
EURACOAL
European Association for Coal and Lignite
AISBL
COAL
INDUSTRY
ACROSS EUROPE
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Contents

Philip Lowe, Director-General for Energy, European Commission

Foreword

The challenges facing the energy world – and the coal industry in particular – are getting more complex. Global energy markets have become increasingly competitive and Europe finds itself in a race for resources and investments. Energy policies and political commitments have had to adapt in the wake of the economic crisis. US shale gas has brought cheaper coal from the US to Europe, shifting the balance in Europe between gas and coal. At the same time, global energy-related CO_2 emissions in 2012 reached a new historic high, whilst scientific consensus on the direct link between our use of energy and climate change, described in the latest IPCC report, has never been stronger.

To deal with these challenges, EU policy makers, together with Member States, are working to find the right balance between sustainability, competitiveness and security of supply concerns, not just in our current strategy and programmes, but also for the forthcoming EU 2030 energy and climate policy framework.

These challenges also have an impact on the European coal industry. The economic arguments for coal have changed recently in its favour. Coal provides much-needed security of supply in our electricity network. After years of decline, demand for coal in the EU has started rising again, with coal imports up 7% in 2012. On the other hand, many coal plants will be faced with closure due to new air pollution limits coming into force in 2016. EU coal production will be affected by the phase out of state aid by 2018. In addition, policies to reduce greenhouse gas emissions have a particularly profound impact on the coal industry and coal-fired power generation.

Coal plays an important role in the European economy. Over one quarter of our electricity comes from coal. Coal and related industries employ well over 200 000 people. Balancing the benefits of coal with its environmental impact is a challenge both for the coal industry and for European policy makers.

The facts are undeniable: 87% of the EU's CO_2 emissions come from energy production or use, with energy industries remaining the dominant source. The only way to reconcile the use of coal with a low-carbon and efficient energy system is with greater flexibility, more efficiency and the widespread uptake of carbon dioxide capture and storage – CCS. It is essential for the coal and power industries to develop more low-carbon options for coal-fired electricity generation. Investing today will give us a more diversified energy mix in the future.

Making progress on CCS development is not just a technical and financial challenge, but also a political issue. The Commission's March 2013 communication on CCS re-launched the debate on how to give CCS the kick-start that it needs. Ideally, the Commission would like to see a commercial-scale demonstration project running this side of 2020. However, we are also aware of the many obstacles which need to be overcome. We want to work with the coal industry, coal generators and coal investors to find innovative solutions for the future of coal and to ensure that coal continues to be a useful resource in a low-carbon energy system.

Paweł Smoleń, President of EURACOAL

Introduction

This is the fifth edition of "Coal industry across Europe" and comes at a time when coal is making a resurgence in Europe. Since the first edition was published in 2003, the coal industry in Europe has undergone a transformation. Underground coal mining has become more automated and more productive in order to compete against imported coal. Surface lignite mining has become a much more important component of energy supply as enlargement of the European Union has brought in countries with rich deposits of this valuable resource. Unfortunately, Europe is in the fifth year of an economic crisis and austerity measures. The means to wealth creation are under scrutiny. Whatever the conclusions, we can be sure that basic industries, like coal mining, will play a decisive role in pulling Europe out of this crisis and back to prosperity.

The European Union is the world's third largest coal-using region, after China and North America. Each year, we mine around 130 million tonnes of hard coal and import a further 210 million tonnes making us the world's largest importer behind China. At 430 million tonnes, our lignite production far exceeds that from any other region. Russia, Australia, the USA and Turkey each mine around 70 million tonnes, far behind Germany which produced 185 million tonnes in 2012. Most Europeans never see a lump of coal, but they use it in their homes in the form of electricity: 27% of EU electricity production comes from burning coal and lignite in power stations.

Despite these remarkable statistics, coal and lignite are not always viewed positively. They are abundant, affordable and accessible so add to the security and competitiveness of energy supply in the EU. 88% of EU fossil energy reserves are in the form of coal and lignite. However, burning fossil fuels of any type – coal, oil or gas – releases carbon dioxide (CO_2) into the atmosphere that is thought to cause global warming and climate change. It is right that the coal industry is taking steps to reduce emissions. EURACOAL itself calls for a three-step strategy encompassing power plant modernisation to improve efficiency using technologies that are commercial today, research and development into even more efficient technologies for tomorrow and finally deploying CO_2 capture and storage the day after tomorrow.

In too many countries, there is a reluctance to take even the first of these practical steps as policy shifts against coal. This needs to be reversed so that the EU is not left behind in a world that is embracing coal like never before. We need to demonstrate how to use coal cleanly and efficiently. There are good examples that we can be proud of and use to promote European technology. In Denmark, one can find the world's most efficient coal-fired power plants. In Germany, lignite-fired power plants that have opened in the last couple of years are the world's most flexible – perfect for balancing the increasing share of electricity from renewable energy sources under the German *Energiewende*. In the Netherlands, new coal-fired power plants will open shortly and ensure that the country

does not become dependent on imported gas as its own North Sea gas reserves deplete. These are all good examples, but when we look to Eastern and South East Europe a different picture emerges.

Newer member states have not been so lucky because the investment climate has not favoured renewal of their ageing and often inefficient coal-fired assets. The basics must be in place to support economic growth. For most countries, this means a reliable and affordable electricity supply that does not pollute the countryside. Whilst many in Western Europe can be satisfied with the progress that has been made in that direction, the same is not true across all parts of the Union.

A startling fact emerges from the chapter that reviews global energy trends. In 2012, China's coal production grew by 130 million tonnes – the same as *total* EU hard coal production. In truth, the EU is now responsible for a rather small and declining share of global greenhouse gas emissions – just 11 % – although EU consumers enjoy the benefits of products from China. This trend towards globalisation extends the EU's carbon footprint in ways that are not properly appreciated.

EU climate and energy policy aims to shift energy consumers in Europe away from coal towards gas. This is one reason why gas is so expensive in Europe – a market is being created not through competitive forces, but through policy, legislation and regulation. If this continues, we will wake up one day to find that competitive energy markets have all but disappeared. Today, it is only competition between coal and gas that protects consumers from high electricity prices.

This report summarises coal industry developments not only across the EU-28 but also the Energy Community which includes countries where there are enormous investment opportunities in the energy sector. Countries that were ravaged by war not so many years ago are vigorously rebuilding their economies. Many of these countries sit on coal and lignite reserves that they want to exploit to provide electricity for their fast-growing economies. If European banks do not lend money to these countries, then it will be Chinese banks with Chinese technology. European power plant suppliers would miss out on new projects right on their doorstep. The EU needs a strong industrial policy to match its strong climate policy so that member states and neighbouring countries become wealthier.

I am pleased that EURACOAL's thirty four members have worked together to produce a report that offers so much information within its pages. Like the European project, it brings the quarter of a million men and women who work in the coal industry closer together, makes us all more aware of the challenges that we face and hints at ways forward to a more prosperous future. With greater prosperity, Europe can look forward to a cleaner and brighter future. For many countries, the foundation of prosperity comes from the exploitation of their natural resources, beginning with coal and lignite.

GERMANY

RECULTIVATION OF COLLIERY SPOIL TIPS

Over the long history of coal mining in the Ruhr basin, hard coal extraction from underground mines inevitably produced unwanted waste material – now a feature of the surface landscape in coalfield areas. Some of these spoil heaps have undergone changes on their own, others have provided a site for artistic works. "Totem" is a piece of contemporary art by the Basque painter and sculptor Agustín Ibarrola. Created from more than one hundred railway sleepers, it is intended to portray the apparent contradictions between industrial landscapes and nature.

UNITED KINGDOM

NORTHUMBERLANDIA – THE LADY OF COAL

At Shotton in Northumberland, the Banks Group decided to create the world's largest human landform "Northumberlandia", using 1.5 million tonnes of carefully selected stone, clay and soil extracted from the adjacent Shotton surface mine. The Lady was designed in line with a "restoration first" approach, where extra land not needed for coal mining was provided by the landowner Blagdon Estate to deliver a lasting and positive legacy for both the local community and the wider region.

Since being officially opened by Her Royal Highness The Princess Royal in September 2012, "Northumberlandia" has proved extremely popular with local residents and tourists alike. Many thousands of people visit the 47-acre public park in which she resides every week.

GERMANY

WATER BUFFALOES AT LAKOMA

Since the natural paradise of "Spreeaue" was opened to visitors in 2007, thousands of tourists, cyclists, hikers, kids and teenagers have come to visit this fascinating area of 530 hectares between Cottbus and Spreewald in Germany. The area became the new home to more than 146 000 amphibians, while oxen, wild horses and water buffaloes graze on the meadows. Many fish are bred in the ponds. Fire-bellied toads and tree frogs have found a new habitat in the biotopes which draw locals and tourists from all across Germany. The new landscape offers new perspectives and new views on local sustainable development.

Global energy trends and the international coal market

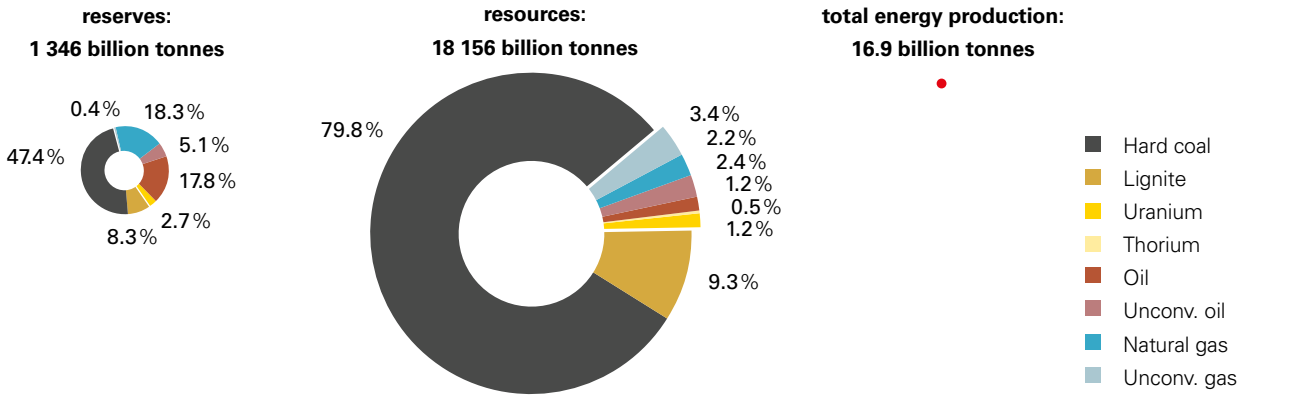
There are many sources of energy data and reconciling these is a task for professionals. Government bodies, such as the European Commission, Eurostat, International Energy Agency (IEA) and the US Energy Information Administration, alongside private companies, investment banks and market research consultancies, aim to provide consistent data to policy makers and other users. Many also forecast future energy supply and demand. EURACOAL itself collects historic data from its members and national governments to build a picture of coal industry developments in Europe for publication in its regular coal market reports. In this chapter, data is drawn from various sources to present a concise overview of global energy trends, notably coal market data from VDKi – the German coal importers association. Coal is seen to be well on the way to becoming the world's most important energy source, helped by a well-functioning international coal market. In contrast, Europe's importance is shown to be declining as energy demand in the emerging economies overtakes that of Western consumers.

Global energy reserves and resources

We are not about to run out of energy: the world has sufficient energy reserves of all types for the next 80 years and resources to last over one thousand years. Well over one half of our reserves are in the form of coal and lignite which together account for an even larger share of resources (Figure 1). Natural gas, oil and nuclear fuels make up the remainder of total non-renewable energy reserves and resources. Renewable energy is abundant and – in the case of wind, solar and geothermal – practically inexhaustible, although much harder to quantify as a resource since converting it into useful energy can be inefficient and expensive.

Figure 1
Global production, reserves and resources of non-renewable fuels

billion tonnes of coal equivalent (Gtce – data for the end of 2011)



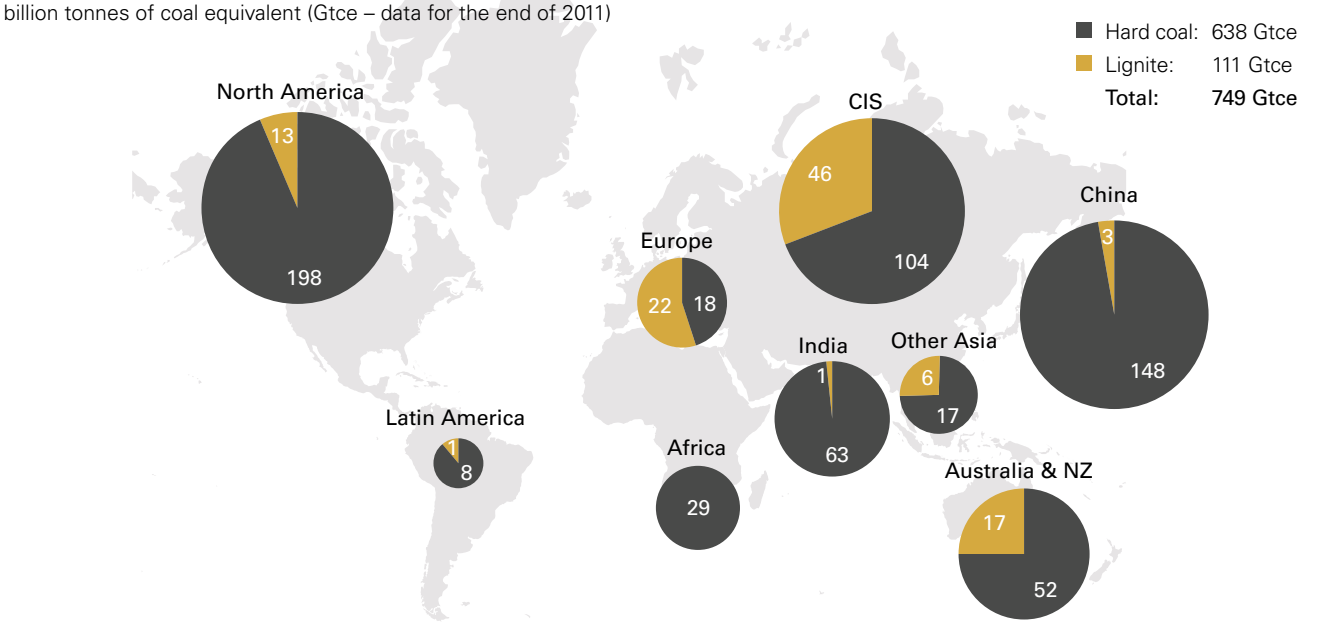
Source: BGR, 2013

Coal and lignite reserves are sufficient for the next 137 years at current rates of production. Unlike oil and gas, coal is widely distributed around the world with particularly large reserves in the USA, Russia and China (Figure 2). For this reason, coal offers a much higher level of supply security: most coal produced is used in the country of extraction. Where there is an indigenous source of coal, supply security is self-evident. Where coal is imported, supply is supported by a competitive market and a well-developed infrastructure.

At around 3%, the European Union's share of global energy reserves and resources is rather small (Table 1). As at the global level, it is the reserves and resources of coal and lignite that are most significant: together they account for 94% of the EU's remaining potential. Some coal deposits lie near consumers and can be exploited under very favourable conditions. For example, surface-mined lignite in Bulgaria, the Czech Republic, Germany, Greece, Hungary, Poland and Romania is used mainly for power generation, often transported to power plants over short distances by conveyor belt to produce some of the lowest-cost electricity in Europe. Hard coal, both indigenously produced and imported, is much less expensive than imported oil or gas and the majority of EU member states enjoy the benefits of competitive coal-fired electricity generation.

Figure 2
Global hard coal and lignite reserves

billion tonnes of coal equivalent (Gtce – data for the end of 2011)



Source: BGR, 2013

Table 1
Non-renewable energy reserves and resources in the European Union

Gtce	reserves		resources	
Hard coal	16.6	43.0%	428.6	77.8%
Lignite	17.4	45.0%	93.1	16.9%
Oil	1.7	4.4%	3.6	0.7%
Natural gas *	2.8	7.3%	20.5	3.7%
Uranium / Thorium	0.1	0.3%	4.8	0.9%
Total	38.7	100.0%	550.7	100.0%

Source: BGR, 2013

** Natural gas includes conventional natural gas, tight gas, shale gas, coalbed methane, aquifer gas and gas hydrates.*

Coal in global energy consumption

Global consumption of commercial energy, excluding non-commercial firewood, dung and other waste, totalled 19 billion tonnes of coal equivalent (Gtce) in 2012. Coal, with a 29% share, ranked second after oil as one of the major sources of primary energy (Figure 3). Coal production has more than doubled since 1980 and, according to the IEA, coal could replace oil to become the most important source of energy within the next five years (IEA, 2013a).

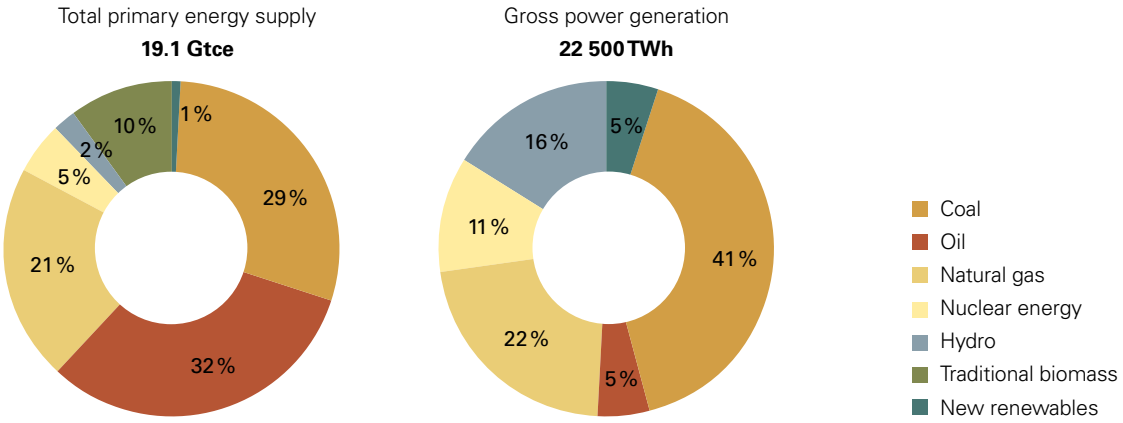
For power generation, coal plays a major role in both developed and emerging economies. In 2012, 41% of global power generation was based on coal: 38% hard coal and 3% lignite (Figures 3 and 4).

Each of the primary energy sources has a different end-use profile. For oil, the transport sector dominates; for natural gas, the heating market is important as well as power generation. Coal is mainly used for electricity generation and steelmaking, while nuclear energy is used commercially for power generation alone. Renewable sources are used both in the heating market and for power generation, while bio-fuels are gaining ground as transport fuels.

World coal production reached 7.8 billion tonnes in 2012: 6.9 billion tonnes of hard coal and 0.9 billion tonnes of lignite. In turn, the production of hard coal comprised 5.9 billion tonnes of steam coal and 1.0 billon tonnes of coking coal. Around one

Figure 3

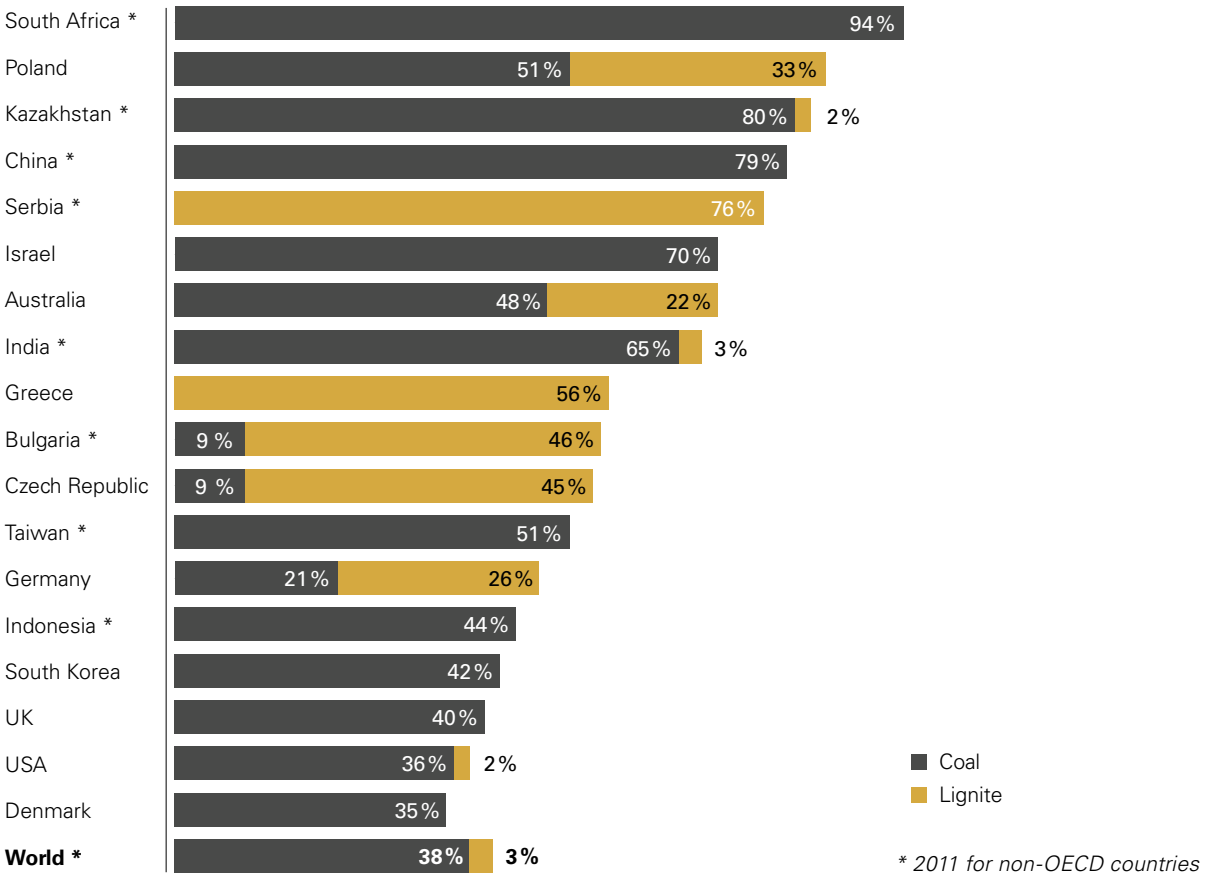
Global primary energy mix and global power generation by primary energy source, 2012



Sources: IEA databases, BP (2013a) and own estimates

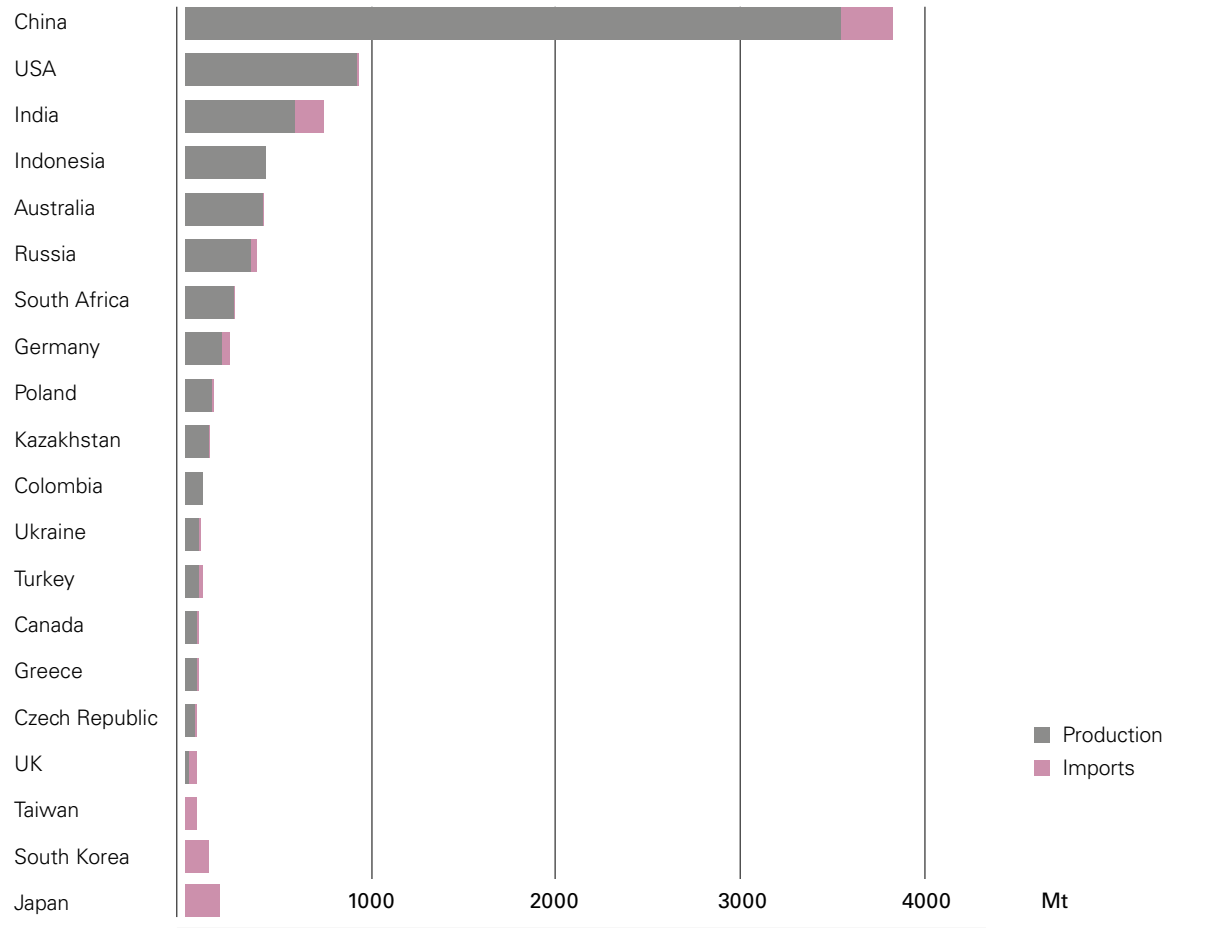
Figure 4

Share of coal-fired power generation in selected countries, 2012 *



Source: IEA databases and own calculations

Figure 5
Major coal producing and importing countries, 2012



Source: IEA, 2013b

hundred countries use coal in commercial quantities: some are major producers; others rely on imported coal; but all value the contribution that coal makes to energy supply (Figure 5). There are some very large consumers of coal which tend to dominate the global picture. On an energy basis, the European Union is the world's fourth largest consumer of coal after China, the United States and India. It is noteworthy that in 2012, China's annual coal production grew by an estimated 130 million tonnes, this being almost identical to the EU's total hard coal production. Nevertheless, at 433 million tonnes, the EU remains the world's largest lignite producer by a wide margin.

Two thirds of all coal produced worldwide is delivered to power plants, or 90% in the case of lignite. Other major customers for hard coal are in the iron and steel sector, chemical fertiliser manufacture and the process heating market, including cement works, paper mills, food processors and other industries. Coal today plays a lesser role in the heating of buildings, except in several eastern European countries, Turkey, China and North Korea. That said, coal-fired district heating and cooling as well as combined heat and power are important in Scandinavian countries.

In many cases, countries with indigenous coal deposits have above-average shares of coal-fired power generation, while countries with insignificant or no reserves have below-average shares. Exceptions include Taiwan and Israel who import all of their hard coal needs (Figure 4). In Japan, coal is a major economic input, not only to the iron and steel industry, but also to the power industry. Over one quarter of electricity supply in Japan relies on imported hard coal. On an electricity production cost basis, lignite-fired power plants are very competitive. Similarly, hard coal contributes to energy supply security at an affordable cost. While the actual cost varies from region to region and depends on many factors, the economic contribution of low-cost electricity from coal and lignite is of great value to economies across the EU. In addition, coal and lignite mines sit at the centre of long value chains – creating wealth in other sectors, from mining equipment suppliers to operators of power plants.

HUNGARY

A BUCKET-WHEEL EXCAVATOR STANDING TALL AT 24 m

In order to further improve productivity at the Bükkábrány opencast mine of Mátrai Erömü in Hungary, a new compact excavator was designed and built.Taking three years to build, the excavator's capacity of 6 700 m^3/h is 20% higher than the known capacity of any other excavator in the world. In terms of weight and power, the excavator also sets new standards and since it has been in operation it has significantly contributed to the mine's productivity. The compact design, the two-crawlers and the large belt wagon allow flexible operations, while the integrated control and monitoring system guarantees easy handling. In 2012, the excavator moved some 13.2 million cubic metres, accounting for some 50% of the total overburden removed at the Bükkábrány mine.

CZECH REPUBLIC

MOST HIPPODROME – A FAVOURITE RECLAMATION PROJECT

The Hippodrome racecourse, located in the 790-hectare Velebudice reclamation park in Most is a unique and highly acclaimed project of the "Czech reclamation school". The idea was to give new breath and social importance to this former surface mine. The result is a unique racecourse, skirted by a 3 370 m in-line skating track, a show jumping field, training fields, a golf course and a picnic park for the public. The brown coal companies Vršanská uhelná and Severní energetická are proud of the outcome: 100 000 visit the Hippodrome every year, proving the success and originality of the project.

CZECH REPUBLIC

THE DRAGON OF BŘEZNO

At Březno village, the retired bucket-wheel excavator KU 800 has become an industrial monument, standing for the glorious history of modern surface mining in the North Bohemian brown coal basin. The veteran KU 800, with a respectable 32 years of service and winner of eleven overburden extraction records, attracts tens of thousands of visitors every year to witness the technical and design skills of Czech brains and hands. This "dragon" symbolises the technological success of modern and efficient surface mining. Children from Březno village might also relate the fantastic fairy tale of the Good Dragon and the Brave Knight, who saved the village many centuries ago.

Coal consumption trends

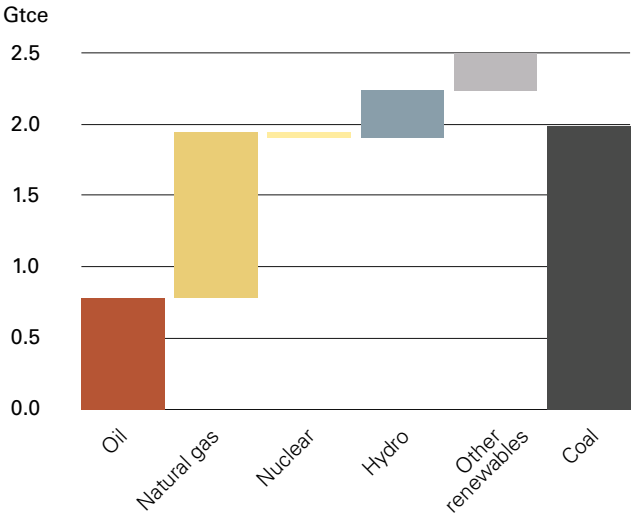
Since the turn of the new millennium, from 2000 to 2012, coal use has grown more strongly than any other primary energy source, in absolute terms, helping to meet a 4.5 Gtce or 34% growth in overall energy demand (Figure 6).

New renewables, such as wind, solar and geothermal, have also grown quickly. However, in absolute terms, their contribution remains rather limited, amounting to just 1.3% of worldwide primary energy consumption in 2012.

Trends in coal use differ by region. In OECD countries, coal consumption declined slightly since 2000; in the EU, there was a 14% drop. In contrast, coal demand in developing countries has increased dramatically. Growth in non-OECD countries from 2000 to 2012 amounted to 2.3 Gtce, a 126% increase. The main driver was China, where coal consumption increased from 1.0 Gtce in 2000 to 2.8 Gtce in 2012. Thus, China has accounted for 83% of the growth in world coal consumption; India accounted for 12%.

In the EU, hard coal production has declined from Europe's mature production centres whilst volumes of imported coal have grown significantly. Major coal-consuming countries in the region are Germany, Poland, the UK, the Czech Republic, Italy, France, Greece, Spain, the Netherlands, Bulgaria and Romania. In 2012, Germany was the largest coal importer in the EU, followed by the UK, Italy, Spain, France, the Netherlands and Poland (see map inside back cover).

