EURACOAL

European Association
for Coal and Lignite
AISBL

Coal industry across Europe

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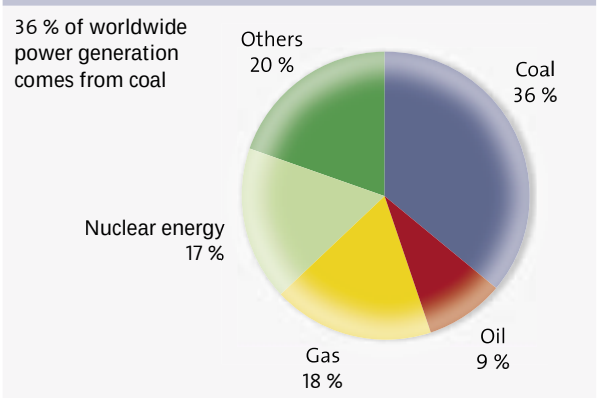
Contents

Europe and the Coal Industry

Coal as an energy source - hard coal and lignite - was one of the factors that shaped Europe's economic and political development in the nineteenth and twentieth centuries. Nationstates and industrial regions owe much of their economic success to this fuel. Will this continue to be true of the 21st century?

Against a background of debate on climate change and the impact of CO2, there are now growing calls for a "decarbonisation" of the world economy. Europe should be taking the lead here, it is said by backing a "progressive" energy supply without using coal - or even nuclear power. However, such demands are neither realistic nor reasonable.

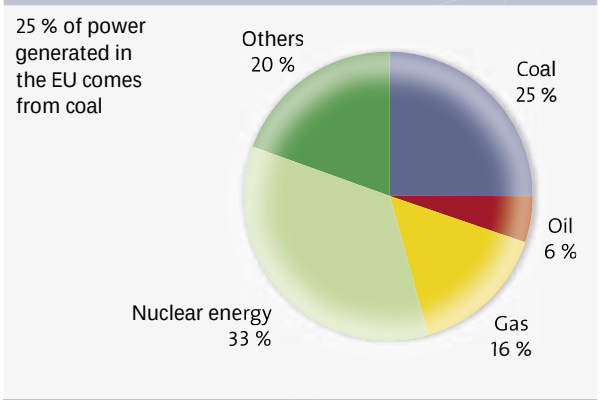
Coal in global power generation



An energy mix without coal is unimaginable even in today's Community of Fifteen. Coal accounts for some 25 % of the EU's electricity supplies. It is indispensable for steel production and other energy-intensive industries. Being the only significant indigenous energy source, coal also guarantees a certain degree of independence in energy policy and is therefore needed for the security of energy supply. The production and consumption of coal also represent added value and provides employment in many parts of the community.

Coal's importance in Europe is in fact set to grow with EU enlargement. In many of the accession countries, hard coal and lignite play a key role in the energy supply sector. Sufficient quantities of coal are available on the world markets and the fuel can be safely shipped and stored without any problems. This is what makes imported coal an important energy source and an economic option for the EU. On a global scale, too, coal remains indispensable. More people need more energy and - for a long time to come - this will primarily mean fossil-based energy. It is not "phasing-out" that we need, but rather "more intelligent utilisation". New materials and improved technical processes mean higher efficiency levels from more advanced power plants. This clearly has economic advantages, but brings ecological benefits as well.

Coal in EU's power generation



We can still go some way down this road. If coal-fired power plants worldwide were refurbished to meet today's European standards, this would save half the CO2 currently being emitted in Europe. But Europe too has an enormous potential for increased efficiency that could be developed in a cost-effective manner. The construction of new and highly efficient power stations is a comparatively inexpensive way to reduce CO2 emissions. Depending on technological and economic developments, we may at some point in the future be in a position whereby we can avoid CO2 emissions altogether.

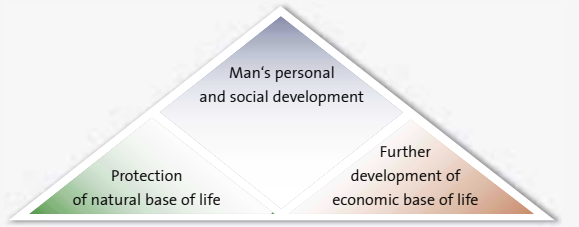
This is where coal's future lies, and it is here that we find opportunities for Europe with its highly developed coal technology. Research and development, innovation and cooperation - these are the key concepts in a European perspective for hard coal and lignite in the 21st century. This is what EURACOAL is working towards.

Dr.-Ing. Dietrich Böcker
President of EURACOAL

Coal and Sustainability

The European coal industry declares its support for pursuing the three sustainability targets social cohesion, economic development and environmental protection with equal intensity. In this context, security of energy supply is an integral part of economic and social development. But secure, cost-effective and environmentally friendly energy supply, to which coal makes a major contribution, are also a crucial prerequisite for economic and social development.

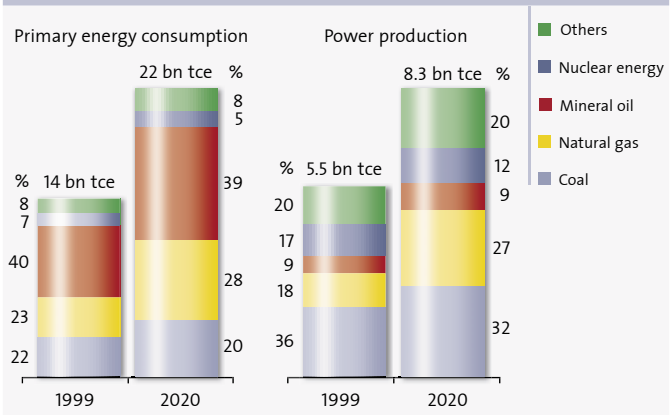
The targets of sustainable development



Coal has a well-established position in the international energy mix

The global energy mix is based on a 25 % input each from coal and natural gas and on a 40 % contribution from oil. A fundamental change of this energy mix is not foreseeable in the forthcoming decades because of resource and competition reasons. The contribution from renewables will not be sufficient to replace fossil energy sources in the near future. As world energy consumption grows, coal consumption is expected to increase dramatically.

Coal has a well-established position in the international energy mix

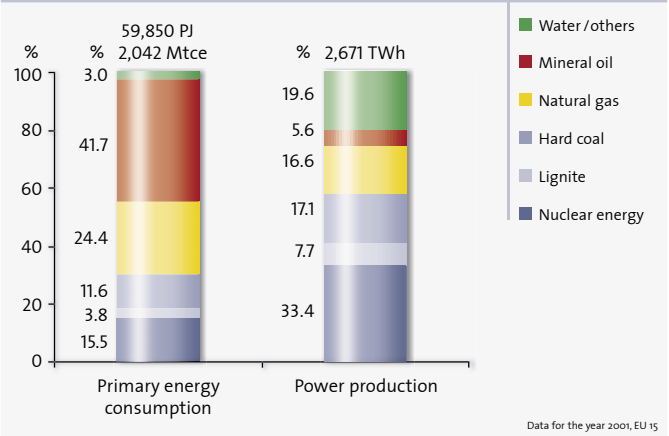


Source: DOE/EIA, International Energy Outlook 2002, Washington DC, 2002

Coal covers some 25 % of the EU's power production

Coal is especially significant for the power generating sector. Some 36 % of global power production, and almost 25 % of the EU´s power output are based on coal. This proportion is even higher in some EU accession countries, such as Poland and the Czech Republic, as well as in Hungary and in some south-east European countries. Here the availability of coal reduces the region's dependence on natural gas imports.

Primary energy consumption and power production in the European Union

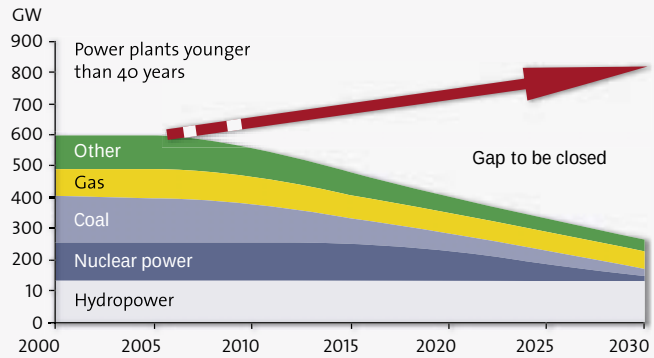


Data for the year 2001, EU 15

Inhaltsverzeichnis
Erste Seite
Startseite

Coal will maintain its market for the foreseeable future

Major investments needed for the EU power industry after 2010
Power generating capacity in EU-15



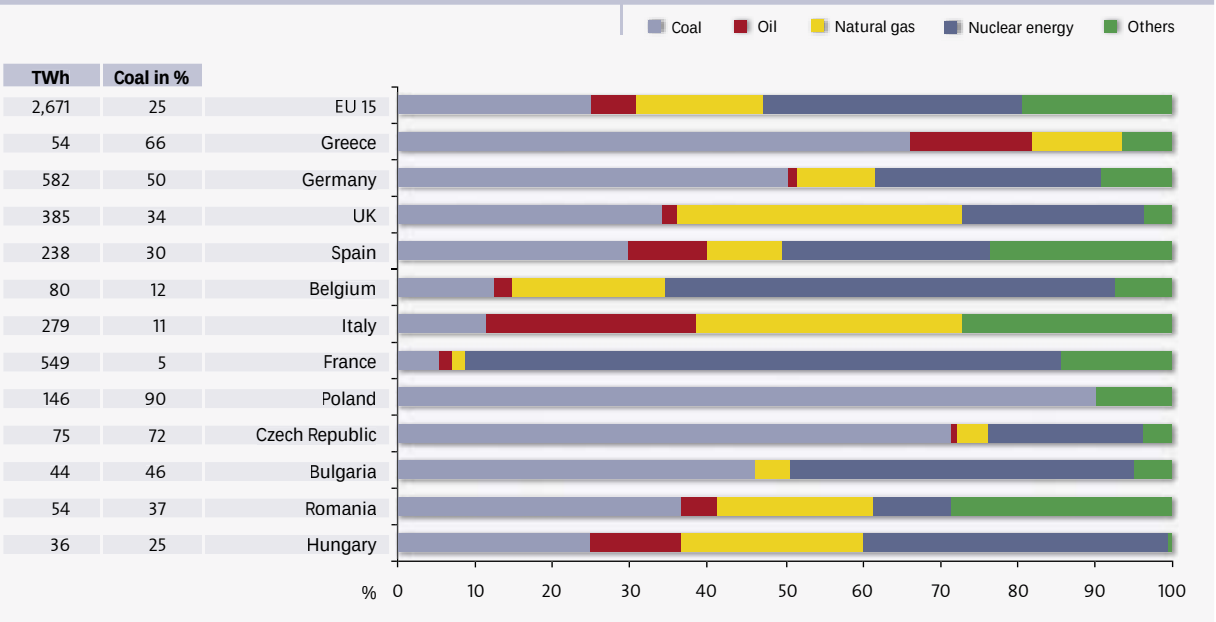
Source: VGB Power Tech

In the medium term, i.e. between 2010 and 2020, many existing power plants will reach the end of their operating lives and will then have to be replaced. In EU-15 alone, this concerns some 200,000 MW of generation capacity. Against the background of the development in electricity demand, and in view of the relatively few technological risks involved, further decisions on the construction of new facilities - which will be based on known and optimised technologies, that promise even greater levels of efficiency - can be expected within the framework of the existing market economy. 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 presupposes that there will be no political discrimination against solid fuel.

Coal is an indispensable part of the energy mix in many countries

Coal and nuclear energy together form a secure and well-balanced partnership for the power generating structure in the EU, which could well be put under the heading Energy mix - a risk containment strategy. The individual Member States clearly have quite different energy supply structures, with coal being indispensable for many countries in the EU.

Power generating structure of selected European countries in 2001



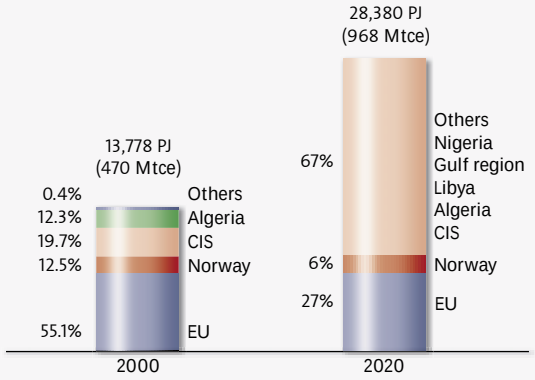
Source: EUROSTAT, EURACOAL Members

Switching from coal (and nuclear power) to gas makes power production politically vulnerable and expensive in the long run

The “energy mix” formula will prevent the power generator´s huge demand for primary energy from being directed towards the oil and gas markets, which in any case are finding it increasingly difficult to satisfy such requirements.

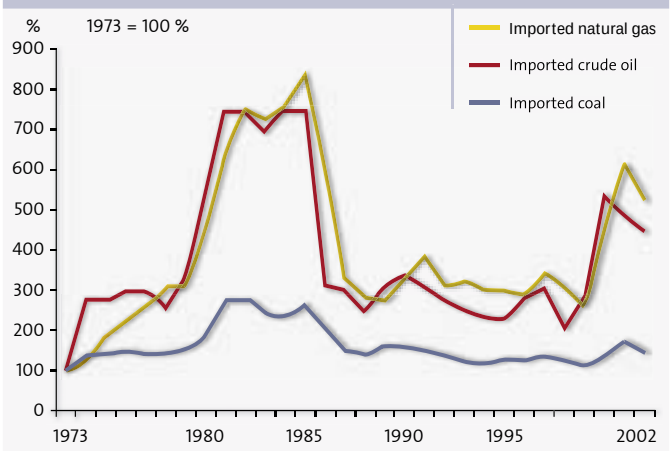
Coal and nuclear energy are both necessary to establish a market balance with natural gas. Although coal conversion (into electricity) is a capital-intensive process, subsequent operating costs are low. Oil and gas-based power generation does indeed require lower investment costs, but the high and fluctuating fuel prices do bring considerable risks. Competitive and stable coal prices free the power generators from the price fluctuations.

Potential gas demand and sources of the EU
as a result of replacing coal and nuclear energy by natural gas as a fuel for electricity generation



Source: EUROSTAT , DEBRIV

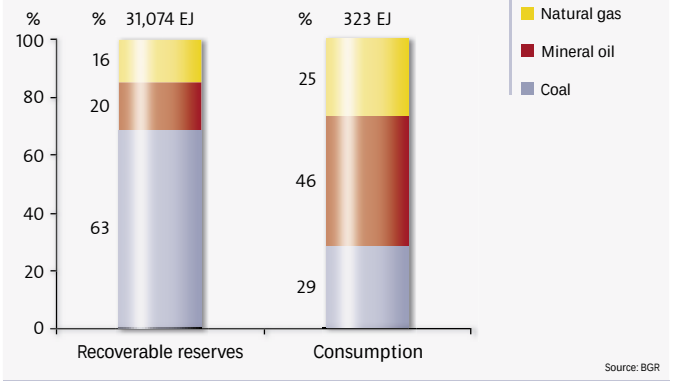
Price fluctuations threaten economic stability



Source: Internal calculations with prices free frontier of the Federal Republic of Germany
Data: Federal Statistical Office and Federal Office for Foreign Trade

Fuel switch from coal and nuclear energy to gas in the power sector will shift energy consumption towards scarce resources and strengthen the cartels of the oil and gas producing countries.

World reserves and consumption of fossil energy sources



Source: BGR

Coal production in Europe 2002

	Hard coal	Lignite	Total
	Mill. t		
Austria	-	1.4	1.4
France	1.5	0.1	1.6
Germany	29.2	181.8	211
Greece	-	70.8	70.8
Spain	13.8	8.6	22.4
United Kingdom	30.0	-	30.0
Total EU-15	**74.5**	**262.7**	**337.2**
Bulgaria	3.3	23.1	26.4
Bosnia-Herzegovina	-	7.9	7.9
Czech Republic	14.5	48.9	63.4
Hungary	0.6	13.4	14.0
Macedonia	-	8.6	8.6
Poland	102.1	58.2	160.3
Romania	3.0	27.4	30.4
Serbia	-	32.0	32.0
Slovenia	-	4.7	4.7
Slovakia	-	3.4	3.4
Turkey	2.2	59.0	61.2
Total Europe (incl. Turkey)	**200.2**	**549.3**	**749.5**

Source: EUROSTAT, EURACOAL Members, IEA

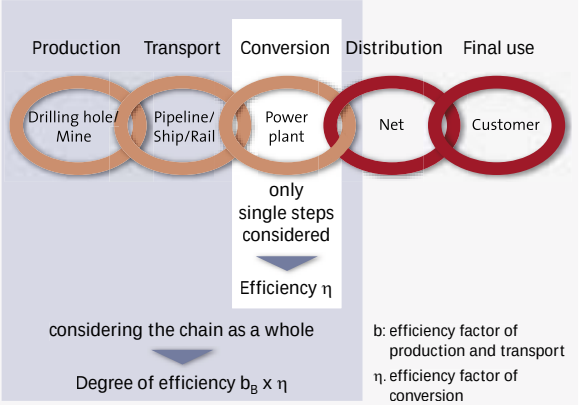
The EU's coal deposits ensure security and predictability of energy supplies

The availability of coal resources in Europe and around the world, combined with high European production levels, at about 340 mill. tonnes 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.

Switching from coal to gas makes no environmental sense

Coal has advantages that are inherent to the product itself. It can be easily stored and there are no real transport risks. Coal is therefore the ideal buffer for supply risks as it can be stockpiled in the required quantities. Many of the debates on global climate only focus on CO2 and the location of power plants. However, accurately assessing the environmental compatibility and acceptability of individual energy sources means examining the entire process chain from production and transport through to fuel conversion.

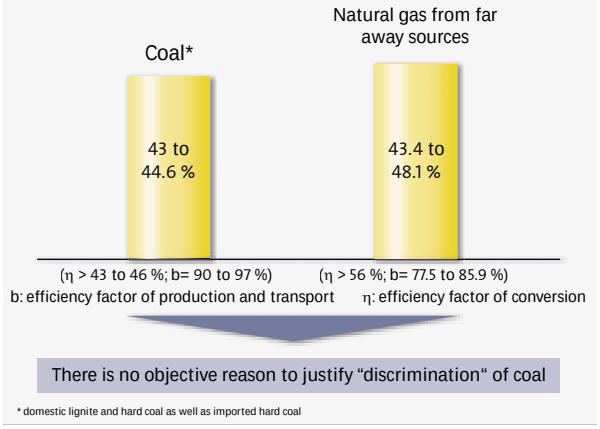
The environmental impact must be considered in its entirety



- Each step in this process requires an input of energy and causes losses.
- ➤ An assessment of the "efficiency at power plant level" distorts the picture as only one element of the chain is taken into account.
- ➤ In order to look at the process in its entirety, the energy input and losses in upstream process steps will have to be taken into consideration.

