with CO_2 capture and numerous national and international projects are now under way in this area. Here it is essential that viable solutions be found to the problem of long-term CO_2 storage in order to keep pace with these developments.

CO_2 storage

The process involved in CO_2 storage requires some clarification:

Technical, economic and ecological feasibility

- Compilation of a register of possible storage facilities. Storage tests with comprehensive monitoring (CO2SINK project)
- Implications for the subterranean hydrosphere

Legal clarification

- Legislation governing storage operations (dumping, interim storage)
- Legal framework for access rights to potential storage facilities

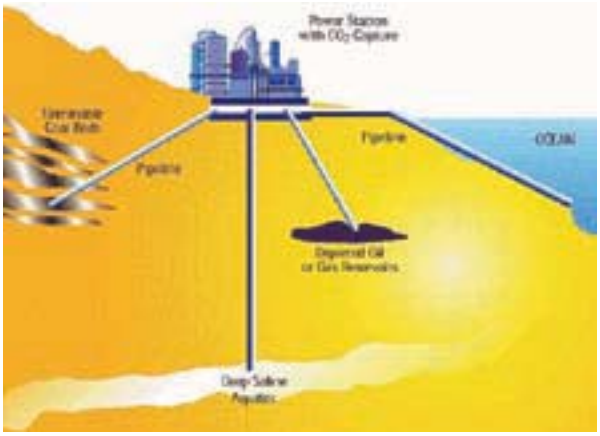


Figure 15: Underground storage of CO_2
Source: IEA

Public acceptance

- CO_2 storage presumes wide public acceptance
- There is still some uncertainty surrounding the feasibility of CO_2 storage in a densely populated area.

The status of CO_2 capture and storage

After capture the CO_2 will have to be stored securely for hundreds or even thousands of years if it is to be prevented from reaching the atmosphere. Major reservoirs that could serve as suitable storage sites have been identified under the earth's surface and in the oceans. Work is currently in progress to develop many of these options.

The first step, which is fundamental to the problem, is to clarify long-term responsibility for the geological structure that is to be filled with CO_2. The main priority for the development of CO_2 capture technology is then to reduce the cost of the operation. On the storage side there is a real need to assess both the reliability and the long-term stability of geological CO_2 storage sites and to build public confidence in this process. The fact that CO_2 has been stored naturally over geological eras enhances the credibility of many of the storage options.

Outlook

Clean Coal Technology provides answers to the problem of how coal can be used efficiently and in an environmentally compatible manner. This concept for coal utilisation can help protect the environment while at the same time ensuring security of energy supply based on solid fuel.

Coal and climate protection

Introduction

In any debate about climate protection the issue of secure energy supplies will be very much to the fore – and this applies especially to concepts for the efficient utilisation of resources. Each increase in the level of energy efficiency and technological expertise means a saving of resources and a reduction in greenhouse gas (GHG) emissions, which is all part of the basic principle of sustainability. The European coal industry is campaigning for pre-emptive climate protection measures

Energy Policy

A far-sighted energy policy has to be based on the triangle of sustainability objectives, with equal weight being given to environmental compatibility, competitiveness and security of energy supply. An equitable energy mix that has been developed under normal competitive conditions is the best way to achieve a balance between these energy policy objectives. Mankind will continue to be dependent on fossil fuels for many decades to come and in its World Energy Outlook 2004 the IEA has stated that the anticipated growth in world energy demand cannot be met by renewables – even if the contribution made by this energy source is increased to its absolute limit (compare the scenarios in Figures 5 and 6).

The contribution made by fossil fuels to energy production must and will rise if we are to satisfy the growing demand for energy worldwide – and this inevitably means an increase in GHG emissions.

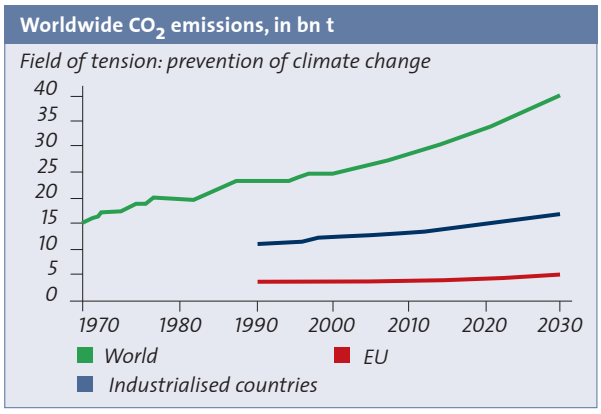


Figure 16: World CO_2 emissions: 1990-2025
Source: EIA

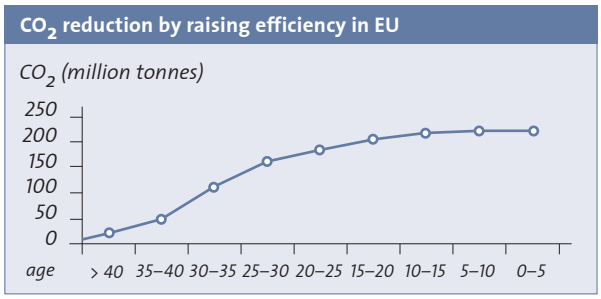


Figure 17: CO_2 reduction by increasing power station efficiency in the EU
Source: ALSTOM

Plant modernisation has enormous implications for the world's resources as well as for the global climate. If all coal-fired power stations more than 30 years old could be refurbished over the next 20 years it would be possible to reduce global CO_2 emissions by more than one billion tonnes a year. The resulting energy savings and the reduction in environmental emissions would be sufficient to meet the Kyoto objectives of every industrialised nation.

Figure 17 shows the accumulated savings in CO_2 that can be obtained for installations in the different age categories, provided that these are replaced by new coal-fired power plants each equipped with up-to-date technology.

The major investors that the industry requires in order to modernise the existing power generating installations will only come on board when a long-term regulatory framework has been put in place. The world still needs a climate policy that can accommodate the needs of the marketplace so as to deliver a rational energy mix capable of exploiting the main benefits of each individual fuel.

Reduction of GHG emissions

GHG emissions can be reduced by greater energy savings and improved energy efficiency right across all sectors of the economy. The efficiency levels of modern coal-fired power stations, for example, have improved dramatically in recent years. With the three-stage programme for coal utilisation, as drawn up under the Clean Coal Concept, efforts are now under way to reduce emissions from existing power stations and facilitate the development

and market penetration of new and highly efficient coal-fired power stations, as well as to promote new technologies for CO_2 capture and storage. Further improvements are expected and progress of this sort will ensure that coal remains a competitive ingredient in the search for a balanced, diverse and secure fuel mix.

The climate debate

The global discussion on climate is becoming increasingly confined to a CO_2 debate. This is prejudicial to coal, which is associated with higher specific emissions of CO_2 than other fossil fuels. However, such an assessment is somewhat short-sighted and ill-conceived, as it fails to take account of the different transport distances involved and the impact of other climate-relevant gases. Any set of measures adopted in response to climate change must take into consideration the impact of all GHGs on the basis of a life-cycle analysis (e.g. from oil well to point of use). Kyoto defines CO_2, CH_4, N_2O, HCFC, HFC, PFC and SF_6 as "greenhouse gases" and all such emissions and each and every link in the production-transport-conversion chain have an important role to play, because while it is a fact that coal combustion – though practised using highly advanced technologies – produces more CO_2 emissions than methane, it is also true that emissions produced during the extraction and handling of other energy sources narrow the gap significantly.

An analysis of long-term climate-substitute indicators has so far failed to establish beyond doubt that temperature trends are dependent on atmospheric CO_2 concentration. For this reason the European coal industry is concentrating its R & D efforts on a range of processes designed to make coal a clean partner in the energy mix. Measures for pre-emptive climate protection are being spearheaded by the European coal industry, with the focus on increasing efficiency levels at coal-fired power stations in order to reduce energy resource input while at the same time cutting CO_2 emissions.

Political response

The political reaction has gathered so much momentum that the economic and social value of fossil fuels, including coal, now seems to be rarely acknowledged. A growing number of policy-makers are seeking to consign these fuels to history without considering the alternative energy sources needed to provide a viable replacement.

As a precautionary measure against climate change, the IPCC has recommended an 80 % reduction in CO_2 emissions by the year 2050, even though the debate is still raging as to whether – after weighing up the associated costs and benefits – such a target is justified given current progress in the field of climate research.

It would appear that the need for a precautionary approach has forced us into political action well before science has been able to answer all the questions about man's impact on the global climate system. If in the next few years the findings of climate researchers support the theory that anthropogenic emissions are having a sustained influence on global climate, effective solutions for low-CO_2 or even zero-CO_2 power generation will have to be on stand-by if the coal industry is to survive in the competitive marketplace.

The European response

In 1997 the industrialised nations signed the Kyoto Protocol, committing them to an 8 % reduction in GHG emissions, relative to 1990 levels, over the period 2008 to 2012. In order to achieve this objective the EU Member States undertook to impose national climate protection targets. Key to this undertaking is the emissions trading scheme. Under the Emissions Trading Directive, which took effect in October 2003, EU Member States are obliged to adopt National Allocation Plans (NAPs) implementing the emissions trading system. The scheme aims to cut CO_2 emissions where it proves cost-effective to do so.

The Kyoto Protocol also introduced a number of so-called "flexible mechanisms":

- Emissions trading (trading in Assigned Amount Units [AAUs])
- Joint Implementation (JI) (trading in Emission Reduction Units [ERUs])
- Clean Development Mechanism (CDM).

Criticism must be levelled at the lack of harmonisation of the allocation rules and at the uneven distribution of emission reductions in Europe. This results in distortions in competition – which surely cannot be the intention. For the next commitment periods much greater attention will have to be given to ensuring that reduction efforts are distributed more evenly in the sectors affected by emissions trading.

The CO_2 Trading Scheme as defined by the Kyoto Protocol

Idea of emissions trading:
*It is not decisive **where** but **the fact that emissions** are cut.This is done by means of **„flexible mechanisms"**:*

Emissions trading:
Between industrialised countries, trading of emission allowances is possible.

Joint Implementation (JI):
Emission reductions caused by investment of one industrialised country in a second industrialised country are only credited to the emissions account of the investor country.

Clean Development Mechanism (CDM):
Emission reductions caused by investment of an industrialised country in a country without reduction commitments are credited to the emissions account of the investor country.

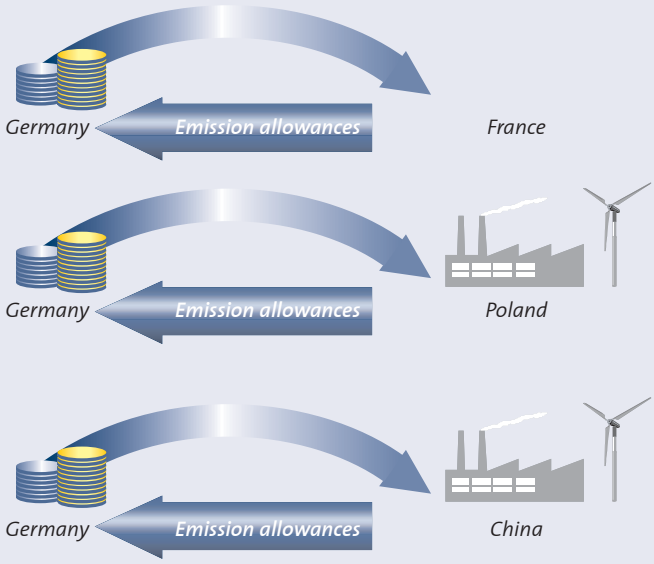


Figure 18: CO_2 trading system according to Kyoto
Source: RWE

On 25th October 2003 the EU issued its Emissions Trading Directive specifying upper emission limits (caps) for industrial installations, whereby plants with emission levels below the caps can sell the difference via a trading market, thus making spare emission capacities available to plants in need of them. These caps are specified in the National Allocation Plans (NAPs).

By the end of 2004 nearly all NAPs had been submitted to the European Commission and most were subsequently approved, albeit with a number of stipulations set. The system will have a profound impact on Europe's future energy supply and in this respect the Commission will have to advocate economically justifiable solutions that ensure stability and sustainability.

Climate protection

Ambitious EU climate protection targets alone will not suffice to ensure cost-effective prevention of climate change. In the years ahead the biggest growth in energy consumption and GHG emissions will be recorded in the emerging nations and in countries in transition. In the long run, these countries will also have to be included in the post-Kyoto process. An overly ambitious and solely Europe-focused climate policy would seriously undermine economic growth and sabotage the aims of the Lisbon Strategy.

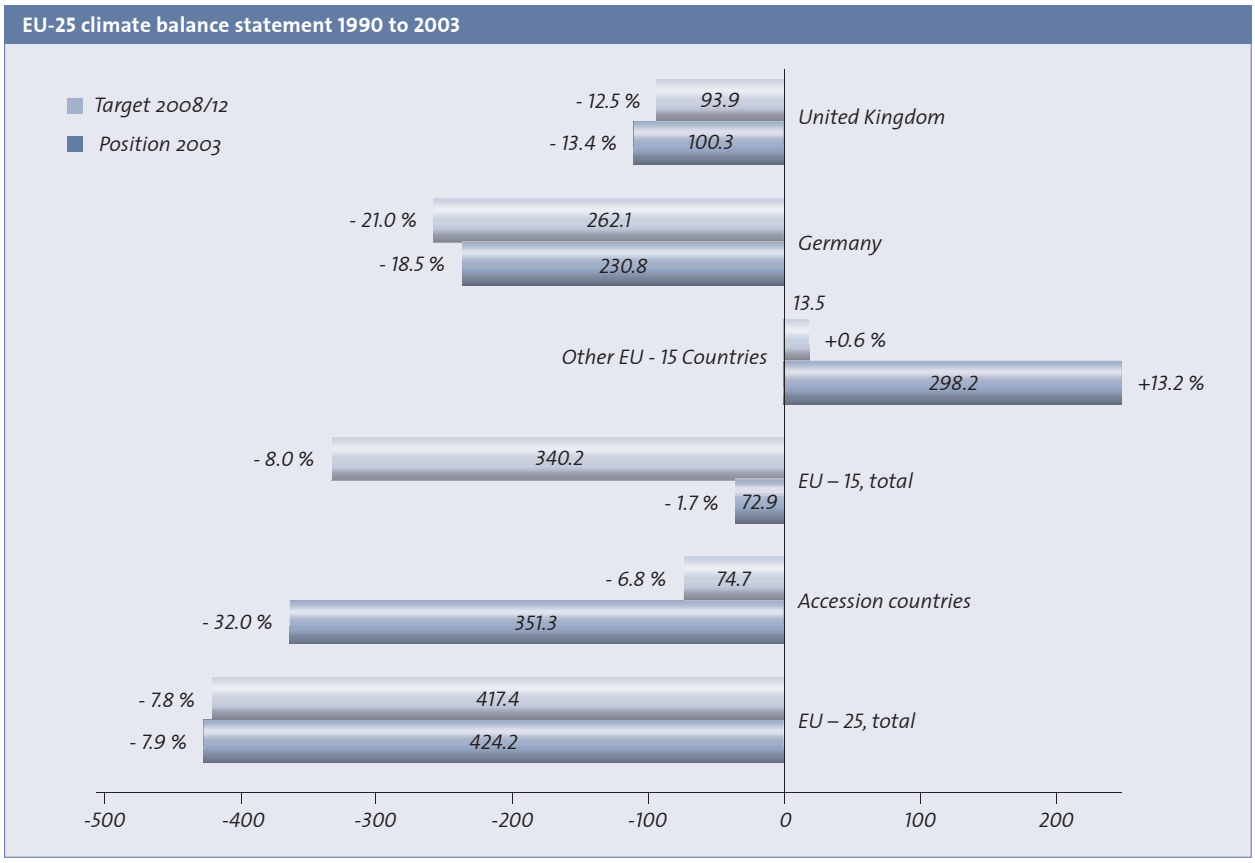


Figure 19: EU-25, climate balance statement, 1990-2003, in million tonnes of CO_2 equivalent
Source: RWE

Outlook

Any future climate policy must keep all energy options open. The question of how to reconcile economic and energy targets with environmental objectives is closely linked with "emission rights trading" strategy. This instrument can be deployed for greater efficiency as part of a balanced energy portfolio. In this respect, the EU wishes to promote R&D investment to support suitable solutions and innovations. In any process adopted, whether avoidance or adaptation measures, preference must be given to market-based tools to ensure target achievement at the lowest possible cost. Promotion efforts should focus on research and technology that is aimed at reducing CO_2 emissions by means of improved efficiency levels, with the long-term objective being low-emission power generation.

Technology and continuous modernisation have the potential to preserve resources and reduce CO_2, the prime objectives of climate policy. In return for this, the coal industry and coal-based power generation require a stable planning framework. With the right policies in place coal can continue to provide secure, low-cost power for Europe, while at the same time meeting the environmental challenges, since it is inexpensive, secure and has no transportation risks. The environmental impact of coal use can be minimised by introducing Clean Coal Technologies. This concept is the basis for coal's long-term acceptance and is sufficiently flexible to be used by all countries.

It is EURACOAL's view that a long-term approach, in other words the need-oriented, free allocation of certificates over several trading periods, is vital for the power plant sector. No one can predict what would happen in a deregulated electricity market if power generation were unable to keep pace with demand because of a shortage of emission rights.

Coal and Research

Rationale

European coal mining will remain a major source of energy supply for the enlarged European Union in the decades to come. In various communications, the Commission has recently addressed the Union's structural weakness regarding energy supply, namely Europe's growing dependence on energy imports, and has proposed measures to ensure the uninterrupted availability of energy products, for example by maintaining a reasonable level of European coal production.

Moreover, as Europe will require about 200,000 MW of new power generation capacity by the year 2020, the opportunity now exists to achieve significant and sustainable improvements in minimising the industry's environmental impact by applying various RTD measures in the field of coal combustion.

The production and use of European coal also provides the necessary industrial base for highly developed mining machinery and combustion equipment with a very high export potential (at present European mining technology has more than half of the world market share). This industry is strongly competitive and largely export-oriented.

However, maintaining this leading market position will depend to a large extent on having a strong coal production and utilisation base within the EU and on the availability of advanced technologies, which is not possible without continued RTD efforts. The spin-offs from coal research activities are also of considerable benefit for other industrial applications.

RTD in coal mining and coal power plant technology therefore remains a vital part of European coal policy and acts as a logical supplement to R&D in the various areas of coal utilisation.

Research Fund for Coal and Steel (RFCS)

The RFCS programme is the continuation of the ECSC RTD programme. It is funded by revenue generated from the remaining assets of the ECSC, thus using money contributed by the coal and steel industries. According to the respective Technical Guidelines, "the objective of the RFCS programme is to support the competitiveness of the Community sectors related to the coal and steel industry". The programme "... shall complement the activities carried out in the Member States and within the existing Community research programmes. ... Coordination, complementarity and synergy between these programmes shall be encouraged...." EURACOAL understands "complementarity" to imply that RTD subjects eligible for funding under the RTD Framework Programme should not be eligible under the RFCS. Ambitious objectives such as sequestration and deposition of CO_2, for example, are already covered by the current EU RTD Framework Programme.

Since the programme's implementation in 2003 the submission and evaluation procedures have improved significantly. Although the RFCS budget for coal comprises only little more than the ECSC programme, it is at present the only programme funding research in mining technology at EU level.

Seventh EU RTD Framework Programme

Following the adoption of the Commission's proposal for the Seventh EU RTD Framework Programme (FP 7) the European Parliament and the Council are now called upon to approve the proposal under the codecision procedure. In line with the next financial framework the programme is to have a seven-year term from 2007 to 2013 and a budget totalling some €73 billion.

FP 7 is organised in four specific programmes termed "cooperation", "ideas", "people" and "capacities". For the mining industry the "cooperation" programme is important; it aims at "gaining European leadership in key areas of science and technology" and suggests trans-national collaborative research to remain

the core activity of the FP. It is organised under nine "priority themes": health, food, agriculture and biotechnologies, ICT, nanosciences, nanotechnologies, materials and new production, transport, socioeconomics and humanities, space and security research, environment and climate change and, most important for EURACOAL, energy, with a proposed overall budget of €2.6 billion.