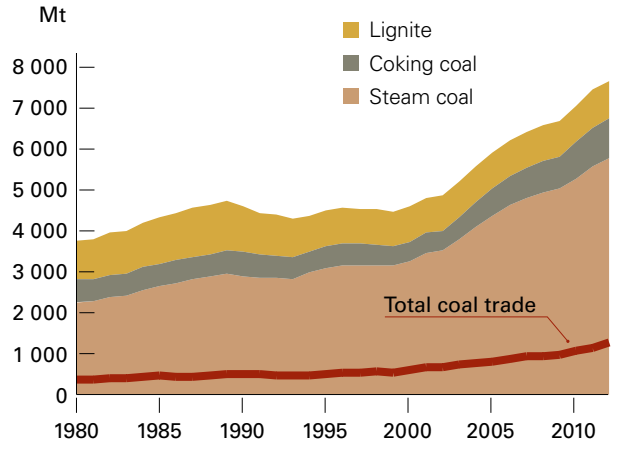
Figure 6
Growth in total primary energy supply, 2000 to 2012



Source: BP, 2013a

International coal trade

Figure 7
Global coal and lignite production and international coal trade, 1980 to 2012



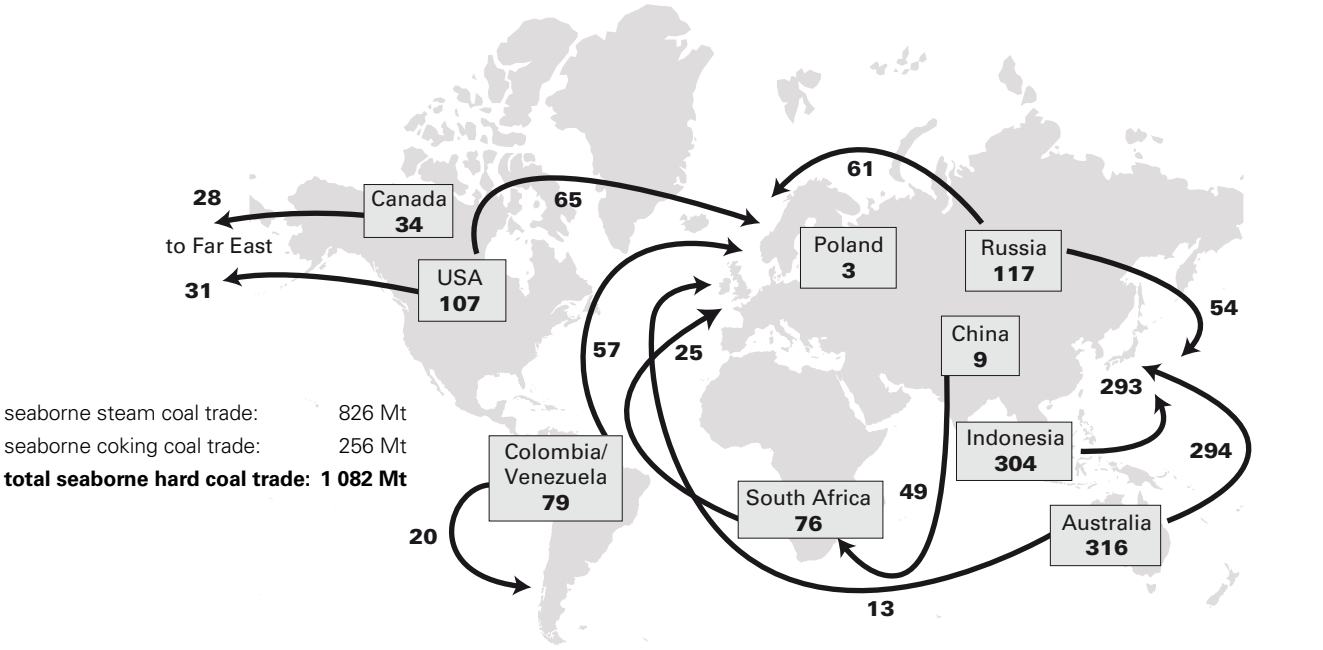
Source: IEA, 2013b

In 2012, international coal trade grew by 11% to 1 258 million tonnes or 18.2% of world hard coal production which reached 6 926 million tonnes – there is little international trade in lignite (Figure 7). Of this, 1 082 million tonnes were transported across the oceans, being the seaborne coal trade (Figure 8). This data shows that coal is mainly used in the vicinity of deposits. However, coal from mines with low production costs and good transport links to sea ports can be delivered competitively to overseas consumers. Since the oil crises of the 1970s, the growth in global coal trade has allowed the world to shift away from an overreliance on oil to the extent that oil is now rarely used for power generation.

Seaborne trade can be further divided into coking coal trade and steam coal trade (Figure 9). In 2012, seaborne steam coal trade grew to 826 million tonnes, with a further 256 million tonnes of coking coal. Overland cross-border deliveries added an estimated 120 million tonnes to international coal trade.

The market for steam coal can be subdivided into Pacific and Atlantic markets, each with different supply patterns

Figure 8
Seaborne trade flows on the international hard coal market, 2012



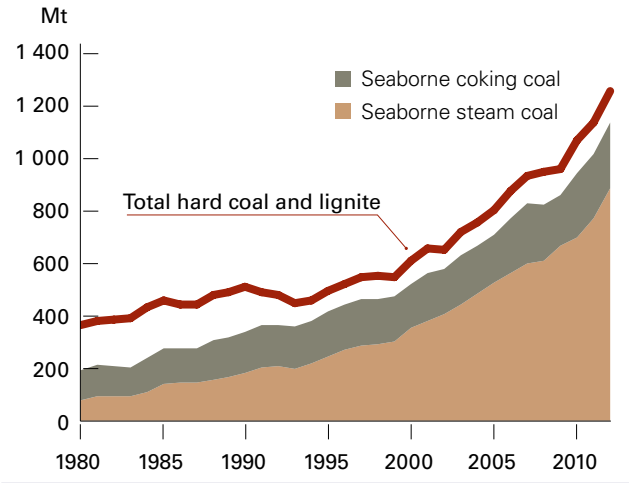
Source: VDKi, 2013

(Figure 10). By contrast, the coking coal market is a more uniform world market, reflecting the small number of supply countries: principally Australia, the USA and Canada, but with strong growth potential in the new entrants Mongolia and Mozambique.

Important exporting countries for hard coal are Indonesia, Australia, Russia, the United States, Colombia and South Africa, who together accounted for around 87% of all coal exports in 2012 (Figure 11). Resource nationalism – normally associated with oil and gas exploitation – is creeping into the coal industry. Indonesia will ban the export of low quality coal from 2014. In South Africa, the ruling ANC party has made proposals ranging from nationalisation of the coal mining industry to greater black economic empowerment and from a rent tax to export tariffs. South Africa, like Indonesia, wants to secure coal for domestic power generation and avoid the premature depletion of its reserves by coal-hungry China.

The top coal importing countries are China, Japan, India, South Korea, Taiwan, Germany, the UK, Russia, Turkey, Italy and Spain, together accounting for 80% of coal trade. India's coal imports are growing quickly, helped by a government decision in 2012 to temporarily remove coal import duties. India will likely overtake Japan to become the world's second largest coal importing country.

Figure 9
International coal trade, 1980 to 2012



Source: IEA, 2013b

Imported hard coal makes a significant contribution to the EU's security of energy supply and offers a competitive fuel which can be easily and safely transported and stocked. In 2012, 17% of all coal exports were destined for EU member states. Leading exporters to the EU are Russia, Colombia, the United States, Australia, South Africa and Indonesia (Figure 12).

BULGARIA

FROM COAL TO GYPSUM

Over one half of Bulgaria's electricity is generated from coal, mainly mined by Mini Maritsa Iztok. At the Maritsa Iztok complex, gypsum is collected as a by-product of the flue-gas desulphurisation process at two power plants. Gypsum is found in nature, but Knauf Bulgaria and Technogips can now produce gypsum plasterboard sheets and gypsum products out of a raw material which is in fact a waste product from power plant operation rather than from gypsum mines. This successful symbiosis between lignite mining, power generation and product manufacturing is a unique solution that ensures the efficient utilisation of indigenous resources, protects ambient air and respects the requirements of EU environmental regulations.

FRANCE

ADVANCED AMINE POST-COMBUSTION CO_2 CAPTURE AT LE HAVRE

The reduction of CO_2 emissions from fossil fuels is one of the challenges that EDF intends to meet over the coming years. The carbon capture demonstration plant located at the coal-fired power plant of EDF in Le Havre aims to demonstrate Alstom's proprietary Advanced Amine Process (AAP) Technology.

The first tonne of CO_2 was captured on 11th July 2013 and approximately 25 tonnes of CO_2 will be captured every day. The primary test objectives are the validation of key process performance parameters such as CO_2 capture efficiency, thermal degradation and related environmental emissions as well as material selection for key components. Additionally, the robustness and behavior of the AAP technology under transient operating modes such as load variations and "cold" and "hot" start-ups and shut-downs will be examined as well as of course the economic viability of the process.

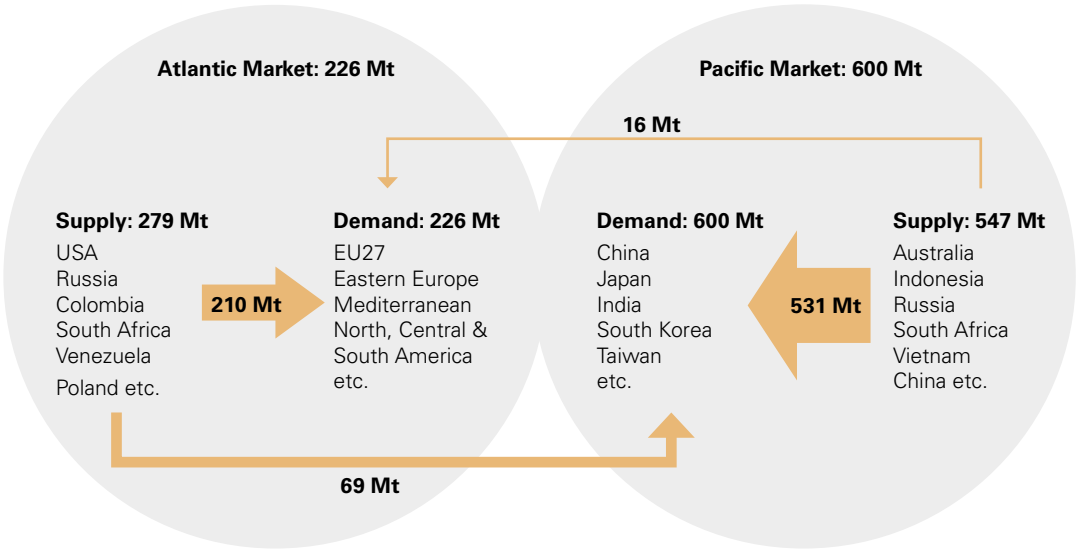
CZECH REPUBLIC

LESS EMISSIONS AND MORE ELECTRICITY

Czech domestic coal reserves will continue to play a key role in the national energy mix to make the country less dependent on fossil fuel imports. ČEZ committed to refurbish coal-fired power plants and construct new high-efficiency ones to provide economically attractive and lower-carbon solutions to meet the country's power demand. Prunéřov power plant (3x250 MW) will increase its efficiency from 32.8% to 40%, Tušimice power plant (4x200 MW) from 33% to 39% and the first supercritical brown coal-fired unit in the country (660 MW) with a net efficiency of 42.5% is under construction at Ledvice. All three power plants have a long future ahead – providing affordable, reliable and lower-carbon electricity.

Figure 10

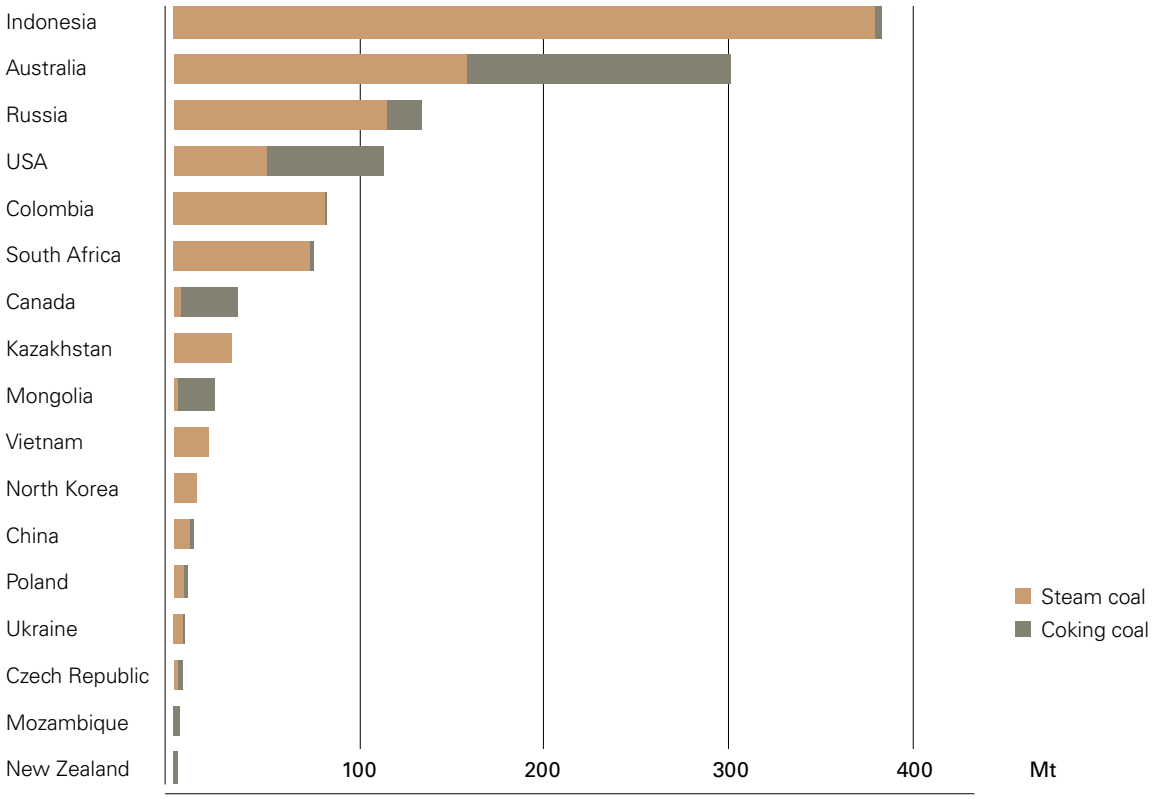
Major steam coal flows within and between the Atlantic and Pacific markets, 2012



Source: VDKi, 2013

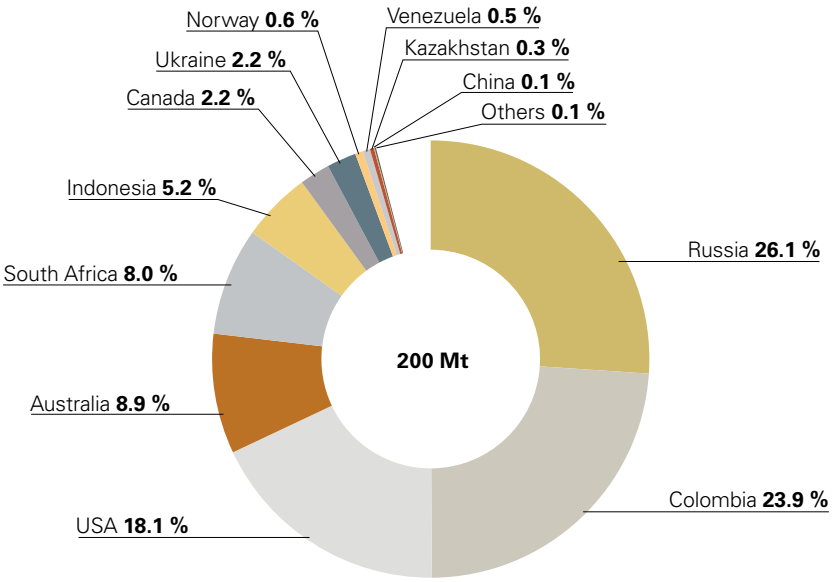
Figure 11

Top coal exporting countries, 2012



Source: IEA, 2013b

Figure 12
Coal imports into the EU by source country, 2011



Source: DG Energy, 2013

Note: the source country of 4.0% of coal imports is not specified in customs data.

Recent coal market developments

Despite the strong growth in coal demand, the global economy remains fragile and many predict a slowdown in Asia as government stimulus spending is reduced. Demand for commodities such as iron ore, coking coal and steam coal may stagnate as infrastructure projects are delayed or cancelled and economic growth slows. Already in 2013, coal markets have become "oversupplied", putting downward pressure on prices. There are various reasons for this oversupply, including an increase in US coal available for export during the summer months due to a fall in US natural gas prices and a devaluation of the Indian rupee against the US dollar. The latter has put coal exporters to India under mounting pressure to reduce prices, pressure felt most acutely by Indonesian producers who supplied an estimated 78% of India's steam coal imports in 2012.

Significant upward swings in coal demand have been seen in Europe where high prices have made natural gas very uncompetitive and the German nuclear phase out created an unexpected demand for alternatives such as coal and lignite. The German *Energiewende* progressed with sharp rises in power generation from solar PV and wind – up 37% in 2011 and 8% in 2012 – leaving new gas-fired power plants lying idle. In Japan, following the ongoing accident at Fukushima nuclear power plant and temporary closure of nearly all Japan's other nuclear plants, there has been no growth in coal demand. Demand-side measures mean that electricity demand fell 7% between 2010 and 2012. In the absence of sufficient coal-fired generation capacity – some was damaged by the tsunami in 2011 – this reduced demand has been met with the greater use of oil and gas for power generation at great cost to the Japanese economy and contributing to the high gas prices seen around the world.

More than ever before, the coal market now depends on events in the Far East. China imported 289 million tonnes in 2012, overtaking Japan to become the world's biggest coal importer and absorbing 23% of internationally traded coal into a country which now consumes just over half of all the coal mined around the world. Some forecasts show China's coal imports rising to an unimaginable one billion tonnes by 2030, coming mostly from Australia and Indonesia.

Surprisingly, US and Colombian coal now finds buyers in Asia, despite the long transport distances and sometimes difficult logistics. South African exporters also now ship to Asia in preference to Europe, although have failed to deploy the full capacity of the country's export terminals. These new coal trade flows have emerged because sea shipping rates remain at historic lows. The Baltic Dry Index – a measure of shipping rates – has been below 2 500 since November 2010, compared with a peak of 11 793

at the height of the economic boom in May 2008 when the rate for shipping coal from South Africa to north-west Europe rose to above 60 US$/tonne. During much of 2012, the same rate was below 10 US$/tonne. With new vessels still being delivered into an already oversupplied market, shipping rates are likely to remain low. Moreover, new or expanded trade routes are opening up with the expansion of the Panama Canal and thawing of the Northwest Passage and Northern Sea Route. How these affect international coal trade remains to be seen, but we can be sure that trade will continue to grow, matching coal producers and consumers in perhaps the world's most dynamic and competitive market.

The shale gas revolution in the United States has had a significant impact on coal demand in that country. Cheap natural gas – averaging one quarter of EU prices in 2012 – has displaced coal for power generation leading to coal mine closures, corporate bankruptcies and greater efforts to export coal. Since 2010, US coal consumption has fallen by 128 million tonnes or 13% to 822 million tonnes – a 20-year low – whilst exports grew 54% to 114 million tonnes over the same two-year period. Europe in particular has benefitted from competitive supplies of US coal: in 2012, the US became the second largest coal exporter to the EU after Russia. There are various reasons to question the long-term durability of this development:

- US natural gas prices are unlikely to remain so much lower than elsewhere in the world once LNG export terminals open and link the now isolated US market with international gas trade.
- Continued low international coal prices would see US producers exit the international market: their production costs are at the upper end of the cost curve for internationally traded coal.
- The production profile of shale gas formations depends on a programme of continuous drilling and fracturing ("fracking"). Decline rates for individual wells are very steep – 65% to 85% in the first year – refracking helps, but more and more wells are needed to maintain production.

More generally, there is much uncertainty on the potential of shale gas. Resource estimates are often based on patchy data because, outside of North America, shale gas exploration is still in its infancy. Even when data is available, the different methodologies and assumptions used to interpret that data have led to wildly varying resource estimates: varying by a factor of 100 in the case of Poland. Hence, any estimates must be treated with caution, at least until they are confirmed by commercial production.

Coal pricing

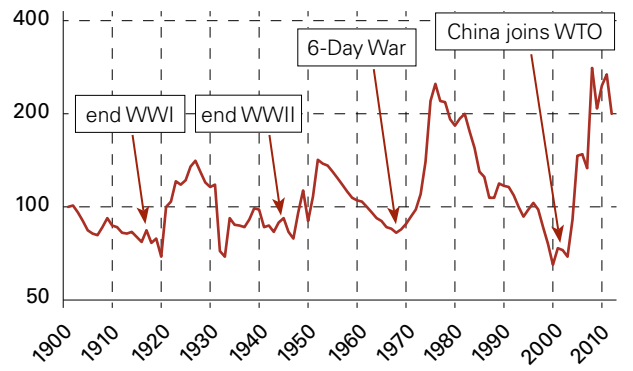
Price formation on the world coal market was for a long time dominated by non-transparent long-term contracts. One reason for this is the non-homogenous nature of hard coal with quality defined by a number of parameters (e.g. calorific value, ash, moisture, volatile matter, sulphur and chloride). Delivery location also determines price since freight costs can be significant. Typical source and delivery locations for pricing purposes are Richards Bay in South Africa, Newcastle in Australia, Qinhuangdao in China and the ARA ports in north-west Europe (Amsterdam, Rotterdam and Antwerp).

Over the years, greater tolerance to coal quality has become possible due to ongoing developments in power plant technology and greater use of flue gas desulphurisation. Today, coal price indices, such as those published by Argus, McCloskey and Platts, refer to standard locations and specifications, and contracts include price adjustments for coals which vary from the norm. In this way, the prices of individual coal trades can be fed into the calculation of benchmark or reference price indices.

Today, the world market for hard coal is characterised by strong competition between many suppliers, large and small. The leading twenty coal companies represent about one third of global coal production and about half of international coal trade. The four largest coal exporters – BHP BILLITON, GLENCOREXSTRATA, ANGLO AMERICAN and RIO TINTO – account for about one quarter of international trade.

Establishing a price no longer depends exclusively on bilateral negotiations and contracts, although these are still important. The availability of reference spot prices for different types of coal and different countries or regions not only increases transparency, but also makes trade in futures and derivatives possible. In the steam coal market, as in other commodity markets, it is now possible to manage risk flexibly and affordably, thanks to derivatives. In practice, this can take place on commodity exchanges such as Nymex and EEX, via exchange-traded funds, on electronic trading platforms such as globalCOAL, as well as on the over-the-counter market. This trend has encouraged the entry of new market participants, thus deepening market liquidity. In the coking coal market,

Figure 13
Australian steam coal real price index, 1901 to 2012



Sources: Reserve Bank of Australia, 2007; IEA, 2013b; own estimates using US CPI

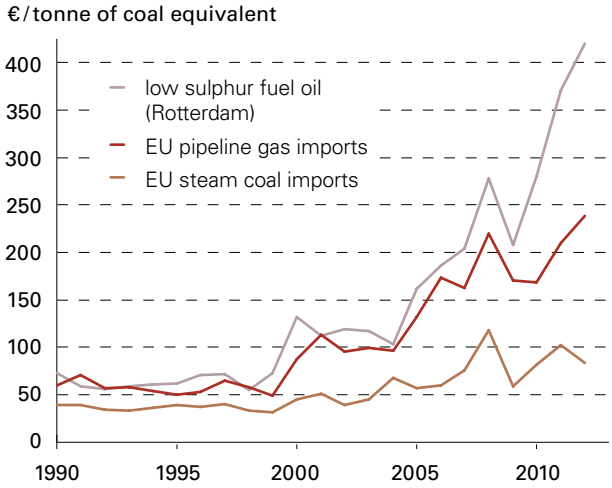
annual contract negotiations – typically led by Australian producers and Japanese steel mills – have moved to a broader participation in the setting of quarterly "benchmarks" coupled with monthly contracts and a growing spot market.

Over the last one hundred years or more, a number of economic cycles can be seen reflected in the real price of steam coal on the international market (Figure 13). The global economic crisis interrupted what was described by some as a "super cycle" with booming demand for products from emerging economies around the world as well as from their new middle classes. Coal prices today still reflect a period of tight supply and it is difficult to predict future prices. However, in its outlooks, the IEA assumes real coal prices will rise steadily over the next twenty years to reach 10% to 20% above the 2012 average.

Imported hard coal is a very affordable source of energy. Over the last 25 years, coal has been consistently cheaper than both oil and natural gas on an energy basis (Figure 14). The strong demand for energy commodities since around 2000, driven by China, has seen a quadrupling of oil and gas prices. Over the same period, coal prices have, on average, remained at below half the level of oil and gas prices.

Unlike for hard coal, there is no free-market price formation for lignite used in power generation and very little international trade – just 3 million tonnes in 2012. This is because its low energy density makes transport uneconomic over longer distances. For this reason, it is common to build lignite-fired power plants adjacent to lignite mines such that producer and consumer co-exist in a captive market and form a single economic entity. Lignite is then most economically transported by dedicated infrastructure – typically a conveyor belt – delivered directly to nearby power plants under, for example, 50-year contracts. Lignite mining and use is a stable, long-term business.

Figure 14
EU import prices for coal, oil and natural gas, 1990 to 2012



Sources: McCloskey, 2013; IEA, 2013b; BAFA, 2013

Global outlook for coal

The future of coal looks assured with rising demand all around the world: the IEA forecasts that demand will grow by 17% between 2012 and 2017 (IEA, 2013a). On current trends and with no major technological changes, coal demand is likely to increase by 50% over the next 25 years. However, many forecasters try to marry the competing challenges of securing global energy supply and reducing global greenhouse gas emissions. This leads to scenarios in which coal's role is significantly curtailed. For example, the IEA *World Energy Outlook 2012* presents three future energy scenarios:

NORWAY

ENABLING SCIENCE IN THE ARCTIC CIRCLE

Store Norske mines coal 1 250 km from the North Pole in some of the most challenging conditions: coal can only be shipped once sea ice melts in late summer. This unique location attracts many scientists and engineers. Only here is there a single ground station that can stay in contact with the polar-orbiting satellites that map the world and measure global temperature changes. The Svalbard Global Seed Vault provides a safety net against losing crop diversity. The NASA rover that is now exploring Mars was tested in the arctic desert of Svalbard. All of this is made possible only because of the mine, its infrastructure and the local community.

POLAND

SKIING ON OVERBURDEN – THE HIGHEST PEAK IN CENTRAL POLAND

Kamieńsk mountain is the highest peak in Central Poland. It is man-made – built of overburden from the lignite mine Bełchatów. Today's forested mountain is the result of a comprehensive rehabilitation plan which transformed this industrial location into an attractive summer and winter tourist resort. The main attraction is a 760-metre long ski slope with one chairlift and two ski lifts, as well as an ultra-modern toboggan run and several bike trails.

SLOVENIA

ŠALEK VALLEY – WHERE COAL MINING STANDS FOR WELFARE AND PROSPERITY

The mining company Premogovnik Velenje in Slovenia provides lignite to the nearby Šoštanj power plant, producing electricity for the entire region and covering 31 % of the country's electricity needs. Thanks to lignite mining, the small town became the fifth largest city in Slovenia in less than fifty years. Premogovnik Velenje takes seriously its commitments in the field of social responsibility and the rehabilitation of mining sites in order to marry industrial activity and high living standards.

POLAND

INTERACTIVE TRAINING WITH VIRTUAL SIMULATION AND ON-LINE DOCUMENTS

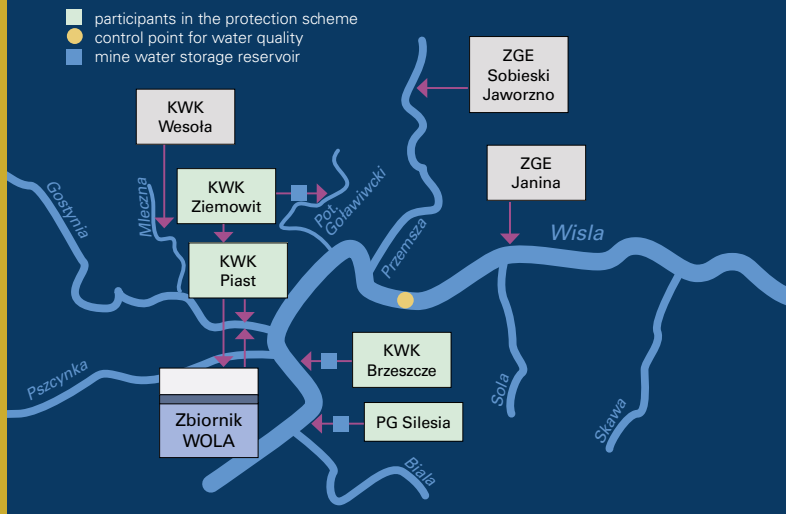
Mining is not only about hard and hazardous work. Nowadays, advanced ICTs are vital to underground operations and also in the field of training. Interactive training material, including accident scenarios as well as advanced applications that aid with manual activities, are successfully used at underground mines in Poland.

POLAND

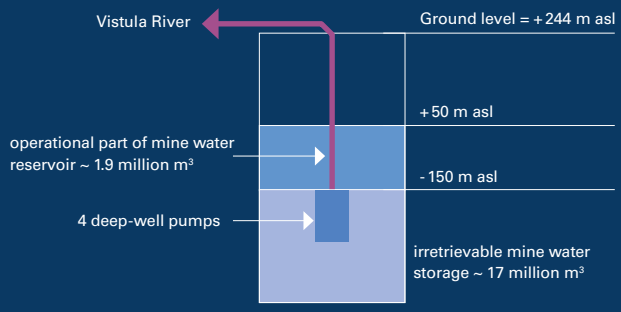
PROTECTING THE UPPER REACHES OF VISTULA RIVER

Since 2002, Kompania Węglowa has worked on the protection of the Vistula river in Poland against salt water from coal mines. The protection scheme is based on a temporary reservoir of salty mining water followed by regulated inflow of this water to the river in order not to exceed the acceptable limits for chloride and sulphide concentrations. During periods of low water levels, the most salty mine water is stored in the Wola reservoir until periods of high level water, when it can be safely released.

The "Mała Wisła" scheme



Commissioned: 2008
Total investment: c. € 10 million
Ecological benefits: balancing salt concentration in the Vistula River and avoiding the discharge of 998 000 tonnes of salt stored in former mining excavation

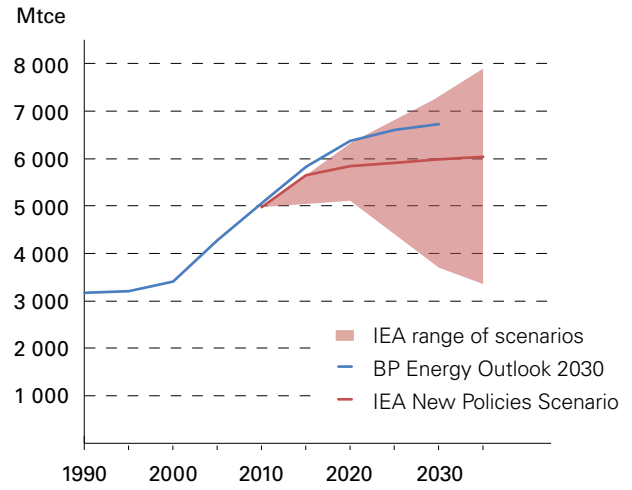


SLOVENIA

THE WORLD'S BEST MINING OF THICK COAL SEAMS

Velenje coal mine in Slovenia – with more than 135 years of mining tradition – uses highly developed technologies. Exploiting one of the thickest lignite seams in the world, the company has developed a unique and patent-protected method for extracting thick coal seams. The basic approach at Velenje coal mine is to extend coal extraction above the protected area at the face. Natural forces break and crush the seam. Thanks to modern mining equipment, especially hydraulic supports and advanced chain conveyors, the company uses a lower number of wider longwall faces. The method is producing enviable results, placing the coal mine at the global forefront of underground coal mining.

Figure 15
Future global coal demand to 2030 and 2035



Sources: BP, 2013b; IEA, 2012

- A Current Policies Scenario or *status quo* scenario in which energy and climate policy frameworks remain unchanged.

- A New Policies Scenario which assumes political promises and announced plans to limit greenhouse gas emissions are met.

- A 450 Scenario in which the atmospheric concentration of greenhouse gases is limited to 450 parts per million of CO_2 equivalent to meet the objective of limiting global temperature rise to 2°C compared with the pre-industrial level.

The Current Policies Scenario is the most realistic in that it has been, over recent years, the scenario which closest matches actual outcomes. The 450 Scenario reflects the stated commitment of G8 leaders to address the climate challenge. However, it is a virtually impossible goal, unless draconian action is taken to stop the use of fossil fuels.

The New Policies Scenario is closest to the assumptions made by the EU institutions that other countries will follow the EU's progressive energy and environment policies. Worldwide primary energy consumption increases by 35% to 24.6 billion tonnes of coal equivalent in 2035 (an annual average increase of 1.2% from 2010). 93% of this increase occurs in non-OECD countries while energy demand in OECD countries increases only slightly. Coal demand rises by 21% over the outlook period, but this global figure masks a 53% decline of coal use in the EU.

