Coal 2016

Still dependable in a changing world

German Coal Association

German Coal Association

Coal Annual Report **2016**

(Excerpt)

Foreword

With the coal policy agreement of 2007 already well behind us, and embedded in the legal framework of the Coal Industry Financing Act, we are now more than three quarters of the way towards the final closure of the German coal mining industry. Coal production is being scaled down as planned and workforce downsizing has continued in a socially responsible manner in line with our agreements.

Our policy makers have also played their part, as per agreement, by granting all the approvals and permits we have needed to overcome the challenges posed by the restructuring and downsizing of the industry. And support has also been forthcoming for all the myriad of projects and activities associated with site redevelopment and after-use. One of these initiatives centres around the development of the future industry is the business park "Gate.Ruhr – the new Victoria", where as many as a thousand new jobs will be created on the site of the former Auguste Victoria colliery. This will be a huge boost for the old coal-mining town of Marl and for the whole Emscher-Lippe region in general. As well as benefiting from the commitment and efforts of RAG Montan Immobilien GmbH and the Marl municipal authorities this project will also be supported and funded by the state North Rhine-Westphalia.

This year's Annual Report of the German Coal Association is entitled "Still dependable in a changing world". This reflects not only the fact that all the industry's agreements and commitments are being kept but also that reliability is the defining theme for the end of the coal mining industry in general and for the future tasks that will result from it.

The withdrawal process is being managed in a sustainable way and the legacy of the mining industry will be handled responsibly. Protecting human life and the environment is a key challenge in this respect and ensuring a safe supply of drinking water is of paramount importance here. RAG has already laid down the water management plans that will provide the guarantees needed in this vital area.

The systematic phasing-out of the coal mining industry also means finding and implementing socially acceptable solutions for our workers. In this context the German Coal Association has been engaged in the work of adapting the existing collective agreement provisions in the run-up to the closure date, and for the period thereafter. One example of this is last year's wage agreement that managed to find a balanced solution to the problem of the traditional concessionary fuel allowances. As Germany will no longer be producing coal after 2018 – the source of the concessionary allowance – the bargaining partners lost no time in drawing up a solution that will serve the interests of the current beneficiaries.

This year's report also presents the current situation of the German coal industry and discusses the national and international background conditions. Still dependable in a changing world – the title has been well chosen, for it recognises an obligation to shape our post-mining environment.

Herne, October 2016

Bernd Tönjes
Chairman of the Executive Board
German Coal Association

Editorial

Economical and political operating environment

Coal mining in Germany is drawing to a close. When Auguste Victoria colliery in Marl ceased production on 1st January 2016 the industry was left with just two active coal mines: Prosper-Haniel colliery in Bottrop – the last of the Ruhr pits – and Ibbenbüren colliery. Both these mines have been operating to plan in 2015 and 2016. They will continue producing coal until the end of 2018 and will then be closed as agreed. A worthy farewell is already being organised that will not just cast a look back at what has been achieved over the years but will also create a vision of what is to come: this "Glückauf Zukunft/Glückauf future" project is a joint initiative that is supported by RAG Aktiengesellschaft (RAG) and the RAG Foundation along with partners Evonik and the Mining, Chemical and Energy Industries Union (IG BCE).

RAG has been systematic in its planning for the post-mining era, this primarily focusing on preparations for managing the "eternity tasks", namely mine dewatering, groundwater purification at a number of former coke works and, where necessary, polder protection measures. RAG has been working continuously to develop its groundwater plans and has been engaged in an objective dialogue on the problems posed by polychlorinated biphenyls (PCB) and the presence of residual materials underground.

Renewable-energy projects are being established at disused mining sites, including wind farms on old spoil tips, solar parks on colliery wasteland plots and installations for generating heat from mine water.

The Ruhr is already home to one real environmental success story that has seen the region become a model for climate protection. The InnovationCity Ruhr Project that was launched in the classic mining town of Bottrop – which combines efforts to achieve CO_2 savings with positive economic stimuli at local level, with the focus very much on the energy-efficient refurbishment of buildings – has proved to be such a success that it has now attracted national and international attention and recognition as a model project. This initiative is now being extended to take in a further 20 urban districts in the Ruhr region.

In 2016 a cornerstone ceremony was held to mark the construction of a new headquarters building for RAG and the RAG Foundation at the Zollverein World Heritage Site in Essen. This initiative of great symbolic significance will create a link between the coal industry, with its rich history and traditions, and the advent of the post-mining era.

Essen is also home to Germany's largest coal-based electricity producer, STEAG GmbH. Having developed from the industrial power stations of the old Ruhr coalfield, STEAG now operates a fleet of large power stations and a large number of decentralised plants, including renewables-based installations, as well as being a leading provider of district heating. The company is a member of the public utilities consortium for the Rhine-Ruhr Region, a fact that highlights its importance as a municipal energy provider. STEAG's diversified business model has enabled it to navigate successfully through the difficult and constantly changing environment of an energy market that has been subject to frequent political intervention. And the company continues to develop its corporate strategy so that it will be well placed to tackle the challenges arising from the energy transition process.

Energy-supply security and efficiency continue to rank alongside environmental sustainability as being fundamental for any modern society. The national energy transition, with its focus on renewables and greater energy efficiency, is slowly but surely making headway, especially in the power generating sector.