It is thus obvious that energy will be an issue again. In contrast to previous programmes and given the developments in the energy sector starting last year, it is also clear that the Commission is prepared to talk about all energies again, including fossil fuels and in particular coal. This was also addressed in the Energy Ministers' contribution to the European spring Council stating that "The EU needs to give higher priority to energy R&D, reversing recent trends."

Consequently the energy section's objective aims at "transforming the current fossil-fuel based energy system into a more sustainable one based on a diverse portfolio of energy sources and carriers combined with enhanced energy efficiency, to address the pressing needs of security of supply and climate change, whilst increasing the competitiveness of Europe's energy industries".

The rationale acknowledges the global rise in energy demand, calls the volatility of oil prices "damaging" and takes account of the geopolitical instability in supplier regions, thus following arguments promoted by EURACOAL.

In the "activities" section, there is a specific reference to CO_2 capture and storage technologies for zero-emission power generation and clean coal technologies. EURACOAL supports the Technology Platform on Fossil Fuel Power Plants suggested by the European Commission to this end. The Technology Platform should promote the development of power stations with significantly reduced CO_2 emissions. When focusing on CO_2 capture and storage, the issues concerning transport and storage of CO_2 must also be addressed. They must also be pursued intensively. The Clean Coal Concept (see above) also indicates that results in resources conservation and reduction of emissions seem possible at an even earlier stage. The Technology Platform should therefore also deal with possible improvements in efficiency by means of new materials and higher steam parameters.
On the basis of today's state-of-the-art technology, it can reasonably be expected that thermal efficiencies will reach about 50 % by the year 2020. This would achieve a further significant reduction of all emissions compared with installations of the 1950s, 1960s and 1970s that will reach the end of their operational life and require investment in the coming 15 years. This requires appropriate research projects and a coherent legal and regulatory framework.

European Technology Platform for Sustainable Mineral Resources

The use of European Technology Platforms as an innovative instrument to prepare FP 7 also applies to mining. Therefore, a European Technology Platform for Sustainable Mineral Resources was launched in March 2005.

The Technology Platform will comprise all mining branches from industrial minerals, iron and metal ore to energy raw materials, and includes upstream and downstream industries.

Its main objective is Technology Leadership along the whole value chain. A Strategic Research Agenda is developed in seven focus areas from exploration to mine closure and restoration. The full proposal for the Platform is to be finalised and presented to the Commission by the end of 2005.

Austria

information

General Data	Unit	2004
Population	millions	8.2
GDP	bn €	224.3
Prim. energy consumption (PEC)	Mtce	47.1

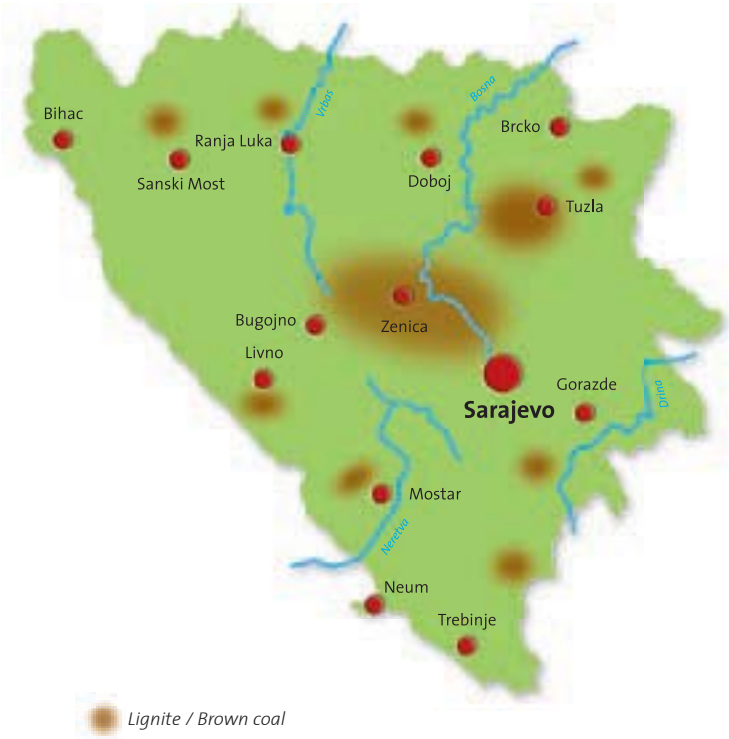
Austria has only limited primary energy resources (except for oil and natural gas), and these mainly consist of small amounts of coal and lignite (30 million t). In the second half of the 18th century systematic coal extraction began in Upper Austria (Hausruck), in Lower Austria (Thallern, Statzendorf and Lunzer measures), throughout Styria (Seegraben, Fohnsdorf) and around Eibiswald, while lignite mining started in the areas around Köflach and Voitsberg. The country's huge coal deposits in North Moravia and Silesia mainly supplied industry and railway operators. To replace the loss of these deposits, collieries that had been closed or mothballed were brought back into service after 1918 and again after 1945. With the resumption of imports, the effect of structural changes in the energy sector, which now favoured oil and natural gas, and the increasing use of hydro-electric power, the economic viability of coal mining declined and production was discontinued at many sites. Ratten mine (Styria) closed in 1960; Seegraben colliery near Leoben, which first opened in 1606, was shut down in 1964; Grünbach mine, at the foot of Schneeberg mountain, closed in 1965 (it had operated as an opencast mine from 1827 to 1850 and then became an underground mine; output in 1951 was 0.2 million t with total production amounting to 11 million t); St. Stefan mine in the Lavanttal valley closed in 1968, while the colliery at Fohnsdorf (the world's deepest roadway, 1130 m) was shut in 1978. In order to ensure the future of the country's remaining collieries, CHP power plants were constructed at Köflach, Timelkam, Trimmelkam, Fohnsdorf and St. Andrä between 1925 and 1982. This approach was only successful at Köflach, where the opencast mine has geological resources of 30 million t. In the Hausruck area, Wolfsegg-Traunthaler AG, which has been in operation since 1856, closed the Ampflwang mine in 1995 (output in 1980: 0.4 million t). The main consumers are VOEST-Alpine steel works in Linz and Donawitz (1.9 million t) and various power plants (2 million t). The Dürnrohr power station in Lower Austria, for example, burns coal imported from Poland (6,000 t a day, or more than 1 million t a year). In 2003 Austria consumed 4 million t of coal and 1.2 million t of lignite. In western Styria the last opencast lignite mine operated by GKB-Bergbau GmbH was closed in 2004. In 2004 the annual output was 0.2 million t. The Oberdorf opencast mine, which covers a total area of some 270 hectares, is now in its closing and recultivation phase which will be finished in 2007. 90 % of the fuel is used in a nearby power plant, thus contributing some 3 % to Austria's total power generating capacity most from stockpile.

information

Coal and Energy Data	Unit	2004
Resources Lignite	Mt	30
Reserves Lignite	Mt	–
Domestic Output		
Lignite	Mt	0.2
Total	**Mt**	**0.2**
Selected Coal Quality Data		
Calorific Value Lignite	kJ/kg	10,000
Ash content Lignite	%	22.5
Water content Lignite	%	36.0
Sulphur content Lignite	%	1.1
Net Imports Hard Coal	Mt	3.9
Prim. Energy Consumption		
Total	**Mtce**	**47.1**
Hard Coal and Lignite	Mtce	5.0
Power Supply		
Generation, total	**TWh**	**59.9**
Hard Coal and Lignite	TWh	8.0
Net power imports	TWh	2.7
Gross power consumption	**TWh**	**62.6**
Power Plant Capacity		
Total	**MW**	**19,100**
Hard Coal	MW	1,500
Lignite	MW	500

Source: EURACOAL member, estimates

Bosnia and Herzegovina



information

General Data	Unit	2004
Population	millions	4.0
GDP	bn USD	26.2
Prim. energy consumption (PEC)	Mtce	9.8

Bosnia and Herzegovina is the only country in south-east Europe that exports significant amounts of electricity, even though most of its generating potential is still not being utilised.

The total production capacity of the country's existing thermal and hydroelectric power plants is 3,940 MW. 50 % of this is hydro-electric based, while the remaining 50 % is provided by thermo-electric installations.

The power stations are supplied with indigenous coal. Brown coal and lignite deposits are found in a number of separate stratified beds and mining is based on the following production centres:

- The Central Bosnian deposits are worked by: the Kakanj group (Vrtlište opencast mine and the deep mines of Stara Jama and Haljinići); the Breza group (deep mines at Sretno and Kamenica); the Zenica group (deep mines at Stara Jama, Raspotočje and Starnjani); the Abid Lolić – Bila group (Grahovčići opencast mine) and the Gračanica group (Dimnjače opencast mine).

- The Tuzla deposits are worked by: the Kreka group (the Šikulje and Dubrave opencast lignite mines, together with deep lignite mines at Mramor and Bukinje); the Đurđevik group (opencast brown coal mines at Višća II and Potočari and the Đurđevik deep mine) and the Banovići brown coal group (opencast mines at Grivice, Čubrić and Turija and one deep mine at Omazići).

- The Gacko deposits are worked by Gacko Mine, which supplies the Gacko thermal power station.

Other production sites in Bosnia and Herzegovina include the mines of Tušnica – Livno and Ugljevik (which supplies the Ugljevik thermal power station) and the Stanari Mine at Doboj.

Many of these mines, especially those located in central Bosnia and around Tuzla, supply fuel to the thermal power plants at Kakanj (578 MW) and Tuzla (779 MW), while Gacko Mine supplies the Gacko thermal power plant (300 MW) and Ugljevik Mine the Ugljevik thermal power plant (300 MW).

Lignite

Brown coal and lignite make a large contribution to the energy mix of Bosnia and Herzegovina. In 2004 the country produced a total of 8.7 million t of solid fuels, of which 47.1 % (4.1 million t) were lignite.

The biggest lignite mines in Bosnia and Herzegovina are at Kreka and Gacko. Bosnia and Herzegovina has larger reserves of lignite than of brown coal. The Bosnian mines employ some 16,000 people.

Brown Coal

Brown coal comprises 52.9 % of the country's total solid fuel production. One of the largest brown coal mines is at Banovići, which is located in the north-east of the country. The mine covers an area of 27 km^2 and the coal measures dip 12° from north to south, with an average bed thickness of 17 m.

The Banovići measures are worked by two opencast mines at Čubrić and Grivice and one deep mine at Omazići, while a third opencast mine is currently being developed.

Banovići brown coal mine

The opencast mines at Banovići operate a discontinuous system of working using shovel dredgers of 20 cbm capacity, dumper trucks with a 170 tonne payload and other ancillary machinery.

Deep mining is part mechanised and the methods used include conventional roadway and face working with retreat mining. There are currently plans to modernise the mines, including the introduction of new transport systems and mechanised equipment for roadway drivage and face working.

Brown coal production from Banovići in 2004 was 1.3 million t, which represented 29.2 % of the country's total brown coal output and 15.3 % of the entire solid fuel production of Bosnia and Herzegovina.

A survey of current production levels and plant modernisation in the first half of 2005 has shown that production trends are up compared with previous operating years, though there is an ongoing need for modernisation of technology for excavation, coal processing and environment protection.

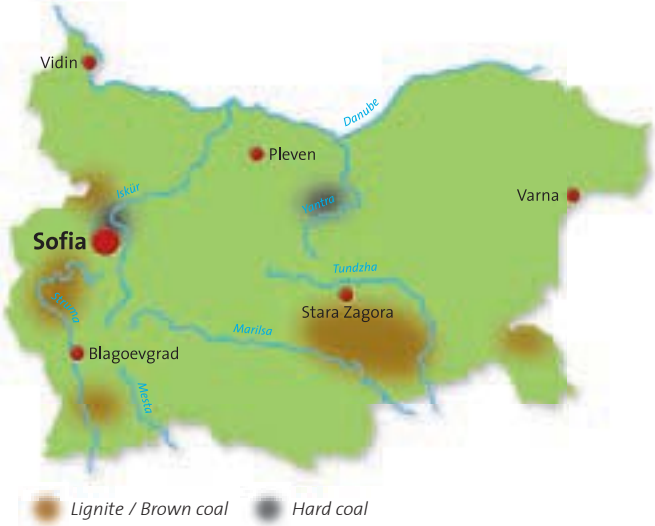
Mining in Bosnia and Herzegovina currently face a huge challenge in the form of industrial restructuring. This mainly relates to the provision of social care for disabled war veterans, who make up between 15 and 20 % of the entire workforce, and the need to reorganise unproductive units into independent companies that will eventually be made profitable through modernisation.

information

Coal and Energy Data	Unit	2004
Resources Brown Coal	Mt	n.a.
Resources Lignite	Mt	n.a.
Reserves Brown Coal	Mt	n.a.
Reserves Lignite	Mt	n.a.
Domestic Output		
Brown Coal	Mt	4.6
Lignite	Mt	4.1
Total	**Mt**	**8.7**
Selected Coal Quality Data		
Calorific Value Brown Coal	kJ/kg	13,700 – 19,700
Calorific Value Lignite	kJ/kg	12,690
Ash content Brown Coal	%	10.1 – 24.4
Ash content Lignite	%	8.1
Water content Brown Coal	%	13.7 – 19.1
Water content Lignite	%	39.1
Sulphur content Brown Coal	%	1.4 – 2.2
Sulphur content Lignite	%	0.6
Net Imports Hard coal	Mt	0
Prim. Energy Consumption		
Total	**Mtce**	**9.8**
Brown coal	Mtce	n.a.
Lignite	Mtce	n.a.
Power Supply		
Generation, total	**TWh**	**10.0**
Brown Coal and Lignite	TWh	4.7
Net power imports	TWh	-1.0
Gross power consumption	**TWh**	**8.3**
Power Plant Capacity		
Total	**MW**	**3,940**
Coal	MW	1,957

Source: EURACOAL member, estimates

Bulgaria



information

General Data	Unit	2004
Population	millions	7.8
GDP	bn €	17.7
Prim. energy consumption (PEC) (2001)	Mtce	27.0

The Republic of Bulgaria has limited reserves of fossil fuels – about 200 tce per capita, a figure well below the world average of 2,000 tce. The country's indigenous energy resources consist mainly of lignite with a low calorific value and negligible hydro reserves. Meeting the current and future energy needs of the Republic of Bulgaria is dependent on the preservation and modernisation of available nuclear and thermal power capacity, as well as on the efficient utilisation of the limited coal reserves for power generation. Their environmentally friendly and economically efficient functioning guarantees Bulgarian industry and the household sector access to cheap electric power. Solid fuels play a significant role as far as the country's energy potential is concerned and they are one of Bulgaria's long-term indigenous energy resources. The solid fuel reserves at mines currently in production amount to some 3 billion t, comprising 88.7 % lignite, 10.9 % brown coal and 0.4 % hard coal. Lignite, and to some extent brown coal, are of considerable economic importance to the country, whilst hard coal, oil and natural gas only play a minor role. At present about one third of Bulgaria's electric power is generated from indigenous solid fuels, from which Mini Maritsa Iztok delivers about 90 %. The country also imports a significant amount of its energy resources from Russian suppliers.

Lignite

Most of the lignite reserves are found in the centre (the Maritsa East and Maritsa West coalfields) and in the west of the country (the Sofia coalfield). In 2004 total lignite production amounted to 23.7 million t, entirely from opencast mines. Deep lignite mining operations went into liquidation at the end of 2002. The industry is currently undergoing a process of privatisation. There are three small JSCs currently operating in the Sofia Basin, namely Stanyantsi Mine, Bely Bryag Mine and Choukourovo Mine, whose combined annual output is in the region of 1.5 million t. Lignite is also extracted at Kanina Mine, which was a part of Pirin Mine EAD until the middle of 2004, when it was privatised. In 2004 lignite was worked at seven opencast mines. Plans have been laid for opencast lignite mining to provide fuel for the generation of some 30 % of the electric power required for the country's total energy balance, and Mini Maritsa Iztok EAD is to play a leading part in this programme. This operation involves Bulgaria's most significant lignite deposits, with workable reserves amounting to over 2 billion t. The three opencast mines operated by the state-owned public limited company (EAD) have the technical potential to achieve an annual lignite output of over 30 million t. In 2004 Mini Maritsa Iztok EAD produced 22.3 million t. Lignite mining and product transport at Mini Maritsa Iztok EAD is fully mechanised and high-performance equipment. Most of the lignite goes to the Maritsa Iztok 1, 2 and 3 power plants (total output: 2,240 MW), while a small proportion is sent to the Galabovo briquette factory, the only one of its kind in Bulgaria. Lignite mines in the Sofia coalfield: Bely Bryag Mine AD, Choukourovo Mine AD and Stanyantsi Mine AD. The total output of these mines in 2004 was about 1.4 million t. Most of the lignite has an average calorific value of between 6,700 and 7,100 kJ/kg and is supplied to the Bobov Dol power station, some 160 to 180 km from the extraction sites. A small amount of the lignite produced is stockpiled for household purposes. All three mines use identical technical and technological arrangements for coal mining operations. The mining and conveying equipment consists of power shovels, belt conveyor installations, road transportation and auxiliary machinery such as bulldozers, front loaders, etc. Beli Bryag Mine has proven reserves

Coal and Energy Data*	Unit	2004
Resources Brown coal, black coal, anthracite*	Mt	440
Resources Lignite	Mt	4,031
Reserves Brown coal, black coal	Mt	270
Reserves Lignite	Mt	2,045
Domestic Output		
Lignite	Mt	23.7
Hard Coal	Mt	3.2
Total	**Mt**	**26.9**
Selected Coal Quality Data		
Calorific Value Lignite/Brown coal	kJ/kg	6,700 – 15,000
Ash content Lignite/Brown coal	%	24.0 –48.0
Water content Lignite/Brown coal	%	23.0 – 56.0
Sulphur content Lignite/Brown coal	%	0.9 –7.0
Net Imports Hard coal	Mt	1.0
Prim. Energy Consumption		
Total	**Mtce**	**27.0**
Hard coal and lignite	Mtce	n.a.
Power Supply		
Generation, total	**TWh**	**41.6**
Hard coal	TWh	4.0
Lignite	TWh	14.9
Net power imports	TWh	0.8
Gross power consumption	**TWh**	**35.7**
Power Plant Capacity		
Total	**MW**	**11,395**
Hard coal	MW	1,475
Lignite	MW	3,370

* MEER estimates
Source: EURACOAL member, estimates

and resources of about 23 million t, giving the company a lifespan of about 45 years at current production levels of 0.5 million t a year. Cnoukourovo Mine has proven reserves and resources of some 8 million t, which gives the company an operating life of 14 years. Stanyantsi Mine has proven reserves and resources amounting to 12 million t, which safeguards the company for more than 20 years at the current annual output of 0.5 million t. Zdravets Mine EAD, which used to operate one deep mine (the Marbas deposits), has ceased lignite extraction since the end of 2002 and is currently implementing a project for technical liquidation. Kanina Mine is an opencast lignite operation working the Gotsedelchev coalfield, whose reserves amount to 1.5 million t. The mine is located in the south-west of the country and has been privatised since the middle of 2004.

Brown Coal

The country's brown coal deposits are mainly located in the south-west (at Bobov Dol, Pernik, Pirin and Katrishte) and near the Black Sea coast (the Cherno More coalfield). Bobov Dol Mines EAD operates the Bobov Dol coalfield, which is the largest deposit of brown coal in the country. These significant coal reserves and resources, amounting to some 160 million t, will ensure the life of the Bobov Dol coalfield for a period of 48 years, given its annual output of 1.2 million t. Mining is carried out at one opencast and two deep mines. The extracted product is mainly sent to the Bobov Dol thermal power plant, and some 12 %–15 % of the total lump coal output is stockpiled. Otkrit Vagledobiv Mines EAD was privatised in 2004. The company's two opencast mines extract brown coal from the Pernik coalfield. The company has proven reserves and resources estimated at some 15 million t, giving the company an operating life of more than 10 years on the basis of the annual output of 1.3 million t. Pirin Mine EAD was involved in working the Pirin and Oranovo-Simitly coalfields, which have some 30 million t of established brown coal reserves and resources. The company worked deposits at two deep mines, i.e. Pirin and Oranovo mines, and one opencast mine until the end of 2004. Prepared reserves guaranteed operation until 2005 at an output rate of 0.2 million t per annum. Thereafter production levels had to be reduced to 0.1 million t per annum until 2008. Oranovo Mine was privatised at the end of 2004, whereas Pirin Mine is scheduled for technical liquidation in the second half of 2005. Vitren Mine EAD carries out opencast mining in the Katrishte deposit, which has proven brown coal reserves and resources of some 0.7 million t. It is planned that the output from these mines will be maintained at a level of 0.15 million t per annum until 2007. Most of the coal is sent to the Bobov Dol power plant and the remainder is stockpiled, as well as used for other consumers. Cherno More Mine EAD is engaged in deep mining in the Black Sea coalfield, which has proven reserves and resources estimated at some 62 million t. This gives the company an operating life of more than 30 years on the basis of the current annual output of 0.3 million t.