Most forecasts and outlooks mirror the IEA's Current Policies Scenario. For example, BP expects global coal supply to grow by an average of 1.4% each year from 2010 to 2030 to 6.7 Gtce by 2030, a 33% increase, with strong growth in India and other non-OECD countries offsetting declines in the OECD. Growing imports drive further expansion and integration of global coal markets. In the EU, production and consumption of energy remains flat.

Coal demand declines in the OECD (by 0.8% p.a. 2011-2030), but continues growing in the non-OECD (1.9% p.a.). China remains the largest coal consumer with over half of global consumption (52%), while India (12%) overtakes the US to become the second largest in 2024. Together, China and India account for 92% of global coal growth to 2030. As the focus of China's economic development shifts from rapid industrialisation and infrastructure development to growth based on services and light manufacturing, its coal demand growth slows rapidly from 9% p.a. in 2000-2010 to 3.5% p.a. this decade and 0.4% p.a. in 2020-2030. India's coal demand growth slows more gradually, from 6.5% p.a. in 2000-2010 to 3.6% p.a. in 2011-2030, as energy efficiency gains partially offset rising energy demand for industrial and infrastructure expansion.

The growth of global coal consumption in power generation slows from 3.6% p.a. in 2000-2010 to 2.4% p.a. in 2011-2020 and 0.4% p.a. after 2020. In the OECD coal use in power is already in decline (-0.2% p.a. 2000-2010); this decline accelerates to -1.2% p.a. in 2020-2030. In non-OECD countries, the growth of coal use in power generation slows, from 7.7% p.a. 2000-2010 to 1.0% p.a. after 2020. As a result, coal's share in fuels used for power generation declines from 44% in 2020 to 39% in 2030 – just a little lower than today.

Overall, there is a clear disjoint between what politicians espouse and the actual outcome that results from the individual decisions of billions of energy consumers. If there is a strong political will to tackle climate change, then perhaps the IEA's optimistic New Policies Scenario will materialise. BP's outlook looks more likely since it is based on an economic assessment of the known alternatives and does not depend on political promises being delivered in a tight timeframe during times of austerity in many countries. It is likely that the energy consumer will have the final say which means that our energy future must be not only clean and secure, but also affordable.

The socio-economic value of a sustainable European coal industry

The key advantages of coal are security of supply and favourable prices compared with competing energy sources. When indigenous supplies can be exploited, the use of coal adds value along the entire supply chain: from coal mine to electricity consumer. This underpins economic development and employment.

Policy makers must balance these socio-economic benefits with environmental protection and climate objectives. Here, technological progress allows coal to take its rightful place alongside other energy sources each of which has its own particular set of advantages and disadvantages.

Employment in the European coal industry

In 2012, across the EU, 130 million tonnes of hard coal and over 430 million tonnes of lignite were mined. Mining this coal employed more than 240 000 people, some at integrated mine and power plants. In the greater Europe, including Turkey and Ukraine, this number rises to almost 600 000 people (Table 1). Adding the indirect jobs supported by coal mining leads to a total of well over one million people whose livelihoods depends on the coal industry.

These jobs are frequently in economically less advantaged regions where coal extraction and utilisation is the only wealth-creating activity. In total, with its capital investments, operating expenditures and payment of salaries and taxes, the coal industry makes an important contribution to the prosperity of Europe's mining regions and national economies.

Table 1

Manpower in the European coal industry 2010 and 2012

	2010			2012		
	Hard Coal	**Lignite**	**Total**	**Hard Coal**	**Lignite**	**Total**
Bosnia and Herzegovina	-	13 000	13 000	-	11 500	11 500
Bulgaria	4 600	8 200	12 800	3 500	7 800	11 300
Czech Republic	13 700	10 200	23 900	12 900	9 100	22 000
Germany	24 200	16 700	40 900	17 600	16 600	34 200
Greece	-	8 400	8 400	-	7 500	7 500
Hungary	-	2 400	2 400	-	2 100	2 100
Poland	114 100	16 300	130 400	113 000	15 000	128 000
Romania	8 800	13 500	22 300	6 000	15 000	21 000
Serbia	-	12 500	12 500	3 900	12 300	16 200
Slovakia	-	3 900	3 900	-	3 700	3 700
Slovenia	-	1 800	1 800	-	1 600	1 600
Spain	5 400	-	5 400	3 400	-	3 400
Turkey	18 500	37 000	55 500	18 500	37 000	55 500
Ukraine	271 000	-	271 000	273 800	-	273 800
United Kingdom	6 000	-	6 000	5 800	-	5 800
Total	466 300	143 900	610 200	458 400	139 200	597 600

Source: EURACOAL

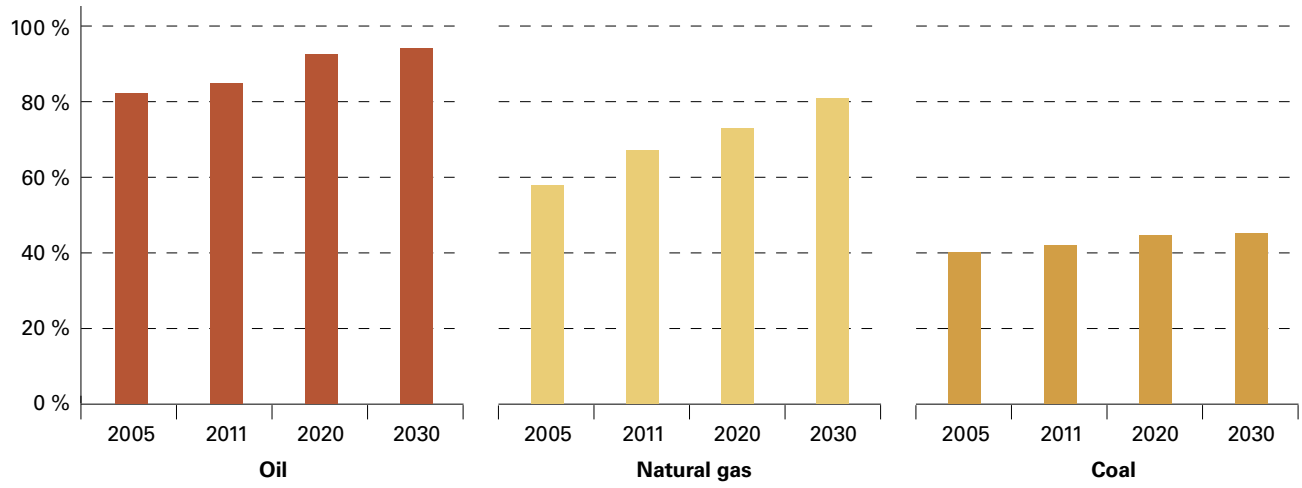
Added value from coal mining in the EU

Access to energy is the very basis of economic and social progress – leading to prosperity and social harmony. Indeed, the founding fathers of the European Union sought peace and prosperity when they signed the Treaty of Paris to establish the European Coal and Steel Community in 1952. This treaty promised energy consumers a common market for coal so that this valuable resource would be distributed as rationally as possible. In contrast, energy poverty causes real hardship in many regions of the world. Supplying EU industry and households with an affordable source of energy that has stable and predictable prices in the long-term is therefore one of the most important reasons to justify coal and lignite mining in the EU. This is of major significance, especially to those countries that are well endowed with these energy resources and should not be overlooked by those that are not.

The coal industry, from extraction to power generation, represents a completely secure value-added industrial supply chain, creating economic wealth and prosperity in the EU. In this context, the impact of coal and lignite mining to alleviate the already high balance of payments deficit of various EU member states cannot be understated. Beyond Europe, the technologies developed by the European mining and power plant equipment suppliers also contribute to improving the efficiency of coal production, preparation and use in other regions of the world.

The annual value of EU-wide coal and lignite production, based on its calorific value and on international hard coal prices at the beginning of 2013, totals more than € 25 billion.[1] If the quantity of coal mined in the EU were to be replaced by natural gas, then the annual cost would be almost € 60 billion.[2] The EU has insufficient indigenous natural gas production to meet its existing gas needs and is 67 % dependent on imports, so this entire sum would leave the EU and weaken the region's economy (Figure 1).

Figure 1
EU energy import dependence, 2005 and 2011 with projections for 2020 and 2030



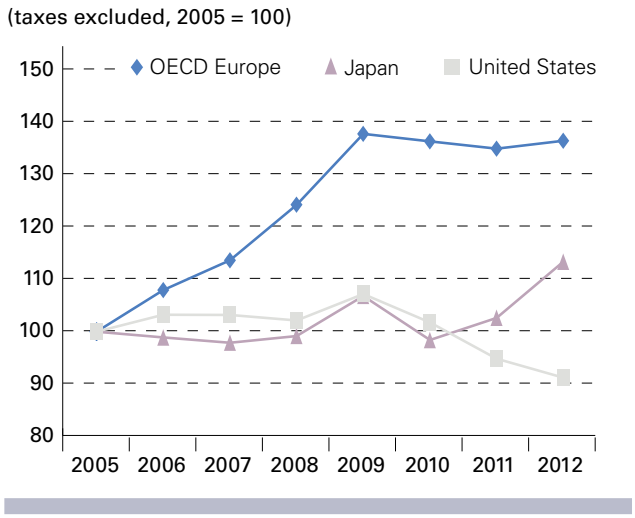
Source: European Commission, 2013

1 *Indigenous production of 239 Mtce or 279 Mt (6 000 kcal/kg) at a price of 90 US$/tonne.*

2 *In 2012, the cost of importing natural gas into Germany was 11.03 US$/mmBtu (BAFA, 2013) which is equivalent to 239 €/tce. The annual cost of replacing indigenous coal production with imported natural gas would therefore be around € 57 billion.*

Economic competitiveness from electricity

Figure 2
Evolution of end-user electricity price index for industry



Source: IEA detabases, 2013

An important indirect benefit of coal is its contribution to competitive electricity tariffs. Tariffs are a key factor for the location of industry, especially for energy-intensive industries looking to make investments at existing or new sites. Any tax or duty on coal and lignite therefore not only costs direct jobs in the coal industry, but indirectly threatens many others across those industries burdened by higher energy costs. Recent data shows that electricity prices in Europe have become less competitive (Figure 2). This is a worrying trend that can be reversed by ensuring that there is true inter-fuel competition between fuel sources for electricity generation: that means between coal, natural gas, nuclear, hydro and new renewables.

Security of supply from indigenous coal and reliable coal imports

Households and especially industry depend on secure energy supplies without interruption. The contribution of lignite and hard coal mining to the security of energy supply in Europe is very significant. EU import dependence for solid fuels was 41 % in 2011, less than half that for oil and gas (Figure 1). Much of the energy imported into EU member states comes from a relatively small number of producing countries, with Russia, Norway, Saudi Arabia, Algeria and Colombia being the most significant. However, those countries supplying hard coal present an overall lower risk than those countries supplying oil and gas. A base supply of indigenous energy raw materials in the EU clearly reduces any potential weaknesses in security of supply. Coal and lignite mined in the EU in 2012 covered about 10 % of EU primary energy demand. Indigenous coal and lignite remain the most important indigenous energy supplies in the EU, exceeding natural gas production in terms of energy supplied by 20 %.

Sustainable coal use in the long term

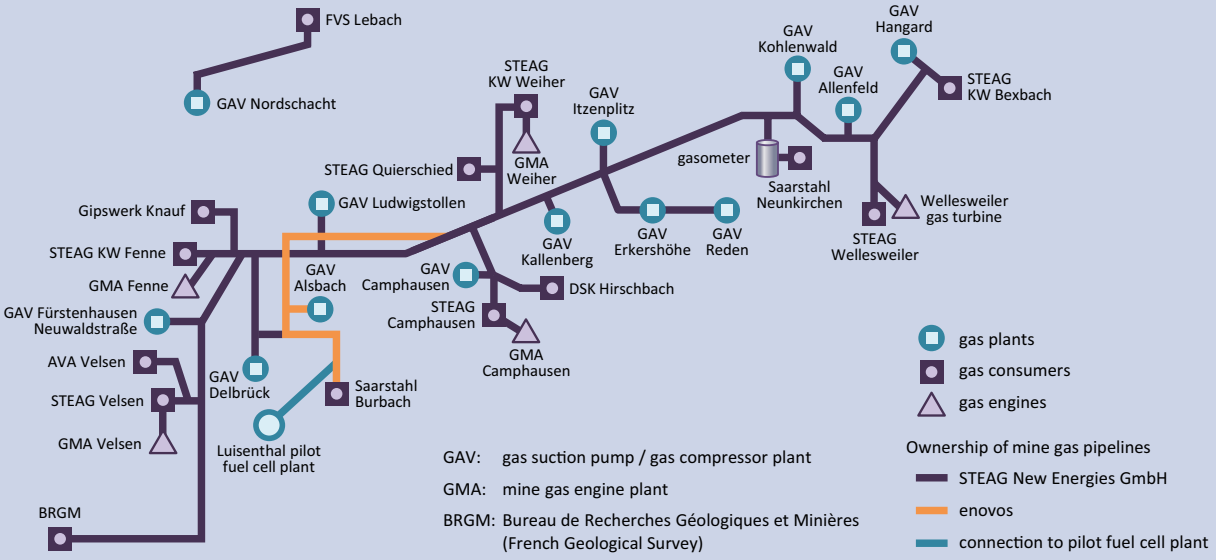
Environmental impacts associated with coal are well understood. Inevitably, coal mining interferes with the environment, in common with the mining or production of any other mineral; however, ecological impacts are increasingly well addressed during mine planning, operation and landscape restoration. The maritime transport of coal is safe and it can be easily stocked in large quantities. Emissions from coal use, such as sulphur dioxide, NO_x and dust, can be almost eliminated by commercially available pollution control equipment. In the EU, most coal-fired power plants are now equipped with highly efficient flue-gas desulphurisation.

For some years, the environmental debate has focused on global climate protection. The strategy to reduce CO_2 emissions from coal use begins with more efficient state-of-the-art power plants, assumes the further development of power plant technology to reach higher efficiencies, and leads ultimately to power plants fitted with CO_2 capture and storage. Installations with CO_2 capture should be commercially available by 2020, reducing CO_2 emissions from coal-fired plants by around 90 %. Central to the wide use of this technology is an investment-friendly legal framework and public support for a CO_2 transport and storage infrastructure.

GERMANY

WHERE ELECTRICITY IS GENERATED FROM MINE GAS

The German Saarland region operates the world's largest mine gas combined heat and power plant at Völklingen-Fenne with a capacity of 42 MW. The Saarland has a 110 km mine gas grid connecting local gas extraction stations with mine gas-fired combined heat and power plants. Mine gas from active hard coal mines is extracted during production and pumped to the surface through a series of pipes. It is then compressed before being delivered to combustion plants. Even after a mine closure, mine gas can still be captured and pumped to the surface, avoiding the uncontrolled relase of gas.



EUROPEAN UNION

LIGPOWER – COST-SAVING CLEANING IN POWER PLANTS

Lignite is a competitive energy source in the power generation of many European countries. However, the specific properties of lignite lead to relatively low softening and melting temperatures, resulting in deposits forming in the boiler during combustion. LIGPOWER was a three year Research Fund for Coal and Steel (RFCS) project aimed at improving the cleaning equipment and finding new easier-to-clean heating surfaces with the goal of enhancing the availability and competitiveness of lignite as an energy source.

EUROPEAN UNION

NEMAEQ – A PROJECT THAT MAKES EUROPEAN HARD COAL MORE COMPETITIVE

Coal mining in Europe occurs at depths of up to 1 400 metres where both the rock temperature and pressure are significantly greater than in the shallow deposits in Australia and America. To compete, European coal producers need to be highly productive which is only possible through improved mechanisation of all processes and optimal automation of the mining equipment. NEMAEQ was a project funded by the Research Fund for Coal and Steel (RFCS) aimed at developing a fully automatic shearer loader system which cuts and loads the coal without major manual interaction; including also load dependent regulation, coal/rock distinction, collision avoidance and appropriate control and data processing technologies.

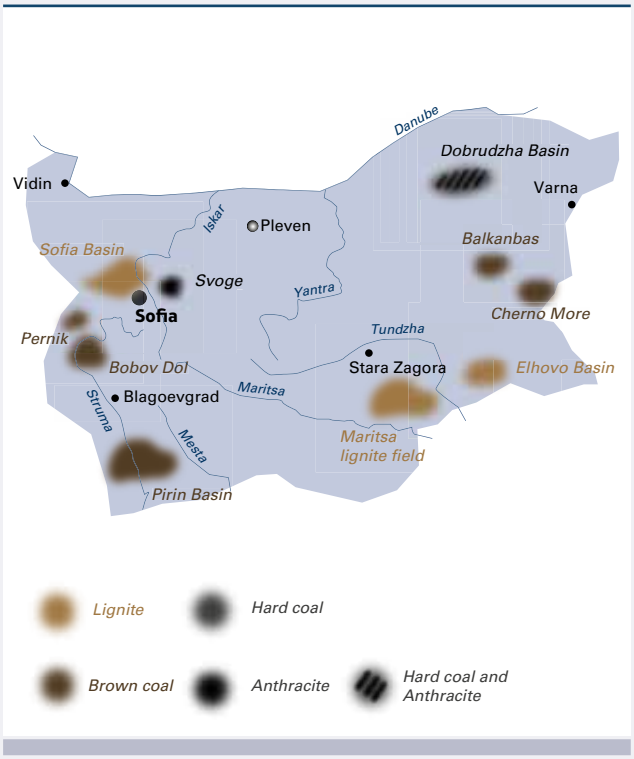
Bulgaria

The mining industry is of outstanding importance to Bulgaria and it has become one of the best developing industries over the last few years. The mining sector has almost reached the average EU labour productivity, considerably surpassing average productivity in other sectors. The mining industry is an important branch and one of the main driving forces of the country`s economy.

Over the last few years the Bulgarian mining industry has attracted considerable foreign and Bulgarian investors and several companies are investing in world best practices in the fields of exploration, extraction and processing.

Bulgaria has great resource potential and provides jobs to highly qualified and experienced specialists contributing to the social and economic development and welfare of the mining municipalities. Nevertheless, the long permitting procedure from the initial investment assessment to exploration and a lack of clear regulations on extraction and planning are slowing down the industry's projects. There are good prospects for the introduction of leading world and European technologies in order to further enhance efficiency in the field of extraction and processing.

The major tasks of the Bulgarian mining industry are the sustainable development of the mining regions, environmental protection and restoration, improvement of safety standards and the improvement of vocational training.



General data	Unit	2012
Population	million	7.3
GDP	€ billion	39.7

Lignite

Opencast lignite mining is mainly carried out in the mines of MINI MARITSA IZTOK EAD, whose production accounts for 95.7% of the total inland output. The entire mines area accounts for some 240 square kilometres and besides being the largest mining site in South East Europe, MINI MARITSA IZTOK EAD is also the biggest employer in Bulgaria. The company supplies four thermo-electric power plants with its own lignite: the state-owned Maritsa East 2 EAD thermal power plant (TPP) (1 600 MW) and the privately-owned CONTOURGLOBAL Maritsa East 3 TPP (908 MW), AES Galabovo TPP (670 MW) and BRIKEL EAD (200 MW). MINI MARITSA IZTOK EAD also supplies lignite to Maritsa 3 TPP in Dimitrovgrad, which has an installed capacity of 120 MW.

The company plays an important role in securing national energy security, and guaranteeing energy independence for Bulgaria. 40% of the generated electric power is provided by lignite from MINI MARITSA IZTOK EAD. The company is part of the BULGARIAN ENERGY HOLDING EAD.

Other lignite mining companies are Beli Bryag mine (1.7%), Stanyantsi mine (1.6%) and Chukurovo mine (1.0%).

Brown coal

Bulgaria's brown coal deposits are mainly located in the western part of the country (Bobov Dol, Pernik and Pirin coalfields and the Katrishte deposit) and near the Black Sea (Cherno More coalfield). In 2012, the total production of brown coal, extracted from both underground and opencast mines, amounted to 2.1 million tonnes.

VAGLEDOBIV BOBOV DOL EOOD mines the Bobov Dol coalfield, which is the largest deposit of brown coal in the country. There are significant coal reserves and resources here, amounting to some 100 million tonnes. Coal mining is carried out at one opencast and two underground mines. In 2012, a total of 1.1 million tonnes of brown coal was produced by the three mines owned by VAGLEDOBIV BOBOV DOL. The produced coal is mainly supplied to the nearby 210 MW Bobov Dol EAD power plant which was retrofitted with flue gas desulphurisation in 2012 to comply with EU legislation. About 10 % to 12 % of coal mined by VAGLEDOBIV BOBOV DOL is used by households.

OTKRIT VAGLEDOBIV MINES EAD, another private company, owns two opencast mines in the Pernik coalfield where it extracted 1.1 million tonnes of brown coal in 2012.

BALKAN MK carries out underground coal mining in the Oranovo coalfield with some 30 million tonnes of brown coal reserves and a production output of 0.7 million tonnes per year. The brown coal is supplied mainly to the Bobov Dol power station.

Other small privately owned mines are the Vitren mine located in the Katrishte deposit, with an annual output of some 0.1 million tonnes, and Cherno More mine in the Black Sea coalfield, with an annual output of 0.25-0.3 million tonnes.

Hard coal output is insignificant (14.1 thousand tonnes) and its extraction is carried out by BALKAN 2000 MINES EAD.

Energy Policy

The liberalisation of the electric power market in Bulgaria is being carried out in line with the requirements of EU legislation. In practice, this is a step-by-step process with the aim of creating the necessary conditions for competition among electric power generators, as well as to give consumers the opportunity to choose their supplier.

The Bulgarian energy sector is relatively small on a global scale, but it is of great significance to the country`s industrial capacity. It mainly encompasses electricity generation and oil and gas transport to Western markets. The sector is traditionally considered to be of strategic importance to the economic development of the country and to national energy security, which to some extent explains the large investments in new capacity, rehabilitation of old power plants and expansion of the power supply grid made over the last 7-8 years.

Coal resources and reserves	Unit	2012
Resources hard (black and brown) coal	Mt	598.4
Resources lignite	Mt	3 386.8
Reserves hard (black and brown) coal	Mt	254.7
Reserves lignite	Mt	1 600.2
Primary energy production		
Total primary energy production	Mtce (2011)	17.7
Hard (black and brown) coal (saleable output)	Mt	2.1
Lignite (saleable output)	Mt	30.4
Saleable coal quality		
Hard coal calorific value	kJ/kg	12 140-13 400
Lignite calorific value	kJ/kg	6 720
Hard coal ash content (black and brown)	% a.r.	<26
Lignite ash content	% a.r.	15.97
Hard coal moisture content (black and brown)	% a.r.	<16
Lignite moisture content	% a.r.	52.9
Hard coal sulphur content (black and brown)	% a.r.	<2.7
Lignite sulphur content	% a.r.	2.28
Coal imports / exports		
Hard coal imports	Mt	2.3
Primary energy consumption		
Total primary energy consumption	Mtce	25.8
Hard coal consumption (black and brown)	Mt	4.4
Lignite consumption	Mt	30.4
Power supply		
Total net power generation	TWh	42.9
Power imports / (exports)	TWh	2.4 / (10.6)
Total power consumption	TWh	34.6
Power generation from lignite	TWh	19.9
Capacity of lignite- and brown coal-fired generation	MW	5 917
Employment		
Direct in lignite and brown coal mining	thousand	11 300
Other lignite- and brown coal-related *	thousand	67 100

** e.g. in power generation, equipment supply, services and R&D*

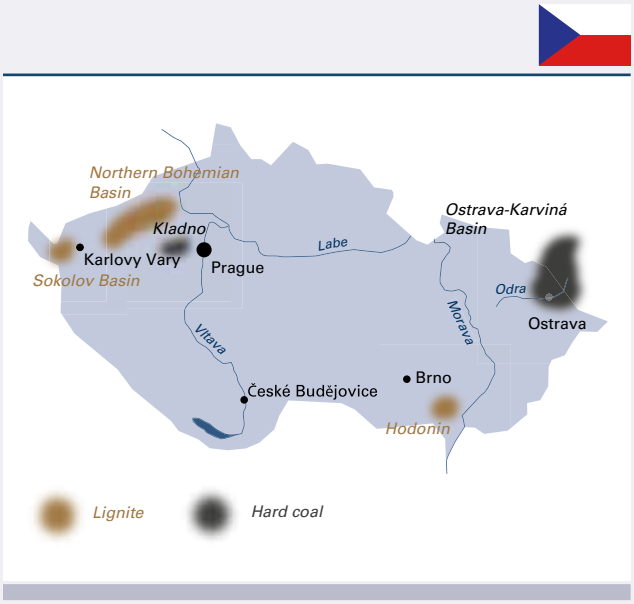
Czech Republic

Coal is the only significant indigenous energy resource in the Czech Republic. The country's economically recoverable coal reserves have been estimated at some 2.33 billion tonnes. Brown coal, which accounts for more than 73% of these resources, is mainly produced in north-western Bohemia, whilst hard coal is mined in northern Moravia. Significant quantities of hard coal are exported to Austria, Slovakia and Poland.

Primary energy consumption, which amounted to 60.8 Mtce in 2012, was supplied as follows: 40.6% coal (total 24.7 Mtce, of which hard coal 5.9 Mtce and brown coal 18.8 Mtce), 15.8% natural gas (9.6 Mtce) and 20.4% oil (12.4 Mtce). This primary energy mix is supplemented by nuclear energy with an 18.6% share (11.3 Mtce), as well as by renewables and hydroelectric power, which together account for some 6.5% (4.0 Mtce), and 0.5% (0.3 Mtce) other fuels and -2.4% (-1.5 Mtce) as net exports of electricity.

The Czech Republic's dependence on energy imports has been quite modest to date; 28.5% of energy demand is met by imports. However, imports are structurally unbalanced. The country's dependence on oil is about 95%, and similarly for natural gas. A number of direct and indirect measures must be adopted to prevent any further increase in energy imports, including: increased energy efficiency, the promotion of renewable energy sources in areas where their use is effective and helps to reach a 13% share in final energy consumption in 2020 and the efficient use of indigenous solid fuel resources, mainly brown coal.

In 2012, approximately 52.4% of total gross electricity production (87.6 TWh) was generated from coal, 34.6% from nuclear energy and 9.3% from renewable sources. Conventional coal-fired power stations have a total capacity of approximately 10.8 GW. The Czech electricity market has been fully liberalised since 2006 and the gas market since 2007.



General data	Unit	2012
Population	million	10.5
GDP	€ billion	152.3

There are five coal mining companies in the Czech Republic: OSTRAVSKO-KARVINSKÉ DOLY, the only hard coal producer, and four brown coal companies, SEVEROČESKÉ DOLY, owned by ČEZ and the biggest producer of brown coal, VRŠANSKÁ UHELNÁ, with coal reserves to last until 2055, SEVERNÍ ENERGETICKÁ (Sev.en – formerly LITVÍNOVSKÁ UHELNÁ) with the largest brown coal reserves in the Czech Republic, and SOKOLOVSKÁ UHELNÁ, the smallest brown coal company. All of these coal mining companies have been privatised. ČEZ is the largest coal consumer in the Czech Republic and the most important Czech supplier of electricity. In 2012, ČEZ generated 64 TWh, i.e. 73% of the country's electricity generation. The ČEZ Group is listed on the Prague and Warsaw stock exchanges, although remains majority state-owned.

Hard coal

The Czech Republic has 181 million tonnes of economically recoverable hard coal reserves. The largest hard coal deposits are located in the Upper Silesian Coal Basin. With an area of 6 500 square kilometres, this coal basin ranks among the largest in Europe. A major part is located in Poland, while about one sixth (1 200 square kilometres) lies in the Czech Republic where it is called the Ostrava-Karviná Basin (after the city of Ostrava and the town of Karviná). Here, OSTRAVSKO-KARVINSKÉ DOLY (OKD) extracts hard coal from deep mines. In 2012, saleable output was 11.4 million tonnes, with a workforce of 12 866 own employees and 16 432 contractors. Coal is currently extracted at four deep mines: Karviná, ČSM, Darkov and Paskov. The worked seams in Ostrava at the Paskov colliery range in thickness from 0.8 to 1.6 metres. The thickness of the Karviná seams ranges from 1.5 to 6.5 metres. Longwall working with shearer loaders (90.2 %) and ploughs (9.8 %) is employed, combined with controlled caving. Mechanical supports (95.1 %) and individual hydraulic props (4.9 %) are used to support the coalfaces. At each of the collieries, the extracted coal is processed in preparation plants where it is graded as coking coal or steam coal, based on its quality parameters.

Brown coal and lignite

The Czech Republic has 873 million tonnes of economically recoverable brown coal and lignite reserves. In addition to a coal basin in northern Bohemia and another near the town of Sokolov, there are also coalfields in the south of the country, although they are not economically viable. Elsewhere, production of brown coal totalled 43.5 million tonnes in 2012, providing an important contribution to the country's energy supply. Brown coal production in the Czech Republic has been quite stable in recent years, ranging from around 44 to 49 million tonnes.

The main brown coal deposit and the largest mining area, covering 1 400 square kilometres, is the Northern Bohemian Brown Coal Basin, which is located in the foothills of the Krušné hory mountains, along the border with Germany (Saxony), in the vicinity of the towns of Kadaň, Chomutov, Most, Teplice and Ústí nad Labem. The seams in this area extend to depths up to 400 metres and are between 15 and 30 metres thick.

Brown coal is extracted in the central part of the Northern Bohemian Brown Coal Basin by two mining companies, VRŠANSKÁ UHELNÁ (VUAS) and SEVERNÍ ENERGETICKÁ (Sev.en – formerly LITVÍNOVSKÁ UHELNÁ or LUAS). In 2012, VUAS extracted 8.9 million tonnes of brown coal at the Vršany site. LUAS extracted 4.6 million tonnes of brown coal at the ČSA site. ČSA boasts the largest brown coal reserves in the Czech Republic – sufficient to support coal mining to 2100 and beyond. However, extraction is curtailed by mining limits imposed in 1991. Within the current mining limits, extraction will last until 2022. However, beyond the mining limits lie an estimated 750 million tonnes of high-quality brown coal. In 2012, VUAS had a total workforce of 850 and LUAS had 590 employees.

The only deep brown coal mine in the Czech Republic, Centrum, is also located in the central part of the Northern Bohemian Brown Coal Basin. In 2012, some 300 employees extracted about 0.4 million tonnes of brown coal there.

After extraction, the brown coal is processed at the Komořany preparation plant, which supplies a broad range of coal products. Graded, pulverised and single-purpose products are delivered to power stations, the heat supply industry and households. Fuels blended for the energy sector are supplied to power stations (Počerady, Chvaletice, Mělník, Poříčí, Opatovice and Hodonín), CHP plants and energy complexes.

The brown coal company SEVEROČESKÉ DOLY (SD) based at Chomutov operates in the north-western part of the Northern Bohemian Brown Coal Basin, to the east of the town of Most. SD extracts brown coal at two sites, namely Doly Nástup Tušimice and Doly Bílina. A total of 22.8 million tonnes was produced in 2012, increasing SD's share in national brown coal production to almost 50 %.

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

The Bílina brown coal mining area has one surface mine. Doly Bílina is located between the towns of Bílina and Duchcov. More than 9.5 million tonnes of brown coal are produced each year and transported to the Ledvice preparation plant before being delivered to power stations, industries and households.

In 2012, the SD group had a total workforce of 5 145.

Located in western Bohemia, in the western part of the coalfield below the Krušné hory mountains, the brown coal basin around the town of Sokolov is mined by SOKOLOVSKÁ UHELNÁ (SU). The company operates two surface mines, the Družba and Jiří mines. In 2012, its output was 6.7 million tonnes.

SU's key products include electricity and heat, graded coal, steam coal and chemical products produced during coal gasification. Brown coal from the Sokolov area is mainly used for power and heat generation. SU generates electricity in two of its own power plants: the Vřesová IGCC plant (2 x 200 MWe) and a CHP plant (5 x 270 MWt), which have a combined annual output of 3.5 TWh. Most of the heat produced is consumed by the company itself, although some is supplied to the towns of Karlovy Vary, Nejdek, Chodov and Nová Role. The company also pursues environmental activities, notably the reclamation of land affected by surface mining, and waste processing and disposal. SU's operations employed a total workforce of 4 070 in 2012.

A smaller deposit of some 200 million tonnes of workable lignite is located in southern Moravia near the town of Hodonín. Approximately 0.5 million tonnes of lignite per year from underground mines were produced there. Lignite production stopped in 2010.