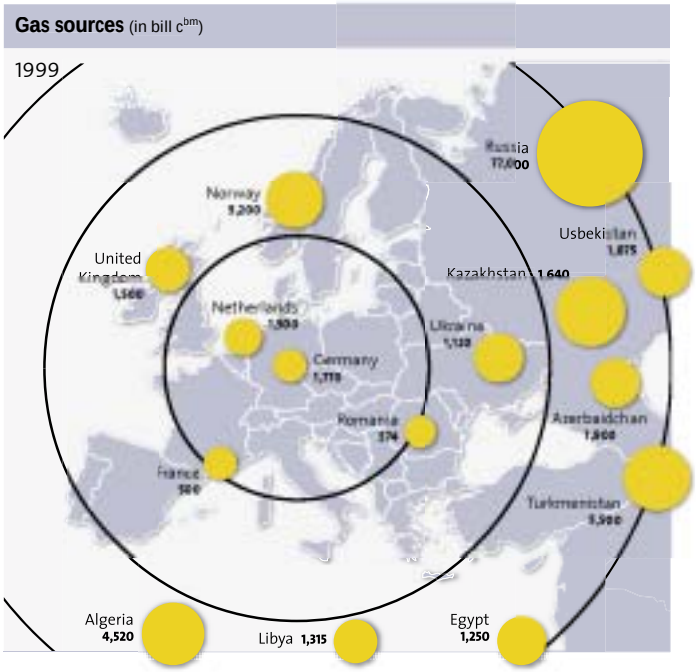
Defining a “dedicated efficiency rating” for power generating stations is one way of making a balanced assessment of the climate effects brought about by using different primary energies. This factor takes account of all process steps and therefore also includes losses incurred during extraction and shipment, as well as the effect of methane on the climate. In fact a study of the environmental impact in its entirety shows that the different fossil fuels used for power generation have a fairly similar effect on the earth’s climate. All our efforts must therefore be directed at increasing efficiency levels, not at changing our choice of fuels.

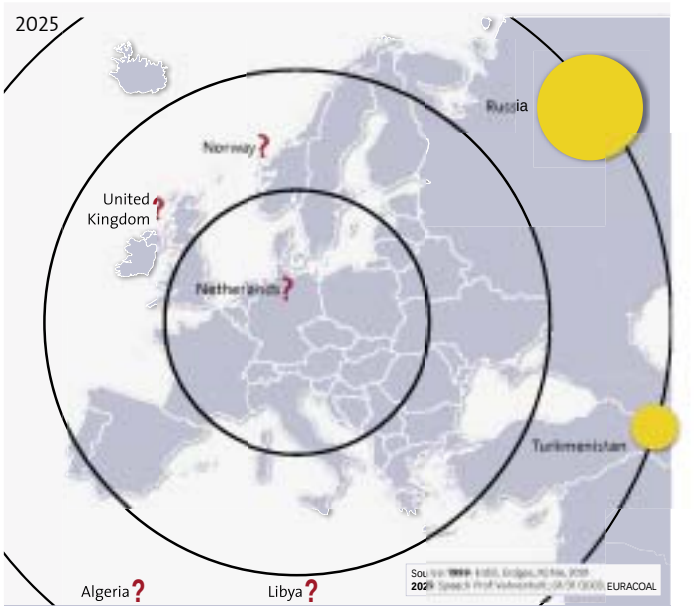
Minor difference in supply efficiency between advanced power plants



* domestic lignite and hard coal as well as imported hard coal

Gas sources (in bill c^{bm})

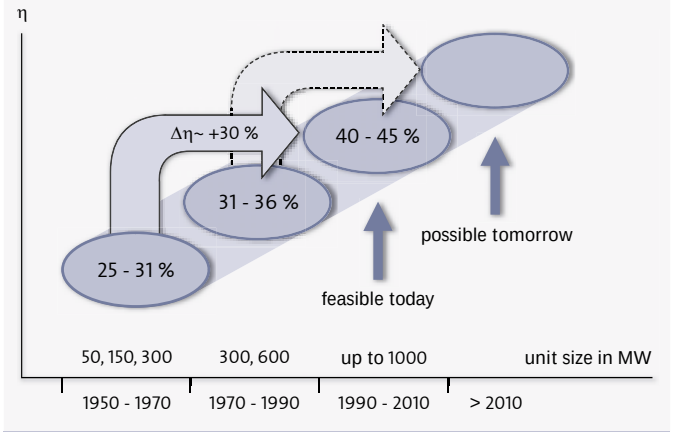




A further boost to efficiency by using coal for the generation of power: The coal industry supports climate protection

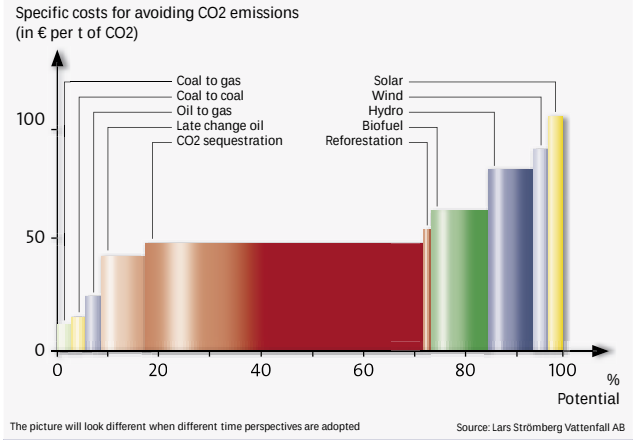
The coal industry supports preventive climate protection. Power-generating efficiency is undergoing continuous improvement through major investment in building new facilities and in upgrading existing plants, while emissions are also being reduced. The construction of new coal-fired power plants is a cost-efficient way of reducing CO2 emissions.

Development in the efficiency of coal-fired power plants



Clean coal technology, combined with continuous increases in productivity, will in the long run give the EU access to a cost-efficient supply of energy. While there is no disputing that modern technology requires additional up-front investment, this will be more than offset by the long-term competitive advantages, i.e. lower manpower requirements, favourable maintenance costs and decreasing fuel consumption. The reduced fuel usage of modern power installations is also vital for the careful management of our increasingly scarce energy resources.

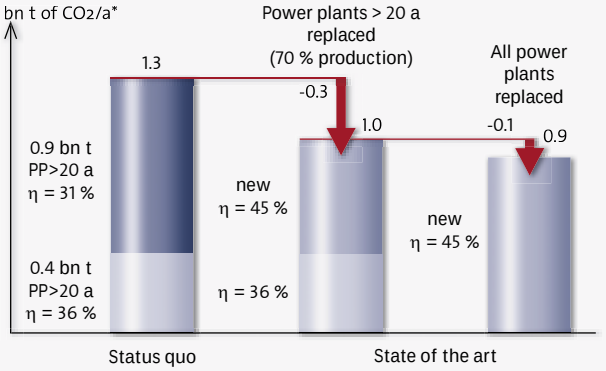
Cost and potential of options to reduce CO2 emissions
Principal example



The figure is illustrating what options are available, their estimated potential as a percentage of all CO2 emitted within the EU from the energy supply sector, and a cost estimate. Cheapest but with a limited potential is probably to change from coal to gas firing in some plants. Exchange or upgrading of coal fired plants comes next and oil to gas third. Of course the worst plants shall be exchanged first. The first and worst coal fired plant exchanged to a newer and better will be less expensive, than to change a newer or better. Therefore an area representing exchange of a bit better plants at a later stage is included named “late change coal”. The total potential for the exchange of plants is estimated at less than 15 % of the total emission.

The cost for and potential of the renewables are the expensive alternatives. This leads to the conclusion that initially we have no other options than exchange of old bad plants into better, and the relatively expensive renewable sources wind, hydro, solar and biofuels. The large potential lies in capture and sequestration of CO2. In due time the costs for the alternatives will go down, but then also cost for CO2 capture and storage can be lower. It can also in the case of coal be recognised as a sustainable solution.

Maximum CO2 reduction
by building new coal-fuelled power plants in Europe



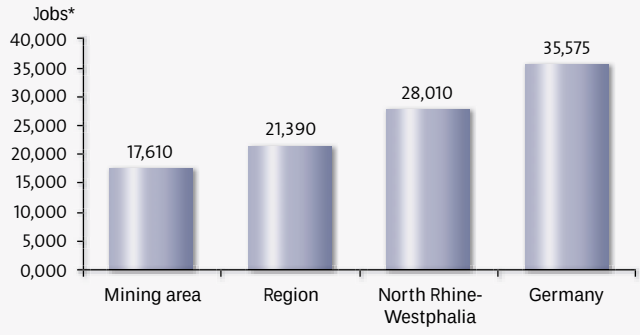
* CO2 emissions of European coal-fired power plants in bn t/a (assuming 1,200 TWh/a)

Modern coal-fired power stations are capable of achieving efficiency levels of more than 40 %. This is about a 30 % improvement on plants built in the 1950s and 1960s, which are now in need of replacement. What is more, modern installations emit less dust, sulphur and NOx and their CO2 emissions are considerably lower. A modern 1,000-MW plant operating under base-load conditions means a 2.5 - 3 mill. tonnes saving in CO2 emissions from the word go.

Coal secures employment in Europe

The coal and power generating industries safeguard some 350,000 jobs in the EU. The production value of generating power from coal in the enlarged EU will amount to almost € 30bn. The production facilities of the coal power generating industries are capital-intensive operations that promise huge investments in the employment sector. The labour market therefore has an enormous significance as a value added factor that extends far beyond the actual mining regions. Coal-industry suppliers are mainly medium-sized companies and the contracts between these firms and the mining industry are often based on long-term agreements. Sectors benefiting most from coal mining include the building industry, the distributive trade and other services. A considerable proportion of these services is rendered by capital-goods and raw-materials suppliers. In the new applicant countries coal mining makes a vital contribution to the labour market and to the economic strength of the regions concerned.

Coal as an employment factor
Significance of the coal industry to the labour market
Example: Rhenish lignite mining area



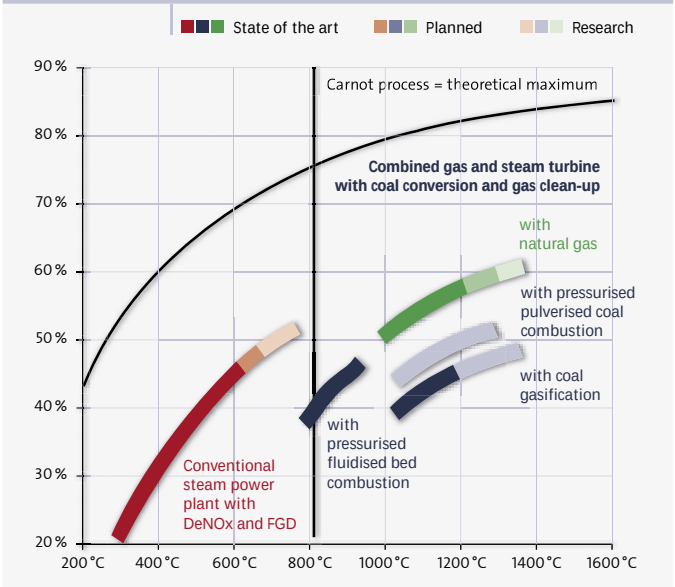
* Jobs in lignite mining and lignite-derived power generation, including direct, indirect and income-induced employment effects
Source: Study by FH Niederrhein (Niederrhein University of Applied Sciences) and RWI (Rhenish-Westphalian Institute of Economic Research), Essen, for RWE Rheinbraun AG, April 2000

Clean Coal Technologies for Coal Based Power Generation

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 available materials. With the Carnot cycle and also in the case of the power plant process, efficiency is boosted by having the highest possible upper process temperature and the lowest possible lower process temperature. In the conventional power plant process, the process temperature is governed by the primary steam condition, while in the case of the gas turbine process, the upper limit temperature is determined by the gas-turbine blade temperature. The lower limit temperature of power plant processes depends on the cooling water temperature, a parameter that can only be influenced to a limited extent. Some of the more recent hard coal-fired power plants can achieve efficiency levels of around 45 %.

Efficiency of different power plant processes
Principal example



Clean coal technologies for power generation

Driven by progress in the field of advanced clean coal technologies, conventional installations with pulverised fuel (PF)-fired boilers, the system used by the majority of boilers around the world, have seen progressive improvements in efficiency levels in the form of higher plant availability, generating costs, competitiveness and lower emission levels.

Efficiency primarily depends on the characteristics of the thermodynamic steam cycle, a process that has undergone considerable changes over the years. Steam pressure and temperature have steadily increased as more advanced materials have become available. There is still scope for further progress in this area, mainly by taking advantage of new materials in order to accommodate even higher steam conditions and thus to further improve the characteristics of the process cycle.

A wide range of clean coal technologies is currently being discussed. This includes coal gasification and liquefaction. While these processes have no real economic significance at present, they do constitute an option for the future in the event of a steep rise in oil and gas prices. They would also provide a safeguard against any excessive increase in the price of oil or transport fuels.

Conventional clean coal processes based on supercritical PF boilers are capable of achieving an efficiency level of about 45 %, depending on the 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 German) has an operating efficiency of over 43 %. One such plant went on stream in August 2002 after a construction period of about four years. The next development phase will include optional lignite pre-drying. An installation using this system is expected to reach an efficiency level of some 47 %.

The fluidised-bed combustion (FBC) technology employs the same steam cycle as the conventional pulverised fuel (PF)-fired boiler. It is simply a different combustion process. This system operates at a lower temperature level, which results in lower emission levels without the need for secondary measures such as catalysts or desulphurisation units, but also benefits from high fuel flexibility. Both stationary and circulating versions of the FBC system are now commercially available.

Pressure elevation can also be used to boost the efficiency of FBC technology. Such a pressurised fluidised-bed combustion (PFBC) system offers the additional advantage of dimensional compactness. There are only a few plants of this type currently in operation around the world. Similar efforts have been made to develop the pressurised pulverised coal combustion (PPCC) process. This system seeks to burn coal in a pressurised environment which can step up net efficiency to above 50 %.

The integrated gasification combined cycle (IGCC) technology is based on the gasification of coal with oxygen (or air) producing 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.

Overall energy efficiency currently stands at about 45 %, based on the lower calorific value of coal, with the potential to reach 51 – 53 % in the foreseeable future. However, IGCC is a complex technology, consisting of the combination of a chemical plant and a power generating equipment. As a result, the investment cost is significantly higher than that for a conventional coal-fired power station.

Clean coal technology provides answers to the problem how to use coal efficiently and in an environmentally compatible manner. In this way, coal can help protect the environment while at the same time ensuring security of energy supply.

Clean coal technologies for power generation

	Subcritical PF	Supercritical PF	FBC	IGCC
Maturity of technology	Completely proven and commercially available.	Substantially proven and commercial plant available.	Substantially proven. Commercial plant available.	Demonstration stage.
Unit capacity in one set	All sizes available (300-1,000 MWe common).	All sizes available.	Three sizes available.	250-300 MWe, currently limited by gas turbine units.
Fuel flexibility	Burns a wide range of internationally traded coals.	Burns a wide range of internationally traded coals.	Burns a wide range of internationally traded and low-grade coal.	Should use a wide range of internationally traded coals.
Thermal efficiency (net) depending on cooling water condition	Limited by steam conditions. Modern designs achieve 40 %.	45 % now possible. Up to 50 - 55 % possible with materials development.	40 % now possible. Improvements likely with further R&D and/or super-critical steam cycle up to 44 %.	43 % now possible. > 50 % possible with advanced gas turbines and further R&D.
Environmental performance Operational flexibility	Good SO_2 and NO_x reduction with FGD and low-NO_x systems fitted. Flexible operation.	Higher efficiency will reduce SO2 and NO_x as well as CO2 emissions. Flexible operation.	Good for SO_2 and NO_x performance and reasonable output due to relatively high efficiency. Solid waste may be difficult to dispose of. Relatively flexible operation.	Could realistically only operate at base load. Flexible operation.
Availability	Proven to be excellent.	Proven to be good.	Proven to be good.	Not yet proven.

Coal and Climate

Climate protection

The European coal industry has declared its commitment to pre-emptive climate-protection measures.

A sustainable energy policy has to base itself on a triangle of objectives that gives equal weight to environmental compatibility, economic efficiency and security of energy supply. In this context mankind will continue to be dependent on fossil-based fuels for decades to come. What the world still needs is a rational energy mix capable of exploiting the main advantages of the individual fuels.

Greenhouse gas 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 over the last ten years. 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 global discussion on climate is becoming increasingly confined to a CO2 debate. This is prejudicial to coal, which is associated with a higher specific emission of CO2 than other fossil fuels. However, this turns out to be a somewhat short-sighted analysis when one takes 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 six greenhouse gases on the basis of a life-cycle analysis (e.g. from oil well to point of use). This is important because life-cycle analyses show that the relative impacts of fossil fuels (oil, gas, coal and lignite) all tend to converge, to the extent that switching from one fossil fuel to another only achieves a relatively small reduction in overall greenhouse gas emissions.

In its Third Assessment Report of 2001 the Intergovernmental Panel on Climate Change (IPCC) – which was set up by the World Meteorological Organisation and the United Nations Environment Programme - presents "new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities". This leads the majority of scientists to believe that prompt and precautionary measures are necessary, though there is still a significant minority of them who are sceptical about the link between human activity and climate change.

Whatever the scientific basis, the political reaction has now gathered so much momentum that the economic and social value of fossil fuels, including coal, is rarely recognised. A growing number of policy-makers are seeking to condemn these fuels to history without considering which alternative energy sources might viably replace them.

As a precautionary measure against climate change the IPCC has recommended an 80 % reduction in CO2 emissions by the year 2050, even though there is still great controversy as to whether - after weighing the associated costs and benefits – such a target would be justified in view of current progress in the field of climate research. The work of climate modelling and forecasting as carried out by the IPCC is subject to many uncertainties and we do not as yet know if the expected twofold increase in atmospheric CO2 concentration will mean a modest 1.5°C rise in global temperature (beneficial to developed nations) or a more dramatic 4.5 °C rise, with its attendant economic impact as nations strive to adapt. Moreover, an analysis of long-term climate-substitute indicators fails to provide proof that temperature trends are dependent on atmospheric CO2 concentration. We know little about the influence of solar fluctuations, for example, yet these could have a profound impact on short-term climate cycles. If in the next few years the findings of climate researchers support the thesis that anthropogenic emissions are exerting a sustainable influence on the global climate, then the development of low-CO2 or even zero-CO2 power generation will have to be driven forward on a long-term basis.