Czech Republic

information

General Data	Unit	2004
Population	millions	10.2
GDP	bn €	75.7
Prim. energy consumption (PEC)	Mtce	66.1

Coal is the Czech Republic's only significant indigenous energy resource. The country's coal reserves have been estimated at 2 billion t. Brown coal, which accounts for more than two-thirds of these reserves, is mainly mined in north-western Bohemia, while hard coal is mined in northern Moravia. A percentage of this output is exported to Austria, Germany, Poland, Hungary and Slovakia.

The Czech Republic's primary energy consumption of 61.9 mtce (in 2003) can be broken down as follows: 48 % coal (29.9 mtce), 18 % natural gas (11.2 mtce) and 16 % oil (10.2 mtce). This mix of primary energy sources is supplemented by nuclear energy with a 16 % share (9.7 mtce), as well as by renewable energies and hydroelectric power, which together account for some 2 % (1.0 mtce). There have been no significant changes in coal, gas or oil consumption over the past two years. The consumption of nuclear energy has almost doubled with the commissioning of the Temelín nuclear power plant.

The Czech Republic's dependence on energy imports has been quite favourable so far (32 % of energy demand is met by imports); however, it is structurally imbalanced. The country's dependence on oil, gas and nuclear fuel is almost 100 %. In 2004 some 305,000 tonnes of oil and 244 million cbm of natural gas came from indigenous sources. However, the country's dependence on energy imports is expected to grow (to almost 50 % by 2020). A number of direct and indirect measures must be adopted to slow down the rate at which dependence on energy imports is increasing, primarily those geared towards promoting energy efficiency, support for renewable energy sources (in accordance with the Government's Energy Policy: 8 % by 2010 and 16.9 % by 2030), and improving the availability and extending the life span of the hidden potential of indigenous solid fuels, mainly brown coal.

About 68 % of the Czech Republic's total electricity output of 84.3 TWh in 2004 came from coal-fired power stations, while a further 25 % was generated by nuclear power plants and 7 % by gas-fired plants. The conventional coal-based power stations have a total capacity of approximately 10.3 GW in 2005.

January 2002 saw the start of electricity market deregulation. Since January 2005 the electricity market has been open to all consumers with the exception of households, and complete deregulation will be achieved by 2006. January 2005 also saw the start of the liberalisation of the gas market for consumers taking more than 15 million cbm of gas a year, and for combined heat and power generation. The gas market will open to all consumers with the exception of households at the beginning of 2006, and complete gas market deregulation will be achieved by the beginning of 2007.

In recent years the Czech Republic has privatised a number of former state-owned energy enterprises. In 2004 Sokolovská uhelná společnost, a.s., a brown coal company, and OKD, a.s., a hard coal company, were privatised. Of the major energy companies, Severočeské doly, a.s., a brown coal company and the most important Czech supplier of electricity, ČEZ, a.s., which meets more than 70 % of the national electricity needs, have not yet been privatised.

Hard Coal

About 50 % of Czech primary energy requirements are met by coal, with hard coal contributing 9 mtce to this demand. In 2004 saleable output was 13.3 million t of hard coal. The largest hard coal deposits are found in the Upper Silesian Basin. With its area of 6,500 sq km, the Upper Silesian Basin ranks among the largest hard coal basins in Europe. A major part of this basin is located in Poland, while about one-sixth, i.e. 1,200 sq km, lies in the Czech Republic, and is

called the Ostrava-Karviná Area (after the cities of Ostrava and Karviná). OKD, a.s. and Českomoravské doly, a.s. deep mine hard coal in this area.

OKD, a.s. is the largest hard coal producer in the Czech Republic. In 2004 its saleable output was 10.5 million t while its workforce was 16,182. Coal is currently extracted from eight working districts of the following collieries: Darkov, Lazy, ČSA and Paskov. The thickness of the Ostrava seams worked (Paskov and Lazy collieries) ranges from 0.8 to 1.3 metres. The thickness of the Karviná seams ranges from 1 to 6.5 metres. Longwall working combined with controlled caving is the mining method employed. Shearer-loaders (84.6 %) and ploughs (15.4 %) are used for longwall coal extraction. Mechanical supports (88.3 %) and individual hydraulic props (11.7 %) are used to support the coalfaces. The extracted coal is processed in the preparation plants of each of the collieries; based on its quality parameters it is graded as coking coal or steam coal.

At Českomoravské doly, a.s. the ČSM colliery in Stonava extracts coal. In 2004 its saleable output amounted to 2.4 million t and it had 3446 employees. Longwall working towards controlled caving is the mining method employed, using cutter loader and mechanical supports.

Brown coal and lignite

The Czech Republic has 812 mtce of economically recoverable brown coal and lignite reserves. As well as the three deposits in Northern Bohemia, Sokolov and Southern Moravia there are also fields in the south of the country, which, however are not economically workable. Brown coal and lignite make an important contribution to the national energy supply, with total production of these two fuels amounting to around 49 million t in 2004.

The main deposit and the biggest mining area, measuring 1400 sq km, is the Northern Bohemian Brown Coal Basin, which is located in the vicinity of the towns Kadaň, Chomutov, Most, Teplice and Ústi nad Labem. The seams in this area extend to depths of as much as 400 metres and are 15 to 30 metres in thickness.

Brown coal is mined in the central part of the Northern Bohemian Brown Coal Basin by Mostecká uhelná společnost, a.s. In 2004 Mostecká uhelná společnost, a.s. extracted 15.8 million t of brown coal from three opencast mines (ČSA, Jan Šverma and Vršany).

After extraction, the brown coal is processed at the Komořany preparation plant and Hrabák preparation site. The Komořany preparation plant supplies a broad range of coal products. Graded, pulverised and single purpose products are delivered to households, power stations, and the heat supply industry. Fuel blends for the energy sector are produced at the Hrabák preparation site and supplied to power stations at Počerady, Chvaletice and Mělník II. In 2004 Mostecká uhlená společnost, a.s. had a total workforce of 4,668.

Near the town of Most some 0.5 million t of brown coal is extracted from the state-owned Kohinoor underground mine, which had a workforce of 398 in 2004.

The Chomutov-based brown coal company Severočeské uhelné doly, a.s. (SD) operates in the north-western part of the Northern Bohemian Brown Coal Basin and to the east of the town of Most. SD mines brown coal at two sites, namely Doly Nástup Tušimice and Doly Bílina. A total of 22 million t was produced in 2004.

The Doly Nástup Tušimice brown coal mining area is located between the towns of Chomutov and Kadaň and consists of one large opencast mine site with an average annual production of 13 million t of brown coal. After preparation at the Tušimice crushing plant most of the product is supplied to power stations operated by the ČEZ Group.

The Bílina brown coal mining area, which contains one opencast mine, Bílina, is located between the towns of Bílina and Duchcov. The 9 million t of brown coal produced each year first goes to the Ledvice preparation plant before being delivered to power stations, industry and households. In 2004 SD had a total workforce of 3,724.

Located in western Bohemia, the brown coal basin around the town of Sokolov, which has workable reserves of 230 million t located in three main seams, is the third most important brown coal mining area in the Czech Republic. Here the brown coal company Sokolovská uhelná, a.s. (SU) operates Družba and Jiří opencast mines. The output in 2004 was 10.1 million t.

Brown coal from the Sokolov area is used mainly for power and heat generation. SU generates electricity in two of its own power installations: the Vřesová IGCC plant (2 x 200 MW_e) and a CHP plant (5 x 270 MW_t), which have a total capacity of 3.5 TWh/a. Most of the heat produced is used for the company's own consumption, though some is supplied to towns such as Karlovy Vary, Nejdek, Chodov and Nová Role. SU operations employed a total workforce of 5041 in 2004.

A smaller deposit of some 45 million t of workable lignite reserves is located in southern Moravia near the town of Hodonín. In 2004 approximately 0.5 million t of lignite was produced by Lignit Hodonín s.r.o. by underground mining, with 97 % of the production delivered to the Hodonín power station. The remainder went to households.

In the last ten years brown coal and lignite output in the Czech Republic has decreased by 20 % to around 49 million t. This can be attributed mainly to the commissioning of the two units at the Temelín nuclear power plant, and the discontinuation of brown coal deliveries to German power stations. However, the downturn in brown coal production has not been as serious as originally expected. This was largely due to electricity exports (net exports amounted to 15.7 TWh in 2004).

The Czech brown coal industry has always played an important role in the national economy. Coal is set to remain the main energy source in the Czech Republic. The Government's Energy Policy, as updated to cover the period until 2030, recommends that long-term availability of coal reserves be ensured, including examining the options for extraction outside the perimeters of the brown coal mining areas stipulated by the Czech government in 1991.

information

Coal and Energy Data	Unit	2004
Resources Hard Coal	Mtce	4,123
Resources Lignite	Mtce	3,873
Reserves Hard Coal	Mtce	295
Reserves Lignite	Mtce	812
Domestic Output		
Hard Coal	Mt	13.3
Lignite	Mt	48.8
Total	**Mt**	**62.1**
Selected Coal Quality Data		
Calorific Value Hard Coal	kJ/kg	21,520 – 29,000
Calorific Value Lignite	kJ/kg	11,200 – 19,900
Ash content Hard Coal	%	6.9 – 29.6
Ash content Lignite	%	19.5 – 12.0
Water content Hard Coal	%	7.9 – 10.2
Water content Lignite	%	26.8 – 39.5
Sulphur content Hard Coal	%	0.4 – 0.6
Sulphur content Lignite	%	0.6 –1.8
Net Imports		
Hard coal	Mtce	1.0
Lignite	Mt	–
Total	**Mtce**	**1.0**
Prim. Energy Consumption		
Total	**Mtce**	**66.1**
Hard coal	Mtce	8.6
Lignite	Mtce	21.4
Power Supply		
Generation, total	**TWh**	**84.3**
Hard Coal and Lignite	TWh	57.0
Net power imports	TWh	-15.7
Gross power consumption	**TWh**	**68.6**
Power Plant Capacity		
Total	**MW**	**17,367**
coal-fired	MW	10,300

Source: EURACOAL member, estimates

France

information

General Data	Unit	2004
Population	millions	62.2
GDP	bn €	1,557.2
Prim. energy consumption (PEC)	Mtce	396.0

France is the fifth-largest industrialised economy, but has very limited fossil fuel resources.

The country has no significant reserves of hard coal and lignite and neither produces nor consumes significant amounts of coal. Since 1973, coal production decreased by 100 % and consumption by 57 %. Coal fired electricity has been mostly replaced by nuclear power.

With its approx. 5 % share in France's primary energy consumption (2004: 396 mtce) coal trails behind nuclear energy (40 %), oil (34 %) and natural gas (15 %).

Major coal imports (total: 18.7 million t 2004) come from Australia (5.6 million t), the United States (2 million t), South Africa (3.4 million t), and Poland (1.1 million t). In France coal is mainly used for power generation (about 8 million t/year), for the steel industry (7 million t/year), for industrial purposes (2 million t), and for domestic use and heating networks (1 million t/year).

France is the second-largest electricity market, consumer and generator in Europe after Germany. In 2004 the country's gross power generation amounted to 550 TWh. In 2004 France generated roughly 78 % of its electricity from nuclear power stations. Hydro-electric power contributed 12 % and thermal energy 10 %, with approximately 4 % for coal and 6 % for gas; the contribution of renewables to power generation is less than 1 %.

French energy policy has been relatively consistent in recent decades, with the main objectives including securing energy supply, achieving international competitiveness and protecting the environment. The focus on energy security has made France one of the world's top producers and consumers of nuclear power. However, the French government has recently organised a national energy policy debate, which will focus on energy sources for the next thirty years, particularly the role of nuclear power and the future of renewables.

In 1996 an EU Directive on the electricity market required at least 26 % of all electricity sales in EU Member States to be opened to competition from February 1999 on. This requirement was increased to 28 % in February 2000 and to 33 % in 2003. In 2000, a full year after the first EU deadline, France decided to begin the process of deregulating its electricity sector. Since then about 1,800 large industrial and commercial consumers (those using more than 16 GWh per year), comprising about 30 % of the market, have been free to choose their electricity supplier. Since 1st July 2004, 70 % of the French market has been open to competition. All facilities with non-residential electricity consumption are able to choose their supplier.

With the closure of France's last hard coal mine in April 2004, the state-owned coal company Charbonnages de France is expected to disappear at the end of 2007. This will spell the end of a coal mining history that has lasted three centuries, an industry that in its heyday provided work for over 330,000 miners. Since the 1970s CdF has implemented a series of social and economic rehabilitation programmes for those areas affected by the rundown of the industry. In 1994 the final phase-out was negotiated between the state-owned monopolist, the trade unions and the government, with the result that production ceases by 2005 at the latest.

Lignite has been of minor importance for the French energy supply sector. Only 0.15 million t of lignite were mined at Gardanne in 2002 before its closure in 2003.

Coal and Energy Data	**Unit**	**2004**
Resources Hard Coal	Mtce	99.0
Resources Lignite	Mtce	2.0
Reserves Hard Coal	Mt	0
Reserves Lignite	Mt	0
Domestic Output		
Hard Coal	Mt	0.2
Lignite	Mt	0
Total	**Mt**	**0.2**
Net Imports Hard coal	Mt	18.7
Prim. Energy Consumption		
Total	**Mtce**	**396.0**
Hard Coal	Mtce	18.8
Lignite	–	–
Power Supply		
Generation, total net	**TWh**	**547.6**
Hard Coal and Lignite	TWh	22.0
Balance power exports	TWh	62.0
Gross power consumption	**TWh**	**480.0**
Power Plant Capacity		
Total	**MW**	**106,000**
Coal and coal products (single fuel fired)	MW	2,370

Source: EURACOAL member, estimates

Germany

information

General Data	Unit	2004
Population	millions	82.5
GDP	bn €	2,128.2
Prim. energy consumption (PEC) (2001)	Mtce	492,6

Germany has considerable reserves of hard coal (21.6 Gtce) and lignite (12.8 Gtce) making these the country's most important indigenous fuels.

In 2004, Germany's primary energy production totalled some 129.7 mtce. With an output of 83.3 mtce, coal had a market share in Germany of 64.3 %. The contributions made by all fuels to primary energy production can be broken down as follows: 56.6 mtce for lignite (43.7 %), 26.7 mtce for hard coal (20.6 %), 22.3 mtce for natural gas (17.2 %), 5.1 mtce for oil (3.9 %), 5.6 mtce for hydro and wind energy (4.3 %) and 13.4 mtce for other fuels (10.3 %).

Germany's primary energy consumption amounted to 492.6 mtce in 2004. Oil accounted for the largest share of this (36.4 %) in percentage terms, followed by coal (24.9 %), natural gas (22.4 %) and nuclear energy (12.6 %). Hydro and wind energy, together with other fuels, made up just 3.7 %. Hard coal (13.5 %) and lignite (11.4 %) rank third and fifth respectively in the league table for energy consumption. Germany is to a large extent dependent on primary energy imports. About 60 % of the hard coal was imported, but virtually no lignite was, in comparison with 97 % of oil and 81 % of gas.

German power generation is characterised by a widely diversified energy mix. In 2004 gross power generation was structured as follows: coal 48.9 % (lignite 26.1 % and hard coal 22.7 %), nuclear energy 27.5 %, natural gas 10.2 %, hydro 4.5 %, wind energy 4.1 % and other energy sources 3.2 %. Oil contributed 1.6 % to power generation. This means that hard coal and lignite – alongside nuclear energy – are the mainstays of the German power supply industry.

Hard Coal

In 2004 the German hard coal market amounted to 66.5 mtce. 49.3 mtce of this was used for power and heat generation, while a further 17.2 mtce went to the steel industry.

In 2004 Germany was the major importer of hard coal in the EU and of coke worldwide. Around 40 million t of hard coal and coke were imported by Germany in 2004. The biggest supplier country of hard coal in this year was the Republic of South Africa (RSA) with a contribution of 25 % followed closely by Poland with almost 22 % and about 16 % import from Russia. Most of Germany's coke imports originated from Poland, with an increasing trend towards imports from the People's Republic of China.

In the Ruhr, Saar and Ibbenbüren regions, the coal is extracted by Deutsche Steinkohle AG (DSK) under the umbrella of RAG AG, Essen. In 2004, DSK produced 25.7 million t of saleable hard coal (equivalent to 26.6 mtce).

The only coal industry coking plant still in operation produced about 2.1 million t of coke in 2004. Steel industry coking plants produced some 6.4 million t of coke in the same year. Briquette output totalled 0.1 million t.

The restructuring of the German hard coal industry has continued as planned. Germany now has nine deep mines in production, namely the collieries West, Lohberg/Osterfeld, Walsum, Prosper-Haniel, Lippe, Auguste Victoria/Blumenthal, Ost, which are all located in the Ruhr area, the mine Saar in the Saar coalfield and one further mine at Ibbenbüren. Production from these three coalfields breaks down as follows: 69 % from the Ruhr area, 23 % from the Saar and 8 % from the Ibbenbüren coalfield.

Employment figures also fell steadily through 2004. The number of employees in the hard coal mining sector decreased by 7.8 % from 45,581 on 31 December 2003 to 42,005 on 31 December 2004. Underground operations employ 22,333 mineworkers, or 53.2 % of the workforce (as at 31 December 2004). Productivity levels measured in terms of saleable output per manshift underground fell by 0.7 % from 6,540 kg in 2003 to 6,497 kg in 2004.

The coal policy situation in Germany is still marked by the Coal Agreement of 13 March 1997 that will be in force until end-2005. The decisions taken in the year 2003 on a follow-up regime for the period 2006 – 2012 that involves a reduction in hard coal output from 26 million t in 2005 to 16 million t in 2012 will be implemented as agreed.

Based on the existing funding arrangements, Deutsche Steinkohle AG has drawn up a blueprint for the German hard coal mining industry to the year 2012. The plan confirms and defines the details of the colliery closures already proposed in September 2003 by the coal industry supervising bodies; the mines earmarked for closure are Warndt/Luisenthal (1 January 2006) and Lohberg/Osterfeld (31 March 2006). This will entail the loss of some 4 million t of coal mining capacity. To reduce coal output further it has also been decided that the Walsum mine will close on 1 January 2009 and the Lippe colliery on 1 January 2010. Further capacity downsizing is also scheduled for 2012 in line with the plan for a core production base, but no details have yet been announced.

Lignite

Lignite availability in 2004 totalled 56.6 mtce, with domestic output accounting for 56.5 mtce and imports for approx. 0.1 mtce. Lignite exports amounted to 0.4 mtce of pulverised lignite and briquettes.

Lignite production, which totalled 181.9 million t (equivalent to 56.6 mtce) in 2004, was centred in four mining regions, namely the Rhineland around Cologne, Aachen and Mönchengladbach, the Lusatian mining area in south-east Brandenburg and north-east Saxony, the Central German mining area in the south-east of Saxony-Anhalt and in north-west Saxony as well as the Helmstedt mining area in Lower Saxony. In these four mining areas, lignite is exclusively worked at opencast mines. In addition, some lignite is mined in the north-east of Bavaria. Lignite is an indispensable energy source for Germany because it is available in abundant quantities long-term, and is competitive by international standards. Furthermore, the lignite industry is an important employer and investor in the mining area, giving it great economic significance.

Lignite is mainly used for power generation, followed by utilisation in processing plants. In 2004, some 11.2 million t were used for product processing at lignite industry-owned facilities. 1.7 million t went to power generation in coal industry power plants. The remaining power plants were supplied with 169.1 million t of lignite. This is equivalent to 26.1 % of the total power generation in Germany and to 93 % of total lignite production in 2004.

