Coal 2013

Partnering the energy transition

German Coal Association

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Coal
Annual Report

2013

Foreword

The year 2012 marked a turning point in the long and tradition-steeped history of the German coal mining industry. Following the end of coal mining in Saarland with the closure of the last Saar colliery in mid-year, the month of December also spelled the end of mining operations in the Lower Rhine area after 150 years of production. Since the beginning of 2013 German coal production has therefore been based around just three active collieries in Bottrop, Marl and Ibbenbüren. The 2007 coal industry agreements underpinned the political decision that subsidised coal mining in Germany should cease at the end of 2018. Moreover, the collective labour agreement on the closure of the German coal industry, which was concluded in early 2012, has proved to be an extremely helpful instrument in that it allows us to offer our younger employees prospects for continuing employment in the post-mining era.

The financial framework that has been put in place by the Federal Government and the Land Government of North Rhine-Westphalia means that the industry phase-out process can be managed in an orderly and socially acceptable way.

After 2018 RAG will be geared up and ready to manage the industry's long-term liabilities, oversee the process of structural change through the development of former mining land and make use of the opportunities created by former mining infrastructure for renewable-energy generation projects. And the company will also continue to be actively involved in trading coal and coal by-products.

As from 2019 the nation will be completely dependent on imports to meet its coal demand. Together with lignite and natural gas coal can provide the bridge that is needed to a new era – as has been accepted both politically and by broad national consensus – when electricity is produced primarily from renewable sources.

'Partnering the energy transition' is therefore the title of this year's GVSt Annual Report and the theme of the 2013 annual coal convention. We are thus underlining the fact that we support the aims of the energy transition and intend to participate fully in implementing the measures that are required. This includes maintaining coal production on a reliable basis until the agreed deadline is reached. During this period RAG will continue to manage the phase-out in an orderly and socially acceptable manner and will promote the future use of the existing infrastructure through 2018 and beyond.

The bodies that constitute the mineworkers' social insurance fund and the employers' liability insurance association have faithfully accompanied the coal industry during this process and will continue to support its efforts in the years to come. Moreover, this year's Annual Report therefore devotes one of its chapters to this partnership. There is also a guest contribution on the history of coal mining in the Lower Rhine, where the last colliery closed at the end of 2012. This year's Annual Report by the German Coal Association reviews developments in environment and climate policy and on the international energy and raw materials markets, as they affect the energy transition in Germany.

Coal mining will remain RAG's main business until the end of 2018. But beyond this date we will continue to be a reliable partner to policy makers, to our customers and to those who live in the former coalfield areas.

Herne, October 2013

Bernd Tönjes
Chairman of the Executive Board
German Coal Association

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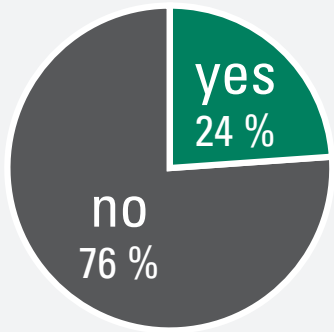
Partnering the energy transition

The energy transition is a huge, self-imposed challenge for Germany. The targets and deadlines that have been set for a sustainable conversion of the energy supply system towards renewables and greater energy efficiency are generally considered to be ambitious, the ways to achieve them are still a matter of controversial debate and the pace of progress in many areas has so far been slow. On 5 June 2013 Die Welt ran a story titled 'Energy transition - a pipe-dream' in reference to a study produced by the McKinsey & Company consultancy in Dusseldorf, giving a dismal assessment of how the energy transformation is being implemented. A great deal of attention is now being directed towards monitoring the transition process. In addition to the McKinsey Energy Index the BDI (Federation of German Industries) in Berlin has also developed an Energy Transition Navigator, while the Federal Government is also carrying out its own monitoring exercise.

McKinsey did not just criticise the way in which the energy turnaround is being implemented but also questioned its role as a model. The reference to Germany's leading role did not stand up to international comparison. McKinsey listed twenty example cases from around the world that could also serve as a model for Germany. A poll of international energy experts from the global World Energy Council network, which was carried out by the World Energy Council, showed that the current German energy policy is not accepted as a blueprint for the world. Some 23 national committees, mostly from Europe, took part in the survey.

World Energy Council poll on the German energy transition

Can current German energy policy be a blueprint for the world?



Source/graph: World Energy Council, „Energy for Germany 2013"

At UN level, and particularly at the United Nations Conference on Trade and Development (UNCTAD), the German energy transformation does not play a model role. Here a number of measures have been developed that could potentially be afforded by the emergent countries too. But despite everything, they are still reliant on the support of the OECD nations. One of the most promising measures aimed at combating climate change is to control the increasing deforestation. However, the OECD countries do not consider themselves to be in a position to provide the support that is required in this area.