In terms of its economic significance coal continued to make the third-largest contribution to the German energy mix in 2015. Oil and gas still dominate the primary energy market, while in the power generating sector renewables have now overtaken lignite. Two thirds of the coal is consumed in power stations, with around 30 % being sold as coking coal and coke to the iron and steel industry. The remainder is taken up by the heat market. In 2015 home produced coal only accounted for about one tenth of the German coal market, with nearly 90 % of demand now being met by imports – the import ratio in this sector now very much resembling that of oil and gas. After 2019 coal imports will inevitably increase to the point where they account for 100 % of the German solid-fuel market.

Renewables on the other hand , and this essentially means wind power and photovoltaics, are acquiring an ever larger slice of the power generation market as a result of state subsidies and feed-in priority. This gives them greater weight in the energy market and in the price-setting process. However, as renewables have a very low guaranteed capacity, and so long as there are no sufficiently large power storage facilities available, combined with the fact that the required grid expansion work is nowhere near complete, conventional balancing and reserve capacity – and this essentially means coal-fired power stations – must remain operational. During this transitional period Germany will therefore be reliant on two types of power generating system that will have to complement each other in a technically practical and economically streamlined way, while at the same time being in accord with energy policy objectives.

The latest energy and climate policies, such as the new Electricity Market Act, the upcoming amendment to the Renewable Energies Act (EEG) and the National Climate Protection Plan 2050, should help establish a reasonable framework in which to operate. The ultimate success of these arrangements is still open to doubt and remains to be determined. Furthermore, the energy transition is also placing huge demands on the heat and transport sectors where the conversion process is not nearly as far advanced as in the electricity market. In the latter case there are still strong arguments for giving priority to grid expansion and storage capacity development projects before conventional generating capacity is phased out or even run down. Modern coal-fired power stations, with their potential for flexibility, have been providing medium-load coverage for many years and coupled with the price and reliability advantages of coal over gas, for example, can serve as a bridge that will take us safely into the new energy future. When operated in conjunction with combined heat and power systems (CHP) these coal-fired installations can even represent a highly efficient option. There should also be no confusion about the fact that for Germany too climate protection is not only or primarily all about coal but rather involves all fossil-based energies and through them practically every economic sector and sphere of life. This means that it affects almost everyone and therefore what is required is an effective process of sustainable change. However very few people seem to be aware of this reality at the present time.

Employment and welfare conditions

Labour legislation is being further re-shaped by the Federal Government as it implements the coalition agreement. One of the main goals is to eradicate the discrimination that exists agaist women in the workplace. Last year saw a new regulation aimed at increasing the proportion of women in high-level posts – supervisory boards, boards of directors, senior management and so on.

This year the focus has been very much on eliminating the gender pay gap, this being highlighted under the heading of "pay equity". There is in fact some debate as to whether this problem actually exists on the scale that has been assumed. What is not in doubt, however, is the fact that the average salary of all the working women in Germany is about 21 % lower than that of all the men. In reality there are many non-

discriminatory reasons for this discrepancy, since vocational choices and employment patterns will always have an impact on levels of pay. This commences with the choice of career and continues as each person's working life takes shape. Career interruptions and part-time working, frequently for family-related reasons, are of particular relevance in this respect. However, if all these different factors are taken out of the picture we are still left with an unexplained differential of about 2 % (according to figures from the Cologne Institute for Economic Research in 2013). It is therefore questionable whether the proposed regulations will actually bring about any reduction in this disparity. Given the causes that underlie the gender pay gap it does not seem to be particularly productive that companies – even those bound by collective agreement – should be burdened with inspection and reporting requirements and with individual claims for information. The coalition party group is now engaged in internal discussions as to the scale and scope of these regulations.

The plans for regulating temporary employment and service contracts have proved equally contentious and some success has now been achieved in improving on the original proposals. Employee leasing and service contracts too have become an essential part of modern business life, an area where flexible working methods are increasingly in demand. For the coal industry in particular it is especially important that these instruments remain in place so that the phasing-out process can be carried through with the number of workers required and with the pool of technical skills that is deemed necessary. It is therefore important that the maximum 18-months duration of assignment for employee leasing should be provided with an opening clause in any collective bargaining agreement. This keeps open the possibility of a responsible tarif structure being negotiated with the contracting partner IG BCE.

The general framework of social-security law is based around two key issues. There are major plans afoot in the area of social insurance with the reform of the nursing care insurance system, which is already under way, and in the field of pensions insurance, where intensive discussions are now in progress.

In the area of social care insurance the First and Second Acts to Strengthen Long-term Care have already been adopted. The key element here is the new definition of long-term care needs. The three care levels specified in the old system are to be replaced by five new care levels that are intended to provide a better assessment of the need for nursing care. The transition from the existing care-level system is to be achieved in a manner that is not detrimental to the insured persons. As the new arrangements contain provisions for an extension of benefits this care reform package will also mean an increase in contribution levels.

An intense debate is also being waged about the development of the old-age pension system. This includes both the state pension insurance scheme and the occupational pension provisions.

As far as the state pension scheme is concerned the Coalition Government has fortunately set itself the objective of introducing greater flexibility into the transition from work to retirement. To this effect the payment process is to be simplified and its scope is to be extended, this to include not only normal retirement pensions but early-retirement pensions too. Moreover, in such cases it will also be made possibe to build up supplementary pension entitlements. There are now proposals to supplement these special facilities by introducing additional elements such as improvements in the arrangements for paying additional contributions – which should help avoid subsequent deductions in cases where pensions are taken early – and in the form of additional prevention and rehabilitation benefits. The Coalition Government is therefore heading in the right direction, although an even more flexible

system would be better placed for meeting the demographic challenges that are facing the state pensions system.