In the **Rhineland**, RWE Power AG produced a total of 100.3 million t of lignite in 2004. There are three opencast mines: Hambach, Garzweiler and Inden. Provision has been made for the transfer from Garzweiler I to the adjuacent opencast mine Garzweiler II in 2006. Almost

89 % of the coal was consumed by the company's own national grid power generating stations, while some 8.9 million t was used for processed products and for private consumption. Only 0.3 million t went to other customers. The generating capacity of RWE Power AG consists of four lignite-fired power plants with a total capacity of 11.5 GW (as at 31 December 2004). At the Niederaussem location a new lignite-fired power plant with optimised plant technology (BoA) went on stream in 2002, boasting a gross capacity of 1 GW. In these plants the lignite-fired power output amounted to around 80.3 TWh.

At the end of 2004, RWE Power AG had a total workforce of 11,158 in the lignite division, including 6,633 employees in mining and 2,965 employees working in the lignite-fired power plants that have been part of the company since October 2003.

In 2004 the **Lusatian mines** produced some 59 million t of lignite. The only coal producer in this area is Vattenfall Europe Mining AG (VE-M). The lignite is extracted in Jänschwalde, Cottbus Nord and Welzow Süd in Brandenburg as well as in the Nochten mine in Saxony. The Reichwalde opencast mine is idle.

Sales of lignite to public power plants amounted to 56.3 million t, thus exceeding the previous year's level by 2.7 %. These positive developments are primarily due to the stepped-up requirements of the power plants of Vattenfall Europe Generation AG & Co.KG (VE-G). The other customers – mainly regional utilities for processing and private consumers – were supplied with 2.6 million t of lignite. At end-2004, VE-M had a total workforce of 5,345. In the Lusatian area, VE-G is the main operator of lignite-fired power plants with a gross rated capacity of a total 6,825 MW in three federal states. In 2004 the gross power output from the Lusatian lignite-fired power plants of VE-G totalled 53 TWh.

The **Central German mining area** around Leipzig yielded a total lignite output of 20.3 million t in 2004. The most important company in this area is Mitteldeutsche Braunkohlengesellschaft mbH (MIBRAG), Theissen. This company has two opencast mines at Profen (Saxony Anhalt) and Schleenhain (Saxony).

In 2004, MIBRAG produced about 19.7 million t of lignite, which is equivalent to an increase of 8 % in comparison to the year 2003. The company also has three power plants at Deuben, Mumsdorf and Wählitz. At end-2004, MIBRAG had a total workforce of 1,977.

Another opencast mine operated by Romonta GmbH located in the Central German mining area is situated in Amsdorf (Saxony-Anhalt). In 2004, 0.5 million t were mined here and used for extraction of raw mineral wax; the wax-free fuel is employed for power generation at Amsdorf. At the end of 2004 Romonta GmbH had a total workforce of 342.

In the **Helmstedt mining area**, BKB Aktiengesellschaft, Helmstedt, produced 2.4 million t of lignite. In the Helmstedt mining area there are no other customers for lignite apart from the power and heat generating industry. Extraction from the Schöningen opencast mine and operation of the Buschhaus (387 MW) power plant will continue until 2015. The lignite-fired plants generated a total power output of 2.8 TWh in 2004. On 31 December 2004, BKB had a total workforce of 755, including 462 employees working in the mining division.

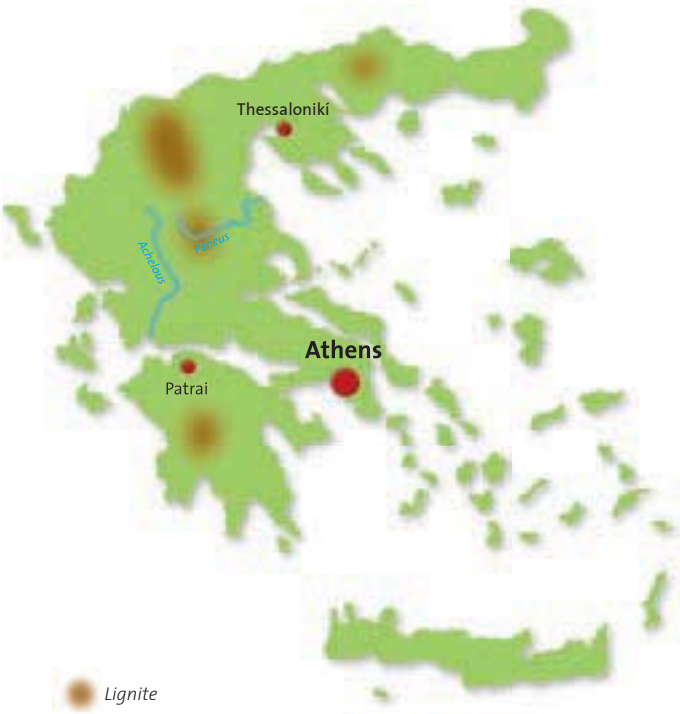
Extraction of lignite from opencast mines changes the landscape. Therefore, extraction and restoration belong together. Only when the "industrial" opencast mine has been transformed into a vivid landscape again can mining activities be regarded as complete. There is a long tradition of restoration implemented in an ecologically ambitious way. For more than 100 years, nature has inspired landscaping projects following opencast mining operations. Wide-ranging potential for different uses and a high recreational value are important factors. This also includes vivid flora and fauna. Restoration involves a learning process in which there is always room for further improvement.

information

Coal and Energy Data	Unit	2004
Resources Hard Coal	Mt	186,000
Resources Lignite	Mt	77,600
Reserves Hard Coal	Mt	23,000
Reserves Lignite	Mt	41,300
Domestic Output		
Hard Coal	Mt	29.2
Lignite	Mt	181.9
Total	**Mt**	**211.1**
Selected Coal Quality Data		
Calorific Value Hard Coal	kJ/kg	27,400 – 33,000
Calorific Value Lignite	kJ/kg	7,800 – 11,300
Ash content Hard Coal	%	6 – 7
Ash content Lignite	%	1.5 – 22.0
Water content Hard Coal	%	8 – 9
Water content Lignite	%	40 – 60
Sulphur content Hard Coal	%	0.8 – 1.0
Sulphur content Lignite	%	0.15 – 2.8
Net Imports		
Hard coal	Mtce	38.5
Lignite	Mtce	-0.4
Total	**Mtce**	**38.1**
Prim. Energy Consumption		
Total	**Mtce**	**492.6**
Hard coal	Mtce	66.2
Lignite	Mtce	56.2
Power Supply		
Generation, total	**TWh**	**606.5**
Hard coal	TWh	138.0
Lignite	TWh	158.5
Net power imports	TWh	-6.5
Gross power consumption	**TWh**	**600,0**
Power Plant Capacity		
Total	**GW**	**112.8**
Hard coal	GW	30.5
Lignite	GW	22.1

Source: EURACOAL member, estimates

Greece



information

General Data	Unit	2004
Population	millions	11.1
GDP	bn €	153.0
Prim. energy consumption (PEC)	Mtce	43.9

Greece has enjoyed fairly strong growth over the last few years. The country has only limited indigenous energy reserves. Besides modest oil and gas reserves, lignite is Greece's only significant fossil fuel source, representing approximately 80 % of primary energy production.

Accounting for about 29 % of primary energy consumption (43.9 mtce in 2003), lignite is at present the country's most important indigenous fuel. Oil is still the most important fuel source overall, accounting for 57 % of the country's primary energy consumption. Consumption of imported natural gas (mostly from Russia) has increased significantly over the last few years and now has a 6.6 % share in the market. Hard coal imports of 0.8 mtce still account for 1.5 % of primary energy consumption. Security of supply, low extraction costs and stable prices are important factors in maintaining the position of lignite in the energy market.

Greece has geological lignite reserves of 6.7 billion t, of which 3.2 billion t are economically workable. The most important deposits are located in the north of the country, at Ptolemais-Amynteon and Florina (1.9 billion t), at Drama (900 million t) and at Elassona (150 million t), and in the south at Megalopolis (250 million t). As well as lignite there is a large peat deposit of about 4 billion cbm at Philippi in the northern part of Greece (Eastern Macedonia). In recognition of lignite's importance for national energy development, most of the major opencast mines – which account for more than 99 % of annual lignite production – belong to the state-owned Public Power Corporation (PPC).

Only 30 % of the total reserves have been extracted to date. Allowing for future developments in energy consumption patterns, existing reserves will be sufficient for more than 45 years.

Lignite deposits in Greece have an average total depth of 150 to 200 metres and typically comprise layers of lignite alternating with layers of soil.

Lignite is mostly mined by PPC and is exclusively opencasted. The operating equipment comprises bucket-wheel excavators, spreaders, tripper cars and conveyor installations. PPC currently has a plant pool of 48 bucket-wheel excavators and 22 spreaders, together with some 300 km of belt conveyor lines. Heavy trucks are used to remove the hard overburden formations encountered at some mines.

The quality of Greek lignite can be characterised as follows: The lowest calorific values are in the areas of Megalopolis and Drama (3,770 to 5,020 kJ/kg) and Ptolemais-Amynteon (5,230 to 6,280 kJ/kg). At Florina and Elassona the calorific value is between 7,540 and 9,630 kJ/kg. The ash content ranges from 15.1 % (Ptolemais) to 19 % (Elassona) and the water content from 41 % (Elassona) to 57.9 % (Megalopolis). The sulphur content is mostly low.

Opencast lignite mines in Western Macedonia include operations at Main Field, South Field, Kardia Field, Amynteon Field and Florina, while there is also an opencast site in the Peloponnese region of southern Greece (the Megalopolis Field).

Lignite production for 2004 stood at 71.9 million t, which was 3.9 % up on the previous year's figure. Lignite is mostly mined by PPC, with 55.5 million t being extracted at the West Macedonia Lignite Centre (WMLC) and 14.4 million t at the Megalopolis Lignite Centre (MLC). The few privately operated mines in the Florina area produced a total of some 2.0 million t of lignite.

In 2004 the West Macedonia Lignite Centre operations removed a total of 288 million cbm of overburden (plus interburden), corresponding to an overburden/interburden to lignite ratio of 4.2 : 1 (cbm : t). At Megalopolis Lignite Centre, overburden plus interburden removal was 46 million cbm, corresponding to an overburden/interburden to lignite ratio of 2.4 : 1 (cbm : t).

Some of the lignite extracted at the Ptolemais-Amyndeon Lignite Centre exhibits a wide disparity in calorific value and ash content. This result in deviations from the specified fuel properties required for optimum power station operation. For this reason high- and low-quality grades are blended and homogenised.

The lignite output is supplied to eight PPC-owned power stations, comprising 22 generating units and a total installed capacity of 5.2 GW. Some is also delivered to a nearby briquette factory. The total installed generating capacity of PPC's power plants is 12.8 GW (including interconnected and autonomous).

In 2004 lignite-based power generators produced 32.5 TWh, giving this fuel a 59.2 % share of the total generating market. Total power generation in Greece was in the order of 54.9 TWh. In 2004 (in the interconnected system, excluding the autonomous islands) lignite contributed 66.5 %, natural gas 16.5 %, oil 5.5 % and hydro 10.1 % to national power generation capacity.

Environmental protection is one of the major parameters defining PPC's overall strategy and its daily operational mining activities. In the lignite mining areas around Ptolemais-Amynteon and Megalopolis, PPC has carried out site restoration projects, creating farmland, plantations of trees and woodland, sanctuaries for small animals and crop-testing areas.

Over the years the policy pursued by PPC has meant a significant increase in lignite production and in mining activities in general. Lignite production in 2004 was ten times higher than in the year 1970. This upturn in business is unusual for a complex technical operation such as mining.

In recent years the total manpower in the mines has remained fairly steady, despite the increase in lignite production. The two mining areas, West Macedonia Lignite Centre and Megalopolis Lignite Centre, and the head office in Athens, currently employ a total permanent workforce of 5,950.

The demand for electricity in Greece in recent years has exhibited a far greater growth rate than the average increase in Europe. This increase is likely to continue, as the per capita consumption of electricity in Greece is considerably lower than the European mean average and domestic charges by PPC S.A. are the lowest in Europe.

Lignite has been Greece's main energy source for the last three decades and this situation is expected to continue for the next 50 years. One of PPC's corporate strategies is that lignite has to retain its dominant position in the energy supply sector. In order to predict lignite's future role with any accuracy it is essential to take into account the crucial effect of the changes taking place in the European energy sector as well as the impact of introducing natural gas to the Greek energy market. Low-cost domestic lignite is still competitive compared to imported energy sources. However, especially compared with natural gas, the pressure to stay competitive is growing.

information

Coal and Energy Data	**Unit**	**2004**
Resources Lignite	Mt	6,700
Reserves Lignite	Mt	3,200
Domestic Output		
Lignite	Mt	71.9
Total	**Mt**	**71.9**
Selected Coal Quality Data		
Calorific Value Lignite	kJ/kg	3,770 – 9,630
Ash content Lignite	%	15.1 – 19.0
Water content Lignite	%	41.0 –57.9
Sulphur content Lignite	%	0.5 – 1.0
Net Imports Hard coal	Mt	0.8
Prim. Energy Consumption		
Total	**Mtce**	**43.9**
Hard Coal	Mtce	0.7
Lignite	Mtce	12.7
Power Supply		
Generation, total	**TWh**	**54.9**
Lignite	TWh	32.5
Net power imports	TWh	2.8
Gross power consumption	**TWh**	**57.0**
Power Plant Capacity		
Total	**MW**	**12,800**
Lignite	MW	5,200

Source: EURACOAL member, estimates

Hungary

information

General Data	Unit	2004
Population	millions	10,095
GDP	bn €	73.2
Prim. energy consumption (PEC)	Mtce	35.0

Hungary has comparatively poor energy resources. The country's most important indigenous energy reserves comprise approx. 69.5 million t of natural gas, 23.9 million t of oil and 3.4 billion t of coal. Lignite accounts for 85 % of the country's solid fuel reserves, making this the most important indigenous fuel. Gas and oil reserves are both sufficient for approx. 20 years, while coal reserves have an estimated lifespan of over 100 years.

Hungary's primary energy consumption in 2004 was approximately 35 mtce. Of this, natural gas has the biggest share with 40 %, followed by oil with 32 %, coal with 16 % and nuclear energy with 12 %. This makes Hungary one of the biggest natural gas consumers in Europe. Domestic production still only meets 20% of the country's gas consumption needs, which have risen to about 14 billion cbm. This means that Hungary's import dependence is increasing steadily.

In 2004 primary energy production totalled some 8 mtce, gas and coal had the biggest share of about 42 % each, followed by oil with 8 % and others with approximately 8 %.

National electricity generation in 2004 amounted to some 33 TWh, with a total capacity of 8.6 GW. Some 6.9 TWh are imported. Nuclear energy accounts for 36 % of national power output. Hungary's sole state-owned nuclear power plant at Paks generates the country's cheapest power. Currently there are considerations to extend the operating permits for the Paks plant – which expires in the period 2012-2017 – by a further 20 years, with a view to safeguarding the country's baseload electricity demand. Gas and oil make another major contribution (38 %) to the national grid. Mátrai Erömü Rt is the biggest lignite-based power generator, with a market share of 25 %. Renewables and hydro do not play an important role in Hungary's energy mix (1 %).

Compared with the EU's other new applicant countries, Hungary has made much headway in the areas of deregulation and privatisation. The opening-up of the electricity market, which began in 2003, has been judged as generally successful by the Hungarian Ministry of Energy. Any further deregulation of the market has, for the time being, been delayed by the current lack of spare electricity capacity. Most generating capacities are earmarked for the public supply sector and import capacities are restricted. Various projects for developing the supply network are therefore under the way in order to increase the opportunities for electricity imports.

The Hungarian electricity sector needs a power station development programme. According to forecasts made by MAVIR (the Hungarian system operator), the Hungarian electricity market is growing at a continuous pace. Between now and 2020 approximately 6 GW of new generating capacity will have to be built to replace 4.5 GW of redundant plant. During the next few years obsolete capacity will have to be taken out of the supply network for environmental and economic reasons.

Lignite

Hungary's lignite and brown coal resources are concentrated in the regions of Transdanubia and in northern and north-eastern Hungary. In 2004 lignite output decreased by 12 % to 11.8 million t. Of the total, 98 % of lignite was used for heat and power generation. The remaining coal went to municipalities, households and other consumers.

The environmental moratorium on coal-fired power stations was lifted on 1st January 2005. This affects coal-fired power generating installations not fitted with flue-gas desulphurisation systems. As a result, coal-based electricity generation is expected to fall by some 700 MW in 2005. This means that the only production sites still in operation after 2005 will be the Visonta and Bükkábrány opencast mines, which supply the Mátra power station group, and another deep mine supplying the Vértes power station group.

The 1,000 km² lignite field of Mátrai Erömü Rt. (MÁTRA), which has mineral reserves of 1.3 billion t, is located 90 km to the east of Budapest. Extraction here is concentrated at the two opencast mines of Bükkábrány and Visonta. In 2004 MÁTRA produced about 8.5 million t of lignite by removing some 56 million cbm of overburden. The MÁTRA power plant is located at Visonta and has a total capacity of 836 MW (2 x 100 MW, 3 x 212 MW). The lignite mined at Bükkábrány, some 60 km away from Visonta, is transported to the power station by rail.

MÁTRA has concluded a long-term supply contract with the state-owned Hungarian power utility MVM, which also has a 25 % interest in MÁTRA. This supply contract stipulates prices and quantities up to the year 2022. Despite this contractual security, MÁTRA has taken various steps to anticipate the deregulation of the power market. This also involves the completion of flue-gas desulphurisation projects and the implementation of retrofitting measures for power stations and mines, which will extend the life of the plant until 2022.

information

Coal and Energy Data	Unit	2004
Resources Hard Coal	Mt	157
Resources Lignite and Brown Coal	Mt	9,000
Reserves Hard Coal	Mt	198
Reserves Lignite and Brown Coal	Mt	3,400
Domestic Output		
Hard Coal	Mt	0.3
Lignite and Brown Coal	Mt	11.8
Total	**Mt**	**12.1**
Selected Coal Quality Data*		
Calorific Value Lignite	kJ/kg	7,000 – 8,000
Ash content Lignite	%	17.0
Water content Lignite	%	48.0
Sulphur content Lignite	%	1.5
Net Imports Hard coal	Mt	0.6
Prim. Energy Consumption		
Total	**Mtce**	**35.0**
Hard Coal	Mtce	1.9
Lignite and Brown Coal	Mtce	3.6
Power Supply		
Generation, total	**TWh**	**33.2**
Hard Coal	TWh	0.2
Lignite and Brown Coal	TWh	8.2
Net power imports	TWh	6.9
Gross power consumption	**TWh**	**40.1**
Power Plant Capacity		
Total	**MW**	**8,600**
Hard Coal	MW	190
Lignite and Brown Coal	MW	1,410

* Lignite from MÁTRA
Source: EURACOAL member, estimates

Poland

information

General Data	Unit	2004
Population	millions	38.2
GDP	bn €	185.2
Prim. energy consumption (PEC)	Mtce	118.0

Poland has coal reserves totalling 10.3 billion tce, the main hard coal resources being located in Upper Silesia and in the Lublin Basin. Lignite reserves in the presently mined areas account for 573 mtce. The country does not have significant reserves of oil and only some of gas. Hard coal and lignite meet some 68 % of Polish primary energy needs (118 mtce). Imported oil accounts for 22 % and natural gas for 15.5 %. Hard coal exports from Poland total some 20.8 million t per year, one third of which is transported by rail to neighbouring countries while about two thirds is transhipped via the Baltic Sea ports of Gdańsk, Świnoujscie, Szczecin and Gdynia.

Coal and lignite are strategic fuels for Polish power generation, which has been expanded on the basis of solid fuels from indigenous sources. Coal and lignite's contribution to the power generating industry is now a predominant one and this will be maintained in the long term. In 2004, 94.2 % of the power output (156.1 TWh) was based on hard coal (94.5 TWh) and lignite (52.5 TWh). More than 50 % of the power stations are older than 25 years, while about 25 % have been in operation for over 30 years. The lignite-fired power plants are among the newest and are subject to refurbishment to meet European environmental standards. Poland has no nuclear power stations and none are planned before 2020.

Several European energy groups, including Vattenfall-Europe, RWE, EdF and Tractebel, are currently active in the Polish energy market. This has a certain influence on energy production and distribution and also impacts on the privatisation issue. The energy policy pursued by the Polish Government is centred on security of energy supply with improved cost structures, minimum environmental impact and increased energy efficiency.