In Germany the indirect subsidies that are paid annually under the Renewable Energy Sources Act (EEG) are now of the same order of magnitude that would have to be raised worldwide for such a forest-based UN climate programme. In implementing its energy transition, however, Germany is going down a very expensive road of its own. And it has become expensive for the simple reason that economic efficiency is not at the forefront of the promotion measures. As the EEG does not favour the most cost-effective measures the contribution made by photovoltaics, for example, has grown significantly and, in spite of a much desired and initially realised reduction in costs, has again triggered a further rise in the average tariff. This effect is likely to become even more pronounced in the future with the growth of offshore wind energy.

For some time now the public debate on the energy transition has turned into a discussion about costs. German industry sees itself facing much higher energy costs than international competitors. Special exemptions for energy-intensive companies can therefore be well justified, though do raise questions about distribution because of the increased burden that would be applied to other users. However, these distribution issues do not resolve the core problem of Germany's high energy costs in comparison with other countries.

At the 2009 annual coal convention Christof Rühl, chief economist at BP p.l.c., London, indicated that the global energy markets would undergo a fundamental reorientation because the use of hydraulic fracturing (fracking) would allow the USA to access cheap reserves of energy on a hitherto almost

unimaginable scale. This has now become a reality, with the result that the USA is now en route to energy self-sufficiency and gas prices in that country are now around one quarter of what we are paying in Europe.

No one in Europe is asking what kind of impact this will have on the USA's role as the 'world's policeman' when it comes to protecting the energy markets.

While the debate in the USA centred on whether fracking causes more methane – a highly potent greenhouse gas – to be released, and indeed technical improvements were initiated in this area, the discussion in Germany has focussed on the impact of the process fluids on drinking water. A draft law on fracking initially failed to get through the Bundestag and will not be tabled again until the new legislative term. And the prohibition on CO_2 separation and storage has already squandered one opportunity for climate-friendly electricity generation.

Even if further power generation from photovoltaic sources has now been capped, the German Government continues to aim for a development target of 80% electricity production from renewable sources by 2050. It is already obvious that a growing proportion of renewable energies are posing exceptional challenges for the country's power generation system. There has been a marked increase in the number of critical grid conditions and some new settings therefore need to be put in place as soon as possible in order to ensure that sufficient power plant capacity is available. The need for a new 'market design' is currently being discussed on a cross-party basis. While this does provide us with an opportunity for action, it also carries the risk of non practice-oriented overregulation. No matter whether a 'strategic reserve' or a 'capacity market' is the model of choice, the decisive factors are efficient implementation and the ease with which the solution can be deployed. At the end of the day this is more important than the choice of instrument itself.

The German energy transition also has consequences for the energy economies of our neighbours and is something that cannot be viewed in isolation. Decisions as to a new market design must be taken in the context of the European single market.

While a whole range of future measures are now under discussion that could make our electricity grid more intelligent and flexible (the 'smart grid' system), what we need are solutions for controlling critical grid conditions. From a current perspective this can only be achieved cost effectively and using the available technology by employing flexible and conventional power stations and electricity storage facilities. Clearly there are those – from Greenpeace to the Federal Environment Agency – who will go on insisting that coal-fired power stations are not suitable for delivering ancillary services. But the reality reveals a very different picture. The load cycling rates of modern combined-cycle power plant are only marginally higher than those of coal-fired installations. However, coal-fired power stations can make up for this by their much greater ability to power-down to partial load operation than is the case with combined-cycle installations.