CO_2 abatement

The development of renewable energies has shown that, despite all efforts, this source can only make a limited contribution to world energy supply. What is more, with the exception of certain niche markets, renewables-based energy also means high-cost energy. Wind and biomass-based generators, small-sized hydroelectric installations and photovoltaics incur CO2 avoidance costs that are well in excess of € 50/t CO2. Generating electricity with minimum CO2 impact is therefore only realistic in the long term on condition that we succeed in being able to burn fossil fuels, such as coal, without releasing CO2 into the atmosphere. This means, firstly, trapping CO2 at the power generation stage and, secondly, developing safe permanent CO2 storage facilities.

A number of process solutions present themselves as far as coal-fired power stations are concerned. CO2 capture at power plants of the current generation is one possibility, though this is expected to be too expensive and less efficient. There are also two other processes with significant technical and economic potential. One is the IGCC system (Integrated Gasification Combined-Cycle), which is already well advanced. CO2 can be captured from coal-derived gas by means of processes that are well-tested on a commercial scale in the chemical industry. One other option, which has to date only been tested on a laboratory scale, is the combustion with oxygen into CO2 and H2O followed by steam condensation. Compared with present-day power generating stations, installations employing these techniques will see their efficiency levels decrease by some 6 to 8 percentage points - which will mean a more rapid consumption of resources.

The fundamental prerequisite for the introduction of this technology is the capacity for the safe and permanent storage of CO2. Instead of focusing on CO2 capture, we therefore need to put much more development effort into the investigation and testing of safe permanent CO2 storage systems. The solution currently favoured is storage in depleted oil and gas deposits. One option with the greatest potential by far is storage in aquifers. Research has already been launched in Europe, the US and Japan, though environmental concerns also have to be considered.

The development of CO2 capture and sequestration techniques could, in the long term, help achieve the ultimate objective of the zero-CO2 power station. However, because of the amount of research effort required, the facilities for commercial-scale testing will not be made available until 2010 at the earliest. The first commercial-scale plant could then possibly be ready by 2020. From a current perspective the CO2 avoidance costs for such a concept, including sequestration, are estimated at € 60-80/t CO2. It is likely that technological advances will bring these costs down to below € 50/t CO2. Given such a scenario, technology of this kind would outperform most renewables-based power generation systems.

The European mining industry will pursue the development of this long-term vision. In doing so, the industry will focus its effort initially on studying and testing potential power plant concepts and assessing their technical and commercial viability. It also intends to participate in international ventures aimed at developing CO2 capture processes, which are to be funded by the EU. Competent establishments have to be brought on board so that a proper investigation can be made of the possibilities available for permanent CO2 storage in Europe. The coal mining industry will lend its support to these research activities at both national and international level.

Austria

Austria has only limited primary energy sources (except for oil and natural gas), and these mainly consist of small amounts of coal and lignite (30.5 mill. tonnes).

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, and 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 pit from 1827 to 1850 and then became an underground mine; output in 1951 was 172,000 tonnes with total production amounting to 11 mill. tonnes); St. Stefan mine in the Lavanttal valley closed in 1968, while the colliery at Fohnsdorf 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 mill. tonnes. In the Hausruck area, *Wolfsegg-Traunthaler AG*, which has been in operation since 1856, closed the Ampflwang mine in 1995 (output in 1980: 435,000 tonnes). The main consumers are *VOEST-Alpine* steel works in Linz and Donawitz (1.85 mill. tonnes) and various power plants (1.80 mill. tonnes). The Dürnrohr power station in Lower Austria, for example, burns coal imported from Poland (6,000 tonnes a day, or more than one mill. tonnes a year). In 2002 Austria consumed 4.0 mill. tonnes of coal and 1.2 mill. tonnes of lignite.

In western Styria lignite is now only mined at opencast pits operated by *GKB-Bergbau GmbH*. In 2002 the annual output was 1.4 mill. tonnes. 90 % of the fuel is used in a nearby power plant, thus contributing some 3 % to Austria's total power generating capacity.

General Data	**Unit**	**2002**
Population	millions	8.2
GDP	bn USD	226
Prim. energy consumption (PEC) (2001)	Mtce	41.9
Resources Lignite	Mt	30.5
Reserves Lignite	Mt	1.5
Domestic Output		
Lignite	Mt	1.4
Selected Coal Quality Data		
Calorific Value Lignite	kJ/kg	10,000
Ash content Lignite	%	22.5
Water content Lignite	%	36.0
Sulphur content Lignite	%	1.08
Net Imports Hard coal	Mt	4.0
Prim. Energy Consumption		
Total	**Mtce**	**41.9**
Hard coal and lignite	Mtce	4.5
Power Supply		
Generation, total	**TWh**	**60.3**
Hard coal and lignite	TWh	7.95
Net power imports (2000)	TWh	-1.4
Gross power consumption	**TWh**	**54.8**
Power Plant Capacity		
Total	**MW**	**19,109**
Hard coal	MW	1,484
Lignite	MW	525

Source: Euracoal Member, estimated/provisional

Bulgaria

General Data	Unit	2002
Population	millions	7.7
GDP	bn USD	50.6
Prim. energy consumption (PEC)	Mtce	n.a.

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 indigenous energy resources consist mainly of lignite and coal of low calorific value.

Solid fuel plays a significant role as far as the country's energy potential is concerned and it is one of Bulgaria's long-term indigenous energy resources. The solid-fuel reserves at mines currently in production amount to some 3 billion tonnes, 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, while 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 fuel, with MINI MARITSA IZTOK contributing about 90% of this. The country also imports a significant portion of its energy resources from Russian suppliers.

Lignite

Most 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 2002 the total lignite output amounted to 23.2 mill. tonnes, 99.3% of which was produced from opencast mines and 0.7% from deep mining operations, which 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 mill. tonnes. Lignite is also extracted at Kanina Mine, which is a part of Pirin Mine EAD. In 2002 lignite was extracted at seven opencast mines and at one deep mine. 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 tonnes. 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 mill. tonnes. In 2002 *Mini Maritsa Iztok EAD* produced 21,650 mill. tonnes. Lignite extraction and product transport are fully mechanised and high-performance equipment such as multi-bucket excavators are deployed. High-performance spreader-leveller machines are used for overburden tipping. Most of the lignite goes to the Maritsa Iztok 1 – 3 power plants (2,490 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 are Bely Bryag Mine AD, Choukourovo Mine AD and Stanyantsi Mine AD. The total output of these mines in 2002 was about 1.5 mill. tonnes. Most of the lignite has an average calorific value of 6,700 to 7,100 kJ/kg and is supplied to the Bobov Dol power station, some 170 km from the extraction sites. A small quantity is also stockpiled. All three mines use identical techniques for lignite extraction and overburden stripping. The mining and conveying equipment consists of power shovels, belt conveyor installations, rail and road transportation and auxiliary machinery such as bulldozers, front loaders, etc. Beli Bryag Mine has proven reserves and resources of about 23 mill. tonnes, giving the company a lifespan of about 50 years at current production levels of 0.5 mill. tonnes a year.

Choukourovo Mine has proven reserves and resources of some 8 mill. tonnes, which at an output of 0.5 mill. tonnes gives the company an operating life of 16 years.

Stanyantsi Mine has proven reserves and resources amounting to 12 mill. tonnes, which safeguards the company for more than 22 years at the current annual output of 0.5 mill. tonnes.

Zdravets Mine EAD, which operates one deep mine (the Marbas deposits), ceased lignite extraction at the end of 2002 and is currently in the process of liquidation.

Kanina Mine, which is run by Pirin Mine EAD, is an opencast operation working the Gotsedelchev deposits. The mine is located in the south-west of the country and has reserves of some 1.5 mill. tonnes.

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 deposits).

Bobov Dol Mines EAD operates the Bobov Dol coalfield, which is the largest deposit of brown coal in the country. These significant reserves and resources, currently estimated at some 160 mill. tones, will ensure the life of the Bobov Dol coalfield for a period of 50 years, given its annual output of 1.2 mill. tonnes. Mining is carried out at one opencast and two underground mines and most of the extracted product is sent to the Bobov Dol power station while a negligible portion is stockpiled.

Otkrit Vagledobiv Mines EAD – Pernik's two opencast mines extract brown coal from the Pernik coalfield. The company has proven reserves and resources estimated at some 16 mill. tonnes, giving the company an operating life of more than 10 years on the basis of the two mines` annual output of 1.5 mill. tonnes.

Pirin Mine EAD is involved in working the Pirin and Oranovo-Simitly coalfields, which have some 30 mill. tonnes of established brown coal reserves contained in two deep mines and one opencast working. The prepared reserves guarantee operation until 2005 at an output rate of 0.180 mill. tonnes per annum. Thereafter production levels will be reduced to 0.1 mill. tonne per annum until 2010.

Vitren Mine AD carries out opencast mining in the Katrishte deposits, which have proven brown coal reserves and resources of some 0.73 mill. tonnes. It is planned that the output from these mines will be maintained at between 0.15 and 0.18 mill. tonnes per annum until 2007. Most of the coal is sent to the Bobov Dol power station and the remainder is stockpiled.

Cherno More Mine EAD is engaged in opencast and deep mining in the Black Sea coalfield, which has proven brown coal reserves and resources estimated at some 62 mill. tonnes. This gives the company an operating life of more than 35 years on the basis of the current annual output of 0.2 to 0.3 mill. tonnes.

Coal and Energy Data	Unit	2002
Resources		
Hard coal	Mt	441
Lignite and brown coal	Mt	4,034
Reserves		
Hard coal	Mt	5
Lignite and brown coal	Mt	2,107
Domestic Output		
Lignite	Mt	23.2
Total	**Mt**	**26.4**
Selected Coal Quality Data		
Calorific value		
Lignite and brown coal	kJ/kg	6,700 - 15,000
Ash content		
Lignite and brown coal	%	24 - 48
Water content		
Lignite and brown coal	%	23 - 56
Sulphur content		
Lignite and brown coal	%	0.9 - 7
Net Imports		
Hard coal	Mt	n.a.
Prim. Energy Consumption		
Total	**Mtce**	**n.a.**
Hard coal	Mtce	n.a.
Lignite and brown coal	Mtce	5.3
Power Supply		
Generation, total	**TWh**	**42.6**
Hard coal	TWh	3.0
Lignite and brown coal	TWh	12.8
Net power imports	TWh	-5.5
Gross power consumption	**TWh**	**36.3**
Power Plant Capacity		
Total	**MW**	**11,395**
Hard coal	MW	1,475
Lignite and brown coal	MW	3,370

Source: Euracoal Member, estimated/provisional

Czech Republic

General Data	Unit	2002
Population	millions	10.2
GDP	bn USD	155.9
Prim. energy consumption (PEC) (2001)	Mtce	58.08

Coal is the Czech Republic's only significant indigenous energy resource. The country's coal reserves have been estimated at 2 bn tce. Brown coal, which accounts for close on two thirds of these reserves, is mainly extracted in North-Western Bohemia, while hard coal is mined in Northern Moravia. A percentage of this output is exported to Germany, Austria, Hungary and Slovakia (approx. 6 mill. tonnes hard coal and 1.8 mill. tonnes lignite in 2002). Czech coal production is now declining as unprofitable mines are closed down.

The Czech Republic's primary energy consumption of 58.08 Mtce (based on figures for 2001) can be broken down as follows: 50 % coal (28.8 Mtce), 20 % natural gas (11.51 Mtce) and 19 % oil (11.22 Mtce). This mix of primary energy sources is supplemented by nuclear energy with a 9 % share (5.08 Mtce), as well as by renewable energies and hydro-electric power, which together account for some 1 % (0.30 Mtce). Coal is now gradually losing out to natural gas in the national energy mix. Since 1993 gas consumption has risen by approx. 30 %, while coal's input to primary energy supplies has declined by 11 %. The commissioning of the Temelín power plant means that nuclear energy will also increase its share of the energy mix at the expense of coal.
Most of the country's oil and gas needs have to be imported, since the Czech Republic has only very small oil and gas deposits of its own (oil reserves: 4 mill. tonnes, gas reserves: 4 bn cbm). These two fuels are mainly imported from Russia. With a transit capacity of 55 bn cbm/a, the Czech Republic is also an important through-route for the pipelining of Russian gas to Western Europe.

Diversification of energy supply is one of the major concerns of Czech energy policy. An important step in this direction was taken with the completion of the "Mero" oil pipeline in 1998, which runs from Ingolstadt in Germany to the refineries at Kralupy and Litvínov. Diversification of natural gas supplies began with the first deliveries from Norway in 1997. Today Scandinavia supplies approximately 20 % of the country's gas.

About 70% of the Czech Republic's total electricity output of 76.3 TWh (figures for 2002) comes from coal-fired power stations, while a further 25 % is generated by nuclear power plants. The coal-based installations have a total capacity of approx. 11 GW and are predominantly fired with brown coal and lignite.

January 2002 saw the start of electricity-market deregulation, as provided for by the 2001 Energy Act. Market opening is to be implemented in several stages. Customers with an annual consumption of more than 9 GWh are at present free to choose their suppliers. Complete deregulation will be achieved by 2006, by which time all electricity consumers will be in a position to choose their respective suppliers. Gas-market deregulation is still some way off. The first stage, i.e. market opening, is scheduled for January 1, 2005. Further phasing-in of deregulation will be laid down in an amendment to the Energy Act, which is currently under discussion.

In recent years the Czech Republic has privatised a number of former public energy companies. In December 2001, for example, RWE was awarded a contract for the acquisition of major companies operating in the country's gas sector. However, the public power utility ČEZ, which supplies more than 70 % of the national electricity needs, has not yet been privatised.

The Czech Republic is making greater efforts towards improved energy efficiency, as reflected in the Energy Management Act that came into force in 2001. These developments have been promoted by the EU, which has attached great importance to increased energy efficiency in its energy discussions with the Czechs as part of the negotiations on EU membership.

Hard coal

About 50 % of the Czech primary energy requirements are met by coal, with a contribution of about 9 Mtce. In the year under review (2002) some 19.6 mill. tonnes was extracted, as compared with 20.4 mill. tonnes in 2001. The largest hard coal deposits are found in the Upper Silesian basin near Karviná and are extracted by underground mining.

Some 6 mill. tonnes of hard coal and approx. 1 mill. tonnes of coke were exported. The main markets are Germany, Austria, Hungary and Poland. 1.2 mill. tonnes of hard coal (steam coal and coking coal) was imported.

Brown coal and lignite

The Czech Republic has 2,515 mill. tonnes of economically recoverable brown coal and lignite reserves. 95 % of these deposits can be extracted by opencast mining. In addition to the three deposits in Northern Bohemia, Sokolov and Southern Moravia there are also lignite fields in the south of the country, though these have not been worked for some time. Brown coal and lignite make an important contribution to national energy supply, with total production of these two fuels amounting to 49.3 mill. tonnes in 2002.

The main deposit and the biggest mining area, measuring 1,400 km^2, is the Northern Bohemian Brown Coal basin, which is located around the towns of Kadaň , Chomutov, Most, Teplice and Ústi nad Labem. The seams in this area extend to depths of as much as 400 m and are 15 to 30 m in thickness.
Brown coal is mined in the central part of the Northern Bohemian basin by the *Mostecká uhlená společnost,a.s.* (Most Coal Company JSC), a member of the Appian Group.

The Most Coal Company extracted 16.3 mill. tonnes of brown coal (as at 30.6.2003) from three opencast mines (ČSA, Jan Šverma and Vršany) and one deep mine (Centrum, as at 30.6.2003).

After extraction the brown coal is processed at the Komořany treatment plant and Hrabák processing site. The Komořany treatment plant supplies a wide range of solid fuels. Graded, pulverised and single-purpose products are delivered to households, heating plants and utilities. Industrial heating blends for the energy sector are produced at the Hrabák processing site and supplied to power stations at Počerady,Chaletice and Mělník II.

In 2002 the Most Coal Company had a total workforce of some 5,108 (opencast and deep mining operations).

The brown coal company *Severočeské uhelné doly, a. s.*, Chomutov (SD a. s.) operates in the north-western part of the Northern Bohemian Brown Coal Basin and to the east of the town of Most. SD a.s. mines brown coal at two sites, namely Doly Nástup Tušimice and Doly Bílina. A total of 21.8 mill. tonnes was produced in 2002.

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 mill. tonnes of brown coal. After treatment at the Tušimice crushing plant most of the product is supplied to power stations operated by *České energetické závody (ČEZ)*.

The Doly Bílina brown coal mining area, which contains the Ledvice opencast mine, is located between the towns of Bílina and Duchcov. The 9 mill. tonnes of brown coal produced each year first goes to the Ledvice processing plant before being sent on to power stations, industry and households, in 2002 SD a. s. had a total workforce of 4,101.

Located in Western Bohemia, the brown coal basin around the town Sokolov, which has workable reserves of 400 mill. tonnes contained 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, a. s.)* operates opencast mines Družba and Jiří. Output in 2002 was 10.4 mill. tonnes.

Brown coal from the Sokolov area is used mainly for power and heat generation. SU, a. s. generates electricity in two of its own power installations: the Vřesová IGCC plant (2 x 200 MW_e) and CHP plant (5x270 MW_{th}), which have a total capacity of 3.5 TWh/a. Most of the heat produced is for the company's own consumption, though some is also supplied to towns such as Karlovy Vary, Nejdek, Chodov and Nová Role.

SU a. s. operations employed a total workforce of 5,530 in 2002.

A smaller deposit of some 51 mill. tonnes of workable lignite reserves is located in Southern Moravia near the town of Hodonín. Approx. 0.5 mill. tonnes of lignite per year is produced by Lignit Hodonín s.r.o. entirely by underground mining, with 97 % of the production being delivered to the Hodonín power plant and the remainder to households.

In the last ten years brown coal and lignite output in the Czech Republic has decreased by 35 % to less than 50 mill. tonnes. A further decline cannot be ruled out. This can be attributed mainly to the commissioning of two new units at the Temelín nuclear power station, the suspension of lignite deliveries to Germany and the increase in imported energy. However, the downturn has not been as serious as originally expected. This was due to energy exports to Eastern and Southern Europe by the Coal Energy Company, which exported about 3 TWh in 2002. The Coal Energy Company was set up by the brown coal mining companies ČEZ and by Carbounion Bohemia. Most of Coal Energy's power is exported to Hungary, Romania, Croatia, Bulgaria and Serbia.

The Czech brown coal industry has always played an important role in the national economy. Despite present restructuring and a fall in demand, brown coal is set to remain the main energy source in the Czech Republic for the foreseeable future.