Another project mentioned in the coalition agreement is now being assessed on its own merits by the coalition parties themselves. The supportive working-life pension, by which certain low-level benefits would be upgraded after 40 years of contributions, remains a contentious issue. As even the experts, including the state pensions department itself, are questioning the impact of such a system in the light of divergence losses and target imprecision, the government is now stepping away from introducing such an element – which would in essence be a welfare benefit – into the state pensions scheme.

All things considered, politicians should be careful to ensure that the correct policies for the state pensions insurance scheme are not compromised through the introduction of a whole raft of individual rules and regulations. However, moves to raise the statutory retirement age and the various measures aimed at stabilising the contribution rate to the year 2030 were both appropriate and necessary and indeed they still remain so.

Given the challenges facing the state pensions insurance scheme the Coalition Government has also set itself the objective of strengthening the occupational pension system and broadening its availability to small and medium-sized enterprises (SMEs). One of the plans being drawn up in this area involves the application of a direct tax subsidy to support an employer-financed occupational pension for low-income earners. A number of improvements are also being prepared in the area of fiscal law.

The Federal Empoyment Ministry (BMAS) has at the same time opened the debate on a "social-partner model for occupational pensions". According to proposals being put forward the bargaining parties are to be given an opportunity to establish joint arrangements through which it will be possible to organise occupational pension provisions. In order to provide employers with a special incentive to participate in such a scheme plans are being laid for the social-partner model that will involve cancelling the mandatory responsibility that currently applies to company pensions. Also being discussed in this case is the introduction of a defined contribution commitment that will not lead to a guaranteed pension provision. Indeed there are still all kinds of questions as yet unanswered in this area. The BMAS is currently engaged in discussions with the social partners and many other bodies that are aimed at giving concrete form to these arrangements.

The legislative process leading to an Occupational Pensions Consolidation Act should be initiated in the autumn, when we shall also be awaiting the proposal for an implementation of improvements to the statutory pension insurance scheme.

In order to live up to the claim of being one of the safest industrial sectors in the land the German coal industry will continue to give occupational health and safety top priority right through the phasing-out period. The industry-wide safety campaign that RAG launched in 2016 under the slogan "Safety! Think first before you start" should help achieve a further reduction in the already very low accident levels.

The RAG occupational health management scheme is making a significant contribution not just in terms of maintaining and restoring the health of the workforce but also when it comes to actively promoting a healthy lifestyle. Employees are presented with a personally tailored health plan that focuses on prevention, rehabilitation and integration. One of the instruments of the occupational health management initiative is the "APUC loop" (analysis, planning, implementation and monitoring), which has been introduced as a means to achieve targeted planning of the different healthcare measures and

if necessary to identify any occupational health risks. The "health quota" as assessed by RAG in its annual health survey – which in 2015 produced a figure of 93.8 % – reflects the success of the German coal industry's health protection strategy.

Coal and the environment

In North Rhine-Westphalia and Saarland large amounts of power and heat are still being produced from mine gas, and in some cases the output has even increased. In 2015 some 4.7 mt CO_2 equivalent were saved by using mine gas in this way for electricity generation alone. After 20 years of operation the existing mine-gas facilities will have to be decommissioned sometime during 2021 to 2024 due to the impact of the EEG. The degressive rate of remuneration imposed by the EEG has meant that it is no longer viable to commission new mine-gas installations with an output of over 1 MW, especially given the high exploration risks associated with such projects. However, there is still time to develop sustainable funding for the continued operation of mine-gas installations after the EEG subsidy for these "old systems" has ceased.

While Germany has seen a massive reduction in the quantity of mercury deposited from the air in recent decades, coal-fired power stations remain at the forefront of public debate as the principal emitters in this regard. However, this discussion has been moving in the wrong direction. Air concentration levels and immission contributions are both well below the statutory requirements as laid down in accordance with the air quality standards applied by the World Health Organisation (WHO). The threshold food levels for mercury in coarse and predatory fish are being reliably adhered to and regularly monitored. Admittedly, European waters in general still do not meet the environmental quality standard for mercury in wet-weight fish. This can be attributed to the fact that in previous centuries it was standard practice to discharge waste water containing industrially released mercury – as produced for example by chlorine-alkali electrolysis – directly into rivers and waterways. It therefore has to be borne in mind that these historical mercury deposits in the river sediments are the main cause of the biota pollution we are measuring today. Even if power stations were to achieve zero emission status many of our rivers and bodies of water would still fail to meet today's biota environmental quality standard.

International energy markets

In 2015, and for the first time in decades, global coal production failed to match that of the previous year. World output was in the region of 7 bn t, some 200 mt down on the 2014 level. This figure comprised 87 % steam coal and 13 % coking coal. The downturn first became apparent at the end of 2014 when there were signs that coal production levels were flattening out. China's domestic market was receding and coal imports into China fell by almost a third. This all pointed to an economy that had lost momentum and to a Chinese energy sector that was undergoing structural reorganisation and realignment. Nevertheless, China continues to dominate this branch of the economy and the country still accounts for more than half of total world coal production. Coal output was also down in Indonesia, Australia, South Africa and Colombia, whereas Russia and India saw an increase in production. The Modi-led government of India, which has been in office for nearly two years now, is to some extent therefore well on the way to fulfilling its election promise of achieving greater self-sufficiency in coal supplies. A total of 1.1 bn t of coal was traded on the world's sea routes in 2015, this being more than 7 % down on the previous year's figure. This can mainly be attributed to the decline in demand from the newly emerging countries, especially China and India.