The Czech brown coal industry has always played an important role in the national economy. According to the current National Energy Concept, coal is expected to remain an important energy resource in the Czech Republic, playing a significant role in the Czech energy mix. The Czech Republic devotes great attention to the clean use of brown coal. A very good example is the comprehensive programme to renovate and develop coal-fired power stations in northern Bohemia. The 800 MW Tušimice power station has been renovated; its CO_2 emissions have been significantly reduced and its life has been extended to 2035. September 2012 saw the launch of the renovation of the Prunéřov power station, with the objective of reducing emissions by 40 % and extending its life by 25 years. The Ledvice power station is under construction and is expected to be commissioned in 2014 with a planned life of 40 years.

Coal resources and reserves	Unit	2012
Resources hard coal	Mt	617
Resources lignite	Mt	1 711
Reserves hard coal	Mt	181
Reserves lignite	Mt	873

Primary energy production		
Total primary energy production	Mtce	45.3
Hard coal (saleable output)	Mt / Mtce	11.4 / 10.5
Lignite (saleable output)	Mt / Mtce	43.5 / 19.2

Saleable coal quality		
Hard coal net calorific value	kJ / kg	25 490 - 32 070
Lignite net calorific value	kJ / kg	11 600 - 20 560
Hard coal ash content	% a.r.	4.3 - 18.9
Lignite ash content	% a.r.	5.97 - 37.8
Hard coal moisture content	% a.r.	3.5 - 9.9
Lignite moisture content	% a.r.	26.46 - 38.3
Hard coal sulphur content	% a.r.	0.42 - 0.43
Lignite sulphur content	% a.r.	0.78 - 1.44

Coal imports / exports		
Hard coal imports	Mt	2.0
Hard coal exports	Mt	5.6

Primary energy consumption		
Total primary energy consumption	Mtce	60.8
Hard coal consumption	Mtce	5.9
Lignite consumption	Mtce	18.8

Power supply		
Total net power generation	TWh	81.1
Net power imports / (exports)	TWh	(17.1)
Total power consumption	TWh	58.8
Power generation from hard coal	TWh	4.5
Power generation from lignite	TWh	35.2
Capacity of coal-fired generation	MW	1 200
Capacity of lignite-fired generation	MW	9 600

Employment		
Direct in hard coal mining	thousand	12.866
Direct in lignite mining	thousand	9.093

Germany

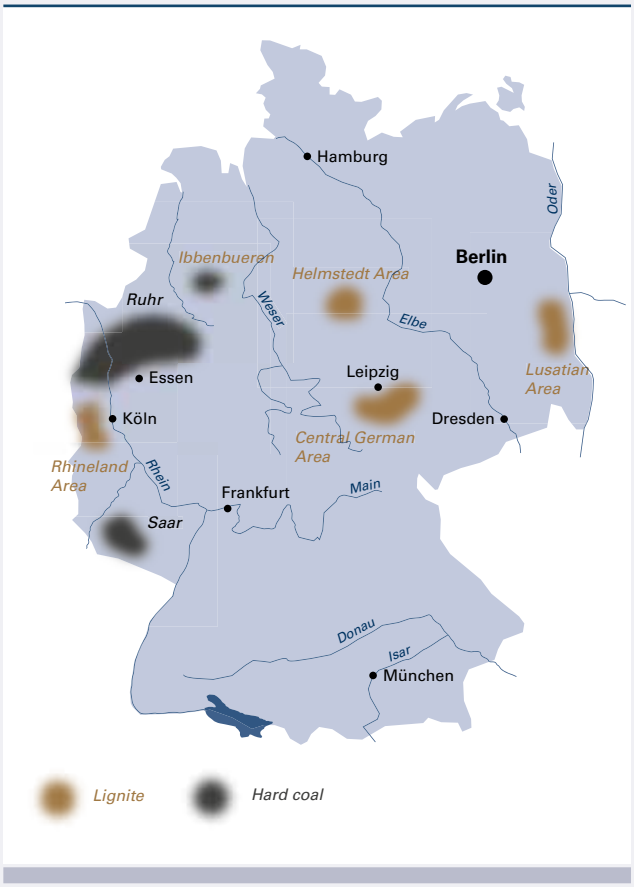
Germany has considerable reserves of hard coal (2 500 million tonnes that are technically accessible of 82 961 million tonnes of known resources) and lignite (40 400 million tonnes), making these the country's most important indigenous source of energy. However, in the case of hard coal there remain only 37 million tonnes to be extracted following the political decision to end subsidised German hard coal production in 2018.

In 2012, primary energy production totalled 148.4 million tonnes of coal equivalent (Mtce), excluding nuclear. With an output of 68.3 Mtce, coal and lignite had a share of 46%. The mix of indigenous primary energy production can be broken down as follows: 57.2 Mtce of lignite (38.5%), 11.1 Mtce of hard coal (7.5%), 13.3 Mtce of natural gas (9.0%), 3.8 Mtce of oil (2.5%), 54.3 Mtce of renewable energy (36.6%) and 8.7 Mtce from other sources (5.9%).

Germany's primary energy consumption amounted to 469.4 Mtce in 2012. Oil accounted for the largest share (32.9%), followed by coal (24.8%), natural gas (21.5%) and nuclear energy (7.9%). Renewable energy grew to 11.6%. Within the figure for coal, hard coal accounted for 12.8% and lignite for 12.0% of total primary energy consumption. Germany is dependent on energy imports to a large extent, except in the case of lignite. About 87% of hard coal was imported, in comparison with 98% of oil and 87% of gas.

The power generation structure is characterised by a widely diversified energy mix. In 2012, gross power generation of 628.7 TWh output was produced as follows: 44.2% from coal (of which 25.7% was from lignite and 18.5% from hard coal), 15.8% from nuclear, 12.0% from natural gas, 22.6% from renewable energy sources and 5.7% from other sources. This means that hard coal and lignite, as well as nuclear energy, are the mainstays of the German power industry.

The federal government adopted its *Energiekonzept* or energy concept in October 2010. It combines a life extension of German nuclear power plants (on average by 12 years, with the last shutdown around 2040) with "green" energy policy objectives. The focus to date has been on ambitious climate protection policies: a CO_2 emission reduction of at least 80% by 2050 with



General data	Unit	2012
Population	million	80.5
GDP	€ billion	2 666.4

step-by-step objectives for each decade, including a 40% reduction by 2020, a massive increase in energy efficiency to yield total energy savings of 20% by 2020 and 50% by 2050, and the steady development of renewable energies to a 60% share of final energy consumption and 80% of power generation by 2050. The *Energiekonzept* should also be understood as a "Roadmap into the age of renewable energies" and the extended use of nuclear energy as the "bridge" to get there, although 2011 saw the collapse of this bridge.

To implement the new *Energiekonzept*, an immediate 10-point programme was introduced for offshore wind and measures in connection with extending the life of

nuclear power plants, including the introduction of a new tax on nuclear energy. Coal played only a secondary role in the *Energiekonzept*, without any specific objectives or long-term perspective. Coal-fired power plants shall, in the future, have the role of swing and reserve supplier to balance the ever-increasing power generation from renewables. Scenario calculations underlying the *Energiekonzept* foresee a drastic decrease of overall coal use in Germany. The market for hard coal halves by 2020 and then halves again by 2050.

Subsidised hard coal production is to be phased out by 2018, in agreement with national and European regulations. Lignite use, according to the scenarios, remains stable until 2020, but practically disappears as an energy source by 2050.

From a technical point of view, the *Energiekonzept* is based on a number of doubtful premises: a strong global agreement on climate policy, a perfectly organised European energy market, future technical innovations and efficiency leaps in the energy sector, solutions to all problems concerning public acceptance, and smooth changes to the structure of the energy economy given the assumed economic growth to 2050. Successful implementation of the concept therefore seems to be questionable.

In the meantime, the nuclear incident at Fukushima in Japan in March 2011 re-ignited the debate about extending the lifespan of nuclear power plants in Germany. The federal government initially announced a nuclear moratorium and wanted to redraft its *Energiekonzept* during the summer of 2011. All political parties have now set themselves the objective of phasing out nuclear as fast as practicable. A return to the situation prior to the granting of lifetime extensions to nuclear power plants is seen as a minimal objective, together with improved efficiency and an accelerated development of networks and infrastructure across the entire energy sector. Now, there is an agreement among all political parties not to restart the eight nuclear power plants that were shut down during the moratorium, to phase out the remaining nine nuclear power plants in Germany by 2022 at the latest and to speed up the move to a "green" energy economy. For this purpose, the German government has outlined a package of several new or amended energy laws and further political measures to foster change in the energy sector.

In total, it is expected that German electricity consumers will pay more than € 20 billion of EEG levies in 2013 to promote renewable energy. This is because a dramatic increase in the *Erneuerbare-Energien-Gesetz* (EEG – German Renewable Energy Act) levy was announced in October 2012. The 5.3 €c/kWh levy has triggered a controversial debate since the public is concerned about how EEG costs are shared. In response, the federal government proposed an "EEG price brake" (*Strompreisbremse*). However, the proposal was not adopted and it does not address other issues, such as the impact on competition in the electricity market.

The way to an "age of renewable energies" has to be smoothed in Germany and elsewhere. Modern coal- and gas-fired power plants represent the technological bridge along this path. To this extent, the prospects for coal in general, and especially for coal-fired power plants under construction or in the planning stage, have become somewhat brighter.

Hard coal

In 2012, the German hard coal market amounted to 57.0 Mtce, of which 40.1 Mtce were used for power and heat generation, whilst 15.4 Mtce went to the steel industry. The remaining 1.5 Mtce were sold to the residential heating market.

Germany was the EU's largest hard coal importer in 2012, as well as one of the world's largest coke importers. Some 45 million tonnes of hard coal (steam coal and coking coal) or 79% of national consumption were imported in 2012. The biggest suppliers of hard coal to Germany were Russia, with a market share of more than 24%, and the USA with 25%, followed by Colombia with 21%. Exports from Australia accounted for 11% and from Poland 8% which was also an important coke supplier.

In the regions of the Ruhr, the Saar and in Ibbenbüren, coal is extracted by RAG DEUTSCHE STEINKOHLE. In 2012, RAG produced 10.8 million tonnes of saleable hard coal (11.6 Mtce).

Restructuring of the hard coal industry continues in Germany which in 2012 still had five operating deep mines, namely the collieries West (which closed at the end of 2012), Prosper-Haniel and Auguste Victoria located in the Ruhr area, the Saar mine in the Saar coalfield (which closed at the end of June 2012) and another deep mine near Ibbenbüren. Production in 2012 from these three coalfields can be broken down as follows: 78% from the Ruhr area, 4% from the Saar and 18% from the Ibbenbüren coalfield.

Employment figures continued to fall steadily. The number of employees in the hard coal mining sector decreased during 2012 by 15.8% from 20 925 on 31 December 2011 to 17 613 on 31 December 2012. Productivity levels, measured in terms of saleable output per man-shift underground, increased after a crisis-driven decline in the previous years from 6 623 kg in 2011 to 6 876 kg in 2012.

In 2007 and 2008, the formal separation of RAG's so-called "white" business, the former RAG Shareholding Limited Company, was completed and the new EVONIK INDUSTRIES AG was created. EVONIK, with its commercial activities in the fields of chemicals, energy and property, is now striving to list on the stock exchange as an independent company.

The core business of RAG became hard coal mining, as was the case for the former RUHRKOHLE AG, although it has retained certain related activities, especially in the fields of real estate in mining areas (RAG MONTAN IMMOBILIEN) and in mining consultancy and equipment sales (RAG MINING SOLUTIONS).

The private RAG Foundation, created in July 2007, is the owner of both RAG and EVONIK. Its remit is to bring its assets in EVONIK to the capital market, retaining only a minority stake. Long-term liabilities after the final phase-out of hard coal mining will be financed by the proceeds. The German government has taken the decision to phase out – in a socially acceptable manner managed by the RAG Foundation – all state aid for coal production by 2018. Using its assets, the Foundation will promote training, science and culture in the mining regions.

Lignite

Lignite supply in 2012 totalled 56.1 Mtce, with domestic output accounting for 57.2 Mtce and imports approximately 43 000 tce. Lignite exports amounted to 1.1 Mtce of pulverised lignite and briquettes.

Lignite production, which totalled 185.4 million tonnes in 2012, was centered in four mining regions, namely the Rhineland around Cologne, Aachen and Mönchengladbach, the Lusatian mining area in south-eastern Brandenburg and north-eastern Saxony, the Central German mining area in the south-east of Saxony-Anhalt and in north-west Saxony as well as the Helmstedt mining area in Lower Saxony. In these four mining areas, lignite is exclusively extracted in opencast mines.

Lignite is an indispensable energy source for Germany because it is abundantly available for long-term use and competitive. Furthermore, the lignite industry is an important employer and investor, adding major economic value to the mining regions.

More than 90% of lignite production is used for power generation (169.4 million tonnes in 2012), accounting for nearly 26% of total power generation in Germany.

In the Rhineland, RWE POWER AG produced a total of 101.7 million tonnes of lignite in 2012 from its three opencast mines: Hambach, Garzweiler and Inden. Almost 90% of the lignite was consumed by the company's own power stations, whilst some 12.0 million tonnes were used for processed products and for private consumption. At the end of 2012, the lignite division of RWE POWER had a total workforce of 11 241.

RWE's BoAplus project is on track following a decision of the Cologne regional council on 5 July 2013 to amend its regional plan. This *Aufstellungsbeschluss* is an important milestone in the overall approval process which is expected to be completed by the end of 2014. The selection of bidders for the main components (boiler, steam turbine, cooling tower, electrostatic precipitator and flue gas desulphurisation) is proceeding so that documents required by the *BImSchG* (the Federal pollution control act) can be prepared – the final stage in the process.

The generation capacity of RWE POWER consists of five lignite-fired power plants with a total capacity of 10 848 MW. At Neurath, a new lignite-fired power plant with optimised plant technology (BoA 2/3) was commissioned in August 2012, boasting a gross capacity of 2 200 MW and replacing old plants. The lignite-fired power output in the Rhenish lignite mining area amounted to some 74 TWh in 2012.

In the Lusatian mining region, where VATTENFALL EUROPE MINING AG (VE-M) is the only producer, total lignite output amounted to some 62.4 million tonnes. The lignite is extracted in Jänschwalde, Cottbus Nord and Welzow Süd in Brandenburg, as well as in Nochten and Reichwalde in Saxony.

Lignite sales to public power plants amounted to 58.6 million tonnes. VATTENFALL EUROPE GENERATION AG (VE-G) is the main operator of lignite-fired power plants in the Lusatian area with a gross rated capacity of 7 581 MW. In 2012, with the opening of the new 675 MW Boxberg power plant, the gross power output from the Lusatian lignite-fired power plants totalled 53 TWh. At the end of 2012, VE-M and VE-G had a total workforce of 7 758.

The Central German mining area around Leipzig yielded a total lignite output of 19.2 million tonnes in 2012. The most important company in this area is MITTELDEUTSCHE BRAUNKOHLENGESELLSCHAFT (MIBRAG), owner of two opencast mines at Profen (Saxony Anhalt) and Schleenhain (Saxony).

In 2012, MIBRAG produced 18.7 million tonnes of lignite, serving the three company-owned combined heat and power plants at Deuben, Mumsdorf and Wählitz with a total capacity of 208 MWe. At the end of 2012, MIBRAG had a total workforce of 1 991.

Another opencast mine operated by ROMONTA is located in Amsdorf (Saxony-Anhalt), in the Central German mining area. In 2012, 0.5 million tonnes of lignite were mined there and processed to extract raw lignite wax. The wax-free fuel is employed for power generation at Amsdorf. At the end of 2012, ROMONTA had a total workforce of 311.

In the Helmstedt mining area, E.ON KRAFTWERKE produced 2.0 million tonnes of lignite. The heat and power generation sector is the only customer for lignite in the Helmstedt mining area. Extraction from the Schöningen opencast mine and operation of the Buschhaus (390 MW) power plant will continue until 2017. The lignite-fired power plant generated a total output of 2.3 TWh in 2012. On 31 December 2012, E.ON had a total workforce of 495.

It is clear that the coal industry, with its capital investments, operating expenditures and payment of salaries, makes a very substantial contribution to the economy. One of the major criteria for sustainability is to maintain and create employment. The shrinkage of the coal industry and coal use has had a considerable impact on employment in the EU. A study by the EEFA research institute analysed the employment created by the German lignite industry. According to this study, approximately 25 000 direct jobs and a further 63 000 indirect jobs at suppliers can be attributed to the lignite industry. So for each direct job in the lignite industry, another 2.5 jobs are created at companies who supply equipment and services.

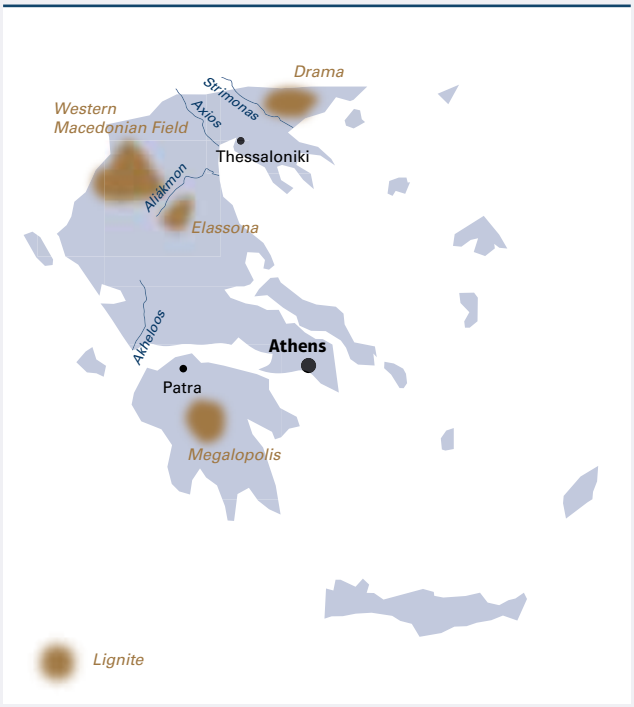
Extraction of lignite from opencast mines changes the natural landscape, so land reclamation is an integral part of any mining project. Mining activities are only complete following the transformation of a former "industrial" opencast mine into a vibrant landscape. There is a long tradition of reclamation in ecologically ambitious ways. For more than one hundred years, nature has inspired landscape restoration projects, including indigenous flora and fauna. Reclamation involves a learning process, in which there is always room for further improvement. Projects that return land to productive use, often with a high recreational and agricultural value, are typical.

Coal resources and reserves	**Unit**	**2012**
Resources hard coal	Mt	82 961
Resources lignite	Mt	36 500
Reserves hard coal	Mt	2 500
Reserves lignite	Mt	40 400
Primary energy production		
Total primary energy production	Mtce	148.4
Hard coal (saleable output)	Mt / Mtce	10.8 / 11.6
Lignite (saleable output)	Mt / Mtce	185.4 / 57.2
Saleable coal quality		
Hard coal net calorific value	kJ / kg	21 000 - 32 000
Lignite net calorific value	kJ / kg	7 800 - 11 500
Hard coal ash content	% a.r.	3.3 - 21.0
Lignite ash content	% a.r.	2.0 - 20.0
Hard coal moisture content	% a.r.	2.5 - 13.0
Lignite moisture content	% a.r.	40.0 - 60.0
Hard coal sulphur content	% a.r.	0.45 - 1.8
Lignite sulphur content	% a.r.	0.15 - 3.5
Coal imports / exports		
Hard coal imports	Mt	44.9
Hard coal exports	Mt	0.2
Primary energy consumption		
Total primary energy consumption	Mtce	469.4
Hard coal consumption	Mtce	60.4
Lignite consumption	Mtce	56.1
Power supply		
Total net power generation	TWh	593.7
Net power imports / (exports)	TWh	(23.1)
Total power consumption	TWh	534.1
Power generation from hard coal	TWh	106.7
Power generation from lignite	TWh	148.2
Capacity of coal-fired generation	MW	24 061
Capacity of lignite-fired generation	MW	21 507
Employment		
Direct in hard coal mining	thousand	17.613
Direct in lignite mining	thousand	16.622
Other hard coal-related *	thousand	22.897
Other lignite-related *	thousand	5.802

** e.g. in power generation, equipment supply, services and R&D*

Greece

Accounting in 2012 for over 30% of the country's total primary energy supply of 37.1 Mtce, lignite is Greece's most important indigenous energy resource, although the country does have modest oil and gas reserves. Oil accounted for approximately 45% of the country's primary energy supply and Greece has a large refining industry which exports oil products. Consumption of imported natural gas increased significantly until the global economic crisis hit in 2008; gas had a 15% share in 2012. At 0.4 Mtce, hard coal imports accounted for 1.2% of total primary energy supply in 2012. Security of supply, low extraction costs and stable prices are important reasons why lignite will maintain a strong position in the energy market.



General data	Unit	2012
Population	million	11.3
GDP	€ billion	193.7

Lignite

Greece boasts lignite resources of 4.7 billion tonnes and 3.0 billion tonnes of economically workable reserves. The most important deposits are located in the north of the country at Ptolemais-Amynteon and Florina (1.5 billion tonnes) which contribute around 80% of production. Other deposits lie at Drama (900 million tonnes) and at Elassona (170 million tonnes), as well as in the south at Megalopolis (225 million tonnes). There is also a large peat deposit of about 4 billion cubic metres at Philippi in the northern part of Greece (Eastern Macedonia). Only 30% of the total lignite reserves have been extracted to date and remaining reserves are good for over 40 years at current production rates.

Lignite deposits in Greece lie at an average depth of 150 to 200 metres and typically comprise layers of lignite alternating with layers of mineral. In 2012, 257.2 million cubic metres of overburden and interburden were excavated at the principal mines.

The quality of Greek lignite can be characterised as follows: the lowest calorific values are in the areas of Megalopolis and Drama (3 770 to 5 020 kJ/kg) and Ptolemais-Amynteon (5 230 to 6 280 kJ/kg). In Florina and Elassona the calorific value lies between 7 540 and 9 630 kJ/kg. The ash content ranges from 15.1% (Ptolemais) to 19.0% (Elassona), and the water content from 41.0% (Elassona) to 57.9% (Megalopolis). The sulphur content is generally low.

Lignite is mined by the PUBLIC POWER CORPORATION (PPC) exclusively in opencast mines. This majority state-owned company is the largest lignite producer in Greece. It operates mines in Western Macedonia at Main Field, South Field, Kardia Field, Amynteon Field and Florina. PPC also has an opencast site in the Peloponnese region of southern Greece, in the Megalopolis Field. Bucket-wheel excavators, spreaders, tripper cars and conveyor belts are used to mine and transport lignite at these sites. PPC currently operates 48 bucket-wheel excavators and 22 spreaders, together with more than 300 km of belt conveyor lines. Heavy trucks are used to remove the hard overburden formations found at some mines.

In 2012, lignite production amounted to 62.2 million tonnes, mostly mined by PPC, with 52.1 million tonnes extracted by the company at the West Macedonia Lignite Centre (WMLC) and 9.6 million tonnes at the Megalopolis

Lignite Centre (MLC). The few privately operated mines in the West Macedonia area produced a total of 1.1 million tonnes of lignite.

In 2012, WMLC operations removed a total of 236.2 million cubic metres of overburden and interburden, corresponding to an overburden-interburden-to-lignite ratio of 4.53 cubic metres per tonne. At MLC, overburden plus interburden removal was 21.1 million cubic metres, corresponding to an overburden-interburden-to-lignite ratio of 2.2 : 1. Although the overburden-interburden-to-lignite ratio has significantly increased in recent years, it is expected to remain stable in the future. The two mining areas, WMLC and MLC, and the head office in Athens, currently employ a total permanent workforce of about 3 720.

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

At the end of 2012, PPC's power generation plants accounted for approximately 68% of the country's total installed capacity of 16.5 GW and include lignite- and gas-fired plants, oil-fired plants on interconnected and autonomous islands, hydro plants, wind farms and solar PV plants. There are also six private power plants with a total capacity of 2 564 MW. PPC owns eight lignite-fired power plants comprising 21 units with a total installed capacity of 5 180 MW. In 2012, lignite-fired generation accounted for 52% of a total interconnected system output of 53.1 TWh which excludes the autonomous islands. The share of gas was 27%, oil 0.2%, hydro 8.6% and renewables 9.4%.

Lignite's future role in Greece will depend on changes taking place in the European energy sector, including the cost of CO_2 emission allowances. Nevertheless, low-cost domestic lignite is still competitive compared to imported energy sources such as natural gas. PPC faces important changes relating to the regulatory framework governing energy market liberalisation. Strategic priorities now include the replacement of old and inefficient plants and the promotion of renewable investments. However, the current recession has a negative impact on any new investment and the government's "green policy" means that while renewables are displacing generation from lignite and natural gas, the cost of producing electricity has increased: in 2013, consumers will be asked to pay €29/MWh in renewables subsidies, up from €9/MWh in 2012. This increase comes at a time when electricity production has fallen 8.5% below its 2008 peak and unpaid electricity bills total €1.3 billion – dramatic indications of the impact that high energy prices have on an economy.

Coal resources and reserves	Unit	2012
Resources lignite	Mt	4 728
Reserves lignite	Mt	2 978
Primary energy production		
Total primary energy production	Mtce	14.5
Lignite (saleable output)	Mt/Mtce	62.2/11.4
Saleable coal quality		
Lignite net calorific value	kJ/kg	3 770-9 630
Lignite ash content	% a.r.	15.1-19.0
Lignite moisture content	% a.r.	41.0-57.9
Lignite sulphur content	% a.r.	0.4-1.0
Coal imports / exports		
Hard coal imports	Mt	0.24
Primary energy consumption		
Total primary energy consumption	Mtce	37.1
Hard coal consumption	Mtce	0.4
Lignite consumption	Mtce	11.3
Power supply *		
Total net power generation	TWh	51.3
Net power imports/(exports)	TWh	1.8
Total power consumption	TWh	53.1
Power generation from lignite	TWh	27.6
Capacity of lignite-fired generation	MW	5 180
Employment		
Direct in lignite mining	thousand	4.795
Other lignite-related **	thousand	2.726

** excluding small islands with independent diesel generators*

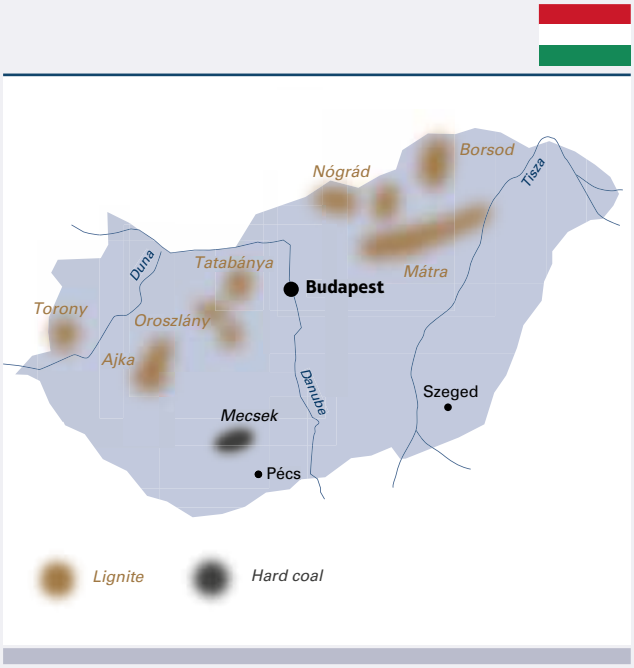
*** e.g. in power generation, equipment supply, services and R&D*

Hungary

Hungary's most important indigenous energy reserves comprise approximately 2.4 billion tonnes of natural gas (including unconventional reserves), 48.2 million tonnes of oil (including unconventional reserves) and 8.5 billion tonnes of coal. Lignite and brown coal account for about 80% of the country's total coal reserves, making these the most important indigenous sources of energy.

Hungary's primary energy consumption in 2012 amounted to 33.6 Mtce. Natural gas had the biggest share in this total (34.5%), followed by oil (24.3%), nuclear energy (17.3%) and coal (12.3%). Hence, energy consumption is characterised by a high demand for natural gas and Hungary is highly dependent on gas imports. Against this background, one focus is on improving access to natural gas by extending the pipeline systems to increase security of supply. To this end, several projects are currently under way in Hungary.

National electricity generation in 2012 amounted to 31.9 TWh, with an installed capacity totaling some 10 GW of which 8.3 GW are constantly available. A net 8 TWh of electricity was imported. Nuclear energy from Hungary's sole state-owned nuclear power plant at Paks accounted for about 46% of domestic electricity production. The Paks power plant has four reactors with a total gross capacity of 2 000 MW. A permission procedure has recently been launched to extend the lifetimes of these units. In addition, there are plans to add new units to the existing nuclear plant.



General data	Unit	2012
Population	million	10.0
GDP	€ billion	97.7

Gas-fired generation also makes a major contribution to the national electricity supply: it had a share of about 27% in 2012. Electricity produced from coal and lignite had a share of 18% in domestic electricity production in 2012. Most of the coal-based electricity was generated by MÁTRAI ERÖMÜ ZRT. Renewable energy had a share of about 8%: biomass and wind being the main pillars followed by hydro and biogas. Solar plays only a subordinate role. Hungary aims to increase the renewable energy share of generation to 15% by 2020.

Lignite

Hungary's lignite and brown coal resources are concentrated in the regions of Transdanubia and in northern and north-eastern Hungary. In 2012, Hungary's total lignite output was about 9 million tonnes. About 95% of this was used for heat and power generation. The remaining lignite went to municipalities, households and other consumers.

Currently, there are three main coal extraction sites in Hungary. Some 10% of the total production come from the Márkushegy underground mine belonging to VÉRTESI ERŐMŰ ZRT in western Hungary. The mine supplies coal to the associated Oroszlány power plant. As the power plant is supposed to be decommissioned, the mining operations will have to close as well. However, political considerations may override this economic decision.

The remaining 90% of Hungary's coal production is lignite from the opencast mines Visonta and Bükkábrány, belonging to MÁTRAI ERŐMŰ ZRT. The company is located 90 km north-east of Budapest. In 2012, MÁTRAI produced approximately 8.4 million tonnes of lignite and removed some 75 million cubic metres of overburden. The lignite is used in the company-owned power plant in Visonta which comprises five lignite-fired units and two topping gas turbines. The power plant has a total capacity of 936 MW (2 x 100 MW units, 1 x 212 MW, 2 x 232 MW and two gas turbines of 2 x 30 MW). Besides lignite and gas, biomass is co-fired to a fuel input level of around 10%. To supply the power plant with lignite, the company operates an opencast mine in Visonta which is located right next to the power station and an opencast mine in Bükkábrány, some 50 kilometres away. From there, the coal is transported by rail to the power plant. The approved mining fields of the two MÁTRAI opencast mines have about 0.5 billion tonnes of lignite. The company is exploring further lignite deposits which could be developed at a later date.

Coal resources and reserves	Unit	2012
Resources hard coal	Mt	1 625
Resources lignite and brown coal	Mt	8 939
Reserves hard coal	Mt	1 915
Reserves lignite and brown coal	Mt	6 580
Primary energy production		
Total primary energy production	Mtce	15.6
Lignite (saleable output)	Mt / Mtce	9.3 / 2.3
Saleable coal quality		
Lignite calorific value	kJ / kg	6 880
Lignite ash content	% a.r.	21.0
Lignite moisture content	% a.r.	46.6
Lignite sulphur content	% a.r.	1.3
Coal imports / exports		
Hard coal imports	Mt	1.5
Primary energy consumption		
Total primary energy consumption	Mtce	33.6
Hard coal consumption	Mtce	1.6
Lignite consumption	Mtce	2.6
Power supply		
Total net power generation	TWh	31.9
Net power imports / (exports)	TWh	8.0
Total power consumption	TWh	39.9
Power generation from lignite and brown coal	TWh	5.7
Capacity of lignite- and brown coal-fired generation	MW	1 430
Employment		
Direct in lignite mining	thousand	2 087
Other lignite-related *	thousand	1 575

** e.g. in power generation, equipment supply, services and R&D*

Poland

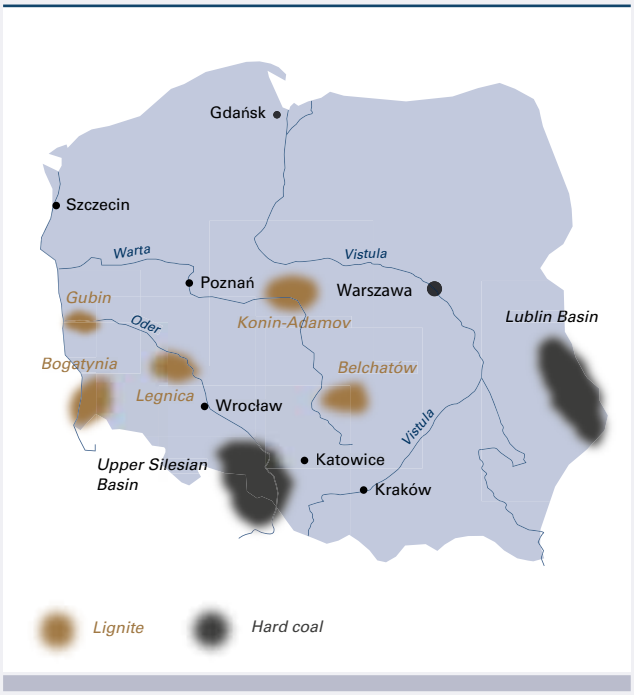
Coal and lignite are strategic fuels for power generation in Poland, where indigenous supplies of these fuels have underpinned growth in electricity supply. The contribution of coal and lignite to total power generation is dominant today and is expected to be maintained in the medium term.