Coal and Energy Data	Unit	2002
Resources		
Hard coal	Mt	8,300
Lignite and brown coal	Mt	9,500
Reserves		
Hard coal	Mt	1,229
Lignite and brown coal	Mt	2,515
Domestic Output		
Hard coal	Mt	19.6
Lignite and brown coal	Mt	49.3
Total	**Mt**	**68.9**
Selected Coal Quality Data		
Calorific value		
Hard coal	kJ/kg	18,560 - 28,700
Lignite and brown coal	kJ/kg	10,700 - 19,640
Ash content		
Hard coal	%	7.6 - 28.5
Lignite and brown coal	%	10.9 - 40.2
Water content		
Hard coal	%	8.2 - 12.6
Lignite and brown coal	%	25.5 - 41.2
Sulphur content		
Hard coal	%	0.3 - 0.6
Lignite and brown coal	%	0.5 - 2.5
Net Imports		
Hard coal	Mt	1.02
Prim. Energy Consumption		
Total (2001)	**Mtce**	**58.08**
Hard coal	Mtce	9
Lignite and brown coal	Mtce	19.8
Power Supply		
Generation, total	**TWh**	**76.3**
Hard coal	TWh	3.5
Lignite and brown coal	TWh	50.1
Net power imports	TWh	-10
Gross power consumption	**TWh**	**52.3**
Power Plant Capacity		
Total	**MW**	**17,735**
Coal-fired	MW	10,631

Source: Euracoal Member, BGR 2003

France

General Data	Unit	2002
Population	millions	59.8
GDP	bn USD	1,540
Prim. energy consumption (PEC)	Mtce	393.2

France is the world's fifth-largest industrialized economy, but has very limited fossil fuel resources.

The country has coal resources of only 99 Mtce of hard coal and 2 Mtce of lignite. France neither produces nor consumes significant amounts of coal. Since 1973, coal production has decreased by 91 % 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 (2002: 393.2 Mtce) coal is in the second line behind nuclear energy (39 %), oil (35 %) and natural gas (15 %).

Major coal imports (total: 16 mill. tonnes 2001) come from Australia (3.9 mill. tonnes), the United States (2.7 mill. tonnes), South Africa (3.2 mill. tonnes), and Poland (0.6 mill. tonnes). In France coal is mainly used for power generation (about 8 mill. tonnes/year), for the steel industry (7 mill. tonnes/year), for industrial purposes (2 mill. tonnes), and for domestic use and heating networks (1 mill. tonnes/year).

France is the second-largest electricity market, consumer and generator in Europe behind Germany. In 2002 the country's gross power generation amounted to 533 TWh. In 2002 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.

The 1996 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 the electricity sector. Since then about 1,800 large industrial and commercial consumers (those using more than 16 mill. kWh per year), comprising about 30 % of the market, have been free to choose their electricity supplier. Since February 2003, 37 % of the French market has been open to competition. All facilities with an annual electricity consumption above 7 GWh are able to choose their supplier.

Hard coal

The state-owned *Charbonnages de France (CdF)*, with its sub-producers *Houillères du Bassin de Lorraine (HBL)* and *Houillères de Bassin du Centre et du Midi (HBCM)*, is the only coal mining company in operation. HBL still has one mine in La Houve, while operations at HBCM finally ended on January 31, 2003 with the closure of the Gardanne lignite mine. Some 1.6 mill. tonnes were produced in 2002.

One deep mine is still operating in the Lorraine coalfield, La Houve, but it is set to stop production during the 2nd trimester 2004.

With the closure of France's last hard coal mines, the state-owned coal company CdF is expected to be wound up sometime in 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 run-down 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 will cease by 2005 at the latest.

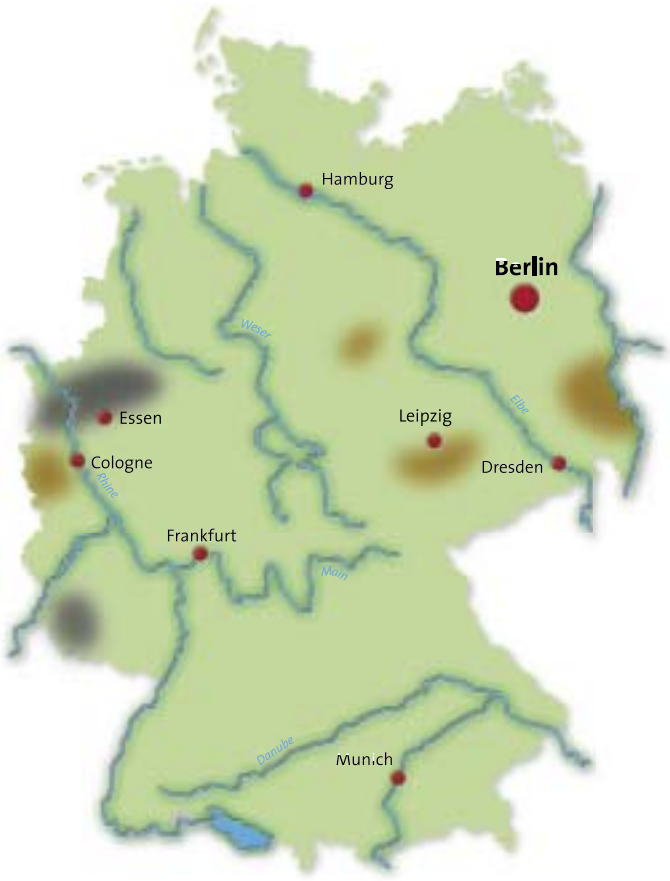
Coal and Energy Data	Unit	2002
Resources		
Hard coal	Mt	99
Lignite	Mt	2
Reserves		
Hard coal	Mt	0
Lignite	Mt	0
Domestic Output		
Hard coal	Mt	1.5
Lignite	Mt	0.1
Total	**Mt**	**1.6**
Net Imports		
Hard coal	Mt	17.8
Prim. Energy Consumption		
Total	**Mtce**	**393.2**
Hard coal	Mtce	18
Lignite	Mtce	n.a.
Power Supply		
Generation, total	**TWh**	**533**
Hard coal and lignite	TWh	18.4
Power exports	TWh	73.2
Power imports	TWh	3.8
Gross power consumption	**TWh**	**451**
Power Plant Capacity		
Total	**GW**	**116**
Hard coal	GW	10.7

Source: Euracoal Member, estimated/provisional

Lignite

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

Germany



General Data	Unit	2002
Population	millions	82.5
GDP	bn USD	2,184
Prim. energy consumption (PEC)	Mtce	488.5

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

In 2002 Germany's primary energy production totalled some 127.6 mill. tce. With an output of 83.4 mill. tce in the same year, coal had a nationwide market share of 65.3 %. The contributions made by all fuels to primary energy production can be broken down as follows: 56.4 mill. tce for lignite (44.2 %), 27.0 mill. tce for hard coal (21.1 %), 22.1 mill. tce for natural gas (17.3 %), 4.5 mill. tce for oil (3.5 %), 4.5 mill. tce for hydro and wind energy (3.85 %) and 12.4 mill. tce for other fuels (9.8 %).

Germany's primary energy consumption amounted to 488.5 mill. tce in 2002. Oil accounted for the largest share of this (37.4 %) in percentage terms, followed by coal (24.8 %), natural gas (21.7 %) and nuclear energy (12.6 %). Hydro and wind energy, together with other fuels, made up just 3.5 %. Germany is to a large extent dependent on energy imports. Hard coal (13.2 %) and lignite (11.6 %) rank third and fifth respectively in the league table for energy consumption.

German power generation of 581 TWh is characterised by a widely diversified energy mix. In 2002 gross power generation was structured as follows: coal 50.6 % (lignite 27.4 % and hard coal 23.2 %), nuclear energy 28.4 %, natural gas 9.3 %, hydro 4.5 %, wind energy 2.9 % and other energy sources 3.3 %. Oil contributed 1.0 % 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 2002 the German hard coal market amounted to 64.3 mill. tce. Some 45 mill. tce of this was used for power and heat generation, while a further 16.8 mill. tce went to the steel industry.

A total of 63 mill. tce was supplied in 2002. Some 27 mill. tce of this was produced by the German mining industry, while the remaining 36 mill. tce was imported. Coal imports therefore accounted for about 57 % of the German coal market in 2002.

The biggest supplier country in 2002 was Poland, which accounted for almost one quarter of Germany's hard coal and coke imports. A further 50 % came from South Africa, Australia, Colombia and Russia. Imports from the People's Republic of China, the Czech Republic, Canada and the U.S. lagged some way behind.

In 2002 the German deep mining industry sold some 28.6 mill. tce of coal and coke to the solid fuel market. Of this, the power generating industry consumed 20.8 mill. tce, while 7.2 mill. tce was supplied to the German steel industry. Sales to the heat market totalled 0.6 mill. tce.

Coal mining in the Ruhr, Saar and Ibbenbüren coalfields is carried out by *Deutsche Steinkohle AG (DSK)* under the umbrella of *RAG Aktiengesellschaft, Essen*. DSK produced 26.1 mill. tonnes of saleable hard coal (equivalent to 26.8 mill. tce) in 2002.

The only mine-industry coking plant still in operation produced about 2.0 mill. tonnes of coke in 2002. Steel-industry coking plants produced some 5.2 mill. tonnes of coke in the same year. Briquette output totalled 123,860 tonnes.

The restructuring of the German hard coal industry continued as planned. Germany now has ten deep mines in production, namely the collieries West, Walsum, Lohberg/Osterfeld, Prosper-Haniel, Lippe, Auguste Victoria/Blumenthal and Ost, which are all in the Ruhr area, the mines of Ensdorf and Warndt/Luisenthal in the Saar coalfield and one further mine at Ibbenbüren. Production from these three coalfields breaks down as follows: 72 % from the Ruhr area, 21 % from the Saar and 7 % from the Ibbenbüren coalfield.

Employment figures also fell steadily through 2002. The number of employees in the hard coal mining sector decreased by 7.4% from 52,576 on December 31, 2001 to 48,673 as of December 31, 2002. Underground operations employ 24,635 mineworkers, or 51 % of the workforce (as at December 31, 2002). Efficiency levels, measured in terms of saleable output per man-shift below ground, rose by 4.7% from 6,244 kg in 2001 to 6,539 kg in 2002.

The future of the German hard coal mining industry as far as 2005 will be determined by the coal policy agreements concluded in 1997. With production expected to be in the region of 26 mill. tonnes, the output from all ten hard coal mines will be close to the previous year's total. A further tightening of the financial framework will see sales continue to decline to just under 28 mill. tce. Also the number of mines will have to be reduced further. For Lohberg/Osterfeld and Warndt/Luisenthal closure decitions were taken in September 2003. Sales to the power generating sector are expected to amount to some 20.6 mill. tce, while supplies to the steel industry will total 6.8 mill. tce. In 2003 workforce downsizing will continue at the same rate as in the previous year. By late 2003 the industry will have about 41,800 employees. Operational optimisation within the scope of target cost projects means that another increase in efficiency is expected in 2003.

Lignite

In 2002, the available lignite amounts totalled 56.8 mill. tce, with domestic output accounting for close on 56.4 mill. tce and imports for approx. 0.5 mill. tce. Lignite exports amounted to 0.4 mill. tce. of pulverised lignite and briquettes.

Lignite production which totalled 181.8 mill. tonnes in 2002 was centered on four mining regions, namely Rhineland around Cologne, Aachen and Mönchengladbach, the Lusatian mining area in south-east Brandenburg and north-east Saxony, the Central German mining area in south-east of Saxony-Anhalt and in north-west of Saxony as well as the Helmstedt mining area in Lower Saxony. In these four mining areas, lignite is exclusively extracted from opencast mines. In addition, a little bit of lignite is mined in Hesse and in Bavaria.

Lignite is an indispensable energy supplier to Germany because it is available in abundant quantities over a long time and competitive by international standards. Furthermore, the lignite industry representing a significant economic factor is an important employer and investor in the mining areas.

The focus of lignite use is on power generation. The power plants were provided with 169.4 mill. tonnes of lignite. This was equivalent to 93 % of total production.

In the Rhineland, *RWE Rheinbraun AG*, Cologne, produced a total of 99.4 mill. tonnes of lignite in 2002. There are three opencast mines: Hambach, Garzweiler and Inden. Almost 90 % of the coal was consumed by the company's own national grid power generating stations, while some 10.3 mill. tonnes was used for processed products. Only

0.2 mill. tonnes went to other customers. The generating capacity of RWE *Rheinbraun AG* consists of five lignite-fired power plants with a total capacity of 9,913 MW (position: Dec. 31, 2002). Furthermore, a 1,000 MW lignite-fired power plant with optimised plant technology (BoA[1]) went on stream at the Niederaussem location in the third quarter of 2002. In these plants the lignite-derived power output amounted to around 75.5 TWh.

At end-2002, *RWE Rheinbraun AG* had a total workforce of 12,693, including 9,121 employees in the mining segment and 3,572 employees working in the lignite-fired power plants which have been part of the company since April 2000. On October 1, 2003, *RWE Rheinbraun AG* will merge with *RWE Power AG*. The new company will be named *RWE Power AG*.

After Germany's reunification in 1990, lignite was exposed to a great structural change in the new federal states. In the Lusatian and Central German mining areas, coal is today primarily used in new and modernised power plants. Coal extraction has been centered around the best deposits and efficient opencast mines. In this context, coal output decreased from some 300 mill. tonnes in 1990 to about 80 mill. tonnes in 2002. Personnel was cut by more than 90 %. After this rapid and profound adaptation process, the competitive strength is now secured in all fields.

To assure rapid and economically efficient rehabilitation of the opencast mines and refining plants that were closed down due to this breach in structure, the *Lausitzer und Mitteldeutsche Bergbau-Verwaltungsgesellschaft (LMBV)* has been set up.

In 2002, the Lusatian mines produced some 59.3 mill. tonnes of lignite. The only coal producer in this area is Vattenfall Europe Mining AG, the former *Lausitzer Braunkohle AG (LAUBAG)*. 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. The quantity sales of lignite to public power plants amounted to 56.9 mill. tonnes, thus exceeding the previous year's level. These positive developments are primarily due to the stepped-up requirements of the power plants of Vattenfall Europe Generation AG & Co. KG. The other customers – mainly regional utilities – were supplied with 1.7 mill. tonnes of lignite. At end-2002, Vattenfall Europe Mining AG had a total workforce of 5,553. In the Lusatian area, Vattenfall Europe Generation (VE-G) is operating three lignite-fired power plants with a gross rated capacity of a total of 6,500 MW. In 2002, the gross power output from the Lusatian lignite-fired power plants of VE-G totalled 51.5 TWh. The Central German mining area located in the surroundings of Leipzig yielded a total lignite output of 20.0 mill. tonnes in 2002. The most important company in this area is *Mitteldeutsche Braunkohlengesellschaft mbH (MIBRAG)*, Theißen. This company has two opencast mines, Profen (Saxony-Anhalt) and Schleenhain (Saxony). In 2002, MIBRAG produced about 19.5 mill. tonnes of lignite. In the same year, the recently built power plant in the neighbouring Lippendorf (1,850 MW) was also supplied with 10.6 mill. tonnes of lignite.

In the years 1995/96, in the centre of the chemical industry, close to Halle, a power plant with a total capacity of 980 MW (gross) was commissioned at the Schkopau location. At end-2002, MIBRAG had a total workforce of 1,906.

Another opencast mine operated by *Romonta GmbH* located in the Central German mining area is situated in Amsdorf (Saxony-Anhalt). In 2002, 0.5 mill. tonnes were mined here and used for extraction of raw mineral wax; the wax-free fuel is subsequently employed in a CHP plant (45 MW). At end-2002, *Romonta GmbH* had a total workforce of 369.

In the Helmstedt mining area, *BKB Aktiengesellschaft*, Helmstedt, produced 2.9 mill. tonnes of lignite. Extraction from the Schöningen opencast mine and the Buschhaus (380 MW) power plant will continue until 2017 with an annual lignite output of some 2 mill. tonnes. On December 31, 2002, BKB had a workforce of 572 employees working in the mining area.

Following the power plants, the processing plants represent another major area of utilisation. In 2002, some 11.8 mill. tonnes was used for product processing at lignite industry-owned facilities. 2.0 mill. tonnes went for

1 *German abbreviation "BoA" standing for Braunkohlenkraftwerk mit optimierter Anlagentechnik*

power generation. These, lignite-fired plants generated a total power of 2.4 TWh in 2002. Other consumers accounted for 0.6 mill. tonnes.

The lignite-derived products are mainly destinated for domestic use. The main customers are the power and heat generators (more than four fifths) as well as households and small consumers.

Extraction of lignite from opencast mines changes the landscape. Therefore, extraction and recultivation belong together. Only when the "industrial" opencast mine has been transformed into a vivid landscape again, mining activities will be completed. Recultivation implemented in an ecologically ambitious way looks back on a long tradition. For more than 100 years, nature has been studied with the object of drafting concepts for the landscape following opencast mining operations. A multifarious use potential and a high recreational value are important factors. This includes vivid flora and fauna as well. Recultivation is a learning process with the object of turning today's good into tomorrow's better.

Coal and Energy Data	**Unit**	**2002**
Resources		
Hard coal	Mt	186,000
Lignite	Mt	77,600
Reserves		
Hard coal	Mt	23,000
Lignite	Mt	41,300
Domestic Output		
Hard coal	Mt	29.2
Lignite	Mt	181.8
Total	**Mt**	**211**
Selected Coal Quality Data		
Calorific value		
Hard coal	kJ/kg	27,400 - 33,000
Lignite	kJ/kg	8,810 - 10,830
Ash content		
Hard coal	%	6 - 7
Lignite	%	5.6 - 10.6
Water content		
Hard coal	%	8 - 9
Lignite	%	48 -54
Sulphur content		
Hard coal	%	0.8 - 1.0
Lignite	%	0.9 - 1.7
Net Imports		
Hard coal	Mt	31.9
Lignite	Mt	0.8
Total	Mt	32.7
Prim. Energy Consumption		
Total	**Mtce**	**488.5**
Hard coal	Mtce	64.3
Lignite	Mtce	56.6
Power Supply		
Generation, total	**TWh**	**581.0**
Hard coal	TWh	135.0
Lignite	TWh	159.0
Net power imports	TWh	0.7
Gross power consumption	**TWh**	**581.7**
Power Plant Capacity		
Total	**GW**	**118**
Hard coal	GW	31.0
Lignite	GW	21.5

Source: Euracoal Member, BGR 2003, estimated/provisional

Greece

General Data	Unit	2002
Population	millions	10.6
GDP	bn USD	201.1
Prim. energy consumption (PEC) (2001)	Mtce	42.7

Greece has enjoyed fairly strong growth over the last few years. The country has only limited energy reserves of its own. The imports equal to 70 % of the total energy needs. Lignite consist the most important indigenous source of energy, representing approximately 80 % of primary energy production.