A combination of significant overcapacity on the supply side and a declining demand pull, especially in the emerging economies, led to a sharp fall in world market prices for steam coal. As a result, the monthly average price for steam coal free north-west Europe was again quoted below the

50 €/tce mark at the beginning of this year, the first time this had happened since 2003. Demand for coking coal also declined rapidly. This was triggered by the global steel crisis of 2014 and 2015, a development that in this market segment too was subsequently to lead to a substantial fall in prices. In the period January 2014 to December 2015, for example, the price of Australian premium coking coal fell by more than 40 % to a level that was well below 80 US$/t fob Australia (Queensland).

The sea freight rates of capesize vessels, which are bulk carriers typically of 120,000 to 180,000 deadweight tonnage that are primarily used for transporting coal and ore, have also had a major impact on coal prices free at the port of unloading. The sharp fall in the cost of marine diesel fuel following the international drop in crude prices has allowed vessel owners to make further cuts to sea freight charges that were already standing at an all-time low. In fact a huge surplus in shipping capacity has been keeping sea freight rates for bulk carriers at a very low level for some years now.

The dramatic fall in coal prices has already resulted in a number of production cutbacks and has forced several major coal producers, especially in the USA, to withdraw from the market completely. Falling revenues from commodity exports have also compromised the economic development of most of the emerging nations. Of the BRIC countries, only India has profited from the fall in commodity prices. In the EU the drop in coal prices has spelled the end of the British deep coal industry, Spain has been negotiating with the European Commission for higher coal subsidies for its coal-fired power stations, while the new Polish Government has for the time being at least been able to rescue its coal mining industry by way of an extensive restructuring programme.

At present it is difficult to predict how the Global Agreement on Climate Change, which was negotiated in Paris in November 2015 and subsequently signed at the UN Headquarters in New York in April 2016, will impact on international energy supplies in general and on the coal industry in particular. In the lead-up to the Climate Change Agreement international investors were already factoring climate change into their calculations and reducing their investments in the fossil-fuel sector. It is questionable whether this will prove to be a wise move in the long run, as many energy consumption prognoses and scenarios indicate that even when rigorous climate protection requirements are taken into account coal is set to remain indispensable for meeting global primary energy needs for years to come. And despite the triumphant progress of renewables this situation will apply in equal measure to the global power-generation mix.

Statistics

World primary energy consumption

		fossil fuels			renewables		
year	nuclear energy	coal and lignite	mineral oil	natural gas	hydro	other fuels	total
	mtce						
1970	28	2,277	3,262	1,326	146	827	7,866
1980	247	2,724	4,320	1,853	206	1,066	10,416
1990	738	3,205	4,477	2,525	271	1,420	12,636
2000	955	3,123	5,005	3,091	329	1,534	14,037
2005	1,031	4,191	5,488	3,522	379	1,960	16,571
2010	1,028	4,968	5,882	3,918	422	1,986	18,204
2011	964	5,395	5,876	3,985	429	2,041	18,690
2012	918	5,547	5,997	4,067	452	2,125	19,106
2013	924	5,618	6,033	4,148	466	2,200	19,389
2014	930	5,690	6,069	4,231	475	2,280	19,675
2015[1]	956	5,713	6,173	4,286	469	2,369	19,966
2020[2]	1,188	5,767	6,379	4,545	548	2,655	21,082
2040[2]	1,717	6,312	6,771	6,062	759	4,025	25,646

[1] estimated [2] outlook

nuclear energy and renewables evaluated by efficiency method; incl. traditional energies

Sources: BP Statistical Review, 2016; WEC Germany, 2016
IEA New Policies Scenario, 2014

Global electricity generation

	coal and lignite	nuclear energy	mineral oil	natural gas	hydro and others	total
year	TWh					
1970	2,075	80	1,625	–	1,175	4,955
1980	3,163	714	1,661	976	1,802	8,316
1990	4,286	1,989	1,216	1,632	2,212	11,335
2000	5,759	2,407	1,402	2,664	2,968	15,200
2005	7,040	2,640	1,240	3,750	3,550	18,220
2010	8,685	2,756	1,000	4,760	4,207	21,408
2011	9,139	2,584	1,062	4,847	4,481	22,113
2012	9,204	2,461	1,144	5,104	4,808	22,722
2013	9,612	2,478	1,044	5,079	5,105	23,318
2014	9,702	2,501	1,054	5,127	5,153	23,536
2015[1]	9,770	2,571	1,021	5,224	5,455	24,040
2020[2]	10,171	3,186	836	5,798	7,231	27,222
2040[2]	11,868	4,606	533	9,008	13,429	39,444

[1] estimated [2] outlook

Sources: BP Statistical Review, 2016; WEC Germany, 2016;
IEA New Policies Scenario, 2015