Poland has hard coal reserves totalling 19.1 billion tonnes, mainly located in Upper Silesia and in the Lublin basin. Mineable lignite reserves amount to almost 1.6 billion tonnes.

More than half of Polish power stations are over 25 years old, whilst about one quarter has been in operation for more than 30 years. The lignite-fired power plants are amongst the newest ones and they are being refurbished to meet EU environmental standards. Poland has no nuclear power stations, but has plans to construct a new nuclear power plant by 2020.

Several European energy companies, including VATTENFALL, RWE, EDF and GDF SUEZ are currently active in the Polish energy sector, having a certain impact on energy production and distribution as well as on the government's privatisation policy. Polish national energy policy is focused on security of energy supply, with competitive cost structures, minimal environmental impacts and increased energy efficiency.

According to the "Energy Policy of Poland to 2030", coal is expected to remain the main fuel for electricity generation, but a general reduction of energy consumption by industry and a 19% share of renewables by 2020 are targeted. Nevertheless, electricity consumption in 2030 is expected to increase by 30%, gas consumption by 42% and petroleum products consumption by 7%.



General data	Unit	2012
Population	million	38.5
GDP	€ billion	381.2

Poland does not have significant reserves of oil and only modest natural gas reserves, although it may have great potential to exploit unconventional gas. The government has issued over 90 licenses for shale gas exploration and reliable assessments are expected to be presented in due time. However, initial analysis shows that Poland has huge shale gas deposits, stretching from the northern Baltic Sea coast to the eastern borders with Ukraine and Belarus, totalling over 5 000 billion cubic metres. Experts estimate that this amount could cover domestic needs for over 100 to 200 years. If these estimates were confirmed, it would change the fuel mix of the country and reduce energy dependence on Russia.

Hard coal

Poland is Europe's biggest hard coal producer and was once one of the world's leading suppliers. In the 1970s, Poland became Europe's biggest coal producer, with an annual output of around 150 million tonnes. In the late 1970s, it was the second largest coal exporter in the world, after the USA, exporting around 40 million tonnes each year. Although the role of Poland, as an exporting country, was already declining in the 1980s, the output was maintained at a significantly high level (193 million tonnes in 1988) compared with other European countries. It was not until the political turnaround in the Eastern Bloc countries and the ensuing transition to a market economy system, that Poland began to experience a contraction of hard coal mining during the early 1990s that had begun in Western Europe two decades earlier. Nevertheless, coal continues to play a major role, making a 52 % contribution to the country's primary energy supply. In recent years, the output of hard coal was about 75 million tonnes reaching 79.2 million tonnes in 2012. In 2012, the Polish hard coal industry employed a workforce of some 113 000.

Commercially workable hard coal reserves are located in the Upper Silesian basin and the Lublin basin in the east of Poland, with the Upper Silesian coalfield accounting for 93 % of the total. The coal reserves in this region contain some 400 coal seams with thicknesses of 0.8 metres to 3.0 metres. About half of these seams are economically workable. Some 56 % of the workable coal reserves consist of steam coal, while the remaining 44 % are coking coal.

All hard coal is deep mined at an average working depth of approximately 600 metres. Mining is fully mechanised, with over 90 % of coal produced by longwall systems. The run-of-mine coal from underground operations contains discard and requires preparation. In the past, only coking coal was cleaned to meet international quality standards. The expansion of existing coal preparation plants, and the commissioning of new coal upgrading facilities in recent years, has resulted in a significant improvement in the quality of Polish steam coal, which meets world market requirements.

Most of the country's natural resources, including coal, are in public hands and coal mining is still mostly a state-run activity. However, in recent years, the state has made decisions on ownership changes in the Polish hard coal industry. In 2009, LUBELSKI WĘGIEL "BOGDANKA", a steam coal producer operating in the Lublin basin, was privatised and listed on the Warsaw stock exchange. Its debut on the stock exchange was seen as a success. "Bogdanka" mine is executing a development strategy that will see a doubling of production. It intends to expand the mining area to new mining fields. Taking advantage of its geographic location, "Bogdanka" has, for the time being, no problems with selling all of its production. In December 2010, the Czech group EPH took over "Silesia" hard coal mine from KOMPANIA WĘGLOWA. The newly created company, PG SILESIA, started coal production in 2012. In 2011 JASTRZĘBSKA SPÓŁKA WĘGLOWA (JSW), the largest Polish coking coal producer, listed on the Warsaw stock exchange. After having reached an agreement with trade unions, the government gave a "green light" to the initial public offering of a minority share in JSW. JSW is regarded as one of the top mining companies in Poland with reserves of good quality coking coal and a well-established customer base of steel producers. JSW is also the largest coke producer in the EU, possessing substantial coking facilities of about 3 - 4 million tonnes annual capacity.

The government has presented a policy which aims to fully privatise all coal mining companies in the coming years. WĘGLOKOKS SA, the biggest Polish coal exporter, is scheduled to be listed on the Warsaw stock exchange in 2013.

Two other coal producing companies remain under state ownership: KOMPANIA WĘGLOWA SA (KW), the EU's largest coal mining group with a production capacity of nearly 40 million tonnes of coal, and KATOWICKI HOLDING WĘGLOWY SA (KHW) with a production capacity of 12 million tonnes of thermal coal. The government plans to list both of these entities on the stock exchange in the next two or three years, but such ambitions will be largely dictated by the economic outlook and general market conditions.

The main objectives of the coal industry over the coming years are to overcome legal barriers that restrict access to new coal deposits and to apply efficient and modern mining technologies alongside low-emission technologies in the power generation sector.

Coal exporters and recently also coal importers have an efficient infrastructure at their disposal, with cross-border rail links to neighbouring countries and to Baltic Sea ports for exports and imports. These comprise Gdańsk, Świnoujście, Szczecin and Gdynia ports. Among these terminals, Gdańsk and Świnoujście are able to load capesize vessels. Hard coal exports from Poland totalled 6.4 million tonnes in 2012, and about half of these were transported by land to neighbouring countries, while the remaining volumes were trans-shipped via the Baltic ports.

Polish ports such as Szczecin-Świnoujście and Gdańsk have built permanent piers for the import of coal and, over time, both the ports and railways may offer better transport conditions for importers with large contracts.

Indeed, Poland has become a net importer of coal. In 2010, imports of coal were 13.4 million tonnes, in 2011 they reached 15 million tonnes, before dropping to 10.2 million tonnes in 2012, mainly due to the economic slow-down. Imports were dominated by deliveries from Russia. Much smaller quantities come from other countries, including the Czech Republic, Colombia, Kazakhstan and the USA.

Polish coal mines still have a geographic advantage, but this is beginning to shrink with the expansion of ports and logistic hubs near Poland's eastern border, both of which facilitate coal imports from abroad. Indigenous coal is becoming less attractive for power generators than cheaper imported coal. This is a big challenge for Polish coal producers, because electricity generators are no longer guided by loyalty, but mostly by economic calculations.

The thermal hard coal market also faces increasing pressure from environmental targets being dictated by the European Union which oblige member states to generate more and more electricity from low-carbon sources, whilst the coking coal industry is at the mercy of the performance of the European steel industry.

In order to increase the use of hard coal, not only for its combustion but also for non-conventional use, it was decided to open a Centre of Clean Coal Technologies co-financed by EU funds and co-managed by the Central Mining Institute (GIG) and the Institute of Chemical Coal Processing. This is an important opportunity to give Polish coal the chance to become an environmentally friendly and socially acceptable fuel in future.

Beside its hard coal mining industry, Poland also has a well-developed and technically advanced mining machinery and equipment industry. Together with the research institutes and technology centres KOMAG, EMAG and GIG, the machinery and equipment sector assists the Polish hard coal industry to continuously develop and modernise its activities.

Despite the current economic slow-down, coal companies and other investors, including those from abroad, are interested in making investments in new Polish coal mines.

Lignite

Poland's lignite deposits are exclusively mined in opencast mines. Two of these operations are located in central Poland and a third one lies in the south-west of the country. In 2012, total lignite production reached 64.3 million tonnes (18.2 Mtce), 98.4 % of which was used by mine-mouth power plants. Lignite-fired power stations generated 55.6 TWh of electricity, representing one third of the total gross power generated in Poland.

The Bełchatów basin, situated in the central part of Poland, incorporates two lignite fields: Bełchatów and Szczerców. In 2012, the Bełchatów mine produced 40.1 million tonnes (10.8 Mtce) of lignite, this being 62.5 % of Poland's total lignite production. Mining this lignite required the removal of some 106.9 million cubic metres of overburden, which equates to an overburden-to-lignite ratio of 2.6 cubic metres per tonne. The depth of the mining operation in the Bełchatów field is about 300 metres and the average calorific value of the fuel is 7 960 kJ/kg. Bełchatów mine is expected to remain in operation until 2038. The lignite output is supplied entirely to a mine-mouth power plant, with a capacity of 5 298 MW. The power plant generates 27 - 28 TWh per year, covering about 20 % of domestic power requirements. Built between 1981 and 1988, it generates the cheapest electricity in Poland. A new 858 MW power unit was put into service on 27 September 2011 in the PGE GiEK SA Bełchatów power plant.

In the Turoszów lignite basin, located in the south-west of Poland, the Turów mine has a production capacity of 15 million tonnes per year (4.1 Mtce). Reserves are estimated at 340 million tonnes (91.6 Mtce). In 2012, the mine produced over 10.3 million tonnes of lignite (2.8 Mtce), representing 16.1 % of Poland's total lignite production, with a calorific value of 9 564 kJ/kg. Up to 96 % of the lignite is supplied to the PGE GiEK SA Turów mine-mouth power station. This plant has been modernised and upgraded to a capacity of 2 100 MW. On 31 December 2012, unit No. 9 at the power plant was decommissioned. Currently, the Turów power plant has a capacity of 1 698 MW and is one of the most modern in Poland. In 2012, some 45.6 million cubic metres of overburden were removed, giving a stripping ratio of 4.4 cubic metres per tonne. Turów mine is expected to be in operation until 2045.

The Bełchatów and Turów lignite mines, as well as Bełchatów and Turów power plants, belong to the group

of companies included in the PGE Górnictwo i Energetyka Konwencjonalna (PGE GiEK SA) having its office in Bełchatów. The company is one of the six key companies belonging to the majority state-owned Polish utility POLSKA GRUPA ENERGETYCZNA SA (PGE).

The Konin-Adamów basin, located in central Poland between Warsaw and Poznań, has been producing lignite for over 50 years. There are two active mines: Konin and Adamów, which belong to the PAK Group and are named PAK KWB Konin SA and PAK KWB Adamów SA.

PAK KWB Konin SA has a production capacity of 15 million tonnes per year (4.1 Mtce). Lignite is produced at three opencast sites: Jóźwin IIB, Drzewce and Tomisławice. Total lignite production reached 10.1 million tonnes (2.7 Mtce) in 2012. It required the removal of 70.7 million cubic metres of overburden, a stripping ratio of 6.9 cubic metres per tonne. The working depth at these pits varies between 25 metres and 80 metres. The extracted fuel has an average calorific value of 9 220 kJ/kg. The planned lignite production from PAK KWB Konin SA is estimated to be about 195 million tonnes (52.5 Mtce). The Konin mine supplies lignite to three mine-mouth power plants: Pątnów I with an installed capacity of 1 200 MW, Konin (583 MW) and Pątnów II (464 MW).

PAK KWB Adamów SA operates three opencast pits, named Adamów, Władysławów and Koźmin. Adamów mine's overall production capacity is 5 million tonnes per year (1.3 Mtce). The depth of mining operations is between 44 metres and 70 metres. The deposits currently being exploited have workable reserves of 44 million tonnes (11.8 Mtce). In 2012, lignite production reached 3.6 million tonnes (0.9 Mtce), all of which was supplied to the 600 MW Adamów mine-mouth power station. Some 31.7 million cubic metres of overburden was removed, which gives a stripping ratio of 8.7 cubic metres per tonne.

The entire Pątnów-Adamów-Konin (PAK) lignite basin generates approximately 8.5% of Poland's electricity requirements. The mines belong to ZESPÓŁ ELEKTROWNI PĄTNÓW-ADAMÓW-KONIN SA which listed on the Warsaw stock exchange in October 2012. PAK KWB Adamów SA is expected to remain in operation until 2023 and PAK KWB Konin SA until 2040.

The average productivity at Poland´s lignite mines was 4 236 tonnes per man-year in 2012 and employment totalled 15 156. Poland's lignite mining areas can maintain their annual production output at current levels of around 60 million tonnes and lignite is expected to play an important role in Poland's energy supply until at least 2030.

Coal resources and reserves *	Unit	2012
Resources hard coal	Mt	48 225
Resources lignite	Mt	22 584
Reserves hard coal	Mt	19 131
Reserves lignite	Mt	1 591
Primary energy production		
Total primary energy production	Mtce	101.1
Hard coal (saleable output)	Mt / Mtce	79.2 / 64.4
Lignite (saleable output)	Mt / Mtce	64.3 / 18.2
Saleable coal quality		
Hard coal net calorific value	kJ / kg	21 000 - 28 000
Lignite net calorific value	kJ / kg	7 400 - 10 300
Hard coal ash content	% a.r.	8.0 - 30.0
Lignite ash content	% a.r.	6.0 - 12.0
Hard coal moisture content	% a.r.	6.5 - 11.0
Lignite moisture content	% a.r.	50.0 - 60.0
Hard coal sulphur content	% a.r.	0.4 - 1.2
Lignite sulphur content	% a.r.	0.2 - 1.1
Coal imports / exports		
Hard coal imports	Mt	10.2
Hard coal exports	Mt	6.4
Primary energy consumption		
Total primary energy consumption	Mtce	140.4
Hard coal consumption	Mtce	60.4
Lignite consumption	Mtce	18.1
Power supply		
Total net power generation	TWh	147.6
Net power imports / (exports)	TWh	(2.8)
Total power consumption	TWh	144.8
Power generation from hard coal	TWh	84.5
Power generation from lignite	TWh	55.6
Capacity of coal-fired generation	MW	20 152
Capacity of lignite-fired generation	MW	9 635
Employment		
Direct in hard coal mining	thousand	113.000
Direct in lignite mining	thousand	15.000

** Source: Państwowy Instytut Geologiczny (Polish Geological Institute) as at 31 December 2012*

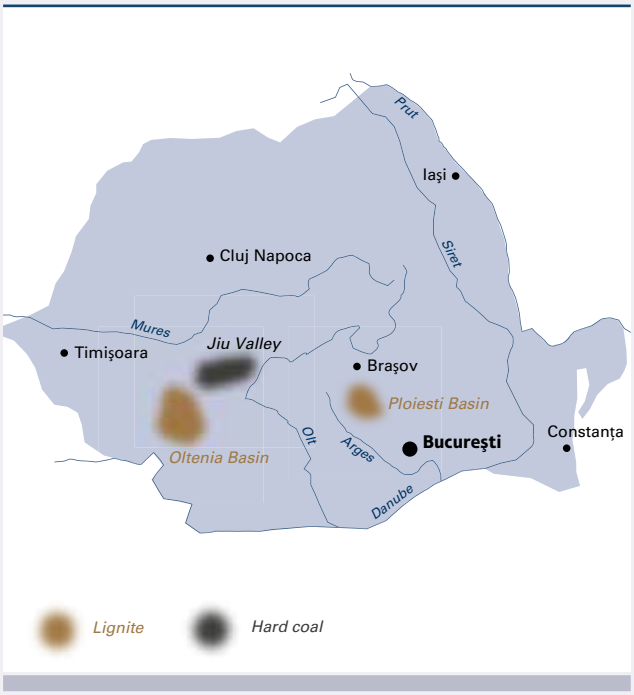
Romania

Romania has significant energy resources, including natural gas, oil and coal, and has a long coal mining tradition, stretching back 150 years. Almost 80% of the country's primary energy demand is met by indigenous energy resources. Current oil reserves are estimated at 82 million tonnes with an annual production of around 4 million tonnes. Natural gas reserves are estimated at 109 billion cubic metres with an annual production of around 11 billion cubic metres. In October 2012, a new 860 MW gas-fired power plant was inaugurated at Brazi. New offshore gas could enable Romania to become a net gas exporter by 2025.

Hard coal reserves and resources are estimated at 2 446 million tonnes, of which 252.5 million tonnes are commercially exploitable within the currently leased perimeters, although as little as 11 million tonnes might be economically recoverable. Proven reserves of lignite total 280 million tonnes, with a further 9 640 million tonnes of resources. 95% of lignite deposits are situated in the Oltenia mining basin and more than 80% of these can be mined in opencast mines. The remaining lignite deposits have low economic potential, explaining why extraction in most other areas has stopped.

Romania's entire hard coal and lignite output is used for heat and power generation. At the end of 2011, the total capacity of installed generation was 20 498 MW; coal-fired power plants had a share of 28.9% or 5 918 MW, other fossil fuel power plants 5 374 MW (26.2%), hydro power plants 6 483 MW (31.6%) and the Cernavodă nuclear power plant 1 411 MW (6.9%). The National Renewable Energy Action Plan shows that there is a large potential for wind power generation; turbines with a capacity of 1 905 MW had been installed by the end of 2012. ENERGONUCLEAR proposes to build two new CANDU reactors (1 440 MW) at the Cernavodă nuclear power plant.

The main consumers of hard coal are the thermal power plants at Paroşeni (3 x 50 MW) and Mintia (6 x 210 MW). Hard coal has the advantage of ensuring a long-term supply for these power plants. Nevertheless, hard coal



General data	Unit	2012
Population	million	21.4
GDP	€ billion	131.7

mining in Romania faces complex geological conditions, making mining difficult. Some mines will be obliged to stop their activities due to the enormous land acquisition costs and very high operational costs. More generally, some mining companies urgently need to modernise their equipment to improve performance and productivity.

Lignite mining in Romania offers some competitive advantages with the use of modern technologies and skilled labour. Reserves are concentrated in a relatively small area of about 250 square kilometres where lignite is currently mined in 19 opencast pits. These reserves provide a long-term secure supply for power plants. In order to avoid impacts on neighbouring agricultural land, overburden is placed back in the excavated voids, which also helps reduce costs. The main consumers are nearby

power plants, including Turceni (2 640 MW), Rovinari (1 720 MW) and Mintia-Deva (1 260 MW). Further to the south lies the 300 MW Craiova power plant, also lignite-fired.

Romania has established an energy policy framework which is in line with EU law, regulating the production of gas, coal, lignite, oil and nuclear energy, as well as power plant modernisation. The National Energy Regulatory Authority (ANRE) is the responsible independent authority, reporting to the prime minister.

The recently transposed EU laws on environmental protection oblige the coal industry to meet several European standards which necessitates large investments. The 2001/80/EC Directive on Large Combustion Plants was adopted and is being implemented. 174 large combustion plants have been identified, of which 78 need to comply with stricter environmental requirements by 2017. Current coal-burning technologies will be replaced by clean coal technologies to reduce SO_2 and NO_X emissions along with particulate emissions from coal-fired thermal power plants. In order to maintain the important role of fossil fuels in power generation, Romania intends to implement CO_2 capture and storage at all new power plants.

During 2012, the coal industry underwent major restructuring. The lignite mines and power plants were combined into the vertically integrated OLTENIA ENERGY COMPLEX to create what the Romanian government hopes will be a national champion. Restructuring of the hard coal sector was more problematic and was finalised only at the end of 2012 with the creation of two separate operating units under the NATIONAL HARD COAL COMPANY (CNH SA Petroşani). One will oversee the closure by 2018 of three coal mines in the Jiu Valley that are not viable (Uricani, Paroşeni and Petrila), following Council Decision 2010/787/EU on state aid to the coal industry. The other unit will continue to operate the remaining four coal mines without state aid (Lonea, Livezeni, Vulcan and Lupeni), with an annual production capacity of 1.5 million tonnes. Job losses will total 2 400, leaving 5 200 employees.

Coal resources and reserves	Unit	2012
Resources hard coal	Mt	2 435
Resources lignite	Mt	9 640
Reserves hard coal	Mt	11
Reserves lignite	Mt	280

Primary energy production		
Total primary energy production	Mtce (2011)	39.4
Hard coal (saleable output)	Mt/Mtce	1.9/0.9
Lignite (saleable output)	Mt/Mtce	32.1/9.4

Saleable coal quality		
Hard coal net calorific value	kJ/kg	14 200-15 900
Lignite net calorific value	kJ/kg	7 200-8 200
Hard coal ash content	% a.r.	37-44
Lignite ash content	% a.r.	30-36
Hard coal moisture content	% a.r.	5.0-7.4
Lignite moisture content	% a.r.	40-43
Hard coal sulphur content	% a.r.	0.5-1.8
Lignite sulphur content	% a.r.	1.0-1.5

Coal imports / exports		
Hard coal imports	Mt	1.4

Primary energy consumption		
Total primary energy consumption	Mtce	48.7
Hard coal consumption	Mtce	2.0
Lignite consumption	Mtce	9.4

Power supply		
Total net power generation	TWh (2011)	56.5
Net power imports/(exports)	TWh (2011)	(1.9)
Total power consumption	TWh (2011)	54.6
Power generation from hard coal	TWh (2011)	0.8
Power generation from lignite	TWh (2011)	24.0
Capacity of coal-fired generation	MW	1 400
Capacity of lignite-fired generation	MW	4 500

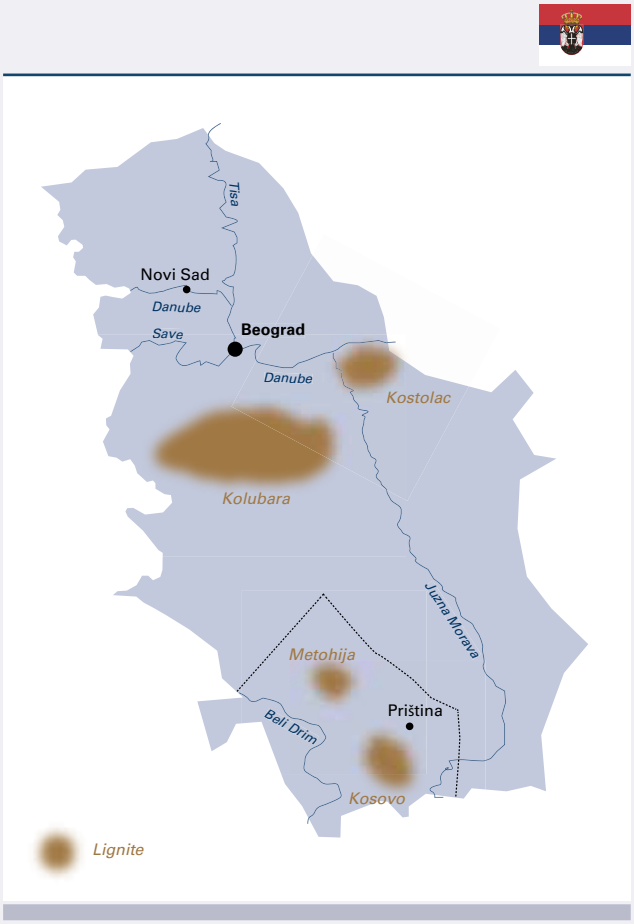
Employment		
Direct in hard coal mining	thousand	6 000
Direct in lignite mining	thousand	15 000

Serbia

The activities of the state-owned ELEKTROPRIVREDA SRBIJE (EPS or Electric Power Industry of Serbia) cover electricity generation, distribution and supply, lignite production, processing and transport, as well as hydro power generation. EPS is also active in the development, design, engineering, construction and maintenance of mining equipment and other energy industry assets.

Lignite is a strategic and dominant energy source for Serbia and the opencast mines of EPS clearly contribute to the country's stable and secure energy supply. Lignite, therefore, remains one of the main fuels for power generation within the long-term development plans of EPS. In 2012, total power generation in Serbia reached 34.5 TWh of which 24.3 TWh were based on lignite. Since 1999, EPS no longer has activities in Kosovo and Metohija.

Coal from underground mines has an insignificant share of 0.7% in the total electricity generation of EPS.



General data	Unit	2012
Population	million	7.2
GDP	€ billion	29.9

Since 1999, EPS does not operate its facilities in the territory of Kosovo

Lignite

In 2012, EPS produced a total of 37.5 million tonnes of lignite in opencast mines located in the Kolubara and Kostolac basins. The lignite extracted by the corporate enterprise MINING BASIN KOLUBARA generated 50% of the total electricity production of EPS and lignite mined by TPPs-OCMs KOSTOLAC at Kostolac fuelled 15% of EPS power generation. The average calorific value of the supplied lignite to the thermal power plants of MB KOLUBARA and TPPs-OCMs KOSTOLAC subsidiaries is about 7 520 kJ/kg and 8 150 kJ/kg, respectively. The ratio of excavated overburden to lignite was 2.31 cubic metres per tonne in the Kolubara mining basin and 4.30 cubic metres per tonne in Kostolac.

Lignite mining in the Kolubara mining basin is carried out in relatively densely populated areas, with much farmland, many roads and water features. These facts heavily impact on the speed and the cost of land acquisition. The Kostolac basin is an agricultural region of the country which includes the well-known archaeological site of Viminacium where MB KOLUBARA operates four opencast mines, namely Field B, Field D, Veliki Crljeni and Tamnava West Field. The extracted lignite generates heat and power at the Kolubara thermal power plant (TPP), TPP Nikola Tesla A and B, and TPP Morava. TPPs-OCMs KOSTOLAC operates Drmno mine, supplying lignite to TPP Kostolac A and B.

Lignite output in both the Kolubara and Kostolac basins is expected to increase, since the Serbian energy development strategy includes the construction of new

thermal power plants. Investments are therefore needed at existing lignite mines and also for the development of new lignite deposits.

Priority is given to joint projects with strategic partners of EPS, including projects to construct two new 350 MW lignite-based units near the Kolubara mine at TPP Kolubara B and a new unit, Nikola Tesla B3 with a capacity of 700 MW. At the same time, the existing opencast lignite mines will be extended and new deposits will be accessed.

EPS is still in the process of upgrading and modernising its thermal power plants in order to reach the standards required by national law on environmental protection by 2015. These activities include the replacement of ash transportation and disposal systems in several thermal power plants, as well as the refurbishment of electrostatic precipitators.

In October 2012, EPS and the German KfW Development Bank signed a loan agreement for a € 65 million project: "Energy Efficiency through Efficient Coal Quality Management in MB KOLUBARA" – part of the international RIO + 20 initiative. Implementation of this project will lead to total annual savings of € 26 million, as well as to less lignite use, saving about one million tonnes per year as the efficiency of the power plant will be improved.

A further significant investment is being carried out by TPPs-OCMs KOSTOLAC to increase annual lignite production to 12 million tonnes. This expansion is a precondition for the construction of an additional 350 MW unit at Kostolac while securing future lignite supplies for the existing A and B units.

As a member of the Energy Community, Serbia has accepted to implement certain rules in the field of energy related to competition, environmental protection, renewable energies and EU regulations. In 2012, EPS continued its efforts to implement EU regulations with a view towards Serbia's integration and accession into the EU.

Coal resources and reserves	Unit	2012
Resources hard coal	Mt	184
Resources lignite	Mt	5 363
Reserves hard coal	Mt	176
Reserves lignite	Mt	3 660
Primary energy production		
Total primary energy production	Mtce	14.3
Hard coal (saleable output)	Mt / Mtce	0.6 / 0.3
Lignite (saleable output)	Mt / Mtce	37.5 / 10.5
Saleable coal quality		
Hard coal net calorific value	kJ / kg	12 000-18 000
Lignite net calorific value	kJ / kg	7 500-8 200
Hard coal ash content	% a.r.	12.0-35.0
Lignite ash content	% a.r.	14.0-18.0
Hard coal moisture content	% a.r.	45.0-54.0
Lignite moisture content	% a.r.	48.0-52.0
Hard coal sulphur content	% a.r.	0.9-3.8
Lignite sulphur content	% a.r.	0.4-0.9
Coal imports / exports		
Hard coal imports	Mt	1.3
Primary energy consumption		
Total primary energy consumption	Mtce	22.2
Hard coal consumption	Mtce	0.3
Lignite consumption	Mtce	11.0
Power supply		
Total net power generation	TWh	34.5
Net power imports / (exports)	TWh	(1.0)
Total power consumption	TWh	33.6
Power generation from lignite	TWh	24.3
Capacity of lignite-fired generation	MW	3 976
Employment		
Direct in hard coal mining	thousand	3 900
Direct in lignite mining	thousand	12 300
Other lignite-related *	thousand	14 350

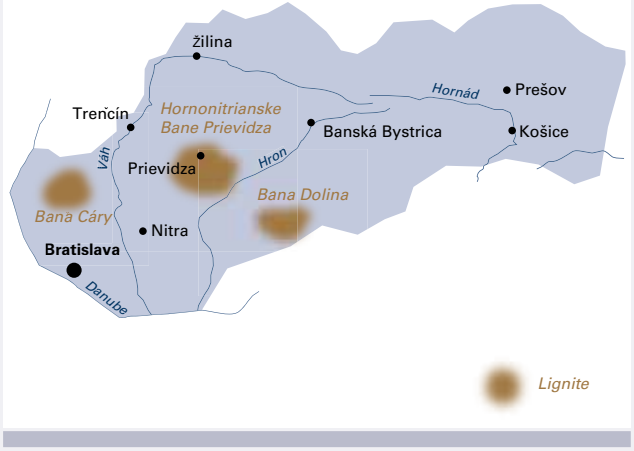
** e.g. in power generation, equipment supply, services and R&D*

Slovakia

The Slovak Republic does not have any significant exploitable indigenous fossil energy reserves. Resources are relatively large, but the majority are not recoverable at the present time. Slovakia's dependency on imported energy sources is therefore higher than 90%.

Whilst exploitable crude oil and natural gas reserves and their extraction accounts for a relatively small share of overall energy supply, there is quite a large potential for gas storage. During recent years a public discussion on the exploitation of a new uranium deposit at Kurišková was launched.

In 2008, Slovakia became a net importer of electricity, following the closure of two 440 MW blocks at the Bohunice nuclear power plant – EBO. In 2011, a new CCGT power plant at the village of Malženice near the town of Trnava went into operation with an installed capacity of 436 MW. In general, the energy mix under the national energy policy is well balanced, supporting indigenous lignite and renewables.



General data	Unit	2012
Population	million	5.4
GDP	€ billion	71.5

Lignite

Lignite resources are estimated at more than 400 million tonnes and a further 500 million tonnes should be available in the future. Exploitable lignite reserves, including brown coal, are calculated at 100 million tonnes. There is an insignificant hard coal deposit in the eastern part of Slovakia, which is not exploitable.

Lignite is extracted by three companies at five underground mines located in the central, southern and western parts of Slovakia. In 2012, 2.3 million tonnes of lignite were produced. Lignite-based power generation reached nearly 2 TWh, representing approx. 7% of total electricity generation (27.9 TWh).

HORNONITRIANSKE BANE PRIEVIDZA (HBP) is a coal mining company with a history of over 100 years. HBP is seated in the town of Prievidza and extracts lignite at the Handlová and Nováky deposits located in the Horná Nitra region. In the past, there were three independent collieries in operation here – Cigel', Handlová and Nováky, which are nowadays integrated into HBP. The depth of the worked coal seams ranges from 150 metres to 450 metres.

The lignite seams have a thickness of up to 20 metres and are mostly extracted by using a long-wall sub-level caving method. HBP also operates a mine rescue station, which serves all mining districts in Slovakia. Lignite output in 2012 was 2.04 million tonnes and all the lignite was supplied to the nearby 522 MW Nováky power plant (Elektráreň Nováky – ENO) belonging to the SLOVENSKÉ ELEKTRÁRNE COMPANY which is majority owned by ENEL of Italy. Nearly one third of the lignite supplied came from the new mine in the Nováky deposit.

BAŇA DOLINA COMPANY, located near the town of Vel'ký Krtiš, extracts lignite from the Modrý Kameň deposit in southern Slovakia at a depth of 150 metres. In 2012, this mine produced only 130 thousand tonnes of lignite due to closure plans which now extend to the end of 2015. Lignite is supplied to the ENO power station. The BAŇA ZÁHORIE COMPANY near the town of Holíč has been in operation since 1990 and extracted 170 thousand tonnes of lignite in 2012 from a working depth of 180 metres. The mine plans to expand its annual production in future to 350 thousand tonnes.