Accounting for about 28 % of primary energy consumption (42.7 Mtce in 2001), lignite is at present the country's most important indigenous fuel. Oil is still the most important fuel source overall, accounting for 55 % of the country's primary energy consumption. The consumption of imported natural gas (mostly from Russia) has increased significantly over the last few years and now has a 5.6 % share in the market. Hard coal imports of 1.3 Mtce still account for 2.7 % of primary energy consumption. Security of energy supply, low extraction costs and stable prices have helped lignite retain its place in the energy market.

Lignite

Greece has geological lignite reserves of 6.5 bn t, of which 3.4 bn t are economically workable. The most important deposits are located in the north of the country, at Ptolemais-Amynteon and Florina (2.0 bn tonnes), at Drama (900 mill. tonnes) and at Elassona (150 mill. tonnes), and in the south at Megalopolis (270 mill. tonnes). As well as lignite there is a large peat deposit of about 4 bn cubic metres (cbm) at Philippi in the northern part of Greece (Eastern Macedonia). Most of the major opencast mines – which account for more than 99 % of the annual lignite production belong to the electric utility Public Power Corporation (PPC).

Only 28% of the total reserves have been extracted up to date. Allowing for future developments in energy consumption patterns, existing reserves will be sufficient for about 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 extracted in opencast operations. 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 (pay-load up to 192 t) 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 recorded 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 2002 stood at 70.8 mill. tonnes, which was 6.8% up on the previous year's figure. This is a new production record for the Greek lignite industry. Lignite is mostly mined by PPC, with 55.8 mill. tonnes being extracted at the West Macedonia Lignite Centre (WMLC) and 14.5 mill. tonnes at the Megalopolis Lignite Centre (MLC). The few privately-operated mines in the Florina area produced a total of some 450,000 tonnes of lignite.

In 2002 the WMLC operations removed a total of 196.5 mill. cbm of waste (overburden plus interburden), corresponding to an overburden/interburden-to-ligni-te ratio of 3.5 : 1 (cbm : t). At MLC, overburden plus inter-burden removal was 25.1 mill. cbm, corresponding to an overburden/interburden-to-lignite ratio of 1.7 : 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 results 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 extracted lignite is supplied to seven PPC-owned power stations, comprising 21 generating units and a total installed capacity of 4,958 MW. Some is also delivered to a nearby briquette factory. The total generating capacity of all power plants in Greece is 11,740 MW.

In 2002 lignite-based power generators produced 31.2 TWh, giving this fuel a 61 % share in the total generating market. Total power generation in Greece was in the order of 51.4 TWh. In 2002 natural gas contributed 13.1 %, oil 18.9 % and hydro 6.6 % to the national power generation capacity.

Another lignite mining site at Florina in Northern Greece, which has an annual production level of 2.5 mill. tonnes, is currently up for development. A new power generating unit of 330 MW is also due to come on stream in the same area in 2003. The total capacity of lignite-fired plants will then be 5,288 MW.

In the lignite mining areas around Ptolemais-Amynteon and Megalopolis, PPC has carried out site recultivation projects, creating farmland, plantations of trees and woodland, sanctuaries for small animals and crop-testing areas.

Over the years the policy pursued by lignite mining companies has meant a significant increase in lignite production and in mining activities in general. This upturn in business is unusual for a complex technical operation such as mining. Since 1988 manpower levels have remained fairly steady, despite the opening of a new production facility at Amyndeon mine in Northern Greece. The two mining areas of WMLC and MLC, and the head office in Athens, currently employ a total workforce of 6,023.

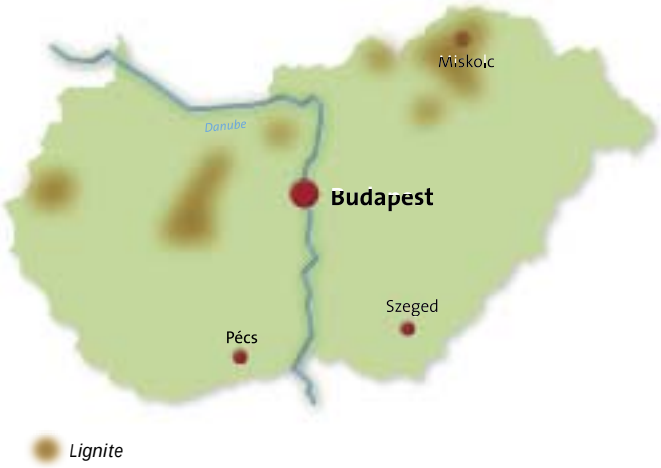
The creation of the European Union's internal energy market has meant that the mines have had to supply a more competitive product and adapt planning and development to suit the new market situation. Fuel competitiveness is now an important factor in the selection of new generating units and in the continued operation of older plant. Current changes to the workforce call for the shaping of a new corporate strategy so that lignite can retain its dominant position in the energy supply sector.

Lignite has been Greece's main energy source for several decades and this situation is expected to continue in future. 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 has to date been competitive with imported energy sources. However, competitive pressures – especially from natural gas – are growing all the time.

Coal and Energy Data	**Unit**	**2002**
Resources		
Lignite	Mt	6,500
Reserves		
Lignite	Mt	3,400
Domestic Output		
Lignite	Mt	70.8
Total	**Mt**	**70.8**
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 - 60.0
Sulphur content		
Lignite	%	0.5 - 1
Net Imports		
Hard coal	Mt	1.3
Prim. Energy Consumption		
Total (2001)	**Mtce**	**42.7**
Hard coal	Mtce	1.1
Lignite	Mtce	13
Power Supply		
Generation, total	**TWh**	**51.4**
Lignite	TWh	31.2
Net power imports	TWh	4.6
Gross power consumption	**TWh**	**54.3**
Power Plant Capacity		
Total	**MW**	**11,740**
Hard coal	MW	0
Lignite	MW	4,958

Source: Euracoal Member

Hungary



Lignite

General Data	Unit	2002
Population	millions	10.1
GDP	bn USD	134.7
Prim. energy consumption (PEC)	Mtce	35

Hungary is comparatively poor in energy resources. The country's most important indigenous energy reserves comprise approx. 69.5 mill. tonnes of natural gas, 23.9 mill. tonnes of oil and 3.4 bn tonnes 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 supply, while coal reserves have an estimated lifespan of over 100 years.

Hungary's primary energy consumption in 2002 was approximately 35 Mtce. Of this, natural gas has the biggest share of 41 %, followed by oil with 33 %, coal with 15 % and nuclear energy with 11 %. This makes Hungary the consumer with the second biggest share of natural gas in PEC in Europe (after the Netherlands). Domestic production still only meets 20% of the country's gas consumption needs, which have risen to about 14 bn cbm. This means that Hungary's import dependence is increasing steadily.

In 2002, primary energy production totalled some 8 Mtce. In percentage terms gas and coal have the biggest share of about 40% each, followed by oil with 18% and others with approximately 2%.

National electricity generation in 2002 amounted to some 36 TWh, with a total capacity of 8,064 MW. Some 3.5 TWh is imported. Nuclear energy accounts for 39 % of the national power output. Hungary's sole state-owned nuclear power plant at Paks generates the country's cheapest power. Gas and oil make another major contribution (36 %) to the national grid, while solid fuel – which accounts for 23 % of the total – has been able to maintain its market position. *Mátrai Erömü Rt* is the biggest lignite-based power generator, with a market share of 14 %; a smaller proportion of some 9 % is provided by deep-mined fuel from subsidised mines. Hard coal and hydro-power do not play an important role in Hungary's energy mix (1 %). Renewables currently account for 2 % of the power generators' needs.

Compared with the EU's other new applicant countries Hungary has made much headway in the areas of deregulation and privatisation. In December 2001 the Hungarian Parliament adopted a new EU-conformable Electricity Act which – with effect from January 1, 2003 - defines fuel users with an annual consumption of > 6.5 GWh as authorised customers; this will deregulate about 33% of the Hungarian market. The Electricity Act of 1994 launched the process of privatisation. All generating companies (except for the 100 % state-owned Paks nuclear power plant and the Vértes coal-fired power station) and the country's six power utilities have now been in private ownership since 1995, with foreign investors holding majority interests. E.ON and the local companies of the RWE Plus/EnBW consortium have equal market shares of 43 to 44 %. *EdF (Electricite de France)* and AES (Allied Energy Systems) control the remaining market.

Lignite

Hungary's lignite and brown coal resources are concentrated in the regions of Transdanubia and in northern and north-eastern Hungary. In 2002 lignite output totalled 13.4 mill. tonnes, with 94 % of this being used for heat and power generation. The remaining 6 % went to municipalities, households and other consumers.

Brown coal extraction in Transdanubia is concentrated in the area around Veszprém. Brown coal is also mined near Veszprém, at the Ajka deep mine, as well as at the Balinka mine some 60 km away. This fuel is destined for the power plants at Inota (52 MW) and Ajka (102 MW), which are operated by the Bakony power utility. These mines will probably be closed in the course of the next three years. Brown coal is also extracted, mainly by deep mining, around the towns of Oroszlány and Mány. The Márkushegy, Oroszlány and Mány mines supply the power stations at Bánhida (100 MW) and Oroszlány (235 MW), which are owned by the Vértes power station company.

The area around Borsod in northern Hungary also extracts brown coal at six different sites - one opencast and five deep mines. The lignite is used in the power plants at Borsod (137 MW) and Tiszapalkonyai (250 MW). These mines will probably close down in the next two years.

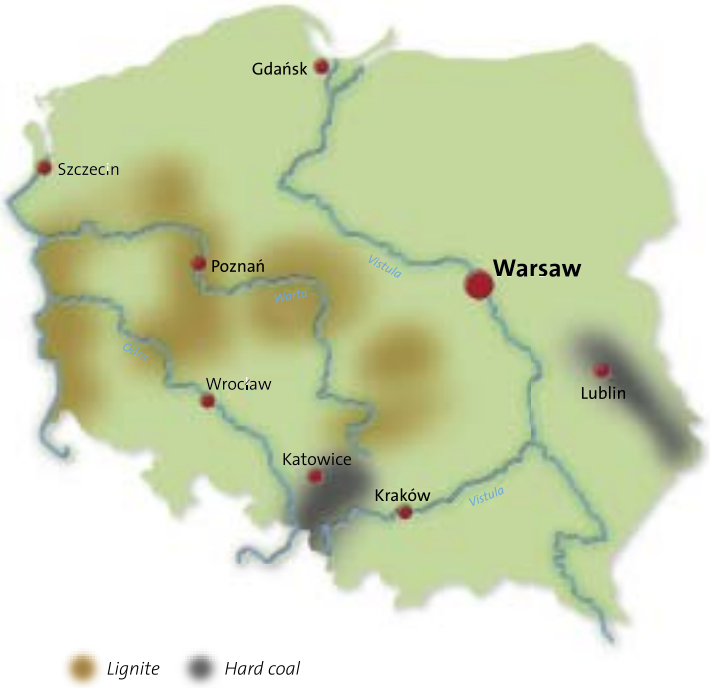
The 1,000 km^2 lignite field of *Mátrai Erömü Rt. (MATRA)*, which has mineral reserves of 1.3 bn tonnes, is located 90 km to the east of Budapest. Extraction here is concentrated at the two opencast mines of Bükkábrány and Visonta. In 2002 MATRA produced about 7.6 mill. tonnes of lignite, which constitutes the country's total lignite output. The MATRA 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.

MATRA has concluded a long-term supply contract with the state-owned Hungarian power utility MVM, which also has a 25 % interest in MATRA. This supply contract stipulates prices and quantities up to the year 2015. Despite this contractual security, MATRA has taken various steps to adjust to the anticipated deregulation of the power market. This also involves the completion of flue-gas desulphurisation projects and the implementation of retrofit measures at power stations and mines, which will extend the life of the plants to 2015.

Coal and Energy Data	Unit	2002
Resources		
Hard coal	Mt	657
Lignite	Mt	9,031
Reserves		
Hard coal	Mt	198
Lignite	Mt	3,159
Domestic Output		
Hard coal	Mt	0.6
Lignite	Mt	13.4
Total	**Mt**	**14.0**
Selected Coal Quality Data		
Calorific value		
Lignite	kJ/kg	7,000 - 8,000
Ash content		
Lignite	%	17.5
Water content		
Lignite	%	47.7
Sulphur content		
Lignite	%	1.5
Net Imports		
Hard coal	Mt	0.77
Prim. Energy Consumption		
Total	**Mtce**	**35**
Hard coal	Mtce	1.9
Lignite	Mtce	3.2
Power Supply		
Generation, total	**TWh**	**35.8**
Hard coal	TWh	0.52
Lignite	TWh	8.04
Net power imports	TWh	3.5
Gross power consumption	**TWh**	**39.33**
Power Plant Capacity		
Total	**MW**	**8,064**
Hard coal	MW	190
Lignite	MW	1,644

Source: Euracoal Member

Poland



General Data	Unit	2002
Population	millions	38.2
GDP	bn USD	368.1
Prim. energy consumption (PEC)	Mtce	133.7

Poland has coal reserves totalling 10.3 bn tce, with the main hard coal resources being located in Upper Silesia and in the Lublin Basin. Lignite reserves account for 573 Mtce. The country does not have significant reserves of oil or gas. Hard coal and lignite meet some 67 % of the Polish primary energy consumption of 133.7 Mtce. Imported oil accounts for 21.6 % and natural gas contributes 10.6 %. Hard coal exports from Poland total some 23 mill. tonnes per year, one third of which is transported by rail to neighbouring countries while about two thirds are transshipped via the Baltic Sea ports of Gdańsk, Świnoujscie, Szczecin and Gdynia.

Hard coal and lignite are strategic fuels for Polish power generation, which has been expanded on the basis of solid fuels from indigenous sources. Hard 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 2002, 97 % of the power output (144.1 TWh) was based on hard coal (91.5 TWh) and lignite (48.9 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 Energy AG, EdF and Tractebel, are currently active in the Polish energy market. This has not yet important 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 mill. tonnes, and until 1979 was the second largest coal exporter after the US, selling 41.4 mill. tonnes that year. Although its role as an exporting country was already declining in the 1980s, output was maintained at a significant level (1988: 193 mill. tonnes) compared to 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 mill. tonnes. 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 % of the country's primary energy needs.

The commercially workable hard coal reserves are distributed 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 0.8–3.0 m, about half of which are of economic interest. 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 % contain coking coal. Most of the country's natural resources, including coal, are in public hands and coal mining is still a state-run activity.

In 1998 the Government initiated a restructuring programme for the domestic hard coal mining sector, the main aim of which was to make the industry profitable. This objective must also be seen against the background of EU accession, which is planned for 2004, and the resulting requirement to reduce subsidies. The difficult geological conditions also mean that a further downsizing of production capacity and total workforce numbers is inevitable. This process is currently under way, albeit hesitantly. The seventy collieries in operation in the year 1952 have now been reduced to 41 (as at the end of 2001). In 1993 the state-owned hard coal mining industry was reorganised and seven coal corporations (Spółki Węglowe) were set up. These remained in operation until the end of 2002. According to Government restructuring plans announced in January 2003, the assets of five coal corporations were taken over on February 1 by the State Hard Coal Restructuring Agency S.A. to form a new body under the name *Kompania Węglowa S.A.*. This new entity now operates 23 mines. Two other corporations, namely Jastrzebska Coal Corporation and Katowice Coal Holding, remain separate mining companies.

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 mill. tonnes, comprising 18 mill. tonnes of coking coal and 85 mill. tonnes of steam coal. The 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 mill. tonnes this gave a productivity level of just under 725 t/man-year. This constitutes an enormous increase in efficiency compared to 1990, when output was 147.7 mill. tonnes and the workforce numbered 399,300 (= 381 t/man-year), though the rate 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 annual handling capacity of about 30 mill. tonnes in all. This comprises Gdańsk, Świnoujscie, Szczecin and Gdynia, though of these only Gdańsk is able to load cape-size vessels. Świnoujscie is accessible for panamax ships, while handysize vessels can access Szczecin and Gdynia. Upper Silesia is 500-650 km away by rail from the exporting ports. In 2002 exports totalled 23 mill. tonnes, comprising 20 mill. tonnes of steam coal and 3 mill. tonnes of coking coal. Of this total, 7.3 mill. tonnes was transported by road to neighbouring countries, with only 15.7 mill. tonnes being exported by sea (including 750 thousand tonnes delivered by barge).

Poland imported 1.9 mill. tonnes of coal in 2001 and 2.7 mill. tonnes in 2002, originating mainly from Russia, the Czech Republic and Kazakhstan.

Lignite

The lignite deposits are exclusively worked by opencast methods in three regions. Two of these are located in central Poland and a third is in the south-western corner of the country. In 2002 total lignite production reached 58.2 mill. tonnes (15.8 Mtce), 99 % of which was used by mine-mouth power plants. Lignite-fired power stations generated 48.9 TWh of electricity, which represents 34 % of total power generation in Poland.

The Bełchatów Basin, which incorporates two lignite fields, is situated in the central part of Poland. Construction work on the Bełchatów opencast mine started in 1977. Here there are still 1.1 bn tonnes (296 Mtce) of proven lignite reserves. In 2002 the Bełchatów mine produced 34 mill. tonnes (9.2 Mtce) of lignite, representing 58.4 % of Poland's total lignite production. This required the removal of some 129 mill. cbm of overburden, which represents an overburden-to-lignite ratio of 3.7 cbm/t. The mine is 240 m in depth 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 extracted lignite 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 mill. tonnes (176 Mtce). Production is scheduled to commence in 2007-2008. A new power generating unit 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 multi-pit mines: Konin and Adamów. The Konin mine, which has a production capacity of 15 mill. tonnes per year (4.1 Mtce), operates four opencast sites at Pątnów, Jóźwin, Kazimierz and Lubstów, whose total lignite production reached 10.8 mill. tonnes (2.9 Mtce) in 2002. Working depths at these pits vary 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 the sites currently being worked total some 110 mill. tonnes (30 Mtce), while the satellite deposits scheduled for progressive development are estimated to contain about 240 mill. tonnes (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, which operates three 40-70 m-deep opencast pits at Adamów, Władysławów and Koźmin, has a production capacity of 5 mill. tonnes per year (1.4 Mtce). The deposits currently being exploited have workable reserves of 83 mill. tonnes (22.6 Mtce), while the satellite deposits are estimated at about 45 mill. tonnes (12.2 Mtce). In 2002 lignite production reached 4.7 mill. tonnes (1.3 Mtce), all of which was supplied to the Adamów mine-mouth power station (600 MW). Some 33.1 mill. 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 mill. tonnes (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.