Global CO_2 emissions

	1990 (base year)	2000	2005	2010	2012	2013	2014	2015	changing rates	
									2015 vs 2014	2015 vs 1990
regions/countries	CO_2-emissions in mt[2]								%	
Annex-I-States[1]	14,988.8	14,432.0	14,900.2	14,170.5	13,816.2	13,808.5	13,561.3	13,251.6	-2.3	-11.6
EU-28	4,442.0	4,143.0	4,270.5	3,917.6	3,727.4	3,645.6	3,451.9	3,489.8	1.1	-21.4
thereof EU-15[1]	*3,375.1*	*3,382.6*	*3,486.0*	*3,166.0*	*2,997.7*	*2,940.3*	*2,765.8*	*2,736.2*	*-1.1*	*-18.9*
thereof Germany[1]	*1,042.1*	*891.5*	*861.7*	*829.4*	*821.7*	*841.4*	*794.2*	*753.6*	*-5.1*	*-27.7*
Australia[1]	276.1	346.6	380.4	399.4	397.8	389.8	380.9	400.2	5.1	44.9
Canada[1]	459.0	567.7	576.7	554.4	550.5	556.6	557.1	532.5	-4.4	16.0
USA[1]	5,100.6	5,963.1	6,103.3	5,712.8	5,375.0	5,519.1	5,568.2	5,485.7	-1.5	7.6
Russia[1]	2,505.4	1,477.0	1,531.7	1,602.4	1,656.8	1,624.4	1,599.7	1,483.2	-7.3	-40.8
Ukraine[1]	718.9	293.5	320.6	289.7	302.7	288.1	236.1	195.1	-17.4	-72.9
Japan[1]	1,141.1	1,251.5	1,282.1	1,191.1	1,275.6	1,264.0	1,224.6	1,207.8	-1.4	5.8
Korea	229.3	437.7	469.1	564.5	592.9	598.5	598.9	648.7	8.3	182.9
India	580.5	978.1	1,191.1	1,749.3	1,954.0	2,034.0	2,198.8	2,218.4	0.9	282.2
China	2,277.7	3,350.3	5,444.3	7,294.9	8,250.8	8,478.2	8,552.6	9,153.9	7.0	301.9
rest of Far East	697.8	1,162.1	1,448.4	1,662.7	1,744.5	1,783.5	1,841.5	2,402.0	30.4	244.2
Middle East	549.9	899.7	1,165.9	1,521.7	1,647.1	1,672.5	1,741.1	2,167.8	24.5	294.2
Africa	545.0	684.0	829.0	982.3	1,032.4	1,045.0	1,071.7	1,201.9	12.1	120.6
Brazil	192.4	303.6	322.7	388.5	440.2	474.4	493.7	487.8	-1.2	153.5
Mexico	265.3	349.6	385.8	417.9	435.8	437.9	431.4	474.2	9.9	78.7
r.o. Latin America	384.9	512.4	577.1	681.5	707.3	730.8	730.6	888.8	21.7	130.8
Other States	1,408.2	1,515.4	1,727.5	1,920.1	1,945.4	1,926.7	1,958.4	1,070.6	-45.3	-24.0
World	21,774.1	24,235.3	28,026.2	30,850.8	32,036.2	32,469.1	32,637.2	33,508.4	2.7	53.9

[1] Annex-I-countries according to United Nations Framework Convention on Climate Change (see also http://unfcc.int)
[2] temperature- and inventory-adjusted

Sources: H.-J. Ziesing, "...CO_2-emissions…", in ET 9/2015; 2015 data: BP Statistical Review, 2016; World Bank: Climate Change, 2016

World reserves of coal, lignite, mineral oil and natural gas 2015

regions	coal and lignite	mineral oil	natural gas	total
	bnt ce			
EU-28	20.8	1.2	1.5	23.5
rest of Europe and Central Asia[1]	136.1	31.2	65.7	233.0
Africa	32.4	26.7	16.7	75.8
Middle East	1.1	167.5	94.8	263.4
North America[2]	156.2	49.7	15.2	221.1
Central and South America[3]	9.7	68.8	9.1	87.6
China	79.7	3.9	4.6	88.2
India	58.7	1.2	1.8	61.7
Indonesia	8.6	0.8	3.4	12.8
Far East	4.3	2.3	4.7	11.3
Australia[4]	50.0	0.8	4.1	54.9
World	557.6	354.1	221.6	1,133.3
	49 %	31 %	20 %	100 %

[1] Rest of Europe, Russia, Kazakhstan, Ukraine, Mongolia
[2] including Canadian oil sands [3] including Mexico [4] including New-Zealand

Source: BP Statistical Review, 2016

World reserves and production of coal 2014

regions	reserves	production
	bnt	
EU-28	19.329	0.106
rest of Europe	0.926	0.004
CIS	130.362	0.462
Africa	13.150	0.266
Middle East	1.203	0.003
USA	222.641	0.835
Canada	4.346	0.061
Rest of North America[1]	1.343	0.014
Colombia	4.881	0.089
Rest of Central and South America	4.062	0.011
China	124.059	3.725
India	85.562	0.612
Indonesia	17.394	0.411
Mongolia	1.170	0.018
Australia	62.095	0.441
Rest of Central Asia / Oceania	6.137	0.096
World	698.660	7.153

[1] Mexico, Greenland

Source: DERA/BGR, 2015

Primary energy consumption in EU-28*

year	coal and lignite	mineral oil	natural gas	nuclear energy	hydro and others	total
	mt ce					
2005	431	1,003	606	367	123	2,530
2010	402	814	631	342	261	2,450
2011	409	785	578	337	263	2 372
2012	420	752	561	329	285	2,347
2013	409	734	553	327	299	2,322
2014	284	382	845	494	290	2,295
2015[1]	277	375	858	517	304	2 331
2020[2]	350	662	531	322	370	2,235
2040[2]	144	448	546	290	541	1,969

* from 2013 EU-28 [1] estimated [2] outlook

Sources: BP Statistical Review, 2016; IEA New Policies Scenario, 2015

Power generation in EU-28*

year	coal[3]	mineral oil	natural gas	nuclear energy	hydro and others	total
	TWh					
2005	990	160	660	930	440	3,180
2010	862	86	758	917	687	3,310
2011	884	74	696	907	696	3,257
2012	935	73	582	882	788	3,260
2013	905	61	507	877	875	3,225
2014	816	48	461	876	957	3,158
2015[1]	833	46	485	859	981	3,204
2020[2]	742	33	497	863	1,131	3,266
2040[2]	205	12	693	777	1,721	3,408