Hard Coal

Poland is not only one of Europe's traditional hard coal producers, but was once one of the world's leading suppliers. In 1972 the country became Europe's biggest coal producer, with 150.7 million t, and until 1979 was the second largest coal exporter after the US, selling 41.4 million t that year. Although its role as an exporting country was already declining in the 1980s, the output was maintained at a significant level (1988: 193 million t) compared with other European countries. It was not until the political turnaround in the Eastern Bloc countries, and the ensuing transition to a market economy system, that Poland also began to experience – in the early 1990s – the process of contraction in hard coal mining that had begun in Western Europe two decades earlier. By 2002 production had fallen to 102.1 million t. The decline in Polish coal's competitiveness compared with other fuels obtainable on the world market was having its effect, accompanied by a rapid fall in demand owing to economic restructuring. Nevertheless, coal continues to play a major role, contributing 52 % to the country's primary energy needs.

The commercially workable hard coal reserves are located between the Upper Silesian and the Lublin basins in the east of Poland (Bogdanka mine), with the Upper Silesian coalfield accounting for 93 % of the total. The coal measures in this region contain some 400 coal seams with a thickness of 0.8 to 3.0 m, about half of which are of economically workable. About two-thirds of the seams have gradients of less than 10°, while the rest have a maximum dip of 35°. Some 56 % of the workable coal reserves consist of steam coal, while the remaining 44 % are of coking coal. Most of the country's natural resources, including coal, are in public hands and coal mining is still a state-run activity.

All hard coal is deep-mined at an average working depth of some 600 m. Winning is fully mechanised, with over 90 % of the coal being produced by longwalling (from a total of 163 longwall faces). In 2001 the industry produced 103 million t, comprising 18 million t of coking coal and 85 million t of steam coal. The ROM coal from underground operations contains discard and requires preparation. In the past only coking coal was cleaned to "Western" quality standards. The extension of existing preparation plants, and the commissioning of new facilities in recent years, means that the quality of Polish steam coal now comes up to world market requirements.

In 2002 the Polish coal industry employed a workforce of some 140,700. With an output of 102.1 million t this gave a productivity level of just under 725 t/manyear. This constitutes an enormous increase in productivity compared with 1990, when output was 147.7 million t and the workforce numbered 399,300 (= 381 t/manyear), though productivity still falls short of international standards. It also impacts on production costs and costing structures. In 2001 high labour costs, which were deposit-related, accounted for 45–50 % of the total average mining costs.

The coal mining industry and exporters have an efficient infrastructure at their disposal based on cross-border rail links to neighbouring countries and to those Baltic Sea ports that are suitable for exporting coal, with their total annual handling capacity of about 30 million. This comprises Gdansk, Swinoujscie, Szczecin and Gdynia, though of these only Gdansk is able to load Capesize vessels. In 2002, exports totalled 23 million t, comprising 20 million t of steam coal and 3 million t of coking coal. Of this total, 7.3 million t was transported by road to neighbouring countries, with only 15.7 million t being exported by sea (including 750,000 t delivered by barge).

Poland imported 1.9 million t of coal in 2001 and 2.3 million t in 2004, originating mainly from Russia, the Czech Republic and Kazakhstan.

Lignite

The lignite deposits are exclusively mined by opencast methods. Two of these operations are located in central Poland and a third one in the south-western region of the country. In 2004, total lignite production reached 61.1 million t (17.6 mtce), 99 % of which was used by mine-mouth power plants. Lignite-fired power stations generated 52.5 TWh of electricity, which represents 33.6 % of total power generation in Poland.

The Bełchatów Basin, which incorporates two lignite fields, is situated in the central part of Poland. Work at the Bełchatów opencast mine started in 1977. Here there are some 1.1 billion t (296 mtce) of proven lignite reserves. In 2004 the Bełchatów mine produced 35.2 million t (9.4 mtce) of lignite, representing 57.6 % of Poland's total lignite production. This required the removal of some 145 million cbm of overburden, which represents an overburden-to-lignite ratio of 4.1 cbm/t. The mine is 240 m deep and the average calorific value of the fuel is 7,960 kJ/kg. The Bełchatów Mine is due to remain in operation until 2035. The lignite output is entirely supplied to the mine-mouth power plant, which has a capacity of 4,400 MW and provides about 20 % of domestic power requirements. The power station was built in the years 1981-1988 and at present generates the cheapest electricity in Poland - and probably anywhere in Europe. In 2002 development began at the new Szczerców opencast mine, where workable reserves are estimated at 650 million t (176 mtce). Production is scheduled to start in 2007-2008. A new power plant with a capacity of 830 MW is also being planned.

The Konin-Adamów Basin is located in central Poland between Warsaw and Poznań and has been producing lignite for over 50 years. There are two active combined mines: Konin and Adamów. The Konin Mine, which has a production capacity of 15 million t per year (4.1 mtce), operates four opencast sites at Pątnów, Jóźwin, Kazimierz and Lubstów, whose total lignite production reached 10.7 million t (2.9 mtce) in 2004. The working depth at these pits varies between 40 and 120 m. The extracted fuel has an average calorific value of 9,350 kJ/kg. Lignite production required the removal of some 72.4 mill. cbm of overburden, which represents a stripping ratio of 6.7 cbm/t. The lignite reserves at these sites total some 110 million t (30 mtce), while the satellite deposits scheduled for progressive development are estimated to contain about 240 million t (65 mtce). One of these new sites (Drzewce) is currently being developed for exploitation, which will start in 2005.

The Konin Mine supplies lignite to two mine-mouth power plants, Pątnów and Konin, which have a capacity of 1,200 MW and 583 MW respectively.

The Adamów Mine operates three opencast pits 40 to 70 m deep at Adamów, Władysławów and Koźmin and has a production capacity of 5 million t per year (1.4 mtce). The deposits currently being exploited have workable reserves of 83 million t (22.6 mtce), while the satellite deposits are estimated at about 45 million t (12.2 mtce). In 2004 the lignite production reached 4.4 million t (1.2 mtce), all of which was supplied to the Adamów mine-mouth power station (capacity 600 MW). Some 32 million cbm of overburden was removed, which gives a stripping ratio of 7 cbm/t. To maintain the present level of lignite production the mine is now developing the northern field at Koźmin, which will safeguard a production level of about 1 million t (0.27 mtce) per year until 2008. The entire lignite basin generates 8.9 % of Poland's energy requirements. The Konin Mine will remain in operation until 2040 and the Adamów Mine until 2022.

The Turoszów Lignite Basin is located in the south-west of Poland. The reserves are estimated at 480 million t (130 mtce). In 2004 there was 15 million t (4.1 mtce) of mining capacity and the mine produced 10.8 million t (3.7 mtce) of lignite with a calorific value of 10,050 kJ/kg. The lignite is supplied to the Turów mine-mouth power station. This plant is currently being upgraded to a capacity of 2,100 MW,

making it the most modern power station in Poland. After modernisation, lignite production will be increased to 12 million t per year. In 2004, some 33.1 million cbm of overburden were removed, giving a stripping ratio of 4 cbm/t. The mine will be in operation until 2045.

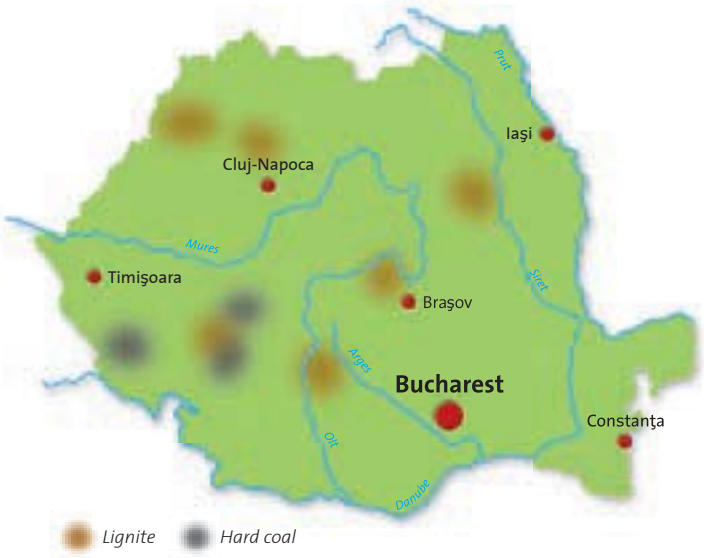
The country's lignite mines are expected to maintain their production capacity of 65–70 million t (17.7–19.0 mtce) per year and this fuel could play an important role until about 2035. The lignite production is likely to continue in Lower Silesia and in the Legnica area, where the copper and silver mines currently in operation are expected to close in the 2020s as their reserves become depleted.

information

Coal and Energy Data	**Unit**	**2004**
Resources Hard Coal	Mt	113,300
Resources Lignite	Mt	31,000
Reserves Hard Coal	Mt	12,113
Reserves Lignite	Mt	2,423
Domestic Output		
Hard Coal	Mt	99.2
Lignite	Mt	61..1
Total	**Mt**	**160.3**
Selected Coal Quality Data		
Calorific Value Hard Coal	kJ/kg	18,000 – 30,000
Calorific Value Lignite		7,400 – 10,300
Ash content Hard Coal	%	7.0 – 30.0
Ash content Lignite	%	7.2 – 16.0
Water content Hard Coal	%	7.0 – 11.0
Water content Lignite	%	50.0 – 52.0
Sulphur content Hard Coal	%	0.6 – 1.2
Sulphur content Lignite	%	0.2 – 1.4
Imports Hard Coal	Mt	2.3
Exports Hard Coal	Mt	20.8
Prim. Energy Consumption		
Total	**Mtce**	**118.0**
Hard Coal	Mtce	62.6
Lignite	Mtce	17.6
Power Supply		
Generation, total	**TWh**	**156.1**
Hard Coal	TWh	94.5
Lignite	TWh	52.5
Net power imports	TWh	-7.5
Gross power consumption	**TWh**	**145.3**
Power Plant Capacity		
Total	**MW**	**35,500**
Hard Coal	MW	20,700
Lignite	MW	9,300

Source: EURACOAL member, estimates

Romania



information

General Data	Unit	2004
Population	millions	21.7
GDP	bn €	50.4
Prim. energy consumption (PEC)	Mtce	59.3

Romania has had a long mining tradition and the country has significant energy resources in the form of natural gas, oil and coal. About 58 % of the country's primary energy demands can be met by indigenous energy resources.

In 2004, Romania's energy mix was essentially based on fossil fuels. Thermal power stations represent 57.1 %, of which 9.3 % are met by nuclear power, 28.5 % by hydro-electric energy, 0.8 % by biomass and 4.3 % by imports. Primary energy consumption amounts to 59 mtce, which is 40 % less than in 1990. In 2004, electricity consumption represented 48.7 TWh, of which 82.3 % was sold to industrial consumers and 16.4 % to households. In 2004 GDP increased by 8.3 % compared to the previous year.

Romania is seeking accession to the EU by 2007. The country therefore signed the Accession Treaty in April 2005. To fulfill all requirements, Romania will have to undergo a wide range of reforms. One element of the reform programme will be the national energy plan, which was adopted in 2001. Its goal is to establish an efficient energy market on the basis of the EU requirements. The energy plan also contains further proposals, including the privatisation of the energy sector, the restriction of gas, oil and coal imports to 40 %, the completion of a second generating unit for the Cernavoda nuclear power plant (900 MW), expansion of the use of hydro energy, the expansion of CHP and thermal power plants to a level of 6,500 MW and the extension or refurbishment of the power grid and natural gas pipelines.

Hard Coal

Hard coal is mined in two areas, namely the Jiu Valley, which is the most important deposit and Anina (in the Banat region). Coal reserves are estimated at 648 million tce. The working conditions are difficult, as the coal is often found at medium and high depths. In the Jiu Valley, coal mining is carried out by the National Hard Coal Company of Petroşani, which operates nine mines including Lonea, Petrila, Livezeni, Vulcan, Paroseni, Lupeni, Barbateni, Uricani and Tebea. Some 3.5 million t hard coal were produced in 2004. In the Anina area hard coal is mined by the Banat Mining Company of Anina which has collieries at Anina, Baia Noua and Ponor. In 2004 this coalfield produced some 0.2 million t of hard coal. The main consumers are the thermal power plants at Paroseni (3 x 50 MW) and Mintia (6 x 210 MW). As annual coal production does not meet all fuel requirements, additional quantities of coal have to be imported.

The current production levels should be maintained at a level of 3.5 million t per year, until 2010.

Coal extraction is subsidised by the Government and the main future challenges will include the closure of unprofitable mines, the modernisation of the operation process at the remaining collieries and further reductions in manpower.

Lignite

Romanian's lignite reserves are estimated to 480 million t. The deposits are mainly situated in the southern part of the country near Oltenia and in the western part along the southern Carpathians all the way to Ploieşti. Lignite mining is carried out by two Companies: the National Lignite Society of Oltenia (Societatea Nationala a

Lignitului Oltenia - SNLO, former CNLO) and the National Coal Society Ploieşti (Societatea Nationala a Carbunelui Ploieşti - SNCP).

In 2004, the lignite production reached 31.6 million t. About 90 % of this was extracted by SNL Oltenia in eight opencast sites (Rovinari, Rosia, Pesteana, Pinoasa, Motru, Berbeşti, Jilt and Mehedinţi).

Almost all the lignite produced by SNL Oltenia is used by the heat and power plants in the Oltenia region. Most of the lignite extracted by SNC Ploieşti is used by the power stations in Braşov, Oradea, Zalau and Doiçesti. A power plant modernisation programme, which will also involve the closure of outdated and non-profitable installations, will be necessary in the near future. The modernisation will enable the companies to supply price-competitive coal.

The SNC Ploieşti operates eight mines in the south-east, in the central area and in the north-west part of the country (Campulung, Capeni, Salaj, Voievozi, Comaneşti, Filipeşti, Sotanga and Borsec).

By Government Decision No. 103 / 2004 three Energy Complexes were separated from the former CNLO, namely Rovinari, Turceni and Craiova.

information

Coal and Energy Data	**Unit**	**2004**
Resources Hard Coal	Mt	8,307
Resources Lignite	Mt	2,500
Reserves Hard Coal	Mt	810
Reserves Lignite	Mt	1,456
Domestic Output		
Hard Coal	Mt	3.7
Lignite	Mt	31.6
Total	**Mt**	**35.3**
Selected Coal Quality Data		
Calorific Value Hard Coal	kJ/kg	13,381 – 27,180
Calorific Value Lignite	kJ/kg	6,700 – 8,550
Ash content Hard Coal	%	14.5 – 55.5
Ash content Lignite	%	29.3 – 44.5
Water content Hard Coal	%	2.0 – 24.5
Water content Lignite	%	40.0 – 43.0
Sulphur content Hard Coal	%	0.5 – 3.0
Sulphur content Lignite	%	<1
Net Imports Hard Coal	Mt	2.9
Prim. Energy Consumption		
Total	**Mtce**	**59.3**
Hard Coal	Mtce	2.4
Lignite	Mtce	10.0
Power Supply		
Generation, total	**TWh**	**57.0**
Hard Coal	TWh	4.4
Lignite	TWh	19.1
Net power imports	TWh	2.6
Gross power consumption	**TWh**	**48.7**
Power Plant Capacity		
Total	**MW**	**28,500**
Hard Coal	MW	1,700
Lignite	MW	5,300

Source: EURACOAL member, estimates

Serbia and Montenegro

information

General Data	Unit	2004
Population	millions	10.5
GDP	bn €	19
Prim. energy consumption (PEC)	Mtce	24.1

The Republic of Serbia, together with the Republic of Montenegro, is a constituent part of The State Union of Serbia and Montenegro. It includes the autonomous provinces of Vojvodina, Kosovo and Metohija.

Serbia has only limited indigenous energy resources and lignite makes a substantial contribution to the country's energy supply.

Power consumption by households has been increasing between 1990 and 2000 and has now found a stable development, while the power requirements of the industrial sector have been falling steadily. Electricity consumption per capita has increased by 45 %. In 2004 a total of 24.1 TWh of power was produced by lignite-fired generating plant. Total gross power generation reached 35.1 TWh in 2004.

The Electric Power Company of Serbia (Elektroprivreda Srbije - EPS) operates coal mines, power generating facilities (including hydroelectric power plants, thermal power stations and heating plants) and grid distribution systems.

Lignite

In 2004 the total lignite output from Serbia and Montenegro amounted to 33.9 million t. This fuel was extracted from seven opencast sites and eight deep mines. Overburden removal at opencast mines totalled 90.5 million cbm.

The country's most important lignite deposit is at Kolubara, south-west of Belgrade. The Kolubara River divides this deposit into an eastern and a western sector. Four opencast mines are currently operating in this region. In 2004 the Kolubara opencast operations produced some 27.2 million t of lignite. The fuel is worked at depths of around 200 m and the seams are 30 m in thickness.

The Kostolac field is about 70 km east of Belgrade near the city of Drmno and south of the river Danube. Three opencast mines are currently operating in this area. In 2004 these sites produced some 6.5 million t of lignite. Working depths have now reached 100 m; seam thickness is 15 m.

The opencast operations employ modern mining equipment, including bucket-wheel excavators, belt conveyors and spreaders with an average capacity of 4,000 to 6,000 cbm/h. This technology allows continuous extraction and thereby ensures a steady flow of fuel to the power stations.

The country's most important lignite-fired thermal power stations are: Nikola Tesla A (1,502 MW), Nikola Tesla B (1,160 MW), Morava (108 MW), Kolubara A (245 MW), Kostolac A (281 MW) and Kostolac B (640 MW). EPS's lignite-fired installations, which include the Kosovo A and B stations, have a total capacity of 5,171 MW and generated 24.1 TWh of power in 2004.

The priority for the countries energy policy is to modernise and restructure its lignite mining operations in order to make this sector more competitive. The Government is therefore planning to reduce operating costs and increase domestic energy prices. This restructuring process will take many years and will require substantial financial support from other countries.

information

Coal and Energy Data	Unit	2004
Resources Lignite	Mt	23.1
Reserves Lignite	Mt	3.4
Domestic Output		
Lignite	Mt	33.9
Total	**Mt**	**33.9**
Selected Coal Quality Data		
Calorific Value Lignite	kJ/kg	6,780 – 7,400
Ash content Lignite	%	18.0 – 25.0
Water content Lignite	%	43.0 – 50.0
Sulphur content Lignite	%	0.5 – 0.9
Net Imports Hard coal	Mt	n.a.
Prim. Energy Consumption		
Total	**Mtce**	**24.1**
Lignite	Mtce	n.a.
Power Supply		
Generation, total	**TWh**	**35.1**
Lignite	TWh	24.1
Net power imports	TWh	2.7
Gross power consumption	**TWh**	**35.1**
Power Plant Capacity		
Total	**MW**	**8,816**
Lignite	MW	5,171

Source: EURACOAL member, estimates

Slovak Republic

information

General Data	Unit	2004
Population	millions	5.4
GDP	bn €	28.8
Prim. energy consumption (PEC)	Mtce	28.0

information

Coal and Energy Data	Unit	2004
Resources Lignite	Mt	500
Reserves Lignite	Mt	80
Domestic Output Total	**Mt**	**3.0**
Lignite	Mt	3.0
Selected Coal Quality Data		
Calorific Value Lignite	kJ/kg	10,700 – 11,600
Ash content Lignite	%	15.2 – 33.9
Water content Lignite	%	20.7 – 33.9
Sulphur content Lignite	%	1.4 – 2.0
Net Imports Hard coal	Mt	7.0
Prim. Energy Consumption		
Total	**Mtce**	**28.0**
Hard Coal	Mtce	4.8
Lignite	Mtce	1.6
Power Supply		
Generation, total	**TWh**	**31.2**
Hard Coal	TWh	4.7
Lignite	TWh	2.1
Import/Export balance	TWh	-2.2
Gross power consumption	**TWh**	**28.9**
Power Plant Capacity Total	**MW**	**8,297**
Lignite	MW	1,180

Source: EURACOAL member, estimates

Slovakia does not have large indigenous primary energy sources. The resources are abundant but not recoverable. Oil reserves account for some 1.7 million t – whilst the resources amount to 7.6 million t. Gas reserves are estimated at 9.2 billion cbm, plus 16.7 billion cbm of resources. However, there are huge reservoirs for storage in Slovakia. Lignite (including brown coal) reserves are estimated at approx. 80 million t (workable reserves). Other reserves amount to more than 150 million t, with approx. 500 million t of resources. Dependency on imported energy sources is around the 90 % mark. The Slovakian primary energy consumption comprises natural gas (30.6 %), solid fuels – mainly coal and lignite (22.2 %), nuclear energy (24.1 %), oil (17.8 %), renewables 3.7 % and 1.6 % by others (2002). The total gross inland consumption of solid fuels (mainly coal including lignite and coke) was some 6.1 mtce in 2002. Imports reached about 4.8 mtce – supplied by the Czech Republic, Poland, Russia and Ukraine. Slovakia's raw materials policy is targeted at the efficient extraction of the solid fuels deposits currently being mined. Future developments are limited by lignite consumption forecasts in the Novaky power plant, where two blocks operate without environmentally compatible technology.