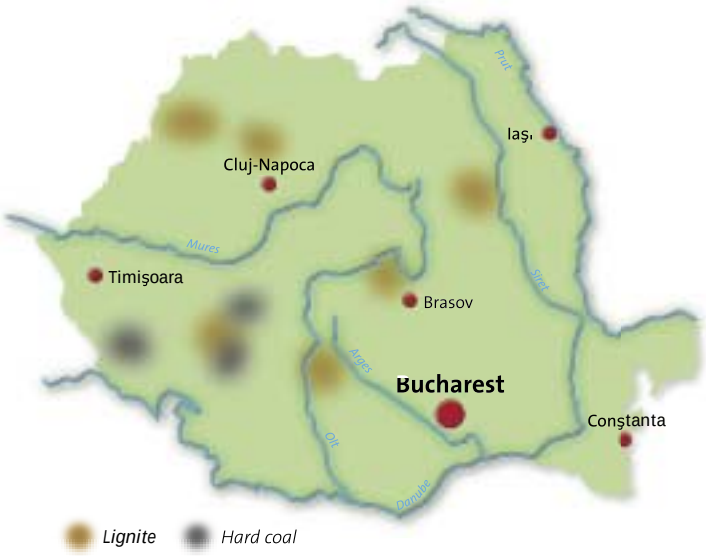
The Turów Lignite Basin is located in the South-Western corner of Poland. The reserves are estimated at 480 mill. tonnes (130 Mtce). In 2002 there was 15 mill. tonnes (4.1 Mtce) of mining capacity and the mine produced 8.7 mill. tonnes (2.4 Mtce) of lignite with a calorific value of 10,300 kJ/kg. The 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 mill. tonnes per year. In 2002 some 34.5 mill. cbm of overburden was 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 some 65-70 mill. tonnes (17.7-19.0 Mtce) per year and this fuel could well play an important role until about 2035. Lignite production is likely to continue in the Legnica area, in Lower Silesia, where the copper and silver mines currently in operation are expected to close in the 2020s as the reserves become depleted. Lignite is expected to continue making an important contribution to Poland's economy and this fuel has the capacities and capabilities to face competition on the open energy market under environmentally friendly circumstances.

Coal and Energy Data	Unit	2002
Resources		
Hard coal	Mt	113,300
Lignite	Mt	31,000
Reserves	Mt	
Hard coal	Mt	12,113
Lignite	Mt	1,955
Domestic Output		
Hard coal	Mt	102.1
Lignite	Mt	58.2
Total	**Mt**	**160.3**
Selected Coal Quality Data		
Calorific value		
Hard coal	kJ/kg	18,000 - 30,000
Lignite	kJ/kg	7,400 - 10,300
Ash content		
Hard coal	%	7 - 30
Lignite	%	7.2 - 16.0
Water content		
Hard coal	%	7 - 11
Lignite	%	50 - 52
Sulphur content		
Hard coal	%	0.6 - 1.2
Lignite	%	0.2 - 1.4
Imports		
Hard coal	Mt	2.7
Exports		
Hard coal	Mt	23
Prim. Energy Consumption		
Total	**Mtce**	**133.7**
Hard coal	Mtce	66.0
Lignite	Mtce	17.4
Power Supply		
Generation, total	**TWh**	**144.1**
Hard coal	TWh	91.5
Lignite	TWh	48.9
Net power imports	TWh	-4.5
Gross power consumption	**TWh**	**137**
Power Plant Capacity		
Total	**MW**	**34,775**
Hard coal	MW	20,453
Lignite	MW	9,233

Source: Euracoal Member, BGR Hannover 2003

Romania



General Data	Unit	2002
Population	millions	22.4
GDP	bn USD	166
Prim. energy consumption (PEC)	Mtce	54.1

Romania has had a long tradition of mining and the country has significant energy resources in the form of natural gas, oil and lignite. About 65 % of the country's primary energy demands can be met by indigenous energy reserves.

Romania's energy mix is mainly based on fossil fuels, namely gas (35 %), oil (30 %) and lignite (17 %). Nuclear power (7 %), hydro electric energy (3 %) and biomass (8 %) are also used. Primary energy consumption currently amounts to some 54 Mtce, which represents a drop of more than 40 % from the 1990 level. GDP has also fallen by 18 %. Due to the closure of many companies, energy demand from industry, which uses over 40 % of total consumption, fell by a 50 % in the 10 years after 1990. Following the removal of pre-1990 supply restrictions household energy consumption levels rose steeply due to the fact that energy prices were still being subsidised.

In 2002 Romania's gross power generation was running at some 54.7 TWh. Two thirds of this is produced by thermal power stations, 28 % comes from hydro electric installations and a further 11 % from the Cernavoda nuclear plant (a Canadian Candu reactor).

Romania is seeking accession to the EU in early 2007. Membership requires a wide-ranging programme of reforms. The fact that energy-sector privatisation is not yet fully under way is viewed with some concern abroad. One element of the reform programme is 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: restriction of the share of gas, oil and coal imports to 40 %, completion of a second generating unit for the Cernavoda nuclear plant with a capacity of 700 MW, expansion of hydro-power capacities by 900 MW, modernisation of hydro, CHP and thermal power plants at a level of 6,500 MW and the extension and refurbishment of the power grid and natural gas pipelines.

In 2000 some 10 % of the power market was opened to industrial consumers buying over 100 GWh/a. 33 % of the power market has now been deregulated, with the minimum consumption being 40 GWh/a. Full deregulation is expected to be achieved by the year 2006.

Hard coal

Hard coal is exploited in two mining areas, namely in the Jiu Valley, which is the most important deposit, and at Anina (in the Banat region). Coal reserves are put at some 648 Mtce. Working conditions are difficult, as the coal frequently occurs at medium and high depths.

In the Jiu Valley coal mining is carried out by the National Hard Coal Company of Petroşani, which operates eleven mines, including Lonea, Petrila, Livezeni, Aninoasa, Vulcan, Paroseni, Lupeni, Barbateni Uricani, Valea de Brazi and Tebea. Some 3 mill. tonnes of hard coal was produced in 2002.

In the Anina area hard coal is mined by the Banat Anina trading company, which has collieries at Anina, Baia Noua and Ponor. In 2002 this coalfield produced some 0.4 mill. tonnes of hard coal. The main consumers are the thermal power plants at Paroseni (3 x 50 MW) and Mintia (6 x 210 MW). Annual coal production does not meet their fuel requirements, so additional quantities have to be imported. Plans have been laid for current production

levels to be maintained at 3.5 mill. tonnes per year until 2010.
Extraction costs and other hardships facing the mining sector mean that the coal industry is a Government-subsidised operation, as is the case in many other European countries. Future challenges include: closing unprofitable mines, modernising operations at the remaining collieries and further reductions in manpower.

Lignite

Romania's lignite reserves are estimated at 480 mill. tonnes. The deposits are mainly situated in the south of the country, from Oltenia in the west along the southern Carpathians all the way to Ploieşti. The most important lignite basin is located in the Oltenia area. Lignite mining is carried out by two companies: the National Lignite Company of Oltenia (Compania Nationala a Lignitului Oltenia - CNL) and the National Coal Company of Ploieşti (Societatea Nationala a Carbunelui Ploieşti - SNCP).

In 2002 lignite production reached 27.4 mill. tonnes. About 90 % of this was extracted by CNL Oltenia, which has eight opencast sites (Rovinari, Rosia, Pesteana, Pinoasa, Motru, Berbeşti, Jilt, Mehedinţi) and six deep-mining operations (Farcaseşti, Cerna, Albeni, Dragoteşti, Motru, Zegujani). Each operating site consists of one or more mines. CNL Oltenia carries out mining activities at a total of nine underground and nineteen opencast mines. Working depths vary from 35 to 125 m, with seam thickness ranging from 6.3 to 26.6 m.

The remaining 8 % of Romania's lignite was produced by SNCP. This company operates eight deep mines in the south-east, in the central area and in the north-west of the country (Campulung, Capeni, Salaj, Voievozi, Comaneşti, Filipeşti, Sotanga and Borsec).

Almost all the lignite produced by CNL Oltenia is used by the heat and power plants of Turceni and Rovinari. Most of the lignite extracted by SNCP is also used as power station fuel to supply plants at Braşov, Oradea, Zalau and Doiçesti. In 2001 lignite accounted for some 30 % (14.9 TWh) of the country's energy mix.
A power plant modernisation programme, which will also involve the closure of outdated and non-profitable installations, will be necessary in the near future. This process will also impact on the country's opencast and deep mining operations. Modernisation will enable CNL Oltenia to supply the market with competitively priced lignite.

Coal and Energy Data	Unit	2002
Resources		
Hard coal	Mt	8,307
Lignite	Mt	2,500
Reserves		
Hard coal	Mt	810
Lignite	Mt	1,456
Domestic Output		
Hard coal	Mt	3.0
Lignite	Mt	27.4
Total	**Mt**	**30.4**
Selected Coal Quality Data		
Calorific value		
Hard coal	kJ/kg	13,381 - 27,180
Lignite	kJ/kg	6,700 - 8,550
Ash content		
Hard coal	%	14.5 - 55.5
Lignite	%	29.3 - 44.5
Water content		
Hard coal	%	2 - 24.5
Lignite	%	40 - 43
Sulphur content		
Hard coal	%	0.5 - 3
Lignite	%	<1
Net Imports		
Hard coal	Mtce	2.5
Prim. Energy Consumption		
Total	**Mtce**	**54.1**
Hard coal	Mtce	5.4
Lignite	Mtce	6.6
Power Supply		
Generation, total	**TWh**	**54.7**
Hard coal	TWh	4.4
Lignite	TWh	14.9
Net power imports	TWh	n.a.
Gross power consumption	**TWh**	**n.a.**
Power Plant Capacity		
Total	**MW**	**28,412**
Hard coal	MW	1,710
Lignite	MW	5,385

Source: Euracoal Member, RWE Power AG, BGR 2003

Serbia

Lignite

General Data	Unit	2002
Population	millions	10.5
GDP	bn USD	25.3
Prim. energy consumption (PEC)	Mtce	18.1

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.

Lignite is the most important indigenous energy source, accounting for about 52 % (9.5 Mtce) of Serbia's primary energy consumption, which totalled 18.1 Mtce in 2001. Power consumption by households has been increasing for the last two years, while the power requirements of the industrial sector have been falling steadily. Electricity consumption per capita has increased by 45 %.

In 2001 a total of 21.6 TWh (66 %) of power was produced by lignite-fired generating plants. Total gross power generation reached 32.7 TWh during the period 1990-2002.

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. With a workforce of 52,240, EPS is Serbia's largest company and the most important economic unit in the country.

Lignite

In 2002 the total lignite output from Serbia and Montenegro amounted to 32 mill. tonnes. This fuel was extracted from seven opencast sites and eight deep mines. Overburden removal at opencast mines totalled 51 mill. cbm, giving an average overburden-to-lignite ratio of 1.6 : 1 (cbm : t). Mining employed a workforce of about 23,000.

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 2001 the Kolubara opencast operations produced some 25 mill. tonnes 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 Danube river. Three opencast mines are currently operating in this area. In 2001 these sites produced some 5 mill. tonnes 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 (1,650 MW), Nikola Tesla B (1,240 MW), Morava (125 MW), Kolubara A (270 MW), Kostolac A (310 MW) and Kostolac B (697 MW). EPS's lignite-fired installations, which include the Kosovo A and B stations, have a total capacity of 5,771 MW and generated 21.6 TWh of power in 2001.

A survey of current machinery specifications and of lignite and overburden removal rates for the first half of 2002 show a positive trend. Substantial improvements have been achieved compared with previous years, especially as regards machine utilisation rates for stripping and extraction. This has been due to some extent to the introduction of a spare-parts delivery system, as well as to better process organisation.

The priority for Serbia's 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.

Coal and Energy Data	**Unit**	**2002**
Resources		
Lignite	Mt	23,115
Reserves		
Lignite	Mt	3,434
Domestic Output		
Lignite	Mt	32
Total	Mt	**32**
Selected Coal Quality Data		
Calorific value		
Lignite	kJ/kg	6,780 - 7,400
Ash content		
Lignite	%	18 -25
Water content		
Lignite	%	43 - 50
Sulphur content		
Lignite	%	0.5 - 0.9
Net Imports		
Hard coal	Mt	n.a.
Prim. Energy Consumption (2001)		
Total	Mtce	**18.1**
Hard coal	Mtce	n.a.
Lignite	Mtce	9.5
Power Supply (2001)		
Generation, total	**TWh**	**32.7**
Hard coal	TWh	n.a.
Lignite	TWh	21.6
Net power imports	TWh	n.a.
Gross power consumption	**TWh**	**n.a.**
Power Plant Capacity (2001)		
Total	**MW**	**9,027**
Lignite	MW	5,771

Source: Euracoal Member, RWE Power AG, BGR 2003, estimated/provisional

Slovakia

Lignite

Slovakia does not have large indigenous primary energy resources. Oil reserves total some 1 mill. tonnes and gas reserves 15 bn cbm. Lignite reserves are estimated at 83 mill. tonnes. The Slovakian energy mix is composed of natural gas (33 %), coal and nuclear energy (25 % each) and oil (16 %). The remaining 1 % is accounted for by renewables and hydro energy. Annual lignite production amounts to 3.4 mill. tonnes, with total coal and lignite consumption standing at 9.9 mill. tonnes/a. Imported coal (about 6.5 mill. tonnes/a) is supplied by the Czech Republic, Poland, Russia and Ukraine.

Lignite

Lignite mining is carried out by three companies at five deep mines in the centre, south and west of the country. In 2002 some 3.4 mill. tonnes of lignite was produced. Lignite-based power generation amounted to 2.2 TWh, or 7 % of total generation of around 31 TWh. *Hornonitrianske bane Prievidza, a. s.*, of Prievidza, extracts lignite at Handlová and Nováky, which are centrally located in the Obernitra region. There are also three independent mines operating at Baňa Cigel', Baňa Handlová and Baňa Nováky, where some 2.9 mill. tonnes of lignite was extracted in 2002. *Baňa Dolina, a. s.*, Vel'ký Krtíš, extracts lignite at Modrý Kameň in Southern Slovakia at a depth of 150 m. In 2002 this mine produced some 0.2 mill. tonnes, all of which was supplied to the Nováky power station. Mining operations are due to continue until 2003 and will then be gradually wound down. *Baňa Záhorie, a. s.*, Holíč, which has only been mining lignite since 1990, currently works the Kúty deposit in Western Slovakia. In 2002 some 0.3 mill. tonnes was extracted from a working depth of 180 m. About 90 % of the total volume of lignite produced in 2002 was used for electricity and district-heat generation. The power stations have an installed capacity of 511 MW. Approximately 0.3 mill. tonnes of the fuel produced was used in other sectors. Slovakia's energy policy is targeted at the efficient extraction of the solid fuel currently being worked. Future developments are limited by lignite consumption forecasts (which predict a constant level of use) and by the transition to environmentally compatible technologies. Companies failing to meet the prescribed limits are required to pay a fine, which goes towards the State's environmental fund. The Government has guaranteed full preferential purchase of electricity produced from lignite-fired power stations. This constitutes 10 % of total power generation up to 2005, followed by 8 % up to 2010 and finally 6 % after 2010.

General Data	**Unit**	**2002**
Population	millions	5.4
GDP	bn USD	66
Prim. energy consumption (PEC)	Mtce	26
Resources Lignite	Mt	698
Reserves Lignite	Mt	83
Domestic Output Lignite	Mt	3.4
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	6.5
Prim. Energy Consumption Total	Mtce	**26**
Hard coal	Mtce	5.2
Lignite	Mtce	1.4
Power Supply		
Generation, total	**TWh**	**31**
Hard coal and lignite	TWh	10.85
Net power imports	TWh	-2.7
Gross power consumption	**TWh**	**22.5**
Power Plant Capacity		
Total	**MW**	**7,450**
Hard coal and lignite	MW	1,360

Source: RWE Power AG, BGR 2003

Slovenia

General Data	Unit	2002
Population	millions	2
GDP	bn USD	36
Prim. energy consumption (PEC)	Mtce	8.5

Slovenia has no significant primary energy resources. The only indigenous energy reserves of any size comprise proven oil reserves of less than 50 mill. 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 power output, which amounted to 13.7 TWh in 2001, is based mainly on nuclear energy, hydro and lignite. Slovenia and its neighbour Croatia each have a 50 % holding in the Krsko nuclear power plant (707 MW), which is located on the border between the two countries. In 2001 Krsko covered 40 % of the demand, while lignite and hydro accounted for 34 % and 27 % respectively. Power plants burning hard coal, natural gas, oil and biomass also made minor contributions to the energy mix. In 2001 gross power consumption reached 13.8 TWh.

Some 25 % of Slovenia's electricity market is now deregulated. There are no plans to deregulate the Krsko nuclear power plant or the power grid. 65 % of the power market has been opened up since April 2001. Customers having a connected supply of at least 41 kW are entitled to participate in the free market for energy. Since the beginning of 2003 these consumers have had access to foreign electricity suppliers. A maximum of 25 % of the power consumed can now be sourced from abroad.

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 for 2002 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 4.7 mill. tonnes of lignite in 2002.

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 tonnes a day, with a record 16,000 tonnes 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 mill. tonnes of lignite in 2002, most of which was burnt in the nearby power station.

Coal and Energy Data	Unit	2002
Resources		
Lignite	Mt	240
Reserves		
Lignite	Mt	150
Domestic Output		
Lignite	Mt	4.7
Total	**Mt**	**4.7**
Selected Coal Quality Data		
Calorific value		
Lignite	kJ/kg	9,801
Ash content		
Lignite	%	18.6
Water content		
Lignite	%	35.6
Sulphur content		
Lignite	%	1.4
Net Imports		
Hard coal	Mtce	0.1
Prim. Energy Consumption		
Total	**Mtce**	**8.5**
Hard coal	Mtce	0.34
Lignite	Mtce	1.28
Power Supply		
Generation, total	**TWh**	**13.7**
Hard coal	TWh	0.2
Lignite	TWh	4.6
Net power imports	TWh	4.1
Gross power consumption	**TWh**	**13.8**
Power Plant Capacity		
Total	**MW**	**2,660**
Hard coal	MW	103
Lignite	MW	868

Source: Euracoal Member, BGR 2003, estimated/provisional

Spain

General Data	Unit	2002
Population	millions	40.1
GDP	bn USD	828
Prim. energy consumption (PEC)	Mtce	187.3

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 the year 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 – makes a 19 % contribution to the national energy mix (187 Mtce).

With electricity demand growing apace (6 % per year) there has been an ever increasing investment in the power 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 2002 solid fuel-fired plants generated 78.7 TWh of electricity (35.8 % of the total output). Hard coal contributed 63.1 TWh (28.7 %) and lignite 15.6 TWh (7.1 %) to the country's gross power generation of 219.6 TWh. Spain continues to privatise its energy sector, a process which began in 1994 with the LOSEN Electricity Act.

Hard coal

In 2002, Spain produced some 13.8 mill. tonnes of hard coal, a large percentage of which was burnt in local power stations. A significant amount of coal (24.5 mill. tonnes) had to be imported, mostly for power generation.