More than 90% of the total lignite produced was used for electricity generation and district heating.

Banská Mechanizácia and Elektrifikácia Nováky (BME) is a modern mining equipment plant owned by HBP that supplies hydraulic powered supports and other equipment.

HBP is a private mining company developing some activities together with SLOVENSKÉ ELEKTRÁRNE – ENEL, mainly in relation to modernising the ENO power plant. HBP also has an interest in research projects and is working together with the University of Košice on underground coal gasification technologies.

Coal resources and reserves	Unit	2012
Resources hard coal	Mt	8
Resources lignite	Mt	1 000
Reserves hard coal	Mt	0
Reserves lignite	Mt	95

Primary energy production		
Total primary energy production	Mtce	9.2
Lignite (saleable output)	Mt / Mtce	2.3 / 0.9

Saleable coal quality		
Lignite calorific value	kJ / kg	10 450
Lignite ash content	% a.r.	< 25
Lignite moisture content	% a.r.	< 36
Lignite sulphur content	% a.r.	< 2.5

Coal Imports / Exports		
Hard coal imports	Mt	3.4

Primary energy consumption		
Total primary energy consumption	Mtce	24.8
Lignite consumption	Mtce	1.2

Power supply		
Total net power generation	TWh	27.9
Power imports / (exports)	TWh	13.4 / (13.1)
Total power consumption	TWh	28.3
Power generation from hard coal	TWh	1.2
Power generation from lignite	TWh	2.0
Capacity of coal-fired generation	MW	660
Capacity of lignite-fired generation	MW	524

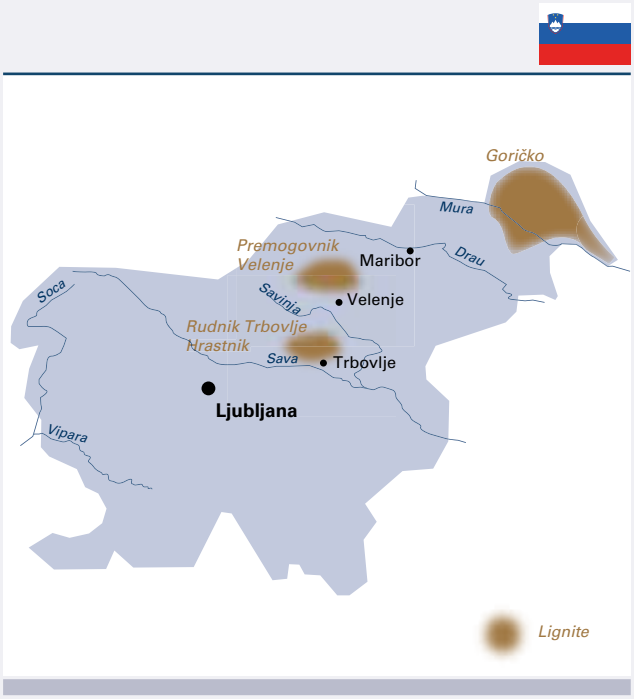
Employment		
Direct in lignite mining	thousand	3 700
Other lignite-related *	thousand	630

** e.g. in power generation, equipment supply, services and R&D*

Slovenia

Resources of lignite and brown coal in Slovenia are estimated at 1 170 million tonnes, with mineable reserves accounting for 140 million tonnes. Since its creation in 1991, the Republic of Slovenia has enjoyed steady economic growth and, between 2000 and 2012, the country's primary energy consumption increased by 11 % to reach 10.2 Mtce, even though there was a slight economic downturn in 2009 due to the global economic crisis. Approximately 50 % of the country's primary energy requirements are met by imports.

The key elements of Slovenian energy policy are closely aligned with the priorities of the European Union, such as a national plan for renewables and a plan to improve energy efficiency. In the long term, coal and lignite are expected to be partially replaced by renewable energies and coal imports reduced. PREMOGOVNIK VELENJE will continue its lignite production until 2054, since lignite is needed in the currently well-balanced energy mix for security of supply reasons.



General data	Unit	2012
Population	million	2.1
GDP	€ billion	35.3

Lignite

There is one underground lignite deposit in Slovenia which is mined at Velenje in the north of the country. The Trbovlje-Hrastnik underground coal mine, operated by RUDNIK TRBOVLJE-HRASTNIK in central Slovenia, stopped coal production in the first quarter of 2013 and is now being decommissioned. In 2012, these two mines produced 4.3 million tonnes of lignite and brown coal. Velenje coal mine is the biggest lignite mine in Slovenia and the major part of its output is used in the nearby Šoštanj power plant. Operated by PREMOGOVNIK VELENJE, the mine is one of the largest and most modern underground mines in Europe. It is located in the Šaleška dolina Valley, boasting one of the thickest known lignite layers in the world (more than 170 metres) where a unique mining method is used. The company's long-term strategy is to operate the mine until 2054, as it is likely to remain Slovenia's only exploitable energy resource for the next 50 years. The majority of Velenje coal mine belongs to the state-owned HOLDING SLOVENSKE ELEKTRARNE (HSE) who also owns two power plants (TEŠ and TET) as well as hydro power plants. Imported coal is mainly used at the Termoelektrarna Toplarna Ljubljana (TE-TOL) heat and power plant in Ljubljana, covering over 90 % of the capital's heat demand and 3 % of its power demand.

Taking into consideration the increasing demand for electricity, the risks of energy import dependence and the abundant coal reserves at Velenje, HSE is building a new 600 MW Unit 6 at Šoštanj thermal power plant. Unit 6 uses best available techniques (BAT) to achieve an efficiency of more than 43 % and deliver a CO_2 emissions reduction of 35 % as older units are replaced. The new Unit 6 will go into operation in 2016 and it is expected to have a noticeable impact on the local economy by supplying electricity at lower prices.

PREMOGOVNIK VELENJE is a technologically developed and strongly integrated company with a 140-year tradition in lignite mining. In 2007, the company received a special award from the Slovenian Chamber of Engineers for its innovative approach to mining engineering. The priority now is to modernise coal production, which will contribute to better working conditions and better public acceptance.

The Velenje mining method is performed by caving hanging seams. The very first long-wall faces appeared in 1947, followed by the extensive introduction of long-wall faces in 1952. The basic approach is to extend the lignite extraction area above the protected area at the face. The Velenje mining method is patent protected and has been proven to be the most effective method for extracting thick coal seams. PREMOGOVNIK VELENJE continues to develop this method in order to gain even more improvements. The largest development project includes the construction of a new shaft NOP II which would reduce the mine's footprint.

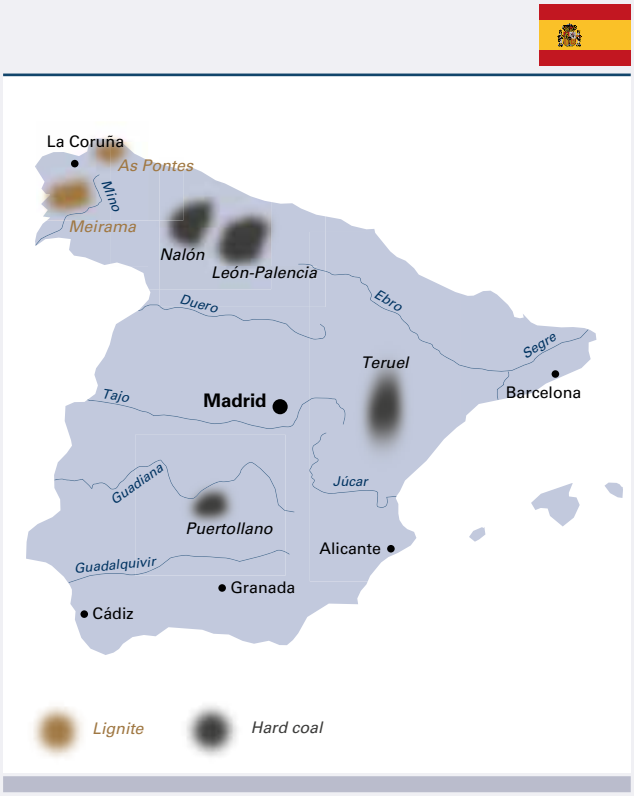
The knowledge and products of PREMOGOVNIK VELENJE offer good opportunities for co-operation with other countries, particularly where there is a need to introduce new technologies (e.g. in Turkey, Slovakia, Bosnia and Herzegovina, Serbia, Macedonia and Montenegro). Further away, some activities are being developed in the Asia-Pacific region. PREMOGOVNIK VELENJE is also a partner in many projects funded by the EU Research Fund for Coal and Steel, such as the CoGasOUT project which aims to develop new technologies to predict gas outbursts and emissions from thick coal seams. PREMOGOVNIK VELENJE also has a long history in underground coal gasification.

PREMOGOVNIK VELENJE makes serious commitments in the field of social responsibility and the rehabilitation of mining sites. The company has always aimed to prevent and eliminate any negative environmental effects and has played an active role in a land, air and water protection programme in the Šaleška Valley. The company regularly monitors its environmental impacts, but the clearest testament to sustainable development is the tourist and sports resort that has been developed around the man-made lakes above the mine.

Coal resources and reserves	Unit	2012
Resources lignite	Mt	1 170
Reserves lignite	Mt	140
Primary energy production		
Total primary energy production	Mtce	5.4
Lignite and brown coal (saleable output)	Mt / Mtce	4.3 / 1.6
Saleable coal quality		
Lignite calorific value	kJ / kg	11 300
Lignite ash content	% a.r.	14
Lignite moisture content	% a.r.	36
Lignite sulphur content	% a.r.	1.4
Coal imports / exports		
Hard coal imports	Mt	0.09
Lignite imports	Mt	0.55
Primary energy consumption		
Total primary energy consumption	Mtce	10.2
Lignite consumption	Mtce	2.1
Power supply		
Total net power generation	TWh	16.1
Power imports / (exports)	TWh	7.5 / (8.4)
Total power consumption	TWh	12.7
Power generation from lignite	TWh	5.1
Capacity of lignite-fired generation	MW	975
Employment		
Direct in lignite mining	thousand	1 617
Other lignite-related *	thousand	2 773

** e.g. in power generation, equipment supply, services and R&D*

Spain



General data	Unit	2012
Population	million	46.2
GDP	€ billion	1 029.0

Spain's primary energy consumption was 178.1 Mtce in 2012, 13.3% less than its peak in 2007. The economic crisis has been particularly harsh in Spain and the government has been forced to introduce many austerity measures which have had a direct impact on the coal industry. At the same time, the country is highly dependent on imported oil and natural gas. It has an overall import dependence of 76.4%, well above the EU average of 53.8%. This places a burden on the Spanish economy by increasing its trade deficit and foreign indebtedness. The only significant indigenous energy resource that Spain possesses is coal, totalling 4 500 million tonnes, including accessible reserves of 1 156 million tonnes. In 2012, coal met 12.2% of the country's energy demand.

The hard coal deposits in Asturias are located in the Nalón valley and are of a low calorific value. Nevertheless, in the past they were Spain's biggest source of coal. Today, high extraction costs have led to the gradual closure of mines. The deposits at León-Palencia are also of a low calorific value, although some anthracite seams are present. Coal in the Astur-Leonesa basin north of La Robla in León, where anthracite is mined by HULLERA VASCO-LEONESA and CARBONAR, has a high calorific value (5 500 kcal/kg) and low volatile matter, making its extraction more economic. The hard coal basin at Puertollano has enough reserves to keep the current opencast mine owned by ENDESA in operation for several decades. Teruel boasts the largest Spanish sub-bituminous hard coal reserves, of which some 200 million tonnes can be extracted by opencast mining. The high sulphur content of this coal (4% to 6%) made it less attractive for use at power plants in the past, before they were fitted with flue gas desulphurisation.

Spain has one of the most dynamic electricity markets in Europe. There is fierce competition between coal-fired and natural gas-fired power generation for the market that remains after nuclear, hydro and must-run renewables have supplied. Hydro output can vary significantly from one year to the next and, with a system capacity margin of 136%, there is plenty of room for switching between energy sources. During 2012, the Spanish government introduced many new measures, including taxes, into the power generation sector which will significantly reduce earnings. The aim is to reduce the growing deficit resulting from generous renewable tariffs which amounted to €8 billion in 2012. In fact, the government put a halt on any subsidises for new renewable projects in January 2012. In addition, a new electricity sector law moved through the Spanish parliament during 2013 and will mean deep cuts to the subsidies paid to renewable projects that are already installed in order to reduce the deficit.

Hard coal

Hard coal mines are located in the region of Castilla y León, especially in the León and Palencia provinces, producing 1.6 million tonnes in 2012. Also in northern Spain, 1.8 million tonnes were produced in Asturias. Mining is very important at Puertollano in the Ciudad Real province south of Madrid with an output of 0.5 million tonnes. Finally, in the eastern part of the country in the Teruel province of Aragon, 2.2 million tonnes of sub-bituminous coal were produced in 2012. In all, there are fourteen active coal mining companies. Over 60% of the hard coal is mined in opencast mines, making indigenous hard coal competitive compared with imported coal. CARBUNIÓN, the Spanish confederation of coal producers, is seeking to maintain such competitive indigenous coal production, even after the expiry of state aid in 2018 as required by Council Decision 2010/787/EU, and, in this respect, is supported by the Spanish government. Nevertheless, in 2012, the government

dramatically reduced subsidies paid to coal mining companies, by 63%. Over the course of two years, state aid to the coal mining sector will have been reduced by over 80%, from €300 million in 2011 to €55 million in 2013. There are now coal mines operating without state aid and these represent the first element of a competitive mining industry in Spain. In September 2013, the Spanish government reiterated in parliament that it is seeking from the European Commission a review of Council Decision 2010/787/EU on state aid to facilitate the closure of uncompetitive coal mines. Specifically, the government wants this review to allow mines that have achieved competitiveness to continue to produce coal after 2018 and not to have to repay past state aid.

Coal demand in 2012 was very strong and was met by a combination of 6.1 million tonnes of domestic production and 21.4 million tonnes of imports. Royal Decrees 134/2010 and 1221/2010 took effect in 2011 and helped to maintain demand for indigenous hard coal via an off-take obligation on utility companies of up to 23.4 TWh per year from the ten coal units still burning local coal. Coal-fired generation increased 24.4% to 55.9 TWh in 2012 from 11.2 GW of installed capacity, covering 19% of overall electricity production. Renewables, including hydro, took a 30% share, natural gas 25%, nuclear 21% and oil 5%.

Spanish coal-fired power plant operators have two major objectives to meet their environmental obligations. On the one hand, the reduction of sulphur dioxide, oxides of nitrogen and particulate emissions are being addressed through the progressive introduction of technical measures. Almost all plants are now fully compliant with the Large Combustion Plants Directive. On the other hand, the reduction of carbon dioxide (CO_2) emissions presents another challenge. In Spain, coal combustion currently generates 18.5% of CO_2 emissions, while the transport sector emits more than one third of CO_2 emissions.

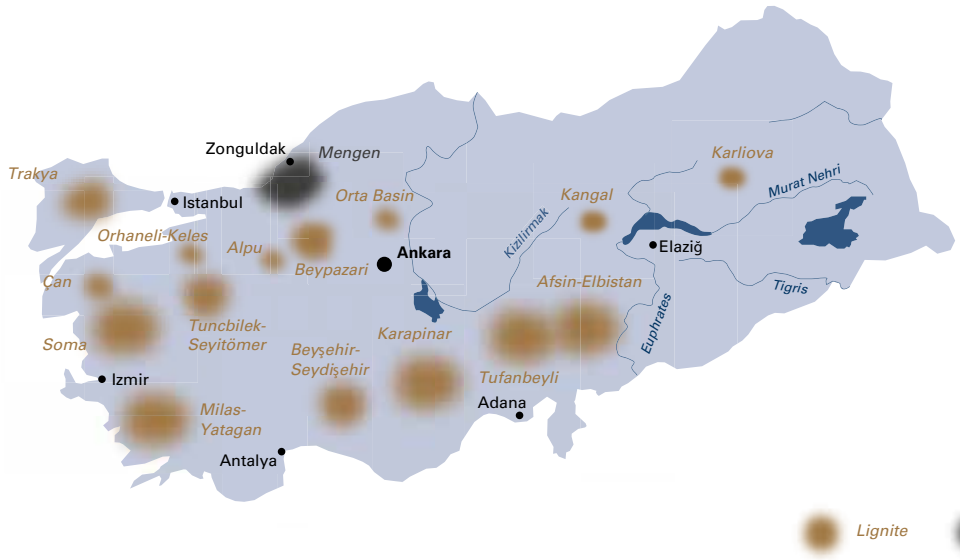
Several projects are well underway to address clean coal combustion and dramatically reduce CO_2 emissions. The Fundación Ciudad de la Energía (CIUDEN), in co-operation with the central government, is managing one of these projects, having benefitted from EU funding under the European Energy Programme for Recovery. The project is a very large scale pilot plant that is already demonstrating oxy-fuel combustion in two types of boiler. In addition, it aims to demonstrate the storage of the captured CO_2 by injecting it 800 metres underground into a deep saline aquifer. It is foreseen that all Spanish power plants will be CO_2 capture-ready by 2020 and that transport and storage options will be in place by the same date. These very challenging goals should allow the continued use of indigenous coal at reasonable prices at least until 2050, and so contribute to Spain's energy supply security.

Coal resources and reserves	Unit	2012
Resources hard coal	Mt	4 308
Resources lignite	Mt	210
Reserves hard coal	Mt	946
Reserves lignite	Mt	210
Primary energy production		
Total primary energy production	Mtce	178.1
Hard coal (saleable output)	Mt / Mtce	6.1 / 3.5
Saleable coal quality		
Hard coal net calorific value	kJ / kg	18 231
Hard coal ash content	% a.r.	34.6
Hard coal moisture content	% a.r.	13.2
Hard coal sulphur content	% a.r.	2.5
Coal Imports / Exports		
Hard coal imports	Mt	21.4
Primary energy consumption		
Total primary energy consumption	Mtce	178.1
Hard coal consumption	Mtce	21.4
Power supply		
Total net power generation	TWh	262.9
Net power imports / (exports)	TWh	(11.2)
Total power consumption	TWh	251.7
Power generation from hard coal	TWh	55.9
Capacity of coal-fired generation	MW	11 200
Employment		
Direct in hard coal mining	thousand	3 407

Lignite

At the end of 2007, Spain's last lignite mines located in Galicia on the north-west of the Iberian Peninsula were closed. Lignite reserves of 210 million tonnes remain.

Turkey



Although per-capita energy use in Turkey is still comparatively low, energy demand is expected to grow rapidly due to the demographics of a very young population and a rapidly growing economy. Total primary energy supply was 165 Mtce in 2012 and is expected to double within a decade, according to the government's most probable scenarios.

The Ministry of Energy and Natural Resources is responsible for the preparation and implementation of energy policies, plans and programmes in co-ordination with its affiliated institutions and other public and private entities. It has statutory duties covering coal mines, power stations and the electricity grid.

The Electricity Market Law came into effect in 2001 and was revised in 2013 giving further impetus towards the liberalisation of the electricity market. The law established the Energy Market Regulatory Authority as an independent regulatory authority.

General data	Unit	2012
Population	million	74.7
GDP	€ billion	612.0

As Turkey's indigenous energy resources consist almost exclusively of lignite and small amounts of hard coal, the country is heavily dependent on imports of oil, gas and hard coal. The country's net energy imports account for approximately 76% of the total primary energy needs. Turkey has around 1.3 billion tonnes of hard coal and 13.9 billion tonnes of lignite reserves and resources, of which 0.5 billion tonnes and 13.4 billion tonnes respectively are proven reserves. Turkey's primary energy production totalled 44.5 Mtce in 2012, of which indigenous coal provided 52.7%, oil and natural gas together 9.1%, hydropower 16.0% and renewable sources, including traditional biomass (firewood) 22.1%. However, natural gas had the biggest consumption share with 32.2%, while the share of coal was 30.3%.

The Turkish coal sector produces both hard coal (2.3 million tonnes in 2012) and lignite (70.0 million tonnes), mainly used for power generation. At present only a small power station (300 MW) is fed with domestic hard coal from the Zonguldak basin, whilst the larger İskenderun power plant (1 200 MW) and Zonguldak Eren Enerji Çatalağzı power plant (1 360 MW) use imported hard coal. Other power plants use lignite. In total, Turkish coal-fired plants have a capacity of approximately 12.2 GW.

Turkey's energy consumption has been growing much faster than its production, increasing the country's reliance on energy imports. Energy demand has doubled over the last two decades, and this trend is set to continue in the future, with a forecast average increase of 4% per year. 29% of Turkey's gross electricity production of 239.5 TWh in 2012 was generated from hard coal (13.9%) and lignite (14.5%). Of the remainder, 43.6% was provided by natural gas, 24.2% by hydropower, 0.7% by oil and the remaining 3.1% by wind and other renewable energies. Turkey aims to increase its domestic electricity production by constructing new power plants.

Turkey mainly produces lignite: hard coal accounts for only 5% of production on a tonnage basis. Over 90% of the entire coal production in 2012 was extracted from three state-owned enterprises: TURKISH COAL ENTERPRISES (TKİ), ELECTRICITY GENERATION COMPANY (EÜAŞ) and TURKISH HARD COAL ENTERPRISES (TTK). The private sector's share was only around 6.9%. However, about one third of coal production reported by the state enterprises is mined by private companies under subcontracts.

Hard coal

Turkey's main hard coal deposits are located in the Zonguldak basin, between Ereğli and Amasra on the Black Sea coast in north-western Turkey. Hard coal resources in the basin are estimated at some 1 314 million tonnes of which 512 million tonnes are in the proven category. The calorific value of hard coal reserves varies between 6 200 and 7 200 kcal/kg.

This coal basin is the only region in Turkey where hard coal is extracted and it has a very complex geological structure which makes mechanised coal production almost impossible and requires labour-intensive conventional coal production methods.

The state-owned TTK has a *de facto* monopoly in the production, processing and distribution of hard coal, although there are no legal restrictions on private sector involvements. The company operates five deep mines in the Zonguldak coal basin that produced approximately 2.5 million tonnes of saleable coal in 2011. Long-standing restructuring and privatisation efforts to increase coal production in the basin have not succeeded so far; coal production today is not very different from that of ten years ago.

In 2012, Turkey also imported 29.7 million tonnes of hard coal for thermal power plants, steel production, industry and domestic heating purposes. Coal imports to Turkey are expected to increase over the coming years. Although gas-fired power stations dominate the newly installed power capacity of Turkey, a number of coal-fired power plants have also been commissioned in recent years. Coal-fired power plants using imported coal have a total capacity of 3 900 MW. An example is the 1 200 MW İskenderun power plant in southern Turkey that was completed by STEAG of Germany in 2004.

Lignite

Lignite is Turkey's most important indigenous energy resource. Deposits are spread across the country, with proven reserves of 13 442 million tonnes.

The most important lignite deposits are located at the Afsin-Elbistan lignite basin of south-eastern Anatolia, near the city of Maraş where the geological and economically mineable reserves are estimated at around 4 381 million tonnes of low quality lignite. The Soma basin is the second largest lignite area in Turkey. Other important deposits are located in the Tunçbilek, Seyitömer, Bursa, Çan, Muğla, Beypazarı, Sivas and Konya Karapınar basins. The quality of Turkish lignites is generally very poor and only around 6% of the reserves have a heat content of more than 3 000 kcal/kg.

A project to develop existing mineral and geothermal reserves and to explore new deposits was initiated in 2005. This has explored new lignite deposits in the country with extensive research and prospecting studies carried out and more than 200 000 metres of drilling completed across approximately 30 000 square kilometres from 2005 to 2011. The project is still ongoing and has added approximately 4 billion tonnes to the total lignite reserves of Turkey.

In 2012, lignite output totalled 70.0 million tonnes. Almost 90% of Turkey's total lignite production is from opencast mines. However, there are some underground mining activities, mainly in the Soma, Tunçbilek and Beypazarı basins.

Thirty opencast and nine deep mines are operated by TKİ, producing 33.4 million tonnes of saleable lignite in 2011. EÜAŞ produced 31.6 million tonnes of saleable lignite for three power plants. The private sector's lignite production in 2011 was 6.9 million tonnes and is expected to increase in the future.

The scale of the surface operations allows lignite to be produced at a relatively low cost, making it competitive with imported energy resources. Its main market is lignite-fired power plants which had a total capacity of 8 278 MW in 2012.

Coal resources and reserves	Unit	2012
Resources hard coal	Mt	1 314
Resources lignite	Mt	13 900
Reserves hard coal	Mt	512
Reserves lignite	Mt	13 442

Primary energy production		
Total primary energy production	Mtce	44.5
Hard coal (saleable output)	Mt/Mtce	2.3/1.7
Lignite (saleable output)	Mt/Mtce	70.0/22.2

Saleable coal quality		
Hard coal calorific value	kJ/kg	26 000-30 000
Lignite calorific value	kJ/kg	8 665
Hard coal ash content	% a.r.	10.0-15.0
Lignite ash content	% a.r.	11.0-46.0
Hard coal moisture content	% a.r.	4.0-14.0
Lignite moisture content	% a.r.	6.0-55.0
Hard coal sulphur content	% a.r.	0.8-1.0
Lignite sulphur content	% a.r.	0.2-5.0

Coal imports / exports		
Hard coal imports	Mt	29.7

Primary energy consumption		
Total primary energy consumption	Mtce	165.0
Hard coal consumption	Mtce	29.0
Lignite consumption	Mtce	22.3

Power supply		
Total net power generation	TWh	239.5
Power imports/(exports)	TWh	4.4/(1.5)
Total power consumption	TWh	230.1
Power generation from hard coal	TWh	32.5
Power generation from lignite	TWh	34.7
Capacity of coal-fired generation	MW	3 900
Capacity of lignite-fired generation	MW	8 278

Employment		
Direct in hard coal mining	thousand	18 500
Direct in lignite mining	thousand	37 000

Ukraine

Ukraine is well-endowed with energy resources, especially its 31 800 million tonnes of proven coal reserves as at the end of 2012, ranking the country No. 7 in the world. Major coal deposits are located in the Donetsk, Lviv-Volyn and Dnipro coal basins, as well as in the Dnipro-Donets and Zakarpattya coal depressions. The deposits are located in thin seams (0.8-1.0 metres) at an average depth of around 700 metres. Some mines are deeper than 1 000 metres.

Although coal production declined significantly from 1990 to 1996, it has stabilised since 2000. While Ukraine is totally self-sufficient in coal, it remains heavily reliant on natural gas and oil imports. Coal-fired power plants produced 38.2% of Ukraine's total electricity supply in 2011. Ukraine's Energy Strategy to 2030, updated in 2013, envisages increasing the installed capacity of coal-fired power plants by upgrading existing units and constructing new ones.

As of December 2012, more than 350 legal entities operated in the coal, lignite and peat production, processing and agglomeration sectors in Ukraine, of which approximately 250 produced and processed hard coal. There are more than 143 mines in Ukraine. The Ministry of Energy supervises 22 coal production enterprises which operate 94 mines, including 43 private mines. The eight largest companies account for approximately 63% of domestic coal production.

Coal is sold either under bilateral contract on the free market or, in the case of some sales from state-owned mines, via the wholesale market operator, Ugol Ukrainy. Coal trading will become even more market-based in 2013 as it moves on to the Ukrainian Energy Exchange. By 2016,

General data	Unit	2012
Population	million	45.6
GDP	€ billion	136.3

the government plans to further liberalise the coal market, accelerate restructuring of the coal sector, close unviable mines and privatise the remaining, more attractive coal mining companies. From 2015 to 2030, the coal industry is expected to invest, steadily grow and reach an output of 115 million tonnes.

In 2012, an agreement was signed for a $3.7 billion loan from the State Bank of China for projects in Ukraine to substitute natural gas with domestic coal and for the construction of coal gasification plants.

Hard coal

In 2012, total coal production increased by 4.0% to 65.6 million tonnes. Steam coal production accounted for 71.1% of total production. Coal consumption also increased to 74.3 million tonnes, of which 55.5% was used in power plants.

The increase in coal production in 2012 was achieved after several years of capital investments in order to modernise the sector. State financing for the technical modernisation of mines amounted to UAH 13.2 billion, with state mines spending UAH 9.9 billion on capital expenditures in 2012, 72% more than in 2011.

State enterprises produced 24.8 million tonnes in 2012, including 17.7 million tonnes of steam coal and 7.2 million tonnes of coking coal. The share of state enterprises in total domestic coal production has been decreasing due to structural changes in the industry resulting from the Ukrainian energy privatisation programme and increased investments by the private sector.

DTEK, the largest private energy company in Ukraine, produced 39.7 million tonnes of run-of-mine coal, which accounted for approximately 46.1% of Ukraine's total coal production. DTEK owns, leases or has concession rights to operate 31 coal mines and 13 coal enrichment plants, including three mines and one coal enrichment plant in Russia.

Based on Ukrainian government estimates of coal reserves, DTEK has production licenses, after reserve reclassifications, new coal discoveries and acquisitions, covering an estimated 1 699.7 million tonnes of reserves.

DTEK's operating subsidiary DTEK Pavlogradugol is the largest coal-producing company with an annual output of approximately 17.0 million tonnes. DTEK Pavlogradugol operates ten mines and an integrated mining complex, including transportation and production infrastructure, located in the Dnipropetrovsk region of Ukraine, with estimated coal reserves of 652.9 million tonnes and a production life of 52 years, assuming current production rates.

DTEK's subsidiary DTEK Mine Komsomolets Donbassa operates one mine and coal enrichment plant located in the Donetsk region with estimated coal reserves of 110.9 million tonnes and a production life of 43 years.

In 2011, DTEK entered into two 49-year concession agreements with the Ministry of Energy and one 49-year lease agreement with the State Property Fund, pursuant to which the company's subsidiaries, DTEK Rovenkyanthracite, DTEK Sverdlovanthracite and DTEK Dobropolyeugol, operate six mines and an integrated mining complex, including three coal enrichment plants, located in the Donetsk and Lugansk regions, five mines and an integrated mining complex, including three coal enrichment plants, located in the Dolzhano-Rovenetskyi region and five mines and an integrated mining complex located in the Donbass region. As at 31 December 2012, DTEK Rovenkyanthracite, DTEK Sverdlovanthracite and

DTEK Dobropolyeugol have coal reserves of 162.9 million tonnes, 208.0 million tonnes and 367.8 million tonnes with average production lives of 33 years, 40 years and 94 years respectively, assuming current production rates.

In February 2012, DTEK acquired a 95.4 % stake in its subsidiary Bilozerska Mine, which operates one mine in the Dobropolsky region with estimated coal reserves of 71.6 million tonnes and a production life of 90 years.

Also in 2012, the company acquired three mines located in the Rostov region of Russia with aggregate reserves of 125.6 million tonnes and an average production life of 73 years. The three Russian mines are operating through DTEK's subsidiaries, Obukhovskaya, Don-Anthracite and Sulinanthracite.

In 2012, DTEK exported 2.8 million tonnes of coal through its subsidiary, DTEK Trading LLC, primarily to Turkey, India, Egypt, Russia, the USA and EU member states. The country as a whole exported 6.1 million tonnes.

Lignite

Ukraine produces only small volumes of lignite – less than 200 thousand tonnes each year – from the Olexandria and Mokra Kalyhirka deposits in the Kirovohrad and Cherkasy regions, near the Dnipro River. However, with estimated reserves of 2 336 million tonnes, there is great potential and in 2012 Ukraine and China began a joint project to exploit lignite for electricity generation in the Kirovohrad region.

Coal resources and reserves	Unit	2012
Resources hard coal	Mt	48 800
Resources lignite	Mt	5 380
Reserves hard coal	Mt	31 800
Reserves lignite	Mt	2 340
Primary energy production		
Total primary energy production	Mtce (2011)	121.7
Hard coal (saleable output)	Mt / Mtce	65.6 / 53.5
Saleable coal quality		
Hard coal calorific value	kJ / kg	20 000
Hard coal ash content	% a.r.	5.0 - 35.0
Hard coal moisture content	% a.r.	5.0 - 14.0
Hard coal sulphur content	% a.r.	0.8 - 4.0
Coal Imports / Exports		
Hard coal imports	Mt	14.8
Hard coal exports	Mt	6.1
Primary energy consumption		
Total primary energy consumption	Mtce	178.9
Hard coal consumption	Mtce	63.6
Power supply		
Total net power generation	TWh	180.5
Net power imports / (exports)	TWh	9.7
Total power consumption	TWh	150.7
Power generation from hard coal	TWh	78.9
Capacity of coal-fired generation	MW	27 408
Employment		
Direct in hard coal mining	thousand	273.820

United Kingdom

The United Kingdom is by far the largest oil producer in the EU, and is also a significant producer of natural gas. It is one of the largest energy consumers in Europe, third only to Germany and France.