* from 2013 EU-28 [1] estimated [2] outlook
[3] Coal, lignite, coal share within cofiring

Sources: IEA WEO 2015; BP Statistical Review, 2016; IEA New Policies Scenario, 2015

Coal and lignite production and imports in EU-28* in 2015

country	production			imports
	coal	lignite	total	coal
	mt ce			
Poland	62	19	81	7
United Kingdom	7	0	7	22
Germany	6	53	59	48
Czech Republic	7	11	18	2
Spain	3	–	3	16
Bulgaria	0	11	11	1
Romania	1	7	8	1
Greece	–	14	14	0
Hungary	–	3	3	1
Slovenia	–	1	1	0
Slovakia	–	1	1	3
Croatia	–	–	–	1
Italy	–	–	–	17
France	–	–	–	12
Netherlands	–	–	–	11
Finland	–	–	–	3
Denmark	–	–	–	2
Belgium	–	–	–	4
Sweden	–	–	–	2
Portugal	–	–	–	5
Austria	–	–	–	3
Ireland	–	–	–	2
EU-28	86	120	206	163

* Croatia's accession to the EU on 1.7.2013

Source: EUROCOAL 2016

EU-28[1] net electricity generation by countries and energy sources 2015

	nuclear energy	coal	lignite	natural gas	mineral oil	other fossil fuels	wind energy	photo-voltaics	biomass	other renew-ables	hydro	others	total	fossil fuels	renew-ables	nuclear energy
	TWh															
EU-28	814.0	416.2	295.4	401.6	33.7	159.6	305.5	102.3	118.6	14.9	357.8	11.8	3,031.5	1,306.6	899.1	814.0
Austria	–	3.0	–	7.5	0.9	2.7	3.6	0.4	2.5	–	36.2	7.8	64.6	14.1	42.7	0.0
Belgium	24.6	4.0	–	20.8	0.1	1.1	5.4	3.0	2.8	2.0	1.4	0.2	65.4	26.0	14.6	24.6
Bulgaria	14.3	1.0	18.8	1.3	–	–	1.4	1.4	0.2	–	6.2	–	44.6	21.1	9.2	14.3
Croatia	–	2.1	–	0.8	–	0.2	0.8	–	–	–	5.7	–	9.6	3.1	6.5	0.0
Cyprus	–	–	–	–	4.2	–	0.2	–	–	–	–	–	4.4	4.2	0.2	0.0
Czech Republic	25.3	4.8	32.2	4.9	0.0	0.1	0.6	2.2	1.9	2.4	3.0	–	77.4	42.0	10.1	25.3
Denmark	–	6.9	–	3.5	0.1	–	14.1	0.6	2.3	–	0.0	–	27.5	10.5	17.0	0.0
Estonia	–	–	–	–	–	7.6	0.7	–	0.8	–	0.0	–	9.1	7.6	1.5	0.0
Finland	22.3	5.5	–	5.0	0.2	2.7	2.3	–	10.7	–	16.6	0.8	66.1	13.4	29.6	22.3
France	416.8	8.6	–	22.1	3.4	–	21.1	7.4	7.9	–	58.7	–	546.0	34.1	95.1	416.8
Germany	86.8	107.1	143.1	53.2	5.2	10.9	75.7	35.2	38.5	1.2	23.7	0.0	580.6	319.5	174.3	86.8
Greece	–	–	19.4	7.3	–	–	3.7	3.6	0.2	1.3	6.1	–	41.6	26.7	14.9	0.0
Hungary	14.9	0.5	5.5	3.2	–	–	0.7	0.0	1.6	0.5	0.2	–	27.1	9.2	3.0	14.9
Ireland	–	4.8	2.5	11.5	–	0.1	6.5	–	–	0.2	1.1	–	26.7	18.9	7.8	0.0
Italy	–	38.4	–	91.5	4.2	28.0	14.7	23.9	18.8	5.8	44.6	–	269.9	162.1	107.8	0.0
Latvia	–	–	–	2.0	–	0.6	0.1	–	0.4	0.4	1.9	–	5.4	2.6	2.8	0.0
Lithuania	–	–	–	1.5	–	0.9	0.8	0.1	0.4	–	1.0	–	4.7	2.4	2.3	0.0
Luxembourg	–	–	–	0.8	–	–	0.1	0.1	0.1	–	1.5	0.1	2.7	0.8	1.8	0.0
Malta	–	–	–	–	1.9	0.2	0.0	0.0	0.0	–	–	–	2.2	2.2	0.0	0.0
Netherlands	4.0	–[2]	–	–[2]	–	88.4	7.1	0.1	4.0	–	0.1	–	103.7	88.4	11.3	4.0
Poland	–	69.1	49.5	4.1	–	9.4	10.5	–	6.7	0.5	2.5	–	152.3	132.1	20.2	0.0
Portugal	–	13.7	–	9.8	0.1	0.2	11.3	0.8	2.6	–	9.6	–	48.1	23.8	24.3	0.0
Romania	10.7	1.7	14.5	4.5	–	4.3	7.0	2.0	0.5	–	16.5	–	61.7	25.0	26.0	10.7
Slovakia	14.1	0.9	1.6	1.8	0.3	–	0.0	0.5	1.1	0.5	4.3	0.1	25.2	4.6	6.4	14.1
Slovenia	5.4	–	3.8	0.0	–	0.1	0.0	0.2	0.2	0.1	4.1	0.1	14.0	3.9	4.6	5.4
Spain	54.8	48.6	4.5	48.6	13.0	–	48.1	13.3	4.6	0.0	30.8	1.3	267.6	114.7	96.8	54.8
Sweden	54.3	0.5	–	1.0	0.1	2.1	16.6	–	9.8	–	74.0	–	158.4	3.7	100.4	54.3
United Kingdom	65.7	95.0	–	94.9	–	–	52.4	7.5	–	–	8.0	1.4	324.9	189.9	67.9	65.7
	shares in percent															
EU-28	27	14	10	13	1	5	10	3	4	0	12	1	100	43	29	27
Austria	–	5	–	12	1	4	6	1	4	–	56	11	100	22	67	0
Belgium	38	6	–	32	0	2	8	5	4	3	2	0	100	40	22	38
Bulgaria	32	2	42	3	–	–	3	3	0	0	14	1	100	47	20	32
Croatia	–	22	–	8	–	3	8	–	–	–	59	–	100	33	67	0
Cyprus	–	–	–	–	95	–	5	–	–	–	–	–	100	95	5	0
Czech Republic	33	6	42	6	0	0	1	3	2	3	4	–	100	54	13	33
Denmark	–	25	–	13	0	–	52	2	8	–	0	–	100	38	62	0
Estonia	–	–	–	–	–	83	8	–	9	–	0	–	100	83	17	0
Finland	34	8	–	8	0	4	3	–	16	–	25	2	100	20	44	34
France	76	2	–	4	1	–	4	1	1	–	11	–	100	7	17	76
Germany	15	18	25	9	1	2	13	6	7	0	4	0	100	55	30	15
Greece	–	–	47	18	–	–	9	9	0	3	14	–	100	65	35	0
Hungary	55	2	19	12	–	–	3	0	6	2	1	–	100	33	12	55
Ireland	–	18	9	43	–	0	25	–	–	1	4	–	100	70	30	0
Italy	–	14	–	34	2	10	5	9	7	2	17	–	100	60	40	0
Latvia	–	–	–	37	–	12	2	–	7	7	35	–	100	49	51	0
Lithuania	–	–	–	32	–	19	17	2	9	–	21	–	100	51	49	0
Luxembourg	–	–	–	29	–	–	4	4	4	–	55	4	100	29	67	0
Malta	–	–	–	–	89	10	0	0	0	–	–	–	100	99	1	0
Netherlands	4	–[2]	–	–[2]	–	85	7	0	4	–	0	–	100	85	11	4
Poland	–	45	33	3	–	6	7	–	4	0	2	–	100	87	13	0
Portugal	–	30	–	20	0	0	23	2	5	–	20	–	100	50	50	0
Romania	17	3	24	7	–	7	11	3	1	–	27	–	100	41	42	17
Slovakia	57	4	6	7	1	–	0	2	4	2	17	0	100	18	25	57
Slovenia	39	–	27	0	–	1	0	1	1	1	29	1	100	28	32	39
Spain	21	18	2	18	5	–	17	5	2	0	12	0	100	43	36	21
Sweden	34	0	–	1	0	1	10	–	6	–	47	–	100	2	63	34
United Kingdom	20	30	–	30	–	–	16	2	–	–	2	0	100	60	20	20