Hard coal is mined in several regions of the country, and especially in Asturias, León and Palencia - where 98 % of Spain's coal deposits are to be found. Most of the deep mines are located in the Asturias coalfield near Oviedo. There are also many deep mines and opencast pits in other parts of the country, almost all of which are run by the state-owned Hunosa Company. Many mines have now been forced to close due to high production costs.

At Santa Lucia there is a large opencast mine and a new colliery ("Nueva Mina"), which was built in the 1990s. Access is provided by three shafts: Aurelio del Valle (new shaft), Eloy Rojo, and Emilio del Valle (new shaft). Other opencast and deep mining operations are to be found at Tineo (west of Oviedo), Vega de Rengos and Monasterio de Hermo (south of Cangas de Narcea), and at several places south of Cordillera Cantabrica between Santa Lucia in the west and Barruelo in the east.

In the south of Spain mining is carried out in the provinces of Ciudad Real and Córdoba. Ciudad Real only has opencast pits, while Córdoba has both opencast and deep mines.

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 mill. tonnes in each case, but like the Ginzo de Limia deposits these have not yet been exploited for economic reasons. Spain produced a total of 8.6 mill. tonnes of lignite in 2002.

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 mill. tonnes. In 2002 production from As Pontes totalled some 6 mill. tonnes. The product is extracted by German-made machinery and then transported out 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 -10 mill. tonnes are contained 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 mill. tonnes, with an overburden-to-lignite ratio of 1 : 1 (cbm : t).

All the lignite produced was used for power and district heat 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 (1 unit, in operation since 1980), are both owned by the mine operators.

Coal and Energy Data	Unit	2002
Resources		
Hard coal	Mt	4,200
Lignite	Mt	80
Reserves		
Hard coal	Mt	600
Lignite	Mt	50
Domestic Output		
Hard coal	Mt	13.8
Lignite	Mt	8.6
Total	**Mt**	**22.4**
Selected Coal Quality Data		
Calorific value		
Hard coal	kJ/kg	n.a.
Lignite	kJ/kg	7,641 - 8,039
Ash content		
Hard coal	%	n.a.
Lignite	%	26.7 - 41.1
Water content		
Hard coal	%	n.a.
Lignite	%	37.5 - 50.8
Sulphur content		
Hard coal	%	n.a.
Lignite	%	1.3 - 2.6
Net Imports		
Hard coal	Mtce	24.5
Prim. Energy Consumption		
Total	**Mtce**	**187.3**
Hard coal	Mtce	32.8
Lignite	Mtce	2.2
Power Supply		
Generation, total	**TWh**	**219.6**
Hard coal	TWh	63.1
Lignite	TWh	15.6
Net power imports	TWh	12.3
Gross power consumption	**TWh**	**190**
Power Plant Capacity		
Total	**MW**	**52,880**
Hard coal	MW	9,500
Lignite	MW	1,950

Source: Euracoal Member, BGR 2003, estimated/provisional

Turkey

General Data	Unit	2002
Population	millions	68.1
GDP	bn USD	468
Prim. energy consumption (PEC) 2001	Mtce	104

As Turkey's indigenous energy resources consist exclusively of lignite and a small amount of hard coal, the country is heavily dependent on imports of coal, oil and gas. Turkey's primary energy consumption of 104 Mtce (based on figures for 2001) breaks down as follows: oil 40 %, coal 28 % and gas 18 %. The primary energy mix is supplemented by renewables, with a 9 % share and by hydro-electric power, which accounts for some 3 %. The contribution made by coal, gas and biomass fuel to Turkey's primary energy consumption is expected to increase over the next few years. By comparison, oil's share of the market is set to decline.

The Turkish coal industry produces both hard coal and lignite, mainly for power generation. Despite the wide range of coals being mined, only one power station is currently supplied with hard coal - the others all burn lignite. The coal-based installations have a total capacity of about 7 GW.

Over the last two decades Turkey has been one of the fastest growing power markets in the world, with an annual growth rate of 9 %. Despite the 1 % downturn in 2001 due to the economic crisis, this trend is set to continue until 2020 at an average increase of 8 % per year. The power generation sector breaks down as follows: about 29 % of Turkey's total electricity output of 129.4 TWh (2002 figures) is generated by coal and lignite-fired power stations, while a further 55 % is produced by natural gas and hydro-electric installations. Lignite is extracted from both opencast and underground mines, which have supply contracts with the power stations. The scale of the surface operations allows these mines to produce relatively low-cost fuel that can compete with imported gas in the power market. 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.

The Turkish Ministry of Energy, which has responsibility for the power sector utilities, has overall control of the coal mines, power stations and electricity grid through different subsidiaries: Turkish Coal Enterprises (TKI) and Turkish Hard Coal Enterprises (TTK) for coal production, and TEDAŞ for electricity distribution. Electricity privatisation is currently on the Government's agenda. 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 with a view to adapting to the new market conditions.

Hard coal

Turkey's main hard coal deposits are located in the Zonguldak area, which lies between Eregli and Amasra. Extensive deposits are also thought to exist close to the Taurus mountains and at Diyarbakir. Overall reserves of hard coal are estimated at some 428 mill. tonnes.
TTK operates five deep mines in the Zonguldak coal basin, which produced approximately 2.2 mill. tonnes of coal in 2002. TTK has a de facto monopoly of coal production, processing and distribution. There are reported to be substantial untapped resources of hard coal in the Zonguldak coalfield and private-sector mining is now set to increase following the issue by TTK of production licenses to private mining companies.

Turkey also imported 14 mill. tonnes of hard coal for steel production, industry and domestic heating purposes. Coal imports to Turkey are expected to increase over the next few years. Although the construction of gas-fired power plants dominates the immediate agenda, there is still significant potential for coal-fired power generation. One of the best examples of this is the construction of the new 1200-MW power plant at Iskenderun in Southern Turkey. This installation will be fired using imported coal and is scheduled for completion in late 2003.

Lignite

Lignite is Turkey's most important domestic fuel source. In 2002 lignite output totalled some 59 mill. tonnes, with national reserves estimated at about 5,900 mill. tonnes. The lignite deposits are spread right across the country. Thirty opencast mines and nine deep mines are operated by Turkish Coal Enterprises (TKI), whose operations produce nearly 40 mill. tonnes annually. There is a small but growing private sector that supplies local power plants.

The most important deposit by far is at Afşin-Elbistan near the town of Maraş, where geological and economically workable reserves are put at 3,200 mill. tonnes - more than 50 % of Turkey's total availability in this respect. The Soma basin is the second-largest lignite area in Turkey, with reserves estimated at 600 mill. tonnes. Other significant 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 coal-fired power generation should mainly be based on indigenous lignite.

In 2002, the power generators consumed some 47.2 mill. tonnes of lignite, or 80 % of the total output. The lignite-fired generating installations have a combined capacity of 6,502 MW. Lignite-based gross electricity production amounted to 34 TWh, representing 26 % of the country's total electricity output of 129.4 TWh.

Lignite production is set to increase in order to meet the growing power requirement and provide a cost-effect basis for the country's long-term energy needs. Output is expected to reach 160 mill. tonnes by 2010 and 185 mill. tonnes by 2020. This increase in production, combined with modernisation and compliance with international environmental standards, will enable lignite to maintain its substantial share in the power generation market.

Coal and Energy Data	Unit	2002
Resources		
Hard coal	Mt	249
Lignite	Mt	400
Reserves		
Hard coal	Mt	428
Lignite	Mt	5,900
Domestic Output		
Hard coal	Mt	2.2
Lignite	Mt	59.0
Total	**Mt**	**61.2**
Selected Coal Quality Data		
Calorific value		
Hard coal	kJ/kg	n.a.
Lignite	kJ/kg	4,564 - 22,316
Ash content		
Hard coal	%	n.a.
Lignite	%	11 - 46
Water content		
Hard coal	%	n.a
Lignite	%	6 - 55
Sulphur content		
Hard coal	%	n.a.
Lignite	%	0.2 - 4.7
Net Imports		
Hard coal	Mt	5.3
Prim. Energy Consumption		
Total	**Mtce**	**104**
Hard coal and lignite	Mtce	29.2
Power Supply		
Generation, total	**TWh**	**129.4**
Hard coal	TWh	4.1
Lignite	TWh	34
Net power imports	TWh	3.2
Gross power consumption	**TWh**	**132.6**
Power Plant Capacity		
Total	**MW**	**31,846**
Hard coal	MW	450
Lignite	MW	6,502

Source: RWE Power AG, BGR 2003, estimated/provisional

United Kingdom

Hard coal

General Data	Unit	2002
Population	millions	60.1
GDP	bn USD	1,520
Prim. energy consumption (PEC)	Mtce	381.9

The United Kingdom is rich in energy resources. It 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 has significant hard coal reserves estimated at 1,000 mill. tonnes. About 600 mill. tonnes of reserves and resources are available to existing deep mines or are in shallow deposits capable of being extracted by surface mining. There are also about 500 mill. tonnes of lignite reserves. In addition, currently unaccessed resources have the potential to provide many years of future production at present levels.

In 2002, the UK's primary energy production totalled 455.1 Mtce. The largest contributor was oil with 211.7 Mtce (46.5 %) followed by natural gas with 174.4 Mtce (38.3 %). Solid fuel production was 34.2 Mtce (7.5 %) followed by nuclear with 33.9 Mtce (7.4 %).

The UK's primary energy consumption in 2002 was 381.9 Mtce with natural gas accounting for the largest share (41.5 %), followed by oil (32.1 %), hard coal (17 %) and nuclear energy (8.9 %). The UK is a significant exporter of petroleum. Production and consumption of natural gas is at present broadly in balance, but increasing consumption and reduced production from the North Sea is likely to result in the country becoming a significant net importer over the next few years. The UK imports slightly less than half of its hard coal requirements. No lignite is consumed.

Power generation in the UK reflects a diverse energy mix. In 2002, gross electricity supply was 393.6 TWh, dominated by natural gas (39.4 %), hard coal (31.8 %) and nuclear power (21.7 %). Hydropower and renewables contributed 2.9 % and net imports provided 2.3 % 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 and increased competition from imported coal. However, over the last three years, more competitive electricity trading arrangements and an increase in gas prices have led to some increase in demand. Production has also stabilised as production costs have fallen towards levels that are internationally competitive due to dramatic increases in productivity. 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.

Consumption of hard coal in the UK in 2002 was 58.5 Mtce, of which 47.5 Mtce was used for electricity generation. Hard coal consumption in the steel industry was 6.4 Mtce.

Hard coal supply totalled 58.2 mill. tonnes, with 30.0 mill. tonnes being accounted for by indigenous production and 28.7 mill. tonnes by imports. Exports were 0.5 mill. tonnes. Imports thus supplied just under half of the overall market. South Africa accounted for about a third of all imports, the other main suppliers being Australia, Colombia, Russia, Poland and the U.S.

6.3 mill. tonnes of imports was coking coal. The UK no longer produces significant quantities of coal suitable for use in coke ovens. The share of imports of steam coal was thus somewhat lower at about 40 %.

Of total indigenous production, deep mines accounted for 16.4 mill. tonnes, with 13.1 mill. tonnes from surface mines and 0.5 mill. tonnes from other sources. In March 2003 the UK Government announced that a three-year coal investment aid scheme was to be introduced, providing around £60 mill. of support for "demonstrably viable" production. The scheme will offer producers up to 30 % of the costs of opening new reserves.

The UK's coal mines 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 2002, there were 15 large deep mines in operation. Twelve of these were owned by UK Coal plc (Daw Mill, Thoresby, Welbeck, Harworth, Clipstone, Maltby, Rossington, Kellingley, Wistow, Riccall, Stillingfleet and Ellington). The other large deep mine producers were Coalpower Ltd. (Hatfield), Tower Goitre Anthracite Ltd. (Tower) and Betws Anthracite Ltd. (Betws). In addition, there were 10 smaller deep mines in production.

UK Coal accounted for 15.2 mill. tonnes of the total of 16.4 mill. tonnes of 2002 deep mine production, with production from Tower and Hatfield being about 0.5 mill. tonnes and 0.3 mill. tonnes respectively. There are about 7,000 direct deep mine employees.

At any one time, there are about 50 surface mines in production and about 20 surface mine operating companies. The largest of these are UK Coal and Scottish Coal, each producing over 4 mill. tonnes a year out of the total 2002 output of 13.1 mill. tonnes. The regional surface mine production and manpower breakdown for 2003 was England with 5.0 mill. tonnes (manpower 1,119), Scotland with 7.1 mill. tonnes (manpower 1,221) and Wales with 1.0 mill. tonnes (manpower 348).

Total direct employment in the industry is some 9,500 with over 7,000 in England and over 1,000 in each of Scotland and Wales.

UK Coal plc is by far the largest producer and is Europe's largest totally independently owned hard coal mining company. In 2002 the company produced 19.5 mill. tonnes (15.2 mill. tonnes deep mined and 4.3 mill. tonnes surface mined) and sold 18.9 mill. tonnes. UK coal directly employs some 7,000 people at over 20 locations and almost as many again on contract or in the supply of goods and services. 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, and markets the "Lionheart" range of house 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 mill. tonnes to 4.5 mill. tonnes annually.

Other important surface mine producers include Celtic Energy, H. J. Banks, I. & H. Brown, ATH Resources and J. Fenton & Sons. Some surface mines are operated by contractors, the largest of which is Crouch Mining.

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

Coal and Energy Data	Unit	2002
Resources		
Hard coal	Mt	1,000
Reserves		
Hard coal	Mt	600
Domestic Output		
Hard coal	Mt	30
Total	**Mt**	**30**
Selected Coal Quality Data		
Calorific value		
Hard coal	kJ/kg	22,500 - 27,000
Ash content		
Hard coal	%	8 - 18
Water content		
Hard coal	%	7 - 17
Sulphur content		
Hard coal	%	0.4 - 2.5
Net Imports		
Hard coal	Mt	28.7
Prim. Energy Consumption		
Total	**Mtce**	**381.9**
Hard coal	Mtce	65
Power Supply		
Generation, total	**TWh**	**387.1**
Hard coal	TWh	118.6
Net power imports	TWh	8.4
Gross power consumption	**TWh**	**393.6**
Power Plant Capacity		
Total	**GW**	**79.6**
Hard coal	GW	30.3

Source: Euracoal Member

Other European Union Countries

Belgium, Netherlands, Italy

In 2002 the Community of Fifteen imported a total of 173 mill. tonnes of hard coal. Other major European coal importing countries not displayed in this brochure include Denmark (7 mill. tonnes), Portugal (5.9 mill. tonnes) and Finland (5.7 mill. tonnes).

Hard coal imports of the EU 2002

Country	1,000 t	Country	1,000 t
Austria	4,000	Italy	19,800
Belgium	8,900	Luxembourg	100
Denmark	7,000	Netherlands	13,500
Finland	5,700	Portugal	5,900
France	17,800	Spain	24,500
Germany	31,900	Sweden	2,700
Greece	300	United Kingdom	28,700
Ireland	2,000	**Total EU**	**172,800**

Source: EUROSTAT, EURACOAL Members, VdKI

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 tonnes. In 1917 coal extraction 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 tonnes. 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 stopping production in 1992.

Although coal is no longer mined in Belgium, imported coal remains an important energy source for the steel industry (4.5 mill. tonnes) and for power generation (4.0 mill. tonnes).

In 2002 Belgium's primary energy needs, amounting to some 79.8 mill. tce, were met by oil (31.9 mill. tce; 40 %), natural gas (19.2 mill. tce; 24 %), nuclear energy (17.6 mill. tce; 22.1 %), coal (9.3 mill. tce; 11.7 %), renewables (0.8 mill. tce; 1 %) and other fuels (1.0 mill. tce; 1.2 %).

Gross power generation in 2002 totalled 82,059 TWh. The majority of this (57.6 %) was generated by the nuclear power stations, while a further 40.6 % was produced in conventional thermal installations (with coal-fired power plants contributing 12.2 %). Belgium is one of eight Member States of the Community of Fifteen currently operating nuclear power stations, although the country has announced a moratorium on nuclear power (along with Sweden, Spain, the Netherlands and Germany).

In 2002 national coal imports amounted to 8.9 mill. tonnes, with the majority of this fuel being supplied by: Australia (26 %), South Africa (28 %), the United States (19 %), the CIS (10 %) and Poland (5 %).

General Data	Unit	2002
Population	millions	10.3
GDP	bn USD	297.6
Prim. energy consumption (PEC)	Mtce	79.8
Imports		
Hard coal	Mt	8.9
Prim. Energy Consumption		
Total	**Mtce**	**79.8**
Hard coal	Mtce	9.3
Power Supply		
Generation, total	**TWh**	**78.1**
Hard coal	TWh	12.6
Net power imports	TWh	7.6
Gross power imports	**TWh**	**80.4**
Power Plant Capacity		
Total	**MW**	**15,544**
Hard coal	MW	2,077

Source: Euracoal Member, Serv. Public Fed. Economie, BFE-FPE

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 and Gent in Belgium, constitute the most important handling centres for imported coking coal and steam coal.

In 2002, the Netherlands imported some 13.5 mill. tonnes of coal, comprising 9.1 mill. tonnes of steam coal, 3.0 mill. tonnes of coking coal and 1.2 mill. tonnes of PCI. The main supplier countries were South Africa (3.3 mill. tonnes), Indonesia (1.7 mill. tonnes), Colombia (1.5 mill. tonnes) and Australia (1.0 mill. tonnes).

In 2002, almost 10 % of the Netherlands' primary energy requirements were met by coal.

Most of the imported coal is used for power generation, amounting to 24.0 TWh in 2002. Coal therefore has a 27.2 % share in the Dutch power generation market. Actual installed coal-fired power plant capacity amounts to 4,090 MW. About 27 % of 15,000 MW is suplied by large scale generation.

General Data	Unit	2002
Population	millions	16.2
GDP	bn USD	434
Prim. energy consumption (PEC)	Mtce	127.2
Imports		
Hard coal	Mt	13.5
Prim. Energy Consumption		
Total	**Mtce**	**127.2**
Hard coal	Mtce	12.9
Power Supply		
Generation, total	**TWh**	**88.3**
Hard coal	TWh	24.0
Net power imports	TWh	17.1
Gross power consumption	**TWh**	**99.4**
Power Plant Capacity		
Total	**GW**	**21.1**
Coal-fired	GW	4.1

Source: RWE Power AG, BGR 2003, estimated/provisional

Italy

Italy - one of the world's largest economies - is almost entirely dependent on imports to meet its energy needs. Italy's heavy reliance on foreign oil and gas, from sources such as Libya and Algeria, has made energy security and diversification one of the country's top concerns.

Most of the coal consumed in Italy is used by the power generation market – where consumption is growing and is expected to reach a 22 % share by 2010 – and for the production of coke for the steel industry, which is a declining market. Coal has only played a minor role in the Italian energy sector and Italy produces almost no coal of its own. In 2001, nearly 8 % of Italy's primary energy consumption of around 246.2 million tce was met by coal.