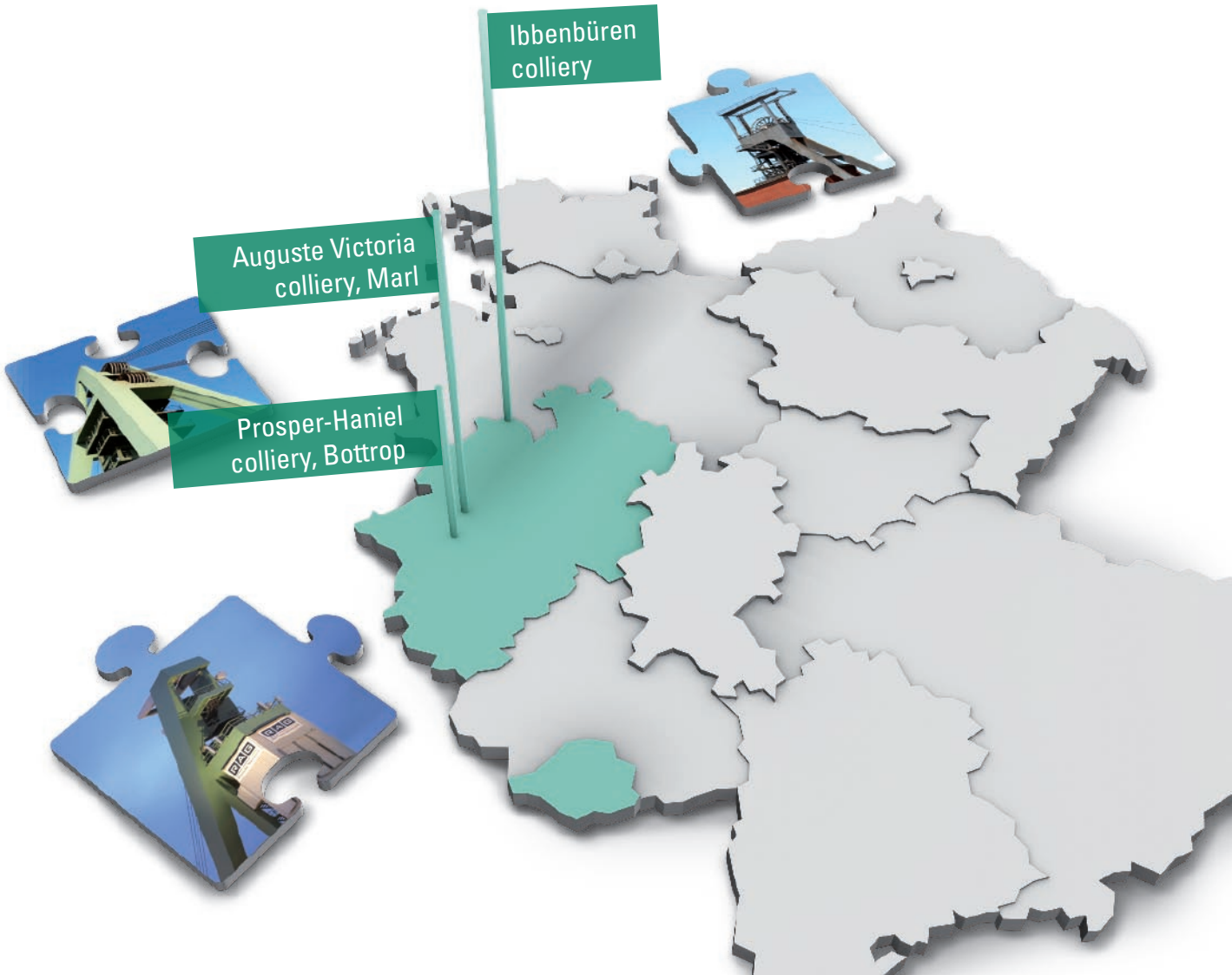
A number of studies funded by various environmental organisations have in fact suggested that gas turbines are an effective flexibility option. While such plant are indeed extremely flexible, they have a much lower efficiency rating than either combined-cycle or coal-fired installations. Coal burning stations can therefore make a cost-effective contribution when it comes to safeguarding electricity production based on renewable energy sources. We simply need to pursue an ideology-free path that tolerates the coexistence of coal and renewables. And finally, coal-based cogeneration is not just a particularly efficient form of energy usage but can also provide a very useful flexibility option.

The decision to phase out the German coal industry means that home-produced coal will only have a limited contribution to make by the end of 2018. Imported fuel is already taking over at an increasing rate and will ultimately replace it completely. Now that the Saar coalfield has ceased production – see the in-depth guest contribution in the 2012 Annual Report – this year's publication covers the closure of West colliery and the cessation of all coal mining operations in the Lower Rhine area. The adaptation process is now fully on track, and this includes the socially acceptable downsizing of the workforce. The collective labour agreement that has been concluded for this purpose has proved to be a most viable instrument.

The end of German coal mining operations also opens up new perspectives. As well as biomass projects and the construction of wind turbines on former mining land, and in particular on wind-intensive spoil tips, there are other unique technical possibilities to consider – such as underground pumped-storage plants. The latter option is now being actively promoted and developed with the support of scientists from the Ruhr area. We want to play our part in the energy transition and are counting on an appropriate framework for this.