[1] incl. cofiring [2] cofiring with coal and natural gas, see other fossil fuels
sources: ENTSOE (STATISTICAL FACTSHEET 2015) and diverse country statistics

Primary energy consumption in Germany

year	mineral oil	coal	lignite	natural gas	nuclear energy	wind energy	hydro, biomass and others	total
	mt ce							
1980	206.7	85.2	115.7	73.9	20.7	0.0	5.9	508.1
1990	178.4	78.7	109.2	78.2	56.9	0.0	7.2	508.6
2000	187.6	69.0	52.9	101.9	63.2	1.2	15.6	491.4
2005	176.3	61.7	54.4	110.9	60.7	3.3	29.4	496.7
2010	159.8	58.5	51.6	108.2	52.3	4.6	50.1	485.1
2011	154.4	58.5	53.4	99.3	40.2	6.0	52.2	464.0
2012	154.4	58.9	56.1	99.6	37.0	6.2	46.6	458.8
2013	157.9	62.8	55.6	104.4	36.2	6.3	48.4	471.6
2014	153.3	60.0	53.7	90.8	36.2	7.0	48.7	449.7
2015	152.6	58.6	53.4	95.5	34.2	10.8	48.5	453.6[1]

[1] incl. elec. exchange balance
nuclear energy and renewables evaluated by efficiency method
Source: AGEB, 3/2016

Power generation in Germany

year	coal	lignite	nuclear energy	mineral oil	natural gas	wind energy	hydro, biomass and others	total
	TWh							
1980	111.5	172.7	55.6	27.0	61.0	0.0	39.8	467.6
1990	140.8	170.9	152.5	10.8	35.9	0.1	38.9	549.9
2000	143.1	148.3	169.6	5.9	49.2	9.5	50.9	576.5
2005	134.1	154.1	163.0	12.0	72.7	27.2	59.5	622.6
2010	117.0	145.9	140.6	8.7	89.3	37.8	93.7	633.0
2011	112.4	150.1	108.0	7.2	86.1	48.9	100.4	613.1
2012	116.4	160.7	99.5	7.6	76.4	50.7	118.8	630.1
2013	127.3	160.9	97.3	7.2	67.5	51.7	126.8	638.7
2014	118.6	155.8	97.1	5.7	61.1	57.4	132.1	627.8
2015[1]	118.0	155.0	91.8	5.4	59.6	88.0	134.0	651.8