Lignite is mined by three companies at five underground mines located in the centre, south and west of the country. In 2004 3.0 million t of lignite was produced. Lignite-based power generation amounted to 2.1 TWh (6.7 % of the total generation of 31 TWh). The Hornonitrianske bane Prievidza, a. s. company, situated near Prievidza, extracts lignite at Handlova and Novaky deposits, located in the Horna Nitra region. There were three mines in operation here – Cigel Colliery, Handlova Colliery and Novaky Colliery, nowadays integrated into the company. The depth of the coal seams being worked is 150 m to 450 metres. Output in 2004 was 2.4 million t. The Bana Dolina a.s. company near Velky Krtis extracts lignite at the Modry Kamen deposit in Southern Slovakia at a depth of 150 metres. In 2004 this mine produced 0.2 million t, all of which was supplied to the Novaky power station. Mining operations are due to continue until 2006 and will cease in 2007. The Bana Zahorie a. s. company near Holic has only been in operation since 1990. In the year 2004, some 0.3 million t lignite was extracted from a working depth of 180 metres. About 90 % of the total volume of lignite produced in 2004 was used for electricity generation and district heating. The power stations have an installed capacity of 522.4 MW. Approximately 0.3 million t of the fuel produced was used for domestic purposes.

Slovenia

information

General Data	Unit	2004
Population	millions	2
GDP	bn €	24.6
Prim. energy consumption (PEC)	Mtce	17.3

Slovenia has no significant primary energy resources. The only indigenous energy reserves of any size comprise proven oil reserves of less than 50 million barrels and 51.8 mtce of lignite.

Since its creation in 1991 the Republic of Slovenia has recorded a steady economic upturn and between 1992 and 2002 the country's primary energy consumption increased by more than 25 % to around 8.5 mtce. Oil has the biggest share of this market, with 39 %, followed by nuclear energy with 21 %, coal with 19 % (imported hard coal accounting for 4 % and domestic lignite for 15 %) and natural gas with 13 %.

Around 60 % of the country's primary energy requirements have to be imported. Almost three quarters of this imported fuel is oil and one quarter gas. Imports increased by more than 50 % from 1992 to 2002 and since 1992 indigenous energy output has risen by 8 %.

National electricity consumption reached 12.4 TWh in 2004, representing an increase of 2.1 % from the previous year. National power output from major generating stations in 2004 was 10.8 TWh, with thermal power plants producing 7.2 TWh and hydro power plants 3.6 TWh. Slovenian utility ELES and Croatian utility HEP each have a 50 % stake in Slovenia's only nuclear power plant at Krško. This installation, which has a rated output of 700 MW, generated 5.2 TWh of electricity in 2004 – sufficient to meet 21 % of national demand. The above-average rainfall in 2004 meant that production from major hydro power plants was sufficient to meet 29 % of national requirements. The thermal power stations at Šoštanj and Trbovlje both burn locally mined lignite and generate power outputs of 3.5 TWh and 0.6 TWh respectively.

About 75 % of the electricity market has been deregulated since 2001 and all customers, with the exception of households, are able to chose their supplier on the free market. Power utility ELES is the only transmission company in Slovenia to maintain and operate a high-voltage supply grid. There are five regional distribution companies.

Slovenia has adopted a National Energy Plan that is designed to safeguard the public infrastructure and support private investment in energy supply utilities. Increased energy efficiency is high on the Plan's list of priorities. Between 1992 and 2000 energy intensity fell by 13 %. Measures aimed at improving this situation will also include better intelligence, an information campaign and the provision of financial support. Economic growth in Slovenia will also lead to an increase in the use of fossil fuels.

In its progress report the European Commission acknowledged that Slovenia had made good headway towards the deregulation of the energy sector. Discussions on the country's energy situation, which are part of the negotiations on EU membership, have now been provisionally concluded.

Lignite

Slovenia has two deep-mined lignite deposits: one at Velenje in the north of the country and one in central Slovenia near Trbovlje. These two mines produced 4.8 million t of lignite in 2004.

The Velenje basin (Saleška Valley) covers an area of about 21 sq km. The thickness of the lignite seam varies from 20 to 160 m and the working depth is between 240 and 500 m. The overburden consists of clay and water-bearing sand. This operation employs a workforce of some 2,650. The lignite is mined in a series of vertical slices from roof to floor using both caving and backfilling, as determined by the structure and hydrological properties of the overburden. Output is 8,000 to 12,000 t a day, with a record 16,000 t having been produced in one day from a single working face. Almost all the fuel extracted is supplied to the Šoštanj lignite-fired power plant north-west of Velenje, which has an installed capacity of 750 MW.

The Trbovlje mine produced about 1 million t of lignite in 2002, most of which was burnt in the nearby power station.

information

Coal and Energy Data	Unit	2004
Resources Lignite	Mt	240
Reserves Lignite	Mt	150
Domestic Output		
Lignite	Mt	4.8
Total	**Mt**	**4.8**
Selected Coal Quality Data		
Calorific Value Lignite	kJ/kg	10,331
Ash content Lignite	%	18.6
Water content Lignite	%	37.2
Sulphur content Lignite	%	1.5
Net Imports Hard coal	Mt	3.0
Prim. Energy Consumption		
Total	**Mtce**	**17.3**
Hard Coal	Mtce	0.7
Lignite	Mtce	2.6
Power Supply		
Generation, total	**TWh**	**16.0**
Hard Coal	TWh	–
Lignite	TWh	4.1
Net power imports	TWh	0.1
Gross power consumption	**TWh**	**12.4**
Power Plant Capacity		
Total	**MW**	**2,972**
Hard Coal	MW	209
Lignite	MW	745

Source: EURACOAL member, estimates

Spain

information

General Data	Unit	2004
Population	millions	43.2
GDP	bn €	743.0
Prim. energy consumption (PEC)	Mtce	197.5

Spain is one of Europe's fastest growing economies and is highly dependent on imported oil and natural gas. The only significant indigenous energy resource is coal (hard coal: 3,234 mtce, lignite: 20.7 mtce), although output has been declining in recent years. Prior to 1990 there were very few mine closures, but the industry is now due to be downsized by about one third by 2005.

Spain's economic growth has been accelerated by the country's accession to the EU. This upturn also led to an increased demand for energy, which has risen by 75 % since the mid-1970s. Coal – the most important indigenous energy source – contributes 19 % to the national energy mix (187 mtce).

With electricity demand growing apace (6 % per year) there has been an ever-increasing investment in the electricity generating sector. Spain now has the fifth-largest energy market in Europe (behind Germany, France, the United Kingdom and Italy). It is estimated that by 2010 Spain's energy requirements will have increased by some 30 %. In 2004 solid fuel-fired plant generated 78.8 TWh of electricity (28.1 % of the total output). Hard coal contributed 72.6 TWh (25.9 %) and lignite 19.9 TWh (2.2 %) to the country's gross power generation of 280.4 TWh. Spain continues to privatise its energy sector, a process which began in 1994 with the LOSEN Electricity Act.

Hard Coal

In 2004 Spain produced some 12.3 million t of hard coal, a large percentage of which was burnt in local power stations. A significant amount of coal (24.5 million t) had to be imported, mostly for power generation.

Hard coal is mined in several regions of the country: in the northern part of the country in Asturias, Castilla-León and Aragón León and Palencia, and in the south in Ciudad Real and Cordoba. Most mines are deep mines; the most important opencast mines are in Aragón and Ciudad Real, apart from one in the border between Asturias and León, Many small mines have now been forced to close due to high production costs and the state-owned company Hunosa has reduced part of its capacity. In the north of León there is a large mine and a new colliery („Nueva Mina"), which was built in the 1990s, access to which is provided by three shafts.

Lignite

Spain's main lignite fields are located in the autonomous region of Galicia in the north-west of the Iberian Peninsula. There is also the Ginzo de Limia lignite deposit in the province of Orense in Southern Galicia and two minor deposits, Arenas del Rey and Padul, near Granada in the province of Granada. Estimated reserves in Andalusia are 40 million t in each case, but like the Ginzo de Limia deposits these have not yet been exploited for economic reasons.Spain produced a total of 8.2 million t of lignite in 2004.

The largest deposit is at the As Pontes mine, some 60 km north-east of La Coruña. This opencast mine, which was first developed in 1976, is operated by the largest

of the four private utilities, ENDESA (Empresa Nacional de Electricidad S.A.), and still has economic reserves of 40 million t. In 2002 production from As Pontes totalled some 6 million t. The product is extracted using equipment manufactured in Germany and transported on a 25 km belt-conveyor line. The overburden-to-lignite ratio is 2.8 : 1 (cbm: t).

A second, much-smaller opencast mine at Meirama has been in operation since 1980. This is located 30 km south of La Coruña and is owned by Spain's third largest utility company, Unión Fenosa S.A. The mine covers an area of 1.5 sq km (1.8 x 0.8 km). The remaining workable reserves of 9 to 10 million t are located in two pockets. The current working depth of 200 m is ultimately expected to reach some 250 m. In 2002 the Meirama mine produced a total of 2.6 million t, with an overburden-to-lignite ratio of 1 : 1 (cbm: t).

All the lignite produced was used for power generation. The lignite-fired power stations are located close to the mines and have a total capacity of 1,950 MW. The As Pontes power station, which has a generating capacity of 1,400 MW (4 units of 350 MW each, in operation since 1976–1979), and the Meirama power plant, which generates 550 MW (one unit, in operation since 1980), are both owned by the mine operators.

information

Coal and Energy Data	Unit	2004
Resources Hard Coal	Mt	4,200
Resources Lignite	Mt	80
Reserves Hard Coal	Mt	600
Reserves Lignite	Mt	50
Domestic Output		
Hard Coal	Mt	12.3
Lignite	Mt	8.2
Total	**Mt**	**20.5**
Selected Coal Quality Data		
Calorific Value Hard Coal	kJ/kg	18,197
Calorific Value Lignite	kJ/kg	11,743
Ash content Hard Coal	%	35.0
Ash content Lignite	%	30.0
Water content Hard Coal	%	12.0
Water content Lignite	%	22.0
Sulphur content Hard Coal	%	1.5
Sulphur content Lignite	%	3.2
Imports Hard coal	Mt	24.5
Prim. Energy Consumption		
Total	**Mtce**	**197.5**
Hard Coal and Lignite	Mtce	37.5
Power Supply*		
Generation, total	**TWh**	**280.4**
Hard Coal	TWh	72.7
Lignite	TWh	6.0
Net power imports	TWh	-3.0
Gross power consumption	**TWh**	**261.5**
Power Plant Capacity		
Total	**MW**	**51,300**
Hard Coal	MW	9,500
Lignite	MW	1,950

* Total National (includes Canarias, Ceuta y Melilla, y Baleares
Source: EURACOAL member, estimates

Turkey

information

General Data	Unit	2004
Population	millions	69.6
GDP	bn €	212.3
Prim. energy consumption (PEC)	Mtce	114.8

As Turkey's indigenous energy resources consist exclusively of lignite and small amounts of hard coal, the country is heavily dependent on coal, oil and gas imports. Turkey has hard coal (anthracite and bituminous) reserves of around 998 million t, plus lignite reserves of around 7,257 million t. In 2004 Turkey's primary energy production totalled 37.4 mtce and consumption amounted to 114.8 mtce, with a 27.9 % share for coal. The contribution from coal, gas and biomass to cover the primary energy needs is expected to increase over the next few years. By comparison, oil's share of the market is set to decline. The share of domestic coal in the primary energy supply is expected to increase to 28.7 % in 2005.

The Turkish coal sector produces both hard coal (2.9 million t per year) and lignite (67 million t per year), mainly used for power generation. Despite the range of coal mined, only one power station is currently fed with hard coal – the others use lignite. The coal-fired plants have a total capacity of approx. 8 GW.

Prior to Turkey's severe economic difficulties in 2001 (as well as a major earthquake in August 1999), the country's energy consumption has been growing much faster than its production, making Turkey a rapidly growing energy importer. During 2004 Turkey recorded an economic growth of some 9 %. Energy demand has trebled over the last two decades and this trend is set to continue until 2020 with an average increase of 8 % per year. About 22.5 % of Turkey's gross electricity production of 149.6 TWh in 2004 was generated from coal (7.6 %) and lignite (15 %). Of the remainder, 6.1 % is provided by oil, 39.2 % by gas, 30.8% by hydro power, and 1.4 % by wind and other renewable energies. Lignite is extracted from both opencast and deep mines, which have supply contracts with the power stations. The scale of the surface operations allows these mines to produce relatively low-price lignite, which is competitive compared to imported energy resources. The future of hard coal mining is less secure because of the difficult mining conditions. Turkey's hard coal mining industry is expected to decline in size over the next ten years. Between 1990 and 2000, the number of workers in Turkey's coal industry fell from 63,993 to 35,665.

The Turkish Ministry of Energy, which is responsible for the power sector utilities, has overall control over the coal mines, power stations and the electricity grid through different subsidiaries: Turkish Coal Enterprises (TKI) and Turkish Hard Coal Enterprises (TTK) for coal production and TEDAŞ for electricity distribution. The former public company TEAŞ, which had both transmission and generation facilities, was

split up into three public companies in October 2001: EÜAŞ (Electricity Generation Company), TETAŞ (Turkish Electricity Trading Company) and TEIAŞ (Turkish Electricity Transmission Company). TEIAŞ both owns and operates the national power transmission network. TEIAŞ is still being reorganised in order to fulfil the new market conditions. In February 2001, Turkey passed the long anticipated Electricity Market Law, which marks a first step towards the liberalisation of the electricity market. By 2006, Turkey wants to finalise the privatisation of the electricity generation and distribution. The country is divided into 17-20 power distribution areas.

Turkey wants to increase its domestic electricity production by constructing new power plants, and by identifying new import possibilities. In December 2003, Turkey began to import power (300 GWh per year) from Turkmenistan via Iran, and would like to double this amount in future. In 2002 Turkey purchased 96 % of its electricity imports from Bulgaria but in February 2004, Turkey announced that it would no longer purchase power from Bulgaria, due to Bulgaria's failure to grant highway and dam contracts which the country agreed on with Turkish clients. Besides Bulgaria and Turkmenistan, Turkey also imports power from Russia (via Georgia) and Iran.

Hard Coal

Turkey's main hard coal deposits are located in the Zonguldak basin in Northwest Turkey, located between Eregli and Amasra. It is the only region where coal is extracted. Other large deposits are presumed to be found close to the Taurus Mountains and at Diyarbakir. Reserves of hard coal are estimated at some 998 million t.

The hard coal is produced, processed, and distributed by the state-owned coal company TTK which operates five deep mines in the Zonguldak coal basin and produces approximately 2.9 million t of coal (2004). Substantial untapped resources of hard coal are presumed to be situated in the Zonguldak coalfield and mining by private investors should increase in future, following the issue by TTK of production licenses to private sector companies.

In 2004 Turkey also imported 9 million t of hard coal for steel production, industry and domestic heating purposes mainly from Australia, South Africa and Russia. Coal imports to Turkey are expected to increase over the next few years. Although the construction of gas-fired power stations dominates the immediate agenda, there is still significant potential for coal-fired power generation. One of the best examples here is the construction of a new 1,200 MW power plant at Iskenderun in southern Turkey. In February 2004, the German STEAG, a subsidiary of RAG, announced that it had completed the construction of a 1,210 MW coal-fired power plant near Iskenderun, in southern Turkey. The plant represents the largest foreign direct investment ever made by Germany in Turkey. The new power plant is expected to burn 3.3 million t of imported coal per year.

Lignite

Lignite is Turkey's most important indigenous energy resource. In 2004, lignite output totalled 67 million t. The total reserves are estimated at 7,257 million t. The lignite deposits are spread right across the country, but around 40 % of Turkey's lignite is located in the Afsin-Elbistan basin of south-eastern Anatolia. Thirty opencast mines and nine deep mines are operated by Turkish Coal Enterprises (TKI), producing some 40 million t of lignite per year. In addition, Turkey's Electricity Generating Authority produces lignite for three power plants. The private sector supplying local power plants, is growing, although at present it is small.

The most important deposits are located at Afşin-Elbistan, near the town of Maraş , where the geological and economically workable reserves are estimated at 3,200 million t. The Soma basin is the second largest lignite area in Turkey, with reserves estimated at 600 million t. Other important deposits are located in the Bursa, Çan and Mugla basins.

The quality of the lignite is very variable, and some 57 % of the reserves are of low calorific value. However, due to the country's dependence on imported fuels, the Turkish

Government has specified that any expansion of lignite-fired power generation should be based on indigenous lignite.

The lignite-fired power plants have a total capacity of 6,502 MW. In 2004 the country's gross electricity production reached 149.6 TWh, of which 22.4 TWh (15 %) was based on lignite.

Lignite production is set to increase in order to meet the growing power requirements and to provide a cost-effective basis for the country's long-term energy needs. Output is expected to reach 160 million t by 2010 and 185 million t by 2020. This production increase, combined with power plant modernisation and compliance with international environmental standards, will enable lignite to maintain its substantial share in the power market.

information

Coal and Energy Data	**Unit**	**2004**
Resources Hard Coal	Mt	1,124
Resources Lignite	Mt	8,375
Reserves Hard Coal	Mt	998
Reserves Lignite	Mt	7,257
Domestic Output		
Hard Coal	Mt	2.9
Lignite	Mt	67.0
Total	**Mt**	**69.9**
Selected Coal Quality Data		
Calorific Value Hard Coal	kJ/kg	n.a.
Calorific Value Lignite	kJ/kg	4,564 – 22,316
Ash content Hard Coal	%	n.a.
Ash content Lignite	%	11.0 – 46.0
Water content Hard Coal	%	n.a.
Water content Lignite	%	6.0 – 55.0
Sulphur content Hard Coal	%	n.a.
Sulphur content Lignite	%	0.2 – 4.7
Net Imports Hard coal	Mt	9.0
Prim. Energy Consumption		
Total	**Mtce**	**114.8**
Hard Coal and Lignite	Mtce	32.0
Power Supply		
Generation, total	**TWh**	**149.6**
Hard Coal	TWh	11.3
Lignite	TWh	22.4
Net power imports	TWh	3.6
Gross power consumption	**TWh**	**116.6**
Power Plant Capacity		
Total	**MW**	**32,300**
Hard Coal	MW	1,660
Lignite	MW	6,502

Source: RWE, BGR 2003, estimated/provisional

United Kingdom

Hard coal

information

General Data	Unit	2004
Population	millions	59.8
GDP	bn €	1,589.5
Prim. energy consumption (PEC)	Mtce	353.5

The United Kingdom is by far the largest petroleum producer and exporter in the EU and is a significant producer of natural gas. It is also one of the largest energy consumers in Europe.

The country also has significant hard coal resources estimated at 1,000 million t. About 600 million t of reserves are available to existing deep mines or are in shallow deposits capable of being extracted by surface mining. In addition, currently unaccessed resources have the potential to provide many years of future production at present levels. There are also about 500 million t of lignite resources, although none is mined or consumed at present.

In 2004, the UK's primary energy production fell by 8.4 % to 340.6 mtce. The largest contributor was oil with 149.5 mtce (44 %) followed by natural gas with 138.9 mtce (40.8 %). Hard coal production was 22.5 mtce (6.6 %) with nuclear supplying 25.8 mtce (7.6 %).

The UK's primary energy consumption in 2004 was 353.5 mtce with natural gas accounting for the largest share (39.8 %), followed by oil (35.4 %), hard coal (15.9 %) and nuclear energy (7.5 %).

After many years of being a net energy exporter the trend was reversed in 2004. Production from North Sea oil and gas fields along with both coal and nuclear were all lower. UK oil and gas production will continue to decline as North Sea supplies diminish, with the result that the UK will become a significant energy importer over the next few years.