The power sector is expected to increase its coal consumption in the years ahead as ENI 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 20 million tonnes of hard coal were imported in 2002. The main suppliers of steam coal to Italy were South Africa (3.7 mill. tonnes), the USA (3.3 mill. tonnes), Colombia (1.8 mill. tonnes), the CIS (1 mill. tonnes) and Poland (0.9 mill. tonnes).

Italy has a power generation capacity of 69 GW. In 2001 the country generated 203.4 TWh and consumed 289.1 TWh. Generation is mostly by thermal means (78 %), 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 kilovolt 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.

General Data	Unit	2002
Population	millions	57.7
GDP	bn USD	1,438
Prim. energy consumption (PEC) (2001)	Mtce	246.2
Imports		
Hard coal	Mt	19.8
Prim. Energy Consumption		
Total	**Mtce**	**246.2**
Hard coal	Mtce	19.7
Power Supply		
Generation, total	**TWh**	**203.4**
Hard coal	TWh	30.6
Net power imports	TWh	54.9
Gross power consumption	**TWh**	**289.1**
Power Plant Capacity		
Total	**MW**	**69,000**
Hard coal	MW	6.7

Source: RWE Power AG

EURACOAL's Position on Future Coal RTD in Europe

Rationale

European coal mining will remain a major source of energy supply for the enlarged European Community in the decades to come. In its Green Paper "Towards a European strategy for the security of energy supply", the Commission addresses the Union's structural weakness regarding energy supply, namely Europe's growing dependence on energy imports, and proposes measures to ensure the uninterrupted availability of energy products, i.e. 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 a highly developed mining-machinery and combustion-equipment industry with a very high export potential (at present more than 50 % of 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. This will require 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 production 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.

Main Orientation of the Research Fund for Coal and Steel (RFCS) Programme

The RFCS programme should adopt the same structure and mode of implementation as the former ECSC RTD programme, whose legacy is now well established. A survey conducted in 1995 by independent experts showed that ECSC research funding had brought many benefits in respect of technology, economic efficiency, industrial safety and the environment. A parallel assessment carried out by one of the Coal Research Committee's working groups came to the conclusion that the ECSC research funds had yielded a 7 to 25-fold economic benefit to the mining industry. In the field of combustion and conversion the research programme has brought substantial increases in power generating efficiency and has helped develop successful deNO_X and deSO_X technology. It has also delivered many products designed to protect the environment, this being expressively defined as a principal objective in the 'Technical Guidelines to the Council's Decision on the Research Programme of the RFCS' (Official Journal of the European Union 2003/78/EC: Technical Guidelines to the Council's Decision on the Research Programme of the Research Fund for Coal and Steel).

The RFCS programme is considered a continuation of the ECSC RTD programme. According to the 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...." To our understanding "complementarity" implies that RTD subjects eligible for funding under FP 6 should not be eligible under the RFCS. Ambitious objectives such as sequestration and deposition of CO2, for example, are already covered by the current EU RTD Framework Programme.

Future objectives for the RFCS programme

To ensure that the available funding is used as efficiently as possible, future RFCS programmes should concentrate not only on the most important matters but also on the most promising developments within the framework of objectives as described in the Technical Guidelines. This would include, for example, improving the competitive position of the Community coal industry, health and safety in mines, efficient protection of the environment, the improved use of coal as a clean energy source and the management of our external dependence on energy supply. In this respect, special consideration should be given to the industry's priorities.

The projects should present the likely impact of the research work in the short to medium term as this applies to a substantial part of the EU's coal production and utilisation sector.

The scientific and technical objectives should also be based around measures designed to preserve and improve public acceptance of Community coal by economic and environmental means.

This could be achieved through research activities aimed at:

1. Improving the Competitive Position of Community Coal

The main objective here is to reduce total production costs at colliery level and to reduce coal utilisation costs by

- overcoming the problems presented by working at great depth; projects should be directed at achieving greater scientific and technological progress, leading to improved knowledge of rock behaviour, strata control (geophysics and geomechanics) and appropriate support technologies;

- focusing on the development of high-performance, highly automated roadheading and coal-winning technologies that are appropriate to the complex geology of the European hard coal deposits; production costs will only be reduced by developing efficient techniques for mining thin and steeply-inclined coal seams at increasingly deep levels;

- ensuring the availability of improved knowledge-based systems, better mine communication and information equipment and improved monitoring and process-control technology;

- upgrading our approach to coal conversion and combustion, for example through
  - improved flexibility in fuel usage
  - reductions in investment and operating costs
  - increased availability of combustion plants.

2. Health and Safety in Mines

The developments mentioned above must be matched by progress in the area of mine safety and by improvements in the underground environment, e.g. gas control, ventilation and air-conditioning. Underground working conditions also need to be improved from an occupational health and safety viewpoint.

3. Efficient Protection of the Environment and Improved Public Awareness of Coal as a Clean Energy Source

Research projects with this objective should seek to minimise the environmental impact (on air, land and watercourses) of coal mining and utilisation in the EU. In view of the ongoing restructuring of the Community coal industry, the research will also be geared to minimising the environmental impact of those deep mines that are set for closure.

RTD should concentrate on projects designed to:

- reduce greenhouse gas emissions from coal deposits, particularly methane (CH_4)
- protect the water tables
- reduce the environmental impact of coal conversion and combustion plants
- protect surface buildings from the effects of subsidence and gas emissions
- improve combustion efficiency.

How EURACOAL Works

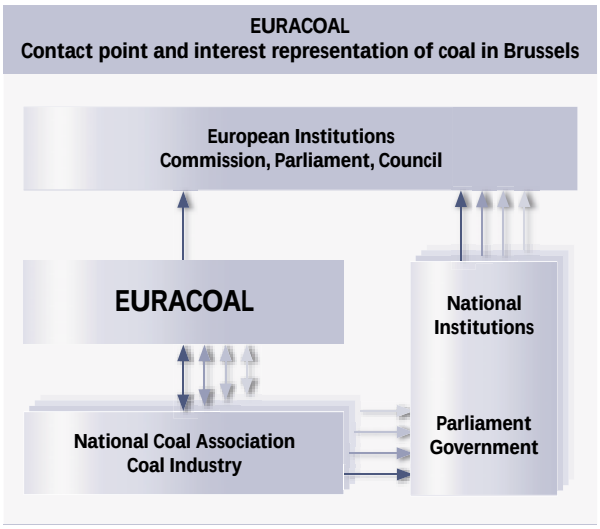
The **Eur**opean **A**ssociation for **Co**al **a**nd **L**ignite is the umbrella organisation of the European coal industry. The associations and companies representing the coal industries of Austria, Belgium, France, Germany, Greece, Spain and the UK, as well as the relevant organisations of the countries Bulgaria, the Czech Republic, Hungary, Poland, Romania, and of Serbia work together in EURACOAL, where they have equal rights. Importers, dealers and consumers have a seat and vote in EURACOAL. By integrating these countries EURACOAL has anticipated an important political development taking place in the European Union as a whole. The new Association, which evolved from CECSO (the European Solid Fuels' Association) after the expiry of the Treaty establishing the European Coal and Steel Community (ECSC Treaty), now 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. Almost 25 % of the power generated in the EU and nearly 50 % in the accession countries are 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 of EU energy supply for the years to come. The importance of coal for the European power supply defines EURACOAL as an active player in the future energy policy of the whole European Union.

EURACOAL's work is entirely geared to the interests of its Members. This includes the entire process chain beginning with coal extraction, marketing and transportation 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 at 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 environmental policy on the other. The EU has to create adequate framework 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 coal and energy industry at European level,
- getting involved in creating the right political and regulatory conditions, especially via the European Parliament, the Commission and the Council,
- improving its information exchange and working relations with the Commission and Parliament,
- participating in the social dialogue and work 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 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 environmental 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 membership, but 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/Organisation

EURACOAL welcomes the European unification process and considers EU expansion to be a complex task whose completion requires full commitment from all involved. EURACOAL owes its origins to the expiry of the ECSC treaty in mid-2002 as well as to the forthcoming accession to the EU of the countries of eastern and central Europe. There is no specific EU authority with responsibility for Community energy supply. The EU's general objectives, which are to implement the Common 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 energy-supply security and climate protection. EURACOAL also regards these as major challenges to be tackled.

EURACOAL
European Association for Coal and Lignite

General Assembly
Coal producers, coal power generators, coal traders, research institutes

Executive Committee
Discussions, opinion forming, work targets

President: Dr. Dietrich Böcker | Vice President: Nigel Yaxley

Secretariat
Secretary General:
Léopold Janssens

National delegations

Committees
- General Purposes Committee: Dr. George Milojcic
- Technical Research Committee: Dr. Hans-Jürgen Czwalinna
- Enviroment Committee: Robert Pentel
- Market Committee: Dr. Wolfgang Ritschel

EURACOAL considers it vitally important for Europe to draw up energy and environmental policy strategies on an international scale. Europe's oil and gas resources are relatively limited when viewed 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 framework conditions.

The EU power of authority in the area of environmental 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 Plants 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 recultivation or large-scale nature conservation projects in and around major infrastructure works, 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.

Members and Committees

Members Association/Enterprise		Country
GKB	GKB-Bergbau GmbH, Östereich	AUS
Euriscoal	European Association of Coal Importers	BEL
ISSEP	Institut Scientifique de Service Publique	BEL
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	RUM
EPS	Electric Power Industry of Serbia	SER
COALPRO	Confederation of the UK Coal Producers	UK
Coaltrans Conferences Ltd.	Conference Organiser	UK
IMCL	Int. Mining Consultants Ltd	UK
University of Nottingham		UK

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

Executive Committee

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VD Mag. Ing. D. BAUMANN GKB Chief Executive GKB	(AUS)	Dipl.-Kfm. Michael G. ZIESLER GVSt Executive Vice President Deutsche Steinkohle AG	(GER)
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E. CIREZ SUAREZ CARBUNION Chairman of the Board	(ESP)	Michal SOBEL ZPGWK Deputy Chairman of Weglokoks	(POL)
Pierre BERTE CdF European Relations CdF	(FRA)	Mgr. Inz. Czeslaw WOJCIECHOWSKY PPWB President and Managing Director Belchatow Lignite Mine	(POL)
Eric DYEVRE CdF Deputy General Manager CdF	(FRA)	Ion Stamin PURCARU PATROMIN General Manager Oltenia Lignite Mining Company	(RUM)
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Dr.-Ing. George MILOJCIC DEBRIV Chief Executive DEBRIV	(GER)	Brian J. ROSTRON H. J. BANKS & COMPANY Ltd. Operations Director	(UK)

Statistics

Energy Data EU-15 and EU-10

			EU 15	EU 10 Accession Candidates
		Unit	2000	2000
1.	General Data			
	Population	Millions	377	104
	GDP(purchas. power parity)	USD 95 bn	9,786	908
	GDP/capita	USD 95	25,937	8,701
	Prim. energy consumption/capita	J	154	103
	Prim. energy consumption/GDP	kg tce/USD 95	0.2	0.4
	Power consumption	TWh	2,477.9	387
	Power consumption/capita	kWh/a	6,567	3,709
	Power consumption/GDP	kWh/USD 95	0.3	0.4
	CO2 emissions/capita	t	8.2	7.2
2.	Domestic Output, Energy			
	Total	PJ	31,776	7,392
	Hard coal	PJ	2,128	2,960
	Lignite	PJ	1,999	1,805
3.	Energy Imports			
	Total	PJ	47,417	4,719
	Hard coal	PJ	4,516	437
	Lignite	PJ	21	12
4.	Primary Energy Consumption			
	Total	PJ	58,006	10,545
	Hard coal	PJ	6,776.0	2,459
	Lignite	PJ	1,650	1,767
	Oil	PJ	24,458	2,606
	Natural gas	PJ	14,408	2,248
	Nuclear energy	PJ	8,848	938
	Hydro	PJ	1,331	117
	Other	PJ	217	410

			EU 15	EU 10 Accession Candidates
		Unit	2000	2000
5.	Power Generation			
	Hard coal	TWh	478	102
	Lignite	TWh	197	155
	Oil/natural gas	TWh	611	40
	Nuclear energy	TWh	864	81
	Hydro	TWh	346	34
	Other	TWh	104	1
	Generation, total	TWh	2,599	412
	Net power imports	TWh	42	-25
	Gross power consumption	TWh	2,478	387
6.	Power Plant Capacity			
	Hard coal	MW	118,398	59,034
	Lignite	MW	30,473	18,010
	Natural gas/oil	MW	173,741	16,906
	Nuclear energy	MW	124,700	14,018
	Hydro	MW	118,236	17,752
	Other	MW	9,328	1,178
	Total	MW	574,876	109,782
7.	Emissions			
	SO2	mill. t	5,750	4,458*
	NOx	mill. t	9,497	1,856*
	Six Kyoto gases	mill. t**	4,067,767	992,929*
	CO2, total	mill. t	3,103,000*	782,861*
	Energy production/conversion	mill. t	1,072,000*	464,575*
	Industry	mill. t	573,400	129,984*
	Transportation	mill. t	903,600	83,135*
	Households & small-sized business	mill. t	716,700	94,085*

* 1999
** CO2 equivalents

29.308 petajoules (PJ) = 1 Mtce

Sources:
Eurostat 2002
IEA, Electricity Information 2002
IEA, Energy Statistics of OECD Countries 2002
UNFCCC Greenhouse Gas Inventory
VIK (publisher), Statistik der Energiewirtschaft 2003 (Statistics of energy sector, 2003)

Trade* with Hard Coal in 2001 (1,000 t)

Exports from	EU-15	Poland	CIS	PR China	Indo-nesia	USA	Canada	Colom-bia	Vene-zuela	South Africa	Australia	Others	World
Imports to													
Germany	1,916	3,783	1,244	18	108	534	0	4,235	377	6,869	1,438	9,696	30,217
Belgium	194	660	830	252	66	2,411	624	215	644	3,549	3,892	-614	12,656
Denmark	9	2,095	1,839	278	0	0	0	414	0	1,881	160	-179	6,497
France	523	596	262	643	137	2,682	423	1,375	408	3,247	3,892	251	14,439
Greece	0	0	116	0	106	0	0	0	0	326	0	100	648
UK	239	1,234	3,975	704	95	2,610	1,183	6,720	54	10,258	7,075	1,394	35,541
Ireland	0	0	0	0	603	1,500	0	1,322	0	0	0	320	3,745
Italy	0	234	866	194	1,733	5,143	1,212	1,451	1,002	4,64	2,682	360	19,517
Luxemburg	76	0	0	0	0	0	0	0	0	81	0	64	221
Netherlands	67	1,795	954	877	2,818	2,580	1,686	3,743	638	10,467	2,485	2,228	30,338
Portugal	0	0	28	0	606	530	0	1,815	109	1,462	399	-143	4,806
Austria	0	1,884	0	0	0	0	0	0	0	0	0	1,387	3,271
Finland	0	1,382	2,702	0	132	0	0	0	0	0	0	-30	4,186
Sweden	16	315	255	0	0	497	0	41	353	0	760	753	2,990
Spain	156	316	1,550	0	2,168	2,734	382	746	53	7,630	2,995	435	19,165
EU-15	**3,196**	**14,294**	**14,621**	**2,966**	**8,572**	**21,221**	**5,51**	**22,077**	**3,638**	**50,410**	**25,711**	**16,021**	**188,237**
Turkey	0	121	319	64	37	803	782	0	0	1,721	1,452	0	5,300
East and Central Europe	0	3,380	8,586	58	66	364	68	215	0	473	495	0	13,707

*) including delieveries to third countries

Source: Statistik der Kohlenwirtschaft (Ed.), Der Kohlenbergbau in der Energiewirtschaft der Bundesrepublik Deutschland im Jahre 2001. Essen/Cologne 2002, pp. 90-91.

Power Generating Structure of Selected European Countries in 2001 *)

	Lignite	Hard coal	**Total coal**	Oil	Natural gas	Nuclear energy	Others	Total power generation **)
	percentage							TWh
Greece	66.0	-	**66.0**	15.8	11.4	-	6.8	**53.7**
Germany	26.6	23.8	**50.4**	1.0	9.9	29.5	9.2	**581.6**
Denmark	-	47.3	**47.3**	11.0	24.6	-	17.1	**37.7**
Ireland	8.8	28.3	**37.1**	20.9	36.6	-	5.4	**25.0**
UK	-	34.1	**34.1**	1.8	36.9	23.4	3.8	**385.8**
Spain	2.7	26.9	**29.6**	10.3	9.8	26.8	23.5	**238.0**
Portugal	-	29.2	**29.2**	20.1	15.5	-	35.2	**46.5**
Netherlands	-	25.3	**25.3**	3.3	59.0	4.2	8.2	**93.7**
Finland	8.3	14.3	**22.6**	0.9	15.5	30.6	30.4	**74.5**
Belgium	-	12.5	**12.5**	2.1	19.8	58.1	7.5	**79.7**
Italy	-	11.4	**11.4**	26.9	34.4	-	27.3	**279.0**
Austria	2.5	8.4	**10.9**	3.1	13.3	-	72.7	**64.1**
France	0.4	5.0	**5.4**	1.8	1.4	76.7	14.7	**549.2**
Sweden	-	1.3	**1.3**	1.7	0.2	44.6	52.2	**161.7**
Luxemburg	-	-	**-**	-	22.5	-	77.5	**1.2**
EU	**7.7**	**17.1**	**24.8**	**5.6**	**16.6**	**33.4**	**19.6**	**2,671.4**
Poland	34.7	55.4	**90.1**	-	-	-	9.9	**145.7**
Czech Republic	69.0	2.6	**71.6**	0.5	4.2	19.8	3.9	**74.6**
Serbia (Kosovo not incl.) 2000	66.1	-	**66.1**	-	3.3	-	30.7	**32.7**
Bulgaria	28.4	17.8	**46.2**	-	4.3	44.5	5.0	**43.8**
Romania	27.2	9.3	**36.5**	4.7	20.0	10.1	28.6	**53.9**
Slovenia 200u	33.8	-	**33.8**	0.4	2.2	34.9	28.7	**13.6**
Turkey	28.1	3.3	**31.4**	8.4	40.3	-	19.9	**123.2**
Hungary	23.0	1.7	**24.7**	11.8	23.4	39.6	0.5	**35.7**
Slovakia	7.0	11.7	**18.7**	0.7	11.2	53.4	16.0	**32.0**

*) preliminary figures
**) Gross power production

Source: Lignite in Europe (RWE Rheinbraun), EURACOAL Members, EUROSTAT

Glossary and Literature

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 in not possible.

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Coal Types and Peat

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

Steinkohle | HARTKOHLE

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