[1] preliminary

German coal sales

year	domestic			EU countries		third countries	total sales
	heat market	power stations	steel industry	steel industry	others		
	mt ce						
1960	61.3	22.1	31.3	27.0		5.3	147.0
1970	28.5	31.8	27.9	19.8	5.7	3.2	116.9
1980	9.4	34.1	24.9	13.0	4.8	2.1	88.3
1990	4.1	39.3	19.8	5.2	2.2	0.4	71.0
2000	0.7	27.6	10.0	0.0	0.3	0.0	38.6
2005	0.3	20.3	6.1	0.0	0.1	0.0	26.8
2010	0.3	10.6	3.7	0.0	0.2	0.0	14.8
2011	0.3	10.1	2.3	0.0	0.1	0.0	12.8
2012	0.3	9.9	1.1	0.0	0.1	0.0	11.4
2013	0.3	6.6	0.9	0.0	0.2	0.0	8.0
2014	0.3	6.8	0.5	0.0	0.1	0.0	7.7
2015	0.2	5.5	0.5	0.0	0.1	0.0	6.3

Rationalisation efforts in German coal industry

year	output per manshift underground	output[1] per working face	mines[2]	working faces
	kg saleable[3]	t saleable[3]	number	
1960	2,057	310	146	1,631
1970	3,755	868	69	476
1980	3,948	1,408	39	229
1990	5,008	1,803	27	147
2000	6,685	3,431	12	37
2005	6,735	3,888	9	24
2010	6,092	3,018	5	16
2011	6,623	3,156	5	14
2012	6,876	3,739	3[4]	11
2013	6,624	3,454	3	8
2014	7,491	3,886	3	8
2015	7,251	3,732	3	6

[1] daily face output [2] data status: end of year excl. small mines
[3] until 1996 Saar figures in t = t [4] as at: 01.01.2013

German coal industry workforce[1]

by end of year	workers		white-collar employees		staff (workers and white-collar employees)	
	underground	surface	underground	surface	total	thereof apprentices
	1,000					
1957	384.3	169.3	16.3	37.4	607.3	48.2
1960	297.0	140.2	16.8	36.2	490.2	22.7
1965	216.8	110.5	15.6	34.1	377.0	15.2
1970	138.3	75.6	13.0	25.8	252.7	11.5
1975	107.9	60.9	11.5	22.0	202.3	14.1
1980	99.7	55.8	10.6	20.7	186.8	16.4
1985	90.1	47.4	10.2	18.5	166.2	15.7
1990	69.6	35.9	8.9	15.9	130.3	8.3
1995	47.2	25.7	6.1	13.6	92.6	2.9
2000	25.6	18.2	3.8	10.5	58.1	2.3
2005	17.7	10.9	2.6	7.3	38.5	3.2
2010	10.7	6.7	1.5	5.3	24.2	1.1
2011	9.0	5.8	1.4	4.7	20.9	1.1
2012	7.1	5.1	1.3	4.1	17.6	1.0
2013	5.6	4.3	1.1	3.5	14.5	0.8
2014	4.4	3.7	0.9	3.1	12.1	0.7
2015	3.3	2.9	0.7	2.7	9.6	0.4

[1] workforce including short-time workers and trainees

Coal production in Germany

year	area				
	Ruhr	Saar	Aachen	Ibbenbüren	total
	mt saleable				
1957	123.2	16.3	7.6	2.3	149.4
1960	115.5	16.2	8.2	2.4	142.3
1965	110.9	14.2	7.8	2.2	135.1
1970	91.1	10.5	6.9	2.8	111.3
1975	75.9	9.0	5.7	1.8	92.4
1980	69.2	10.1	5.1	2.2	86.6
1985	64.0	10.7	4.7	2.4	81.8
1990	54.6	9.7	3.4	2.1	69.8
1995	41.6	8.2	1.6	1.7	53.1
2000	25.9	5.7	–	1.7	33.3
2005	18.1	4.7	–	1.9	24.7
2010	9.6	1.3	–	2.0	12.9
2011	8.7	1.4	–	2.0	12.1
2012	8.4	0.4	–	2.0	10.8
2013	5.7	–	–	1.9	7.6
2014	5.7	–	–	1.9	7.6
2015	4.6	–	–	1.6	6.2

Coal industry data for 2015

Mines (as at 01.01.2015)		**3**
Workforce[1] total		**12,104 employees**
- Ruhr coalfield	9,500	employees
- Saar coalfield	311	employees
- Ibbenbüren	2,293	employees
Coal production total		**7.6 mt saleable**[2]
	≙ 7.8	mt ce[3]
- Ruhr coalfield	5.7	mt saleable
- Saar coalfield	–	mt saleable
- Ibbenbüren	1.9	mt saleable
Technical statistics		
output per production unit	3,886	t saleable/day
average seam thickness	203	cm
average face length	312	m
average winning depth	1,249	m
deepest shaft	1,545	m
Sales total		**7,7 mt ce**
- electricity industry	6.8	mt ce
- steel industry	0.5	mt ce
- heat market	0.4	mt ce
German coal's contribution		
- to primary energy consumption in Germany	2	%
- to electricity generation in Germany	4	%
- to coal consumption	13	%
- to coal-fired electricity production	17	%

[1] at year end; including staff on short time working and trainees

[2] saleable includes water and ash content

[3] t ce = tonnes of coal equivalent. 1 kg t ce = 7,000 kcal or 29,308 kJ

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