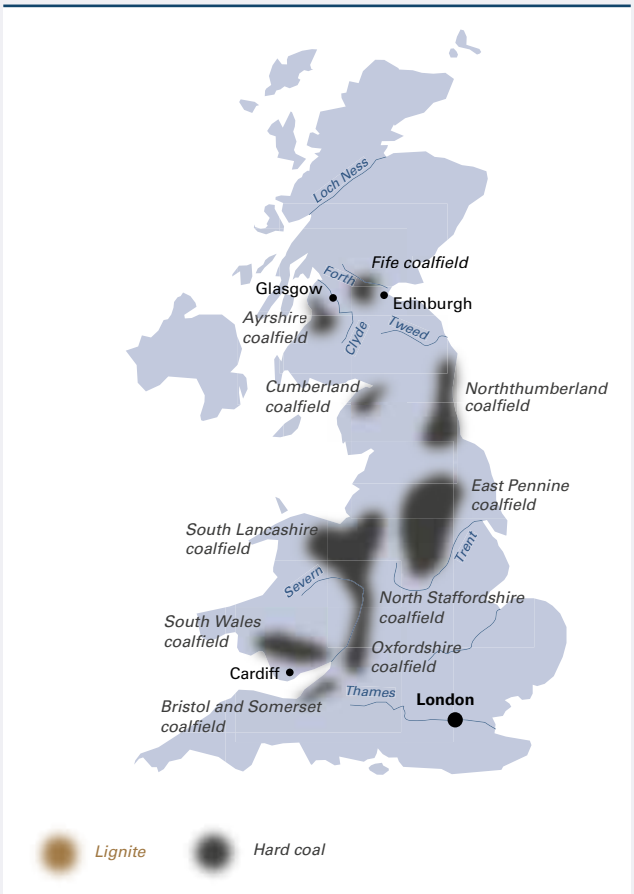
The country has significant, potentially economic, hard coal resources estimated at around 3 200 million tonnes. About 500 million tonnes of reserves are available in existing deep mines or in shallow deposits capable of being extracted by surface mining. In addition, currently inaccessible resources have the potential to provide many years of future production at present levels. There are also about 500 million tonnes of lignite resources, mainly in Northern Ireland, although no lignite is mined at present.

In 2012, the UK's primary energy production fell by 10.5% to 175.7 Mtce. The largest share of production came from oil (39.7%), followed by natural gas (33.3%). Hard coal production represented 12.2%, with nuclear supplying 13.0% and renewables 1.8%.

The UK's primary energy consumption in 2012 was up 2.5% to 294.7 Mtce, with natural gas accounting for the largest share (36.0%), followed by oil (32.3%), hard coal (22.5%), nuclear energy (7.7%) and renewables (1.5%).

After spending most of the previous 25 years as a net exporter of energy, the UK became a net importer in 2004. The gap between imports and exports has increased since 2004 and in 2011 imports of energy outstripped indigenous production for the first time. This trend looks set to continue as North Sea oil and gas reserves deplete.

Power generation in the UK reflects a diverse energy mix. In 2012, net electricity supplied was 353.5 TWh, dominated by coal (38.4%), gas (27.7%) and nuclear power (18.1%). Hydropower and renewables contributed 11.4%, oil 1.0% and net imports provided 3.4% of electricity supplied.



General data	Unit	2012
Population	million	63.3
GDP	€ billion	1 929.6

In March 2013, 5 GW of coal capacity closed to meet the requirements of the LCPD, having utilised their 20 000 hours allowed under the opt-out derogation. Many UK generators are actively pursuing biomass conversions of their coal fleet, encouraged both by green tariffs and the carbon price support mechanism which placed an additional levy on coal generation from April 2013.

Hard coal

UK hard coal consumption rose by almost 25% in 2012 due to a combination of low international coal prices, high natural gas prices and falling CO_2 emission allowance prices.

Coal consumption in 2012 was 64.1 million tonnes, of which 54.9 million tonnes were used for electricity generation. Coal consumption by the electricity sector was the highest since 1995. Hard coal consumption in the steel industry was 5.9 million tonnes.

In 2012, hard coal supply totalled 61.6 million tonnes, with 16.8 million tonnes covered by indigenous production and 44.8 million tonnes by imports. There was a significant stock reduction of 3.0 million tonnes. Imports supplied virtually the whole of the coking coal market, as the UK

no longer produces significant quantities of coal suitable for use in coke oven. Nevertheless, steel makers in the UK are using more UK-produced coals by increasing the PCI capability of their blast furnaces. The UK also exported 0.5 million tonnes of hard coal. Indigenous production was split between deep mines with 6.1 million tonnes, surface mines with 10.2 million tonnes and 0.5 million tonnes from other sources, such as tip washing.

The UK's coal imports rose dramatically in 2012 as increased demand could only be met from overseas. Russia, Colombia and the USA are the main sources, accounting for around 95% of all imports. Supplies from South Africa dropped to relatively low levels, with no coal from Indonesia reaching the UK. As the size of the UK coal market fluctuates markedly, depending on the relative pricing of international coal and natural gas, along with carbon allowance prices, imports are expected to remain the swing component of supply.

The UK's coal mines are mainly located in central and northern England, south Wales and central and southern Scotland where there is the highest concentration of surface mines. There are three large deep mines remaining in operation. Two of these are owned by UK COAL MINE HOLDINGS LIMITED (Kellingley and Thoresby) with HARGREAVES SERVICES PLC operating Hatfield colliery.

The UK lost two major deep mines in the early part of 2013. Daw Mill mine, the UK's largest, closed as a result of a massive underground fire. Maltby mine was mothballed following difficult geological conditions which forced the abandonment of the production face.

The low international coal price and rising domestic production costs and a government energy policy which encourages fuel switching from coal to natural gas has put pressure on many UK coal producers. Several companies have been forced either to financially restructure or go into administration and the final outcome of these events is still awaited. Meanwhile, all UK producers are reluctant to invest in long-term production capacity under current policies.

UK COAL was Britain's biggest producer of coal, accounting for 6.4 million tonnes in 2012. The closure of Daw Mill colliery, leaving both contractual and restoration liabilities, resulted in the company entering administration and its output will reduce in 2013. The second largest UK producer was SCOTTISH COAL, with an output of around 3 million tonnes annually from six to eight surface mines. However, the company went into voluntary liquidation in April 2013 and whilst HARGREAVES SERVICES has a contract to continue some mining operations – having already acquired other surface mines in Scotland – the long-term future of the former SCOTTISH COAL surface mines depends on how restoration liabilities are assigned. Other important surface mine coal producers include CELTIC ENERGY, H J BANKS, KIER MINING,MILLER-ARGENT and HALL CONSTRUCTION SERVICES. The industry's trade association is the Confederation of UK Coal Producers, whose member companies produce over 95% of the UK's coal output.

Total direct employment in the coal mining sector at the end of 2012 was 5 827 (3 441 at deep mines and 2 386 at surface mines).

Coal resources and reserves	Unit	2012
Resources hard coal	Mt	3 200
Resources lignite	Mt	500
Reserves hard coal	Mt	500
Primary energy production		
Total primary energy production	Mtce	175.7
Hard coal (saleable output)	Mt / Mtce	16.8 / 13.9
Saleable coal quality		
Hard coal calorific value	kJ / kg	22 000 - 27 000
Hard coal ash content	% a.r.	7.0 - 18.0
Hard coal moisture content	% a.r.	7.0 - 17.0
Hard coal sulphur content	% a.r.	0.6 - 2.8
Coal imports / exports		
Hard coal imports	Mt	44.8
Hard coal exports	Mt	0.5
Primary energy consumption		
Total primary energy consumption	Mtce	294.7
Hard coal consumption	Mt / Mtce	64.1 / 55.2
Power supply		
Total net power generation	TWh	353.5
Net power imports / (exports)	TWh	12.0
Total power consumption	TWh	353.5
Power generation from hard coal	TWh	135.6
Capacity of coal-fired generation	MW	27 900
Employment		
Direct in hard coal mining	thousand	5 827

Other EU Member States and Energy Community stakeholders

Figure 1
EU-28 Member States and Energy Community stakeholders

Source: Energy Community
*** the 16 EU member states shown in bold on the map hold participant status*

Earlier chapters have reported on the key coal-producing countries of the EU and its neighbours. This chapter examines the other EU member states that all use coal to a greater or lesser extent. Also included, because of their alignment towards EU energy policy, are the contracting parties and observers to the Energy Community.

The 2005 treaty establishing the Energy Community requires contracting parties to implement important parts of the EU *acquis* on energy markets and the environment. It provides for the creation of a single energy market and a mechanism for the operation of networks in the South East European region which disintegrated following the conflicts of the 1990s. In 2011, the contracting parties agreed to implement the EU's third internal energy package by January 2015, although parties are not obliged to join the EU emissions trading scheme.

The Energy Community offers opportunities to owners of coal-fired power plants in South East Europe who will gain access to what should soon become the world's largest electricity market. At the same time, plant owners will be required to make very substantial investments in pollution control equipment to meet stringent EU emissions legislation.

Austria

Austria has limited primary energy resources and is dependent on energy imports for over two thirds of its primary energy supply. Although no longer exploited, lignite resources total 333 million tonnes, lying mainly in western Styria near Graz.

During the Monarchy, Austrian energy demand was largely met by coal from Moravia and Silesia, although coal mining in Austria began during the second half of the 18th century. After each World War, hard coal and lignite mining in Austria was expanded to replace production lost elsewhere; lignite output peaked at over 6 million tonnes in 1963 when hard coal output was 100 thousand tonnes. However, with the re-opening of borders and resumption of trade, as well as the general trend towards greater oil and natural gas use and the development of hydro power, Austria's underground hard coal mines became less competitive and were closed during the 1960s. By 1991, lignite production had fallen to 2 million tonnes, this being a rather small component of energy supply. After more than two centuries of mining activity, Austrian coal production definitively ended in 2006 with the recultivation of Oberdorf lignite mine.

Today, the steel industry and the power industry each consume around 2 million tonnes per year of mainly Czech, Polish, US and Russian coal. The integrated steel works operated by VOESTALPINE AG at Linz has an annual crude steel production capacity of 6 million tonnes. At the 757 MW Dürnrohr power plant in Lower Austria, one unit is owned by VERBUND and the other by EVN. Small quantities of hard coal are consumed by the cement and paper industries.

In 2011, EVN and AE&E installed a CO_2 capture pilot plant at Dürnrohr. The clean CO_2 is sold to the industrial gas industry and is also used in innovative CO_2 conversion processes that are at the experimental stage.

Baltic States

The neighbouring states of Estonia, Latvia and Lithuania lie between the Baltic Sea and Russia. In 2004, these former Soviet states joined the EU and, in 2011, Estonia joined the euro area. To their south, the Russian enclave of Kaliningrad Oblast borders Lithuania and Poland.

Whilst no coal is produced in the Baltic States, all three countries consume modest volumes of imported coal, mainly from Russia. More significantly, Estonia, Latvia and Lithuania offer alternative transit routes for Russian coal exporters, since ice can hinder exports from Russia's Baltic ports at Vyborg, St. Petersburg and Ust-Luga.

Some Russian coal is shipped through Tallinn port in Estonia. Latvia's major ports – Riga, Ventspils and Liepāja – are likely to grow in importance with a planned high-speed upgrade to the 922-km rail link between Moscow and Riga. Lithuanian ports, notably Klaipėda, can also ship Russian coal, although none was handled in 2012. However, Klaipėda State Seaport is strategically important, because it is the northernmost ice-free port on the eastern coast of the Baltic Sea and has good infrastructure links to Russia.

The Kaliningrad enclave is dependent on imported fuel and power from Russia, although power is also locally produced from hydro, gas and wind. In February 2012, construction work began at a new 2 400 MW nuclear power plant (NPP), but was stopped in June 2013 because of financing, offtake and political problems. When operational, the Baltic NPP would be able to export electricity to the EU. However, the intention is to desynchronise the Baltic States from the Russian IPS/UPS network, leaving Kaliningrad isolated unless DC links are built or the enclave joins the ENTSO system.

The closure of Ignalina NPP in Lithuania at the end of 2009 left a power vacuum in the Baltic region. This could have been filled by the proposed Visaginas NPP, but a consultative referendum in October 2012 saw Lithuanians vote against this project. Meanwhile, the first unit at the 2 400 MW Astravyets NPP is also under construction in Belarus. If all NPP projects move to completion, the region will become a significant exporter of electricity.

For its energy supply, Estonia is uniquely dependent on indigenous oil shale. Large quantities are used to generate competitively priced electricity at thermal power plants where it is used in much the same way as coal – either as a pulverised fuel in older boilers or in new circulating fluidised beds (CFBs).

Oil shale is a sedimentary rock containing up to 50% organic matter – Estonian oil shale extracted from the Baltic kukersite basin has a heating value of 8-11 MJ/kg and 1.5-1.8% sulphur content. Once extracted from the ground, the rock can be either used directly as a fuel in power plants or processed into petroleum products. EESTI ENERGIA and privately owned VKG and KIVIÕLI KEEMIATÖÖSTUS process oil shale into mainly heavy fractions such as bunker fuel. EESTI ENERGIA's new Enerfit280 plant produced its first oil in December 2012 and the private companies also have new projects; when fully operational, these will increase Estonia's oil production capacity from the current 20 000 bbl/day. Looking ahead, Estonia is exploring whether to build a refinery to produce lighter transport fuels from shale oil.

Although oil shale deposits are found in fourteen EU member states, only Estonia has any exploitation experience. Its oil shale industry is the most developed in the world, and accounts for 4% of Estonian GDP and about 1% of national employment (over 7 700 people). In 2012, 18.8 million tonnes of oil shale were mined from reserves that total 1-2 billion tonnes. The VKG Ojamaa oil shale mine was opened in February 2013, the first new mine in 40 years, whilst EESTI ENERGIA plans to open a new underground mine at Uus-Kiviõli, having closed the exhausted Viru mine in June 2013, and is developing large integrated projects in Jordan and Utah, USA.

In 2012, Estonia generated 85% of its electricity supply from oil shale, a share that is expected to decrease in the future in line with government policy. Almost 80% of oil shale production is used for electricity generation, notably at the EESTI ENERGIA Narva energy complex, comprising the 1 615 MW Eesti power plant and the 765 MW Balti power plant which also supplies heat to the town of Narva. In January 2011, a contract to add two 300 MW units was signed with ALSTOM; completion of the first unit of the Auvere power plant is scheduled for 2015. State-owned EESTI ENERGIA has enough generation capacity to cover all of Estonia's electricity needs, helping to ensure the country's energy security.

Figure 2
"Room and pillar" oil shale mine in north-east Estonia

EESTI ENERGIA operates one underground and one opencast mine as well as a rail transport division

Russian seaborne Baltic coal trade (including coke), 2012

Port (north to south)	million tonnes
Vyborg (Vysotsk), Russia	3.30
St. Petersburg, Russia	0.00
Ust-Luga, Russia	15.72
Tallinn (Muuga), Estonia	0.04
Riga, Latvia	14.90
Ventspils, Latvia	7.87
Liepāja, Latvia	0.28
Klaipėda, Lithuania	0.00
Kaliningrad, Russia	0.14

Source: Klaipėda State Seaport Authority

The Estonian electricity market became fully liberalised in January 2013. Electricity is traded with other Baltic States and with the Nordic power market via the 350 MW HVDC Estlink 1 undersea cable to Finland. The 650 MW Estlink 2 is being laid and will open in 2014. By 2016, the NordBalt project linking Lithuania and Sweden will further strengthen the Baltic Ring that connects the electricity grids and markets of the Baltic and Nordic States, bringing greater competition and opportunities for the most efficient power producers.

The environmental issues associated with oil shale exploitation are complex. With 45% incombustibles, ash can occupy 25% more volume than the original shale which does not collapse when burnt. Under the accession treaty agreed when Estonia joined the EU in 2004, oil shale has certain temporary derogations. To meet EU directives on emissions to air, all old pulverised-fuel boilers must be closed or upgraded by the end of 2015. Balti 11 and Eesti 8 have already been repowered with CFB boilers and a further four units have been fitted with ALSTOM's novel integrated desulphurisation, supplemented with lime injection.

Belgium

In the 19th century, the Walloon coal mines of southern Belgium made a major contribution to the industrial expansion of the country. Coal mining started in the north-east of the country in 1917, around Limburg where the geological conditions were favourable. Between 1952 and 1953, national coal production peaked at 30 million tonnes and was maintained at this level until the late 1950s, after which output gradually declined as the Walloon mines closed. Closure of the Limburg mines followed twenty years later, with Belgium's last colliery at Heusden-Zolder ceasing production in 1992. Although not currently economic to exploit, remaining hard coal resources are estimated to be 4 100 million tonnes.

Imported coal remains an important energy source for the steel industry and for power generation. Consumption of imported coal in 2012 totalled

3.5 million tonnes, coming mainly from the USA, Australia and Russia (more coal is imported into Antwerp for onward delivery to customers in other EU countries). Coal provides 5% of Belgium's primary energy supply.

Power generation in 2012 totalled 77.3 TWh: 52% from nuclear power stations, 27% from gas-fired power plants and 7.1% from coal-fired plants E.ON Langerlo (556 MW) and ELECTRABEL Ruien (290 MW) which finally closed at the end of August 2013. Other coal-fired plants consumed biomass. Renewables grew to 12%. Belgium's largest power utility, ELECTRABEL – a subsidiary of GDF SUEZ, has further investments in coal-fired power plants in the Netherlands.

Coal imports are expected to decline with the closure of DUFERCO's Carsid blast furnace in 2013 – ARCELORMITTAL announced the permanent closure of its last blast furnaces at Liège back in 2011. Whilst the Belgian steel industry will continue to consume smaller volumes of coal, a highly political situation developed in 2013 with the fall in global steel demand and competition from Chinese steel exports leading to the potential for further job losses at ARCELORMITTAL.

Cyprus

Cyprus imported 13 thousand tonnes of hard coal in 2012 for use mainly in the cement industry. With the memorandum of understanding signed by Cyprus, Greece and Israel in August 2013 and its new offshore gas exploration, Cyprus is set to become a link between Europe and Asia for electricity transmission and gas supply.

Denmark

With the rise in oil and gas production from the North Sea, Denmark became energy self-sufficient in 1999 and is today the only EU member state producing more energy than it consumes. The country is the third largest oil producer in Western Europe, after Norway and the UK. However, oil and gas production are in decline. Gas production in 2012 was 5.6 billion cubic metres – less than half of its 2005 peak – placing Denmark in fourth place behind the largest North Sea producers: Norway (115 bcm), the Netherlands (64 bcm) and the UK (41 bcm).

Danish energy production has changed significantly as a result of political efforts to promote the use of renewable energy, combined heat and power (CHP) and energy efficiency. The Energy Strategy 2050, published in 2011, aims at 100% renewable sources in the energy and transport sectors by 2050. It was given a boost in March 2012 when broad political support was reached on a new Energy Agreement which outlines how renewables will be subsidised to 2020. In 2012, renewable energy (excluding renewable electricity imports) accounted for 27% of total energy consumption, mainly from biofuels and waste, but also from a steadily growing wind capacity which provided 34% of electricity generation.

The relatively high use of wind for electricity generation enhances supply security, but also poses balancing challenges. As a part of the integrated Nordic electricity market, Denmark's coal-fired generation plays an important role in balancing not only wind power, but also hydro power from Norway and Sweden which depends on annual precipitation. High reservoir levels at the beginning of 2012 were the result of record inflows in 2011 and Denmark electricity imports soared such that its domestic electricity generation fell by 23% between 2010 and 2012.

In 2012, 35% of Danish electricity generation came from coal-fired power plants at Amager (319 MW), Asnæs (1 057 MW), Avedøre (810 MW), Ensted (626 MW), Esbjerg (378 MW), Fyn (409 MW), Nordjylland (660 MW), Randers (52 MW), Stigsnæs (409 MW) and Studstrup (700 MW), having a total capacity of 5.4 GW. With the exception of Randers, the plants are owned by DONG ENERGY and VATTENFALL, both majority state-owned. Some co-fire coal with biomass and many are CHP plants with connections to district heating systems, including Nordjyllandsværket 3 which is one of the world's most efficient coal-fired power plants. Its "supercritical" boilers and steam turbines result in a very high electrical generation efficiency of 47% and, with the supply of heat, the overall efficiency can exceed 95%. Under the Energy Agreement, some of the larger coal-fired CHP plants will be converted to fire 100% biomass, mainly wood pellets.

Denmark has no indigenous coal resources. In 2012, the country imported 3.9 million tonnes of coal, mainly from Colombia, Russia and South Africa. Over 95% of this coal is used for electricity and heat generation, including district heating. Having peaked in 1984 at 96%, the share of electricity produced from coal has fallen and the Danish government expects this decrease to continue: to 27% in 2020 and 15% in 2030.

Finland

Finland is very dependent on foreign energy supplies, as the country lacks its own oil, natural gas or coal reserves. Around half of the energy consumed in Finland is imported. This fact has dictated and will continue to dictate Finland's energy policy: the energy mix must be as diversified as possible. One third of electricity production is from nuclear plants and Finland's fifth nuclear reactor, a 1 600 MW EPR, is under construction at Olkiluoto, with more reactors planned. Around 4 million tonnes of locally produced peat are consumed each year for its energy value. Peat is used at dedicated district heating plants and at combined heat and power (CHP) plants, the latter accounting for 6% of total electricity supply in 2012.

Finland is one of the world's leaders in renewable energy, especially bio-energy. Renewable energy meets over one quarter of Finland's total energy consumption and accounted for 40% of its power generation in 2012. Nevertheless, coal and natural gas are the main fuels for CHP plants in Finland. For conventional thermal power generation, coal is the leading source of energy. In 2012, the share of coal in electricity production was 11% (70 TWh total) and 25% in district heating (58 TWh total). The efficiency of heat and power production in Finland is very high compared with most other countries. Approximately one third of electricity is produced at CHP plants which operate with overall efficiencies of 80% to 90%. These plants are used widely by industry and for district heating and cooling.

Annual coal consumption in Finland is fairly stable at about 6 million tonnes: 5 million tonnes of steam coal for energy production and 1 million tonnes of coking coal for the steel industry. Smaller quantities of coal are used by the cement industry. All coal is imported, steam coal mainly from Russia and coking coal from North America and Australia.

The EU's role in domestic energy policy has increased in recent years. The core framework for Finnish energy policy comes from the Union's energy and climate policy, notably the 20-20-20 targets. Finland must implement integrated energy and climate policy measures, in particular energy efficiency and energy savings measures, and increase the share of renewable energy to 38% by 2020, which is fairly challenging.

In the future, energy sources for electricity production should continue to be diversified and versatile, thanks to the flexibility and variety of CHP plants. As well as the increased share of renewable energy, the objectives of the national energy and climate strategy are to maintain the position of peat as an indigenous energy resource, but to diminish the share of fossil fuels, in particular coal. Therefore, the construction of new coal-fired capacity is very unlikely, except where coal is co-fired with biomass or used in multi-fuel boilers.

France

Hard coal mining in France ended in April 2004 with the closure of the last operational mine, La Houve in the Lorraine region. The state-owned coal company Charbonnages de France ceased its activities at the end of 2007. Today, all coal is imported, with the exception of small quantities recovered from spoil tips in Northern France and slurry ponds in Lorraine – an estimated 100 thousand tonnes in 2012.

Coal resources in France are estimated by the French geological survey (BRGM) to be 425 million tonnes of hard coal plus an additional 300 million tonnes of lignite. Despite various proposals, there has been, to date, no successful project to revive coal mining in France.

In 2012, coal imports amounted to 17.0 million tonnes, including one million tonnes of coking coal. The main coal suppliers were the USA (24%), Australia (20%), Colombia (19%), Russia (15%) and South Africa (11%). Coal is delivered through the ports of Dunkerque, Le Havre, Rouen, Montoir and Fos-sur-Mer, as well as via the ARA ports.

The *Service de l'observation et des statistiques* reports that gross power generation in France was 561 TWh in 2012, with 75.8% of this total generated at nuclear power plants. Thermal electricity production contributed 9.6%, hydro 11.2%, wind 2.7% and solar PV 0.7%. Coal-fired generation accounted for 3.3% of the total, while the share of renewables reached 14.6%.

Coal consumption amounted to 15.9 million tonnes in 2012 of which 7.1 million tonnes was consumed at power plants. The largest plants are located at Le Havre (1 450 MW) and Cordemais (1 200 MW), both owned by EDF adjacent to ports, and Emile-Huchet (1 045 MW) owned by E.ON in Lorraine. In compliance with the Large Combustion Plants Directive (LCPD), two of Le Havre's three units will close by 2014. The remaining unit 4 is expected to operate until 2035 and, with a view to the future, EDF commissioned a pilot-scale CO_2 capture plant at Le Havre in 2012. The company owns four smaller coal-fired plants: Blénod (500 MW), Bouchain (250 MW) and La Maxe (500 MW)

which it plans to close by 2015. Similarly, E.ON plans to close the four oldest units at its French coal-fired power plants (235 MW Hornaing 3, 245 MW Lucy 3 and Emile Huchet 4 and 5) between 2013 and 2015, as required by the LCPD, while the 230 MW Provence 4 will be converted to biomass, leaving the 595 MW unit 5 on coal.

The French steel industry consumes important but declining volumes of coal – 5.6 million tonnes of coking and steam coal in 2012. ARCELORMITTAL plants at Dunkerque, Florange and Fos-sur-Mer are the biggest coal consumers in this sector. However, the company created a political controversy in 2013 when it announced the closure of Florange because of sluggish demand in the major steel consuming sectors (construction and automotive).

Georgia

Lying in the Caucasus region between Europe and Asia, Georgia has proven hard coal reserves of 201 million tonnes plus resources of 700 million tonnes in the Tkibuli-Shaori and Tkvarcheli deposits. The Akhaltsikhe lignite deposit near Vale has reserves of 76 million tonnes. These deposits supported a major coal industry during the 1950s to 1970s supplying power stations at Rustavi, Kutaisi, Tkvarcheli and Gardabani, the metallurgical industry (Rustavi iron and steel works and Zestafoni ferroalloys works) and residential customers. Production peaked at 3 million tonnes in 1958. By 2000, coal production had collapsed to almost zero. Today, following the "Rose Revolution" of 2003 and conflict with Russia in 2008, the coal industry is being revitalised.

In 2011, 77% of Georgia's electricity production of 10.2 TWh came from hydro plants. The balance was produced at gas-fired plants, using imported gas from Russia. Greater political stability has seen new investment in hydro plants and electricity transmission, including the commissioning of a 700 MW DC link with Turkey in 2013 – part of the bigger "power bridge" project with Azerbaijan which will facilitate electricity exports to the EU.

Today, the Dzidziguri and Mindeli underground coal mines (up to 1 200 m deep) are operated by SAQNAKHSHIRI (GIG Group) LLC in the Tkibuli-Shaori coalfield, supplying cement works at Kaspi and Rustavi and the ferroalloy industry. The company produced 258 thousand tonnes of coal in 2012 and employed 1 600 workers. In the breakaway republic of Abkhazia, TAMSASH produces coking coal from an opencast mine in the Tkvarcheli coalfield. Although no coal is used for electricity production, there is some political support for a new 300 MW coal-fired power plant at Tkibuli and a 160 MW lignite-fired plant at Gardabani, both promoted by GEORGIAN INTERNATIONAL ENERGY CORP.

Ireland

The Republic of Ireland has no indigenous coal production, although 1.5 million tonnes of peat were extracted in 2012 for energy use. Coal imports totalled 2.2 million tonnes in 2012, mainly from Colombia, but with small volumes from Poland and the USA. Coal and peat have taken a declining share of the Irish industrial and residential markets, but together still accounted for 20% of primary energy supply in 2012 – used mainly for power generation.

BORD NA MÓNA is the leading peat producer and distributes solid fuel products within the residential heating market in Ireland. The company's peat briquettes are popular due to their low sulphur emissions and competitive price.

Since 2001, peat-fired electricity plants have been supported by a public service obligation as they contribute to security of supply through the use of indigenous fuels. However, this support will expire over the coming years: 2015 in the case of Edenderry power plant and 2019 in the case of West Offaly and Lough Ree. In addition, the government has set biomass dilution targets for peat used as a fuel. Taken together, these developments will further reduce the demand for peat. In 2012, 10% of Irish electricity was generated at peat-fired power plants.

The main user of coal is the 915 MW coal-fired power plant at Moneypoint. Commissioned in 1987, it is owned and operated by the ELECTRICITY SUPPLY BOARD (ESB) which recently invested € 368 million in pollution control equipment to meet EU regulations on NO_x and SO_x. In 2012, the plant met 20% of the country's electricity demand and consumed an estimated 1.9 million tonnes of coal.

In 2012, Ireland imported 92% of its natural gas needs. Given that 50% of the country's electricity generation is gas-fired, this points to a high security of supply risk since all imports must flow through a single transit point at Moffat in Scotland. According to a government White Paper "Delivering a Sustainable Energy Future for Ireland" which outlines an energy policy framework for 2007-2020, the increased market penetration of renewable energy sources in the electricity, heat and transport sectors will displace fossil fuels and improve energy security.

Italy

The only coal reserves and resources in Italy are located in the Sulcis Iglesiente basin, in south-west Sardinia, estimated to be 610 million tonnes. Mining activities were stopped there in 1972, but restarted in 1997 with many environmental improvements. Currently, CARBOSULCIS, owned by the Autonomous Government of Sardinia, is struggling to survive and production fell in 2012 to an estimated 80 thousand tonnes.

Imported coal plays a small but growing role in the Italian energy sector. In 2012, 9.8% of Italy's primary energy supply was provided by coal, 90% of which was consumed for power generation. It is expected that the share of coal in electricity production will continue to grow from the 16% share in 2012. Following a heavily subsidised investment boom in wind and solar PV, new renewables accounted for a 16% share in 2012. Hydro produced 14%.

With a share of 46%, Italy is one of the most dependant countries in the EU on natural gas for electricity production. Moreover, it has an overall energy import dependence of over 80% – far exceeding the EU average of 54%. This situation, which makes Italy heavily dependent on Algerian and Russian gas imports, will continue in the years to come and will have a significant impact on Italy's security of energy supply and electricity costs. It is therefore perhaps not surprising that in 2012 Italy's energy bill hit a new record of € 65 billion or 4.2% of GDP, compared to an average figure of 1.5% during the 1990s. High electricity costs are having a negative impact on industrial competitiveness: in 2012, Italian industry paid 23.29 €c/kWh compared with an EU average of 14.66 €c/kWh. Only Denmark with its expensive wind energy and Cyprus with its dependence on fuel oil for power generation have higher electricity rates than Italy.

In a decisive June 2011 referendum, Italian voters rejected government proposals to restart a nuclear programme that was abandoned following an earlier referendum held after the 1986 Chernobyl disaster. The government responded with the National Energy Strategy. Approved in March 2013, the strategy places great emphasis on renewable energy sources and the greater use of natural gas for power generation – both of which would further increase the cost of electricity in Italy.

In 2012, Italy imported 19.8 million tonnes of steam coal and 4.6 million tonnes of coking coal. Since the year 2000, steam coal imports have grown by over 4% per annum. The main supply countries are the USA, Indonesia, South Africa, Colombia and Australia. ENEL has a 10% shareholding in PT BAYAN RESOURCES of Indonesia which produced 16.3 million tonnes of coal in 2012. Italy has thirteen coal-fired power plants with a total capacity of 11.2 GW. Of these, nine are built with the very latest technologies, reaching an average 39% efficiency – 46% in the case of ENEL's Torrevaldaliga Nord which went into full operation in 2011 following its conversion from oil-firing. With more conversions planned, steam coal imports should reach 25-26 million tonnes over the coming years.

A key new project is ENEL's 1 980 MW oil-to-coal conversion at the Porto Tolle power plant on the Adriatic coast. It will have an efficiency of 45% – halving CO_2 emissions – and use new clean coal technologies to reduce sulphur dioxide, NO_x and dust emissions by 70% to 80%. The company has well-developed plans to capture and store the CO_2 from one of the plant's three units in an offshore saline aquifer. Porto Tolle's authorisation has suffered legal delays, but the conversion can go ahead as soon as permission is granted. In addition, TIRRENO POWER has been granted authorisation to build a new 460 MW coal-fired unit at the Vado Ligure power plant in the province of Savona. This unit will also have a very high efficiency of 47%. Other coal-fired projects that have been submitted for permitting include Saline Joniche, a 1 320 MW coal/biomass-fired plant proposed by SEI in the province of Calabria.

Recent years have seen significant developments in CCS technologies in Italy at various scales, from pilot to demonstration. At the 2 640 MW Federico II power plant near Brindisi, a 50 MW pilot plant was inaugurated in March 2011 and other R&D projects, such as an oxy-combustion experimental plant at Gioia del Colle, are adding to the knowledge base. Separately, coal gasification at the proposed Sulcis power plant could offer another route for CO_2 capture.