Power generation in the UK reflects a diverse energy mix. In 2004, electricity supplied was 386.6 TWh, dominated by natural gas (41.0 %), hard coal (32.7 %) and nuclear power (19.1 %). Hydropower and renewables contributed 3.2 % and net imports provided 1.9 % of electricity supplied.

Hard Coal

UK hard coal consumption and production have decreased dramatically over the last fifteen years due to an increase in gas-fired power generation, the rationalisation of collieries in the run up to privatisation in 1995 and more recently as mines reach the end of their economic lives.

However, the introduction of more competitive electricity trading arrangements in 2001 has seen coal demand stabilise, assisted by a firming of gas prices. Consumption of hard coal in the UK in 2004 was 60.6 million t, of which 50.5 million t was used for electricity generation. Hard coal consumption in the steel industry was 6.4 million t.

In 2004 hard coal supply totalled 61.2 million t, with 25.1 million t being accounted for by indigenous production and 36.1 million t by imports. 6.3 million t of imports was coking coal, supplying virtually all the coking market, as the UK no longer produces significant quantities of coal suitable for use in coke ovens. The UK also exported around 0.6 million t.

The UK is now the biggest importer of seaborne steam coal in Europe, with imports supplying well over half of the overall market. South Africa and Russia are the main sources accounting for almost two thirds of all imports, the other main suppliers being Colombia, Australia, Indonesia and Poland. UK producers can also generally command slightly higher prices than the landed cost of imports because their location is in most cases closer to power stations than the main coal importing ports.

Indigenous production was split between deep mines 12.6 million t, 12.0 million t surface mines and 0.5 million t from other sources. The UK is currently in the middle of a three year Coal Investment Scheme providing around £60 million to support for "demonstrably viable" production. The Government scheme offers producers up to 30 % of the costs of opening new reserves.

The UK's coalmines are mainly located in central and northern England, South Wales and central and southern Scotland, where there is the largest concentration of surface mines.

As at the end of 2004, there were 9 large deep mines in operation. Eight of these were owned by UK Coal plc (Daw Mill, Thoresby, Welbeck, Harworth, Maltby, Rossington, Kellingley, and Ellington), along with Tower Goitre Anthracite Ltd. (Tower). In addition, there were 10 smaller deep mines in production. At the beginning of 2005 an inrush of water flooded the working coalface at Ellington Colliery, resulting in the closure of the mine.

UK Coal accounted for 12.0 million t of the total of 12.6 million t of 2006 deep mine production, with production from Tower around 0.5 million t. There are about 5,400 direct deep mine employees.

At any one time, there are about 50 surface mines in production and about 15 surface mine operating companies. The largest operator is Scottish Coal producing over 4 million t a year out of the total 2004 output of 12.0 million t. The regional surface mine production and manpower breakdown for 2004 was England with 3.0 million t (manpower 557), Scotland with 7.6 million t (manpower 1,378) and Wales with 1.4 million t (manpower 375).

Total direct employment in the industry is some 7,800 with over 5,600 in England, 1,400 in Scotland and 800 in Wales.

UK COAL is Britain's biggest producer of coal, supplying around 10 % of the country's energy needs for electricity generation. The Group now has 7 deep mines located in Central and Northern England with substantial reserves and employs 4,200 people. In 2004 the company produced 14.0 million t (12.0 million t deep mined and 2.0 million t surface mined) and sold 14.2 million t. The company also manufactures smokeless fuels at its Monckton plant near Barnsley. In addition to supplying power stations, the company also produces a wide range of coal for industry, schools and hospitals along with a range of domestic coals.

The second largest UK producer is Scottish Coal, which directly employs some 700 people at 8 to 10 surface mines with an output of 4.0 million t to 4.5 million t annually. Other important surface mine producers include ATH Resources, Celtic Energy, H.J. Banks, I & H Brown, and Kier Mining.

The industry's trade association is the Confederation of UK Coal Producers, whose member companies produce approximately 90 % of UK coal output.

information

Coal and Energy Data	Unit	2004
Resources Hard Coal	Mt	1,000
Reserves Hard Coal	Mt	220
Domestic Output		
Hard Coal	Mt	25.1
Total	**Mt**	**25.1**
Selected Coal Quality Data		
Calorific Value Hard Coal	kJ/kg	22,500 – 27,000
Ash content Hard Coal	%	8.0 – 18.0
Water content Hard Coal	%	7.0 – 17.0
Sulphur content Hard Coal	%	0.4 – 2.5
Imports Hard coal	Mt	36.1
Prim. Energy Consumption		
Total	**Mtce**	**353.5**
Hard Coal	Mtce	56.1
Power Supply		
Generation, total	**TWh**	**386.6**
Hard Coal	TWh	126.5
Net power imports	TWh	7.3
Gross power consumption	**TWh**	**407.5**
Power Plant Capacity		
Total	**MW**	**78,500**
Hard Coal	MW	28,000

Source: EURACOAL member, estimates

Other European Union Countries

In 2004 the Community of twentyfive imported a total of 210.5 mill. tonnes of hard coal. Other major European coal importing countries not displayed in this brochure include Denmark (9 mill. tonnes), Portugal (5 mill. tonnes) and Finland (7 mill. tonnes).

Belgium

In the nineteenth century the Walloon coal mines of southern Belgium made a major contribution to the industrial expansion of the country. In 1890 coal production already totalled some 20 million t. In 1917 coal mining started in the north-east around Limburg, where the geological conditions made production much more efficient. Between 1952 and 1953 national coal production reached a record peak of 30 million t. This level of production was maintained until the late 1950s, after which output gradually declined as the Walloon mines were shut down. The closure of the Limburg mines followed 20 years later, with Belgium's last colliery ceasing production in 1992.

Although coal is no longer mined in Belgium, imported coal remains an important energy source for the steel industry (4.0 million t) and for power generation (3.3 million t).

In 2004 Belgium's primary energy needs, amounting to some 81.9 mtce, were met by oil (32.1 mtce; 39.2 %), natural gas (20.8 mtce; 25.4 %), nuclear energy (18 mtce; 22 %), coal (9.1 mtce; 11.1 %), renewables (0.9 mtce; 1.1 %) and others (1.0 mtce; 1.2 %).

Net power generation in 2004 totalled 81.5 TWh. The majority of this (55.1 %) was generated by nuclear power stations, while a further 42.8 % was generated in conventional thermal installations (with coal-fired power plants contributing 10.7 %). Belgium has announced a moratorium on nuclear power (along with Sweden, Spain, the Netherlands and Germany).

In 2004, Belgium imported 9.8 million t coal, with the majority being supplied by: South Africa (3.1 million t; 32 %), Australia (2.6 million t; 27 %), the United States (1.7 million t; 17 %), the CIS (1.3 million t; 13 %), Canada and Poland both 0.4 million t or 4 % each. Some 1.3 million t are re-exported exclusively to EU Member States. Coke imports amounted to 0.3 million t.

information

	Unit	2004
Population	millions	10.4
GDP	bn €	267.5
Net Imports Hard coal	Mt	8.5
Prim. Energy Consumption		
Total	**Mtce**	**81.9**
Hard Coal	Mtce	9.1
Power Supply		
Generation, total	**TWh**	**81.5**
Hard Coal	TWh	8.7
Net power imports	TWh	7.8
Gross power consumption	**TWh**	**83.8**
Power Plant Capacity		
Total	**MW**	**15,700**
Hard Coal	MW	1,900

Source: EURACOAL member, estimates

Netherlands

Hard coal mining dominated the south Limburg area of the Netherlands from the early 1900s to the mid-1970s. The coalfield was located in the south of the country, close to Germany and Belgium, and mainly comprised deep mining operations.

Since about 1915 lignite has been extracted by opencast mining around the towns of Eygelshoven and Hoensbroek. These deposits were located on the north-west fringe of the large German lignite basin to the west of Cologne. Lignite mining ceased in 1968 with the closure of the Carisborg site, the last remaining operator.

The Netherlands is now the main transloading point for coal imports to Europe. Together the ports of Rotterdam and Amsterdam, along with Antwerp in Belgium, constitute the most important trading centres for imported coking coal and steam coal.

In 2004 the Netherlands imported some 13.5 million t of coal, comprising 8.9 million t of steam coal, 3.1 million t of coking coal and 1.5 million t of PCI. The main supplier countries were South Africa, Indonesia, Colombia and Australia.

In 2004 almost 9 % of the Netherlands' primary energy requirements were met by coal.

Most of the imported coal is used for power generation, amounting to 24 TWh in 2004. Coal therefore has a 25 % share of the total Dutch power generation market and a fuel share of approx. 35 % in large installations.

information

	Unit	2004
Population	millions	16.3
GDP	bn €	453.8
Net Imports Hard coal	Mt	13.5
Prim. Energy Consumption		
Total	**Mtce**	**114.3**
Hard Coal	Mtce	10.3
Power Supply		
Generation, total	**TWh**	**100.0**
Hard Coal	TWh	24.0
Net power imports	TWh	15.0
Gross power consumption	**TWh**	**115.0**
Power Plant Capacity		
Total	**MW**	**20,000**
Hard Coal	MW	4,100

Source: EURACOAL member, estimates

Italy

Although Italy has a big economy, it is almost entirely dependent on imports (84 %) to meet its energy needs. Italy's heavy reliance on foreign oil and gas, from sources such as Libya, Algeria and Russia, has made energy security and diversification one of the country's top concerns. Most of the coal consumed in Italy is used for the power generation market. Coal consumption is growing and is expected to reach a 22 % share by 2010. Another major but declining market is its use for the production of coke for the steel industry. Coal has only played a minor role in the Italian energy sector and Italy produces almost no coal of its own. In 2004 nearly 7.7 % of Italy's primary energy consumption of around 260 mtce was met by coal. The power sector is expected to increase its coal consumption in the years ahead as ENEL strives to decrease its reliance on imported oil, although coal will not play as important a role as natural gas. Clean Coal Technology will figure prominently in this increased coal usage. The expansion in coal utilisation will be met by increased imports. Approximately 24 million t of hard coal were imported in 2004. The main suppliers of steam coal to Italy were South Africa (7 million t), Indonesia (3.8 million t), Columbia (3.1 million t), and Russia (1.9 million t).

Italy has a power generation capacity of 60 GW. In 2004 the country generated 276.4 TWh and consumed 322 TWh. Generation is mostly by thermal means (80 %), namely oil, gas, and coal. The mix of thermal power is shifting away from oil towards natural gas and the latter is expected to become the dominant fuel source for power generation by the end of the decade. Italy's extensive electricity network is linked to its neighbours. Electricity imports come mostly from France and Switzerland, with a small percentage from Slovenia. In the summer of 2002 Italy and Greece completed the construction of a new 163 km, 400 kV underwater power cable which will allow Greece to transfer electricity (from its lignite-fired power plants) to the EU, as well as serving as a back-up source for Italy. The Italian energy sector has been undergoing considerable restructuring in recent years. EU directives on electricity have established common rules for the creation of internal markets and have required the privatisation of Italy's dominant energy monopolies. In November 2002 EU Ministers set deadlines for complete energy deregulation across the Community. All business users will be free to choose their energy suppliers by July 2004, and this will be extended to all domestic users in 2007.

information

	Unit	2004
Population	millions	57
GDP	bn €	1,300
Net Imports Hard coal	Mt	24.0
Prim. Energy Consumption		
Total	**Mtce**	**260.1**
Hard Coal	Mtce	20.0
Power Supply		
Generation, total net	**TWh**	**276.4**
Hard Coal	TWh	47.1
Net power imports	TWh	46.4
Gross power consumption	**TWh**	**322.0**
Power Plant Capacity		
Total	**MW**	**60,100**
Hard Coal	MW	5,700

Source: EURACOAL member, estimates

Steam coal in the energy industry is only used in combined heat and power plants. Coking coal and coke are responsible for more than half of Sweden's coal imports, for use by the steel industry. Some coal is also used by the cement industry but the sector is trying to increase its use of other fuels. The paper industry also uses coal.

About 50 % of Sweden's electricity needs are covered by hydro and some 45 % by nuclear. In the late 1970s the Government decided to shut down all nuclear power plants by 2010. In 2002 the Government voted a new energy programme under which nuclear power plants are still to be shut down, but only if this is economically and socially feasible. For the moment it is not probable that nuclear energy could be replaced by other domestic energy resources. The potential of domestic hydro reached its maximum level and wind energy is not sufficient (at present wind energy accounts for 2 % of Swedish electricity production). Gas is not a solution either, as the infrastructure for using gas is largely absent in Sweden. The only solution at this moment would be to replace nuclear energy by imports, but this solution will not get the necessary political support. It is therefore probable that Sweden will continue to produce nuclear power.

Sweden

There was only one coal mine in Sweden, situated in Skåne, in the southern part of Sweden. In the 1980s it became unprofitable and was shut down.

Back in the 1930s coal accounted for more than half of Swedish energy demand with imports of around 7 million tonnes per year.

Today the figures vary from year to year depending on climate – water in the reservoirs, cold or warm winter, the price of electricity, etc. A normal year the import of coal is around 3 to 3.5 million tonnes.

information

	Unit	2004
Population	millions	9.0
GDP	bn €	267.3
Net Imports Hard coal	Mt	3.0
Prim. Energy Consumption		
Total	**Mtce**	**72.0**
Hard Coal	Mtce	3.0
Power Supply		
Generation, total net	**TWh**	**148.0**
Hard Coal	TWh	1.5
Net power imports	TWh	0.0
Gross power consumption	**TWh**	**148.0**
Power Plant Capacity		
Total	**MW**	**33,361**
Hard Coal	MW	800

Source: EURACOAL member, estimates

EURACOAL´s mandate

The European Association for Coal and Lignite is the umbrella organisation of the European coal industry. The associations and companies representing the coal industries of Belgium, France, Germany, Greece, Spain, the UK, the Czech Republic, Hungary, Poland, Slovakia, Slovenia, as well as the relevant organisations of Bulgaria, Romania, Serbia and Bosnia-Herzegovina work together in EURACOAL, where they have equal rights. Importers, dealers and consumers have a seat and vote in EURACOAL. By integrating the countries of eastern and central Europe, EURACOAL has anticipated an important political development taking place in the European Union as a whole. The new Association, evolved from CECSO (the European Solid Fuels' Association) after the expiry of the Treaty establishing the European Coal and Steel Community (ECSC Treaty) in 2002, has a much broader remit.

EURACOAL's task is to highlight the importance of coal's contribution to security of energy supply within the enlarged EU, to price stability, to added value and to environmental protection. EURACOAL seeks to be an active communicator, doing all that is necessary in order to create an appropriate framework within which the European coal industry and coal consumers can operate.

Around 30 % of the power generated in the EU-25 is coal-based. Steel producers and other energy-intensive industries all need large quantities of energy. Coal has therefore established itself as a permanent and reliable source of energy in its own right and will remain a vital source for the EU energy supply for the years to come. The importance of coal for European power supply defines EURACOAL as an active player in the future energy policy of the whole European Union.

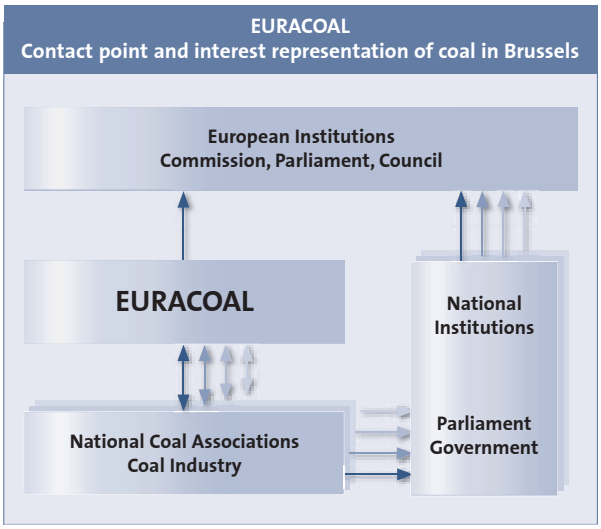
EURACOAL's activities are entirely geared to the interests of its Members. This includes the entire process chain beginning with coal extraction, marketing and transport right through to its utilisation at power stations, in the steel industry and in other industrial and private sectors. Coal research plays an important role here.

EURACOAL is the voice of the coal industry in Brussels. EURACOAL is actively involved in balancing the political requirements for a secure and cost-effective supply of fuel on the one hand with the objectives of environment policy on the other. The EU has to create adequate conditions for coal utilisation, as this fuel is vital if we are to achieve a balanced European energy mix. EURACOAL's activities are directed towards:

- keeping its Members continuously informed from Brussels about all coal-relevant matters and activities,
- creating a platform for its Members to have discussions and exchanges of opinion,
- voicing the interests of the coal and energy industry at European level,
- getting involved in creating adequate political and regulatory conditions, especially via the European Parliament, the Commission and the Council,
- improving its exchange of information and working relations with the Commission and Parliament,
- participating in the Social Dialogue and activities of the Economic and Social Committee,
- cooperating with the politically relevant associations and interest groups in Brussels, in order to promote greater awareness of the coal industry's interests, and
- public relations work in order to improve coal's image.

The way EURACOAL works as a Brussels-based European association is largely determined by the considerable powers of the EU institutions, especially the European Parliament and the Commission.

EURACOAL is expected to represent the interests of its Members in its dealings with these institutions and therefore participates in expert discussions and also helps to shape public opinion.



While EU decisions are primarily determined by the Brussels-based institutions, the Council – and therefore the Member States - also have far-reaching powers. The contribution that EURACOAL Members make to energy and environment policy at national level is therefore just as important as the collective representation of their interests in Brussels. When looked at this way, EURACOAL is therefore not just a platform for voicing the collective interests of its Members, but it also acts as a forum for information exchange through which EURACOAL Members are able to put on the agenda the main concerns of the coal industries of the individual Member States.

Major Activities of EURACOAL

EURACOAL welcomes the European unification process and considers EU expansion to be a complex task whose completion requires full commitment from all involved. EURACOAL evolved from the former CECSO (the European Solid Fuels' Association) after the expiry of the ECSC Treaty in mid-2002 with regard to EU enlargement. The EU's general objectives, which are to implement the Internal Market, to increase the Community's economic strength, to protect consumers and to achieve reasonable standards in respect of environmental protection, have all created a great deal of scope for legislative activities within the EU, and much of this impacts on the coal industry. The deregulation of the power and gas markets, the introduction of EU regulations on grants and subsidies and the adoption of measures aimed at strengthening commercial businesses by introducing competitive market structures all open up good opportunities for coal - but are also fraught with risks. The coal industry welcomes the Commission's strategy on security of energy supply and climate protection. EURACOAL also regards these as major challenges to be tackled.

EURACOAL considers it vitally important for Europe to draw up energy and environment policy strategies in the long term. This in turn will open up new opportunities for coal in the power generation sector - and these have to be seized and developed by creating proper conditions. EURACOAL therefore has developed a Clean Coal strategy.

The EU authority in the area of environment protection will not only impact on the production and utilisation of energy, but will also affect the relative competitive relationship between oil, gas and coal. Some of the most important activities here include:

- the clean air policy, as reflected in the Large Combustion Plant Directive and the emission regulations for particles and dust,
- the management of mining waste and residues from power plants,
- water protection, mining activities and ground water, the extraction of water for power plant operations,
- soil and nature conservation, such as the rehabilitation or large-scale nature conservation projects in and around major infrastructure sites, such as pipeline construction or the production of raw materials,
- climate protection, European programmes and individual regulations, such as Emissions Trading, support for renewable energies as well as combined heat and power generation (CHP).

Many such projects are currently being planned or implemented and these will need flanking support, not just by way of Commission initiatives and formal legislative procedures in Parliament, but also from specialists and from politicians who have been properly briefed on the basis of experts' reports. EURACOAL raises all the legitimate interests of a key sector of the economy, namely the European coal industry, for discussion at EU level.

EURACOAL´s Members and Committees

Members Associations / Companies		Countries
ISSEP	Institut Scientifique de Service Public	BEL
Euriscoal	European Association of Coal Importers	BEL
Banovici Coal Mining	Bosnian Coal Producer	BZH
Mini Maritsa Iztok EAD	Bulgarian Lignite Producer	BUL
ZSDNP	Czech Confederation of the Coal and Oil Producers	CZR
CARBUNION	Federation of Spanish Coal Producers	ESP
CdF	Charbonnages de France	FRA
DEBRIV	Deutscher Braunkohlen-Industrie-Verein	GER
GVST	Gesamtverband des deutschen Steinkohlenbergbaus	GER
VDKI	Verein der Kohlenimporteure	GER
VDMA	Mining Equipment	GER
PPC	Public Power Corporation	GR
MATRA	Mátra Erömü Rt	HUN
PPWB	Confederation of the Polish Lignite Industry	POL
ZPGWK	Polish Hard Coal Employer's Association	POL
PATROMIN	Federation of the Romanian Mining Industry	ROM
EPS	Electric Power Industry of Serbia	SER
HBP	Hornonitrianske Bane Prievidza	SK
Premogovnik Velenje	Slovenian Lignite Producer	SLO
COALPRO	Confederation of the UK Coal Producers	UK
Coaltrans Conferences Ltd.	Conference Organiser	UK
IMCL	International Mining Consultants Ltd	UK
University of Nottingham		UK

Status: July 2005

Committees		
	Chairman	**Secretary**
General Purposes Committee	Dr.-Ing. George Milojcic	Chris McGlen
Technical Research Committee	Dr.-Ing. Jürgen Czwalinna	Bernd Bogalla
Environment Committee	Robert Pentel	Bernd Bogalla
Market Committee	Dr.-Ing. Wolfgang Ritschel	Gitta Hulik

Executive Committee					
Nigel YAXLEY President EURACOAL UK Coal Mining Ltd Marketing Director UK COAL MINING LTD	UK		Dr.-Ing. Wolfgang RITSCHEL VDKI Chief Executive VDKI	GER	
Prof. Dr. K. V. KAVOURIDIS Vice President EURACOAL PPC Managing Director, Mining Division PPC	GR		Dipl.-Ing. Bernd TÖNJES GVST President and CEO DSK AG	GER	
Jacques GLORIEUX EURISCOAL Director of EURISCOAL	BEL		Dr.-Ing. Nikolaos GALITIS PPC Director, Human Resources Department	GR	
Hristo OVCHAROV Mini Maritsa Iztok EAD Chairman of the Supervisory Board, Ministry of Energy	BUL		Markus KOSMA MATRA Executive Vice President MATRA	HUN	
Dipl.-Ing. Shterjo SHTEREV Mini Maritsa Iztok EAD Executive Director Mini Maritza Istok AG	BUL		Leszek JARNO ZPGWK Chairman of the Jastrzebie Coal Mining Company	POL	
Dr. Renata EISENVORTOVÁ ZSDNP Foreign Relations, Appian Group a. S.	CZR		Dr. Jacek LIBICKI PPWB President of Poltegor Engineering Ltd	POL	
Dipl. Ing. Zdenek BUCKO ZSDNP	CZR		Piotr RYKALA ZPGWK Chairman of the Board	POL	
José GONZALEZ CARBUNION General Director of CARBUNION	ESP		Michal SOBEL ZPGWK Deputy Chairman of Weglokoks	POL	
Efrén CIREZ SUAREZ CARBUNION Chairman of the Board	ESP		Stanislaw ZUK Kopalnia Wegla Brunatnego "Turow" President	POL	
Jean-Jacques BESSON CdF General Secretary	FRA		Toni Mihail GREBLA PATROMIN General Director	ROM	
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Prof. Dr.-Ing. Kurt HÄGE DEBRIV Executive Vice President Vattenfall Europe AG	GER		David BREWER COALPRO Director General COALPRO	UK	
Dipl. Ing. Matthias HARTUNG DEBRIV Executive Vice President RWE POWER AG	GER		Brian J. ROSTRON H. J. BANKS & COMPANY Ltd.	UK	
Dr.-Ing. George MILOJCIC DEBRIV Chief Executive DEBRIV	GER		M. CERGIC Director General RMU Banovice	BZH	
Dipl.-Volksw. Wolfgang REICHEL GVSt Chief Executive GVSt	GER		Frantisek VERBICH Director Hornonitrianske Bane Prievidza a.s.	SK	

Statistics

Trade with Hard Coal in 2004 (1,000 t)											
Exports from	**Poland**	**USA**	**Canada**	**Colombia**	**South Africa**	**Australia**	**Indonesia**	**China**	**Russia**	**Others**	**World**
Imports to											
EU-25	**17,424**	**12,043**	**6,212**	**25,606**	**52,556**	**27,218**	**11,911**	**1,520**	**32,000**	**23,970**	**210,460**
Austria	–	–	–	–	–	–	–	–	–	3,900	3,900
Belgium	400	1,700	400	134	3,100	2,600	–	127	900	439	9,800
Czech Republic	1,227	–	–	–	–	–	–	–	–	–	1,227
France	1,100	2,000	388	3,400	8,760	5,600	–	240	–	–	21,488
Germany	7,911	1,540	2,123	4,719	9,876	4,357	814	347	6,200	943	38,830
Greece	–	–	–	–	–	–	–	136	–	664	800
Hungary	183	–	–	–	–	–	–	–	–	417	600
Italy	94	1,908	813	3,100	7,000	3,800	5,200	185	1,900	–	24,000
Netherlands	191	1,622	1,139	3,765	1,743	3,622	1,105	313	–	–	13,500
Poland	–	–	–	–	–	–	–	–	2,300	–	2,300
Romania	–	256	–	–	–	45	–	–	2,500	99	2,900
Sweden	327	570	–	184	–	1,323	–	–	–	596	3,000
Slovak Republic	1,147	–	–	–	–	–	–	–	800	5,053	7,000
Slovenia	–	–	–	782	–	–	622	–	–	–	1,404
Spain	134	1,380	113	1,290	9,700	3,321	2,776	–	3,130	2,656	24,500
Turkey	–	1,179	–	–	–	758	–	–	6,500	563	9,000
UK	1,365	1,793	1,064	2,853	10,210	5,477	1,132	172	9,820	2,224	36,110

Source: EURACOAL member states, Verein der Kohlenimporteure

Power Generating Structure of Selected European Countries in 2004 (estimates)								
	Lignite	**Hard Coal**	**Total Coal**	**Oil**	**Natural Gas**	**Nuclear Energy**	**Others**	**Total Power Generation**
			in percentage					TWh
EU-25	**10.6**	**22.1**	**32.7**	**5.4**	**18.4**	**31.2**	**12.3**	**3,005**
Austria	3.0	10.5	**13.5**	3.0	19.0	–	64.0	**59.9**
Belgium	–	10.7	**10.7**	1.2	26.5	55.1	6.0	**81.5**
Bosnia	47.0	–	**47.0**	1.0	–	–	52.0	**10.0**
Bulgaria	35.8	9.6	**45.4**	1.9	4.2	37.5	10.9	**41.6**
Czech Republic	63.5	4.0	**67.5**	0.4	6.5	24.5	1.0	**84.3**
France	–	4.0	**4.0**	1.0	5.5	77.5	12.0	**547.6**
Germany	26.1	22.7	**48.8**	1.6	10.2	27.5	11.8	**606.5**
Greece	59.2	0.1	**59.3**	15.9	14.6	–	10.2	**54.9**
Hungary	24.7	0.6	**25.3**	3.8	33.8	36.0	1.0	**33.2**
Italy	–	17.0	**17.0**	26.5	40.0	–	16.5	**276.4**
Netherlands	–	24.0	**24.0**	4.0	58.0	5.0	9.0	**100.0**
Poland	33.6	60.6	**94.2**	1.6	1.6	–	2.7	**156.1**
Romania	33.5	7.5	**41.0**	6.0	19.5	8.5	25.0	**57.0**
Sweden	0.0	1.0	**1.0**	2.6	0.4	45.7	50.3	**148.0**
Serbia	68.7	–	**68.7**	0.7	1.6	–	29.0	**35.1**
Slovak Republic	6.7	15.1	**21.8**	2.3	7.7	50.0	18.2	**31.2**
Slovenia	25.6	–	**25.6**	0.5	3.0	37.0	33.9	**16.0**
Spain	2.2	25.9	**28.1**	7.0	12.0	20.0	33.0	**280.4**
Turkey	15.0	7.6	**22.6**	6.1	39.2	–	32.2	**149.6**
UK	–	32.7	**32.7**	3.5	41.4	19.1	3.2	**386.5**

Source: Verein der Kohlenimporteure, Jahresbericht 2004; EUROSTAT, EURACOAL member states

Energy Data EU-25 in 2004						
	Unit	EU-25	Belgium	Czech Republic	France	Germany
1. General data						
Population	millions	456.9	10.4	10.2	62.2	82.5
GDP (purchas. Power parity)	bn €	11,122.7	267.5	75.7	1,557.2	2,128.2
GDP/Capita	€	2,434.4	2,572.1	740.7	2,503.5	2,579.6
PEC/Capita	J	158.2	230.8	189.6	186.6	175.0
PEC/GDP	kg tce/€	0.2	0.3	0.8	0.2	0.2
Power Consumption	TWh	2,953.2	83.8	68.6	480.0	600.0
Power Consumption/Capita	kWh/a	6,463.6	8,057.7	6,712.3	7,717.0	7,272.7
Power Consumption/GDP	kWh/€	0.3	0.3	0.9	0.3	0.3
CO_2 Emissions/Capita	t	7.4	12.2	12.0	6.5	10.5
2. Primary Energy Consumption (PEC)						
Total	PJ	72,346.9	2,400.3	1,937.3	11,606.0	14,437.1
Hard Coal	PJ	10,257.8	266.7	249.1	551.0	1,949.0
Lignite	PJ	3,414.4	0.0	627.2	0.0	1,650.0
Oil	PJ	26,230.7	888.9	326.5	3,697.2	5,045.4
Natural Gas	PJ	16,705.6	434.6	259.1	1.414.1	2,345.2
Nuclear Energy	PJ	10,550.9	825.0	492.7	6,330.6	3,680.2
Hydro and others	PJ	5,187.5	14.9	17.3	386.9	232.7
3. Power Generation						
Hard Coal	TWh	664.5	8.7	57.3*	22	137.7
Lignite	TWh	265.5	–	*	–	158.3
Oil/ Natural Gas	TWh	713.3	19.9	0.5	28.3	63.1
Nuclear Energy	TWh	936.6	47.4	24.8	441.1	165.3
Hydro and others	TWh	520.5	5.5	1.7	56.2	82.1
Generation, total	TWh	3,005	81.5	84.3	547.6	606.5
Net Power Imports	TWh	1.5	7.8	-15.7	62	-6.5
Gross Power Consumption	TWh	2,953.2	83.8	68.6	480	600
4. Power Plant Capacity						
Hard Coal	MW	231,000	1,900	10,300*	2.370	30,500
Lignite	MW	40,000	–	*	–	22,100
Nuclear Energy	MW	133,000	5,728	3.472	63.473	20,643
Total	MW	690,000	15,700	17,367	106,000	112,800
5. Emissions						
SO_2	mill. t	6.2	0.2	0.2	0.6	0.6
NOx	mill. t	10.0	0.3	0.3	1.4	1.5
Six Kyoto Gases	mill. t	4,178.6	152.0	144.2	564.4	1,023.9
CO_2, total	mill. t	3,382.3	126.6	123.0	406.0	864.1
Energy Production/ Conversion	mill. t	1,217.6	34.2	70.1	65.0	362.9
Industry	mill. t	608.8	38.0	27.1	93.4	146.9
Transport	mill. t	879.4	26.6	13.5	150.2	181.5
Households & small-sized business	mill. t	676.5	27.9	12.3	97.4	172.8

* Accumulated value for hard coal and lignite
Source: Verein der Kohlenimporteure; EUROSTAT, EURELECTRIC, IEA Statistics, estimates

Greece	Hungary	Italy	Netherlands	Poland	Sweden	Spain	UK
11.1	10.1	57.7	16.3	38.2	9.0	43.2	59.8
153.0	73.2	1,300.9	453.8	185.2	267.3	743.0	1,589.5
1,378.4	724.8	2,254.6	2,784.1	484.8	2,970.0	1,719.9	2,658.0
115.9	101.6	132.1	205.5	90.5	234.5	134.0	173.3
0.2	0.4	0.2	0.2	0.5	0.2	0.2	0.2
57.0	40.1	322.0	115.0	145.3	148.0	261.5	407.5
5,135.1	3,970.3	5,580.6	7,055.2	3,803.7	16,444.4	6,053.2	6,814.4
0.4	0.5	0.2	0.3	0.8	0.6	0.4	0.3
9.5	5.7	8.1	10.8	N.A.	6.1	7.5	9.0
1,286.6	1,025.8	7,623.0	3,349.9	3,458.3	2,110.2	5,788.3	10,360.4
20.5	55.7	586.2	301.9	1,834.7	87.9	1,099.0*	1,644.2
372.2	105.5	–	–	515.8	–	*	–
598.2	233.3	2,786.6	1,056.0	738.3	558.9	2,416.4	3,046.3
17.6	301.3	1,622.5	955.7	335.6	21.1	593.2	2,133.3
0.0	348.5	–	1,046.5	–	1,651.9	2,928.5	3,562.4
278.1	18.5	2,627.7	10.2	33.9	209.6	149.8	25.8
–	0.2	47.1	24	94.5	1.5	72.7	125.9
32.5	8.2	–	–	52.5	–	6	–
16.9	13.5	192.6	59.7	5.2	4.3	64.2	151.2
–	11	–	4	–	65.4	61.9	88.9
5.5	0.3	36.7	12.3	3.9	76.8	75.6	19.6
54.9	33.2	276.4	100	156.1	148	280.4	386.5
2.8	6.9	46.4	15	-7.5	–	-3	7.3
57	40.1	322	115	145.3	148	261.5	407.5
–	190	5,700	4,100	20,700	800	9,500	28,000
5,200	1.410	–	–	9.300	–	1,950	–
–	1.755	–	452	–	9,429	7,584	11,852
12,800	8,600	60,100	20,000	35,500	33,361	51,300	78,500
0.5	0.4	0.7	0.1	N.A.	0.1	2.0	1.0
0.3	0.2	1.3	0.4	N.A.	0.2	1.9	1.6
137.2	79.3	561.5	215.2	N.A.	71.0	408.8	641.9
105.5	57.2	469.0	176.6	N.A.	54.8	325.4	537.4
55.9	24.6	168.8	67.1	N.A.	9.9	123.7	215.0
15.8	9.7	98.5	45.9	N.A.	12.6	71.6	75.2
23.2	9.2	126.6	31.8	N.A.	23.6	104.1	134.4
10.6	13.7	75.0	31.8	N.A.	8.8	26.0	112.9

Glossary

Mtce Million tonnes of coal equivalent (1 Mtce = 29,308 petajoules).

Primary energy consumption PEC refers to the direct use at source, or supply to users without transformation, of crude energy, that is, energy that has not been subjected to any conversion or transformation process.

Reserves Portion of known coal reserves that can be profitably mined and marked with today's mining techniques.

Resources Concentration of identified and/or undiscovered coal in such forms that economic extraction is not possible.

Coal Types and Peat					Total Water Content (%)	Energy Content af* (kJ/kg)	Volatiles maf** (%)	Vitrinite Reflection in oil (%)
UN-ECE	USA (ASTM)	Germany (DIN)						
Peat	Peat	Torf						
					75	6,700		
Ortho-Lignite	Lignite	WEICHBRAUNKOHLE						
					35	16,500		0.3
Meta-Lignite		Mattbraunkohle		HARTKOHLE				
	Sub-bituminous Coal				25	19,000		0.45
Subbitum. Coal		Glanzbraunkohle						
					10	25,000	45	0.65
Bituminous Coal	High Volatile Bituminous Coal	Flammkohle	Steinkohle					
							40	0.75
		Gasflammkohle						
							35	1.0
		Gaskohle				36,000		
	Medium Vol. Bitumin. Coal						28	1.2
		Fettkohle			Kokskohle			
							19	1.6
	Low Vol. Bitumin. Coal	Eßkohle						
							14	1.9
Anthracite	Semi-Anthracite	Magerkohle						
					3	36,000	10	2.2
	Anthracite	Anthrazit						

af * = ash-free maf ** =moisture ash-free

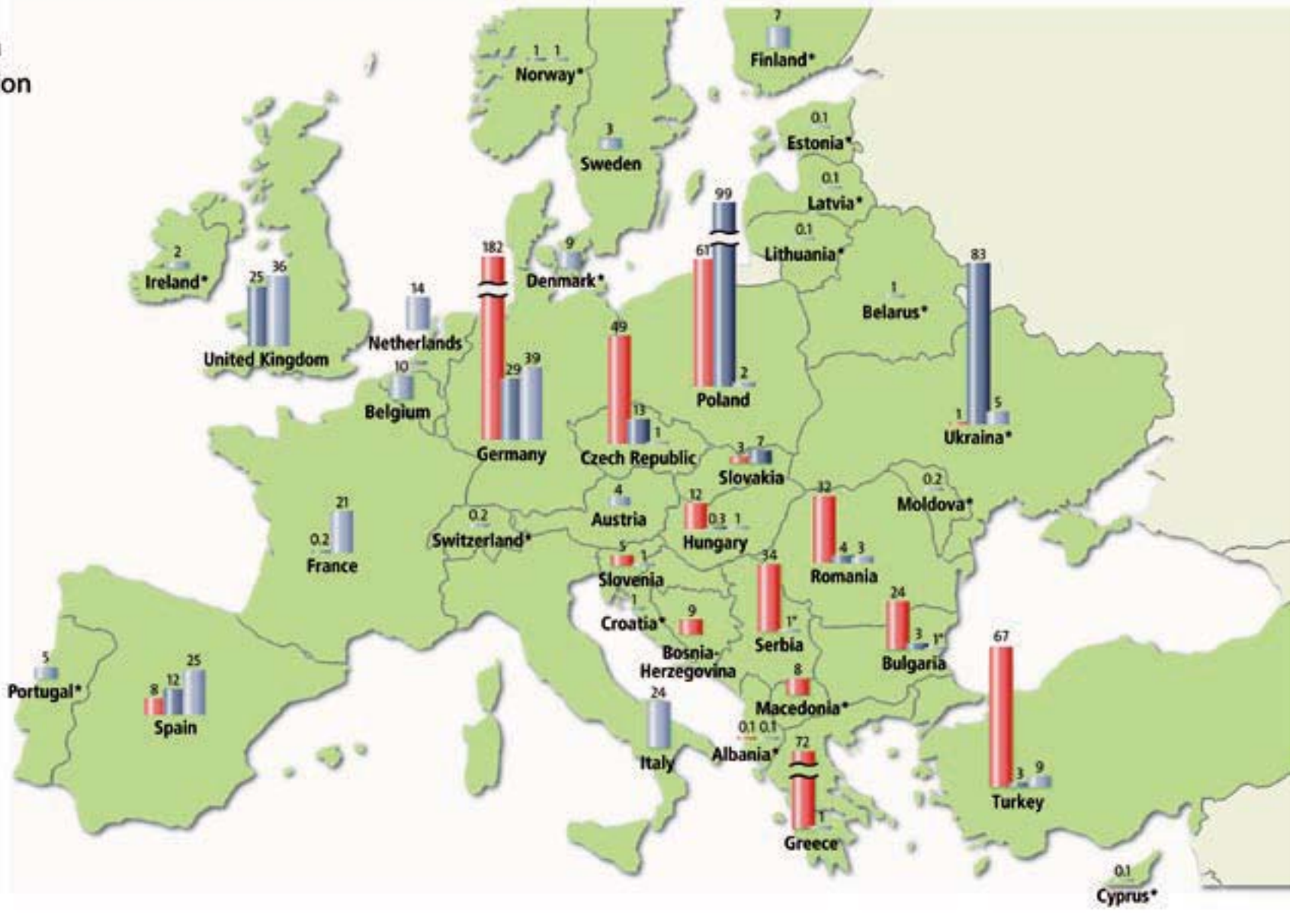
UN-ECE: Ortho-Lignite up to 15,000 kJ/kg, Meta-Lignite up to 20,000 kJ/kg, Subbituminous Coal up to 24,000 kJ/kg, Bituminous Coal up to 2 % average Vitrinite Reflection
USA: Lignite up to 19,300 kJ/kg

Source: BGR

Coal in Europe

Lignite production, hard coal production and imports in Mt in 2004

- Lignite production
- Hard coal production
- Hard coal imports



*2002/2003