Luxembourg

In 1952, when its prosperity was based on steelmaking, the Grand Duchy of Luxembourg was chosen as the site of the European Coal and Steel Community (ECSC), marking the start of the institutional development that led to the European Union.

Luxembourg is almost entirely dependent on imports for its energy needs. At 97%, it has an energy import dependence second only to Malta among the EU member states. Hence, the government aims to develop the national potential for energy production and conversion. For example, the gas-fired Twinerg CCGT power plant at Esch-sur-Alzette has increased the country's electricity production since it opened in 2002, but at the expense of a sharp rise in CO_2 emissions. The country has the highest CO_2 emissions per capita of all the OECD countries (20 tCO_2/capita).

The steel industry's conversion to electric-arc furnaces (ARCELORMITTAL steel works at Belval, Differdange and Schifflange) has practically eliminated Luxembourg's coal use. Coal is used today mainly for the production of cement at the CIMALUX Rumelange plant. All coal is imported – 82 thousand tonnes in 2012 – and makes only a small contribution to the country's primary energy supply.

Malta

Malta has no indigenous energy production and reports no coal consumption. Until 1995, coal was imported for power generation. Today, the Delimara and Marsa power stations, with a combined capacity of 571 MW, burn imported fuel oil in steam boilers/turbines and diesel engines, as well as distillate fuel in gas turbines. In 2013, the utility company ENEMALTA announced a competitive bidding process to build a LNG terminal to import fuel for a new 200 MW gas-fired CCGT, as well as refuelling some existing plants.

An alternative proposal for Delimara comes from SARGAS AS: a new 360 MW power plant with a fluidised-bed boiler burning bio-paste (coal and biomass). Around 95% of the plant's CO_2 emissions – 0.7 million tonnes per annum – would be captured using a post-combustion process. CO_2 could be transported by ship for enhanced oil recovery or urea production.

Moldova

The Republic of Moldova does not produce coal or lignite. It imports small quantities of hard coal for use by industry and in heating plants – 155 thousand tonnes was consumed in 2012. The 2 520 MW Kuchurgan power station, in the breakaway region of Transnistria on the Ukrainian border, can be fuelled by coal (8 units) and natural gas or fuel oil (2 units). In 1990, over 4 million tonnes of coal were consumed there, but since the late 1990s the station has used virtually no coal. Although the Moldovan electricity grid is synchronised with Russia's (IPS/UPS), some units at Kuchurgan could be synchronised with Continental Europe to allow exports of electricity via Romania. Owned by CJSC MOLDAVSKAYA GRES, a subsidiary of INTER RAO UES, the plant is in need of refurbishment.

The Netherlands

Hard coal mining dominated the South Limburg area of the Netherlands from the early 1900s to the mid-1970s. The coalfield, located in the south of the country close to the German and Belgian borders, was mainly exploited from underground mines.

Since around 1915, lignite was extracted at opencast mines near 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 Netherlands is home to the main trans-loading ports for coal imports into Europe. Rotterdam and Amsterdam ports, along with Antwerp in Belgium, constitute the ARA trading area – the most important for imported coking coal and steam coal in north-west Europe.

Just over 10% of the Netherlands' primary energy demand is met by coal. In 2012, the country imported 12.4 million

tonnes, comprising 9 million tonnes of steam coal, 2.5 million tonnes of coking coal and 1 million tonnes of PCI coal. The main supplier countries were Colombia, the USA and Russia.

Most imported coal is used for coal-fired power generation. Coal had a 27% share of the Dutch power generation market, which totalled 102 TWh in 2012, and a smaller share of the heat supply market. Large coal-fired plants are located at Geertruidenberg (Amer 1 245 MW), Borssele (426 MW), Nijmegen (Gelderland 635 MW), Amsterdam (Hemweg 630 MW) and Rotterdam (Maasvlakte 1 040 MW). All these plants co-fire coal with biomass, to a greater or lesser extent. Ownership is very diverse, with ESSENT (a subsidiary of RWE), ELECTRABEL (a subsidiary of GDF-SUEZ), E.ON, EPZ and NUON (a subsidiary of VATTENFALL) being the major players in coal-fired generation. The 253 MW Buggenum plant – one of the world's few integrated coal gasification combined cycle (IGCC) plants – was closed in 2013 by its owner NUON.

TATA STEEL owns the IJmuiden integrated steel works which has a steel production capacity of 7.6 million tonnes and consumes most of the coking and PCI coal imported by the Netherlands. A pilot project at IJmuiden to demonstrate a new iron-making process, called Hisarna, aims to reduce CO_2 emissions from steelmaking.

In the power sector, the Netherlands has a progressive policy on coal and the government has supported CCS demonstration projects. As a result, three large ultra-supercritical coal-fired power plants are now being built. In the north, at Eemsmond near Groningen, RWE / ESSENT's 1 600 MW coal- and biomass-fired Eemshaven power plant is under construction with commissioning scheduled for 2014. A planned CCS project at Eemshaven was submitted, through the Dutch authorities, for EU funding from the New Entrants´ Reserve 300 under the EU Emissions Trading Scheme. However, like many other CCS projects in the EU, progress has stalled.

In the Rotterdam area, two new coal-fired power plants are under construction and will be commissioned in 2013 / 2014: ELECTRABEL's Maasvlakte plant (800 MW) and E.ON's MPP3 (1 100 MW). Both include preparatory work for CCS. Trials of CO_2 storage in North Sea oil and gas fields will be undertaken as part of the ROAD project (Rotterdam Opslag en Afvang Demonstratieproject) whilst the CINTRA consortium has proposed a CO_2 hub with ship transport of CO_2 to offshore operations for enhanced oil recovery.

Norway

Norway, Europe's northernmost country, opted to stay out of the EU by referendum in 1994, but is a significant supplier to the EU of coal, oil and natural gas. In 2011, 27% of EU gas imports came from Norway, the world's second largest gas exporter after Russia. In April 2010, Norway and Russia signed an historic agreement dividing the Barents Sea and defining maritime boundaries that clear the way for future oil and gas exploitation.

In 2012, Norway consumed 796 thousand tonnes of mainly imported coal and imported 0.4 million tonnes of coke for use in the metallurgical industry, chemicals production and cement manufacture.

Coal mining on Spitsbergen, the largest and only permanently populated island of the Svalbard archipelago, serves multiple government goals, not all related to energy. Without continued peaceful economic activity on Spitsbergen, Norwegian sovereignty might be weakened by foreign economic activity since the Svalbard Treaty of 1920 grants rights to all 39 signatories. To this end, the state-owned STORE NORSKE SPITSBERGEN KULKOMPANI (SNSK) operates the most northerly coal mines in the world with 300 employees: the Svea Nord longwall mine and the Gruve 7 room-and-pillar operation.

Annual production over the last decade has averaged 2.4 million tonnes, but reserves are close to exhaustion at Svea Nord and production fell to 1.2 million tonnes in 2012. Coal is sold on the international market with Germany being the largest customer; however, SNSK cannot provide a year-round supply of coal because the sea port at Sveagruva is frozen for much of the year. Spitsbergen's 10 MW coal-fired combined heat and power plant takes coal from Gruve 7.

At the end of 2011, SNSK gained approvals from the Norwegian government to open a new longwall mine at Lunckefjell. The mine boasts probable reserves of bituminous coal totalling 8.4 million tonnes, 60% of which is expected to be suitable for metallurgical purposes (PCI). Construction began in March 2012 and first output is scheduled for 2015 by which time production from Svea Nord will have ceased, although its coal transport infrastructure will serve Lunckefjell mine until production ends there in 2019.

SNSK and its subsidiaries have located coal and mineral deposits in large parts of Svalbard. Its concessions not in operation are held in reserve for future operations. Under the company's long-term plan to 2028, annual coal production will be between 1.5 and 2 million tonnes.

Political guidance for SNSK's operations is laid down in a government White Paper (No. 22 to the Storting, 2008-2009), establishing that SNSK and its coal mining operations are – and will remain – important for maintaining a Norwegian community in Longyearbyen on Spitsbergen.

Despite generating 97% of its electricity needs from hydro sources in 2012, Norway's per capita CO_2 emissions at 8 tCO_2/capita are no lower than the EU average. The government is also conscious that end-use emissions from the country's exports of oil and gas are very substantial. In response, Norway has been a pioneer in the field of carbon capture and storage: at the Sleipner natural gas field and at the Snøhvit LNG project. The CO_2 Technology Centre Mongstad was inaugurated in May 2012 to develop CO_2 capture technologies for both gas- and coal-fired power plants. Since 2007 at Longyearbyen, the UNIS CO_2 Lab has drilled a series of test wells and injected water to prove the CO_2 storage potential of Svalbard's deep saline aquifers.

Portugal

Portugal has limited indigenous energy resources, leading to 78% energy import dependence in 2012. Its last coal mine, Germunde in the Castelo de Paiva region, was closed in 1994, leaving behind reserves of 3 million tonnes. The country also has some lignite deposits: reserves and resources total 66 million tonnes.

In 2012, 42% of Portugal's electricity production came from renewable energy sources: wind, hydro, solar PV, geothermal and wave. Nevertheless, coal-fired electricity generation remains crucial to cover those periods when wind and solar are not available and to balance the annual variation in hydro electricity production on the Iberian Peninsula. Imported coal accounted for 13% of total primary energy supply in 2012 with 5.2 million tonnes coming mainly from Colombia and the USA, but also from South Africa. This is almost entirely consumed at Portugal's two coal-fired power plants located at Sines (1 180 MW) and Pego (628 MW) which together produced 29% of the country's electricity in 2012. Both are fitted with flue gas desulphurisation (FGD) and selective catalytic reduction (SCR) for SO_x and NO_x control.

Sines power plant, adjacent to a coal import terminal on the Atlantic coast, was built in the late 1980s and is owned by ENERGIAS DE PORTUGAL (EDP). The inland Pego power plant which was fully commissioned in 1995 is owned by INTERNATIONAL POWER PLC, a subsidiary of GDF-SUEZ, and ENDESA GENERACIÓN SA, a subsidiary of ENEL. The National Laboratory on Energy and Geology (LNEG) has completed a project (KTEJO) to examine the feasibility of retrofitting CCS at Pego power plant. Although there are currently no plans for new coal-fired power plants in Portugal, both coal and gas have been proposed as fuels for a possible new 800 MW plant at Sines.

By 2020, Portugal intends to be generating 60% of its electricity from renewable resources, in order to satisfy 31% of its final energy consumption. Although Portugal has this aggressive target, it is also facing severe austerity measures which mean that the government has had to scale back the support offered for renewable energy and revise capacity payments.

South East Europe

The countries of South East Europe not covered in earlier chapters include Albania, Bosnia and Herzegovina, Croatia, Kosovo, the Former Yugoslav Republic of Macedonia and Montenegro.

Albania produces very small volumes of lignite and imports further volumes to meet demand totalling an estimated 300 thousand tonnes at industrial and residential customers, who use the fuel for heating purposes, and at the Antea cement works which opened in 2010. The country produces all of its electricity at hydro plants. With reserves of 522 million tonnes and a further 205 million tonnes of resources, the country has the potential to support a much larger lignite mining industry. During the 1980s, annual production of around 2.4 million tonnes came from mines in central Albania near Valias, Manëz and Krrabë; at Mborje and Drenovë in the Korçë district; in northern Tepelenë at Memaliaj and in Alarup to the south of Lake Ohrid.

In *Bosnia and Herzegovina*, brown coal and lignite make a large contribution to primary energy supply (67 % in 2011), consumed mainly at power plants near to mines. In 2012, the country produced a total of 6.3 million tonnes of lignite and a further 6.3 million tonnes of sub-bituminous brown coal. Of this total, roughly two thirds were from underground mines and one third from opencast mines – some being subsidiaries of the major electricity utilities. The country also imported 1.2 million tonnes of hard coal in 2012. At 1 272 million tonnes, Bosnia's reserves of lignite are substantial and further resources of 1 801 million tonnes are reported. Brown coal reserves total 827 million tonnes.

The largest coal deposits are located in the north-east of the country around Tuzla in the Kreka-Banovići coal basin. These are worked by KREKA at the Sikulje and Dubrave opencast lignite mines, and at the Mramor and Bukinje underground mines.

Other deposits in central Bosnia are worked by KAKANJ (Vrtlište opencast mine, the Haljinići undergound mine and the new Begići–Bištrani underground mine opened in July 2013), BREZA (underground mines at Sretno and Kamenice), ZENICA (underground mines at Stara Jama, Raspotočje and Stranjani) and ABID LOLIĆ. BILA operates the Grahovčići opencast mine, and GRAČANICA operates the Dimnjače opencast mine. ĐURĐEVIK operates opencast brown coal mines at Višća II and Potočari, and an underground mine at Đurđevik. RMU BANOVIĆI operates large opencast mines at Grivice and Čubrić, employing shovel dredgers and 170-tonne trucks to mine a 17-metre seam, and has developed a third opencast mine at Turija. The company also operates one partly mechanised underground mine at Omazići.

The Gacko deposits in the south-east are worked by RiTE GACKO to supply the 300 MW Gacko supercritical power plant owned by the public enterprise ELEKTROPRIVREDA REPUBLIKE SRPSKE. Other production sites in Bosnia and Herzegovina include Livno and Ugljevik, the mines of Tušnica, which supply the Ugljevik power plant, and the Stanari mine at Doboj.

The total production capacity of the country's power plants is 3 824 MW. 54 % of this is hydro-electric based, while the remaining 46 % is provided by thermo-electric installations. The Tuzla power plant has three operating blocks, with an installed capacity of 715 MW. The plant also supplies heat for Tuzla and Lukavac, process steam for nearby industries and fly ash for the cement factory at Lukavac. After the Bosnian war of 1992-95, major overhauls were completed at the plant, including boiler upgrades and the installation of new precipitators. The Kakanj power plant has three operating blocks, with a total capacity of 450 MW and, like Tuzla, is owned by the public enterprise ELEKTROPRIVREDA BOSNE I HERCEGOVINE. The Ugljevik and Gacko power plants, each 300 MW, are operated by state-owned enterprise ELEKTROPRIVREDA REPUBLIKE SRPSKE.

In general, coal mining in Bosnia and Herzegovina faces many challenges. For years, poor geological conditions and a lack of funding for maintenance and investment have hindered mining. The government plans to restructure the industry by merging coal mines and power plants to attract new investment. To that end, many new projects are on the horizon.

RMU BANOVIĆI proposes a new 300 MW power plant with a circulating fluidised bed combustor and supplied with brown coal from its existing mines from 2017. ELEKTROPRIVREDA HRVATSKE ZAJEDNICE HERCEG BOSNE, a state-owned enterprise, has proposed the construction of a new 2 x 275 MW lignite-fired mine-mouth plant near Tomislavgrad. The plant would be supplied with lignite from a new mine in the Kongora deposit. There are many other potential mine and power plant projects in Bosnia and Herzegovina: the new Kotezi mine would supply a new 350 MW power plant near the town of Bugojno; a new 300 MW plant adjacent to the existing Stanari mine; a 600 MW expansion of the Ugljevik power plant; the potential Miljevina brown coal mine; a 300 MW expansion of the Kakanj power plant; a new 450 MW block at Tuzla; and a possible 430 MW two-unit plant at Kamengrad mine. Bosnia and Herzegovina is already a net electricity exporter to neighbouring countries and exports could grow in the future as these projects are materialised.

Croatia became the newest member state of the EU-28 on 1 July 2013. The county does not produce coal, but imported 1.3 million tonnes in 2012. Over three quarters of this are used for power generation at the 335 MW Plomin power plant, owned by HRVATSKA ELEKTROPRIVREDA (jointly with RWE in the case of unit B), while the balance is used for cement production and food processing. HRVATSKA ELEKTROPRIVREDA has invited bids to construct a third coal-fired unit at Plomin which is seen as a priority by the government. The new 500 MW unit C would replace unit A and thus increase the plant's overall capacity to 710 MW.

Kosovo is governed by the United Nations Interim Administration Mission in Kosovo (UNMIK), following the violent conflict of 1996-99. It has very large lignite resources, totalling 10.8 billion tonnes and fourth only to Poland, Germany and Serbia in Europe. Reserves are located in the Kosova, Dukagjini, Drenica and Skenderaj basins, although mining has been limited to the Kosova basin to date. Lignite production in 2012 was 8.9 million tonnes.

For electricity, Kosovo is almost entirely dependent on lignite, with just over 2% coming from hydro plants and imports in 2011. The state-owned KORPORATA ENERGJETIKE E KOSOVËS (KEK) has a monopoly position in lignite mining and electricity generation. Kosova A (5 units totalling 800 MW) and Kosova B (2 x 339 MW) power plants near Pristina are supplied with lignite from the adjacent Mirasha and Bardh opencast mines, in production since 1958 and 1969 respectively, and from the smaller Sitnica mine. These mines are nearing exhaustion and the new Sibovc Southwest mine near Obiliq was opened in 2010 to secure future lignite supplies for Kosova power plants until 2024. The plants operate at a reduced capacity of 910 MW and the plan is to retire A units by 2017 and B units by 2024. A new 600 MW Kosova C or Kosova e Re power plant is proposed as a replacement and this would improve the reliability of electricity supply in Kosovo and, at the same time, significantly reduce emissions.

The Former Yugoslav Republic of Macedonia is a significant lignite producer: 7.5 million tonnes in 2012 from the state-owned Suvodol-Brod Gneotino and Oslomej-Zapad surface mines, and from a number of smaller privately owned surface mines. It has lignite reserves of 332 million tonnes in the Pelagonija and Kicevo deposits with further potential in the Mariovo and Tikves deposits – new mines at Mariovo, Zhivojno, Negotino, Popovjani, Lavci, Zvegor-Stamer and Star-Istevnik / Pancarevo could add to supply. The country also imports sub-bituminous coal (168 thousand tonnes in 2012). Most coal and lignite is used for power generation, around 90% on an energy basis. The balance is used almost entirely by the steel industry, including DUFERCO MAKSTIL's integrated steel works at Skopje and ARCELORMITTAL's steel mill, also at Skopje. The state-owned ELEM Bitola (675 MW) and ELEM Oslomej (125 MW) lignite-fired power plants generated 77% of Macedonia's electricity in 2011. With hydro, total production was 6.9 TWh. The government plans to build a new 300 MW lignite-fired power plant at Mariovo – conditional upon the part privatisation of ELEM.

Montenegro produced and consumed an estimated 2 million tonnes of lignite in 2012. It is used mainly for power generation – over half of the country's electricity comes from coal. Although not currently exploited, Montenegro boasts hard coal reserves of 142 million tonnes.

Sweden

There are very limited hard coal deposits in Sweden: reserves and resources are reported at just 5 million tonnes. In the past, small-scale coal mining took place in southern Sweden. In 2012, 630 thousand tonnes of peat were extracted.

In the 1930s, coal met more than half of Swedish energy demand, with imports of around 7 million tonnes per year. Today, at just over 4%, coal has just a minor share of the country's total primary energy supply.

Since the mid 1990s, demand for coal imports had been stable at close to 3 million tonnes per year, but declined in 2012 to 2.2 million tonnes as coal is replaced with biofuels. Steam coal is now only used at a few combined heat and power (CHP) plants, including at Fortum's efficient and clean Värtan plant in Stockholm – site of the world's first commercial pressurised fluidised bed combustor. The majority of coal demand comes from Sweden's speciality steel industry which uses mainly high-quality coking coal. Some coal is used by the cement industry, but the sector is increasing its use of alternative fuels. The pulp and paper industry uses mainly biofuels with small quantities of coal.

In a typical year, almost half of Sweden's electricity demand is met by hydropower and almost half by nuclear power. The balance is met by CHP plants, firing either solid waste, biofuels or fossil fuels. Wind power production is increasing with a share of 4% in 2012. In 2010, the Swedish parliament agreed that new nuclear power plants could replace old ones at existing locations. Government support schemes exist for the construction of biofuelled CHP and wind farms. The national energy mix for power generation is well balanced and Sweden has good interconnections with its neighbours. More interconnectors are under construction to enable a future increase of cross-border power trade. For the coming years, Sweden is expected to be a net exporter of electricity.

EU Statistics

General data and coal-related data for EU member states that use imported coal, 2012

(see country chapters for data on coal-producing member states)

	Population (million)	GDP (€ billion)	Primary energy production (Mtce)	Primary energy consumption (Mtce)	Primary energy consumption coal and peat (Mtce)	Gross power generation (TWh)	Power generation from coal (TWh)	Capacity of coal-fired generation (GW)
Austria	8.4	307.0	18.1	47.0	4.6	64.5	6.2	2.2
Belgium	11.1	376.2	23.5	81.8	3.9	77.3	5.5	0.8
Croatia*	4.4	43.9	5.4	12.1	1.0	10.7	2.6	0.3
Denmark	5.6	245.0	28.5	24.3	3.5	30.4	10.6	5.9
Finland	5.4	192.5	24.5	47.8	6.7	70.4	7.4	7.8
France	65.3	2 032.3	190.2	359.6	16.4	561.2	22.7	6.3
Ireland	4.6	163.9	2.0	19.1	3.8	27.5	5.5	0.9
Italy	60.8	1 565.9	46.7	226.6	22.2	294.4	47.1	11.2
Netherlands	16.7	599.3	92.5	111.7	11.7	102.2	27.3	4.2
Portugal	10.5	165.2	6.9	31.4	4.2	45.5	13.1	2.3
Sweden	9.5	407.7	49.9	69.8	3.2	165.4	1.6	1.1

** Energy data for 2011*

Sources: EURACOAL members, Eurostat, IEA

Coal production and imports in 2012 for the EU-28 (million tonnes)

	Hard coal production	Lignite production	Hard coal imports
Austria			3.2
Belgium			3.5
Bulgaria	2.1	30.4	2.3
Croatia			1.3
Czech Republic	11.4	43.5	2.0
Denmark			3.9
Finland			4.0
France			17.0
Germany	10.8	185.4	44.9
Greece		62.2	0.2
Hungary		9.3	1.5
Ireland			2.2
Italy	0.1		24.3
Netherlands			12.4
Poland	79.2	64.3	10.2
Portugal			5.2
Romania	1.9	32.1	1.3
Slovakia		2.3	3.4
Slovenia		4.3	0.6
Spain	6.1		21.4
Sweden			2.2
United Kingdom	16.8		44.8
others			0.8
EU-28	128.4	433.8	212.6

Source: EURACOAL members

Power generation structure in EU-28 in 2011

	Total gross power generation		coal & coal products	oil	natural gas	nuclear energy	hydro	renewables, waste & other
	TWh	EU-share (%)	%	%	%	%	%	%
EU-28	3 290.4	100.0	27	2	21	28	10	12
Austria	65.7	2.0	11	2	19	0	57	11
Belgium	90.2	2.7	6	<1	28	53	2	10
Bulgaria	50.8	1.5	54	<1	4	32	7	2
Croatia	10.8	0.3	24	7	24	0	43	2
Cyprus	4.9	0.1	0	96	0	0	0	4
Czech Republic	87.5	2.7	57	<1	1	32	3	6
Denmark	35.2	1.1	40	1	17	0	<1	42
Estonia*	12.9	0.4	89	<1	2	0	<1	9
Finland**	73.5	2.2	21	<1	13	32	17	17
France	562.0	17.1	3	<1	5	79	9	4
Germany	608.9	18.5	45	1	14	18	4	19
Greece	59.4	1.8	52	10	23	0	7	7
Hungary	36.0	1.1	18	<1	30	44	<1	7
Ireland**	27.5	0.8	25	<1	54	0	3	17
Italy	302.6	9.2	17	7	48	0	16	13
Latvia	6.1	0.2	<1	<1	49	0	47	3
Lithuania	4.8	0.1	0	4	55	0	22	18
Luxembourg	3.7	0.1	0	<1	63	0	30	7
Malta	2.2	0.1	0	100	0	0	0	0
Netherlands	113.0	3.4	22	1	61	4	<1	13
Poland	163.5	5.0	86	1	4	0	2	7
Portugal	52.5	1.6	19	5	28	0	23	25
Romania	62.2	1.9	40	1	13	19	24	3
Slovakia	28.7	0.9	14	2	11	54	14	5
Slovenia	16.1	0.5	33	<1	3	39	23	2
Spain	291.8	8.9	15	5	29	20	11	19
Sweden	150.4	4.6	1	<1	1	40	44	13
United Kingdom	367.8	11.2	30	1	40	19	2	8

** coal figure includes oil shale*

*** coal figure includes peat*

Source: Eurostat

EURACOAL

The European Association for Coal and Lignite is the umbrella organisation of the European coal industry. Associations and companies from twenty countries work together in EURACOAL to ensure that the interests of coal producers, importers, traders and consumers are properly served. Its thirty-four members come from across the EU-28 and Energy Community. As the voice of coal in Brussels, EURACOAL evolved from CECSO (European Solid Fuels Association) after the expiry of the treaty establishing the European Coal and Steel Community in 2002.

EURACOAL's mission is to highlight the importance of the European coal industry to energy supply security, energy price stability, economic added value and environmental protection. EURACOAL seeks to be an active communicator, with the aim of creating an appropriate framework within which the coal industry and coal consumers can operate.

Country	EURACOAL Members	as at October 2013
Belgium	ISSeP – Institut Scientifique de Service Public (Scientific Institute of Public Service)	
Bosnia-Herzegovina	RMU Banovici dd	
Bulgaria	MMI – Mini Maritsa Iztok EAD	
	Vagledobiv Bobov dol EOOD	
Czech Republic	ZSDNP – Zaměstnavatelský svaz důlního a naftového průmyslu (Employers' Association of Mining and Oil Industries)	
Finland	Finnish Coal Info	
France	BRGM – Bureau de Recherches Géologiques et Minières (The French Geological Survey)	
Germany	DEBRIV – Deutscher Braunkohlen-Industrie-Verein eV (German Association of Lignite Producers)	
	GVSt – Gesamtverband Steinkohle eV (German Coal Association)	
	VDKi – Verein der Kohlenimporteure eV (Hard Coal Importers Association)	
Greece	PPC – Public Power Corporation SA	
	CERTH – Centre for Research and Technology Hellas	
Hungary	Mátrai Erőmű ZRt	
Italy	ENEL SpA	
Poland	PPWB – Porozumienie Producentów Węgla Brunatnego (Confederation of Polish Lignite Producers)	
	ZPGWK – Związek Pracodawców Górnictwa Węgla Kamiennego (Polish Hard Coal Employers' Association)	
	GIG – Główny Instytut Górnictwa (Central Mining Institute)	
	EMAG Institute of Innovative Technologies	
	KOMAG Institute of Mining Technology	
Romania	APFCR – Asociatia Producatorilor si Furnizorilor de Carbune din Romania (Coal Producers and Suppliers' Association of Romania)	
Serbia	EPS – Elektroprivreda Srbije (Electric Power Industry of Serbia)	
Slovak Republic	HBP – Hornonitrianske bane Prievidza as	
Slovenia	Premogovnik Velenje dd	
Spain	CARBUNIÓN – Federación Nacional de Empresarios de Minas de Carbón (National Coal Mining Employers' Association)	
	Geocontrol SA	
Sweden	Svenska Kolinstitutet (Swedish Coal Institute)	
Turkey	TKİ – Turkish Coal Enterprises	
Ukraine	DTEK	
	Ukrvuglerobotodavtsy (All-Ukrainian Coal Industry Employers' Association)	
United Kingdom	CoalImp – Association of UK Coal Importers	
	CoalPro – Confederation of UK Coal Producers	
	Coaltrans Conferences Ltd	
	Golder Associates (UK) Ltd	
	University of Nottingham	

Glossary

Coal reserves
The portion of known coal resources that can be profitably mined and marketed with today's mining techniques.

Coal resources
Coal deposits that are either proven, but at present are not economically recoverable, or not proven, but expected to be present based on geological knowledge.

Mtce
Million tonnes of coal equivalent
(1 tce = 0.7 toe or 29.307 gigajoules or 7 million kcal)

Total primary energy supply
TPES refers to the direct use of primary energy (e.g. coal) prior to any conversion or transformation processes. It is equivalent to total primary energy demand or consumption.

Coal mining terminology varies around the world. For a comprehensive and current glossary of English terms, see IHS Energy Publishing's coalportal website: *www.coalportal.com.*

For a glossary of terms used in energy statistics, see Eurostat's Statistics Explained website: *http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Category:Energy_glossary*

Data sources and references

Data and information has been provided by EURACOAL members and national government agencies. Eurostat databases and IEA databases have also been valuable sources. Other data and information has come from the following publications.

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Coal classification

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

* a.f. = ash-free

** d.a.f. = dry, ash-free

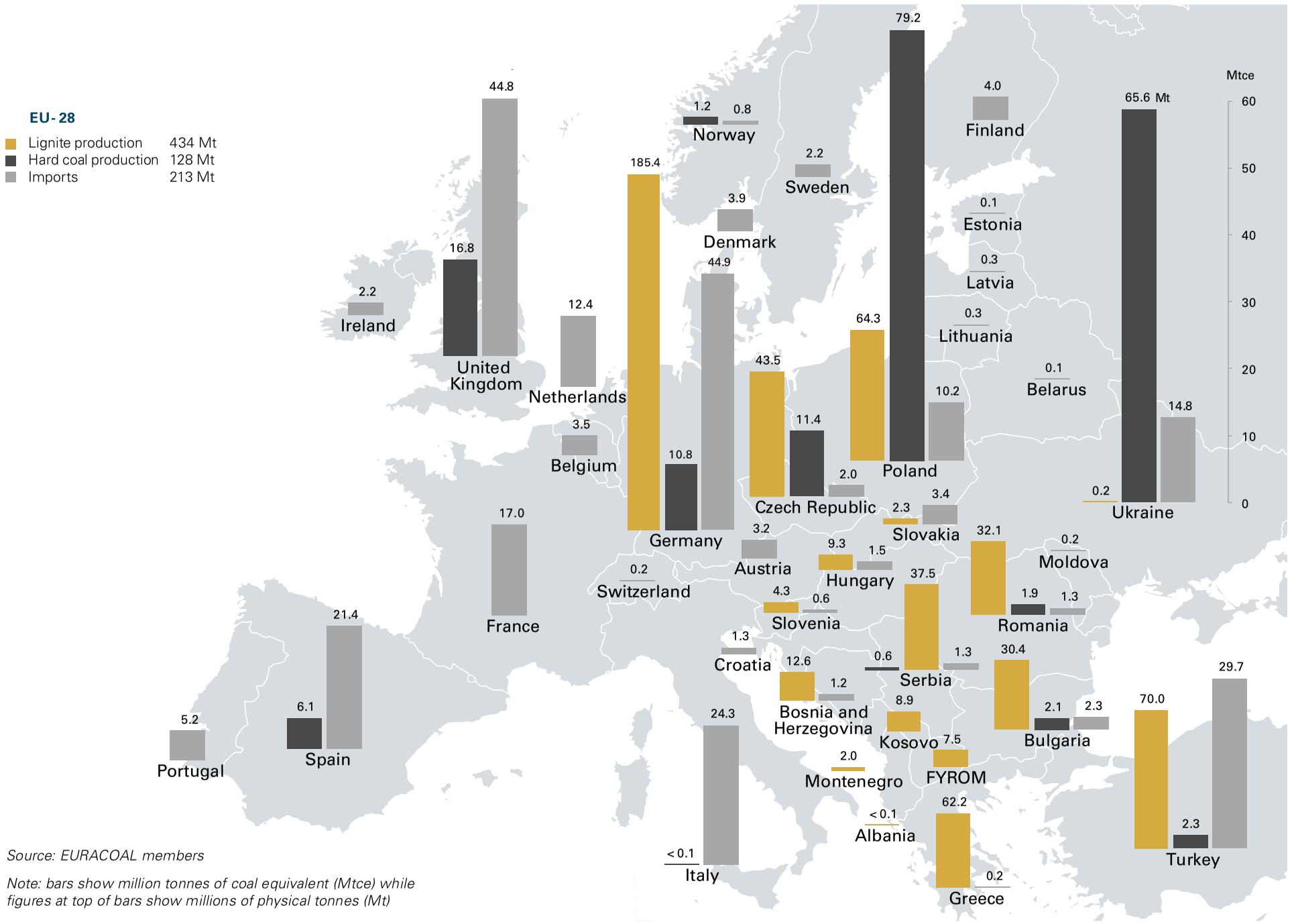
UNECE: Ortho-Lignite up to 15,000 kJ/kg
Meta-Lignite up to 20,000 kJ/kg
Sub-bituminous Coal up to 24,000 kJ/kg
Bituminous Coal up to 2 % average Vitrinite Reflection

USA: Lignite up to 19,300 kJ/kg

Source: BGR

Coal in Europe 2012

Lignite production, hard coal production and imports in 2012, million tonnes



Source: EURACOAL members

Note: bars show million tonnes of coal equivalent (Mtce) while figures at top of bars show millions of physical tonnes (Mt)

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