Chapter 1

Status assessment



Macroeconomic situation

After a period of weak economic growth in Germany of only 0.7 % in real terms in 2012, and stagnation in the early months of 2013, the rate of growth for 2013 as a whole is also expected to be low. Nevertheless it is still growth, while large parts of the euro area remain in depression with unemployment standing at record levels. Some predictions for 2014 point to a tangible economic recovery, as long as the crisis in the euro zone does not further worsen and the global economy picks up speed again. The political decisions that have already been taken, or will be instigated, following the Bundestag elections of 22 September are set to be of enormous overall economic significance for Germany and indeed for the EU as a whole.

The new German Government has some important tasks to face. There is significant need for reform, particularly in the energy sector, which continues to be marked by the energy transformation process. There is one point of particular interest in this respect: the subdued economic growth of recent months has not only resulted in a reduction in the already low inflation rate but has also temporarily depressed energy market prices, which had undergone a sharp increase in recent years. What has not decreased, but in fact has risen considerably in the meantime, is the level of tax burden imposed by the state on energy prices. In 2013 the state tax component in each electricity bill went over the 50 % mark for the first time. Much of this can be attributed to the sharp rise in the EEG levy for financing the in-feed of renewables-based energy, now amounting to more than 20 bn €, which is exclusively funded by electricity consumers. This has led to an intense debate on a possible 'electricity price brake' in the EEG, though no agreement could be reached on this before the Bundestag elections.

Electricity and energy prices, and in particular the state burden imposed in this specific sector, are not just of general interest to consumers but are also an important location factor for German industry. This applies not only to the energy-intensive industries, which includes coal mining, but indeed to the manufacturing sector as a whole because of the supply chains and the connections between them. A survey conducted by the Cologne-based Institute for Economic Research (IW) in early 2013 found that nine out of ten industrial companies in Germany are not only concerned about rising energy costs but also consider this to have a detrimental impact on business location. Germany has been an industrial nation for many years and if it is to remain so, and it must, then energy costs must be made affordable. Industry and industry-related services form the productive backbone of the German economic system, they are the driving force for our social market economy. And in Germany industry's contribution to gross value added has been increasing, contrary to the international growth trend for the services sector, which includes trade, finance, IT services and so on. Having a stable industrial sector as a basis for an efficient 'real economy' is one of the reasons why Germany has come through the financial and economic crises of recent years better than many other countries, and not just in Europe. Many former industrial nations – and the USA in particular – are now seeking to 're-industrialise' their national economies. Even the economic rise of China and other emerging nations cannot be explained without reference to their sustained and strong industrial development. And here it is important for the industries concerned to have access to cheap and reliable supplies of energy and raw materials – including coal.

Key energy data

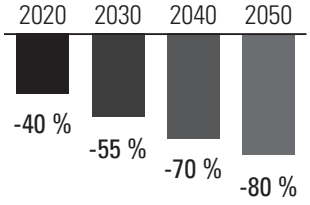
Since the adoption of the National Energy Plan in 2010 and the energy policy decisions taken following the events at Fukushima in 2011 developments in the German energy sector have been shaped by the political objectives of the energy transformation programme. These include not only the phased withdrawal from nuclear energy by 2022 but also the medium and long-term milestones for reducing both greenhouse gas emissions and energy and electricity consumption levels, combined with an expansion of renewables-based input. All this will require a radical restructuring of the energy supply system.

In spite of the political decisions on the transition process we have only seen a gradual change in the basic structures of the energy industry – this being influenced by many different factors that are beyond the reach of the policy framework. While 2012 witnessed an impressive 8 % expansion in German renewable-energy development, primary energy consumption (PEC) and CO_2 emission levels for the same year did not fall but in fact underwent a slight increase. Economic energy productivity in 2012 also remained fairly static, after having risen dramatically the year before. PEC in 2012 amounted to 466 mt ce, a slight increase of 1 % over the previous year.

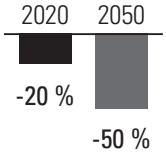
The German Energy Plan: targets and timeframes

reduction by…

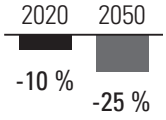
GHG emissions compared to 1990



primary energy consumption compared to 2008

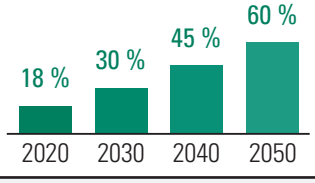


electricity consumption compared to 2008

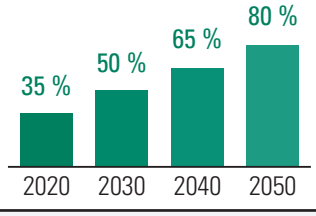


increase in…

renewables' share of gross final energy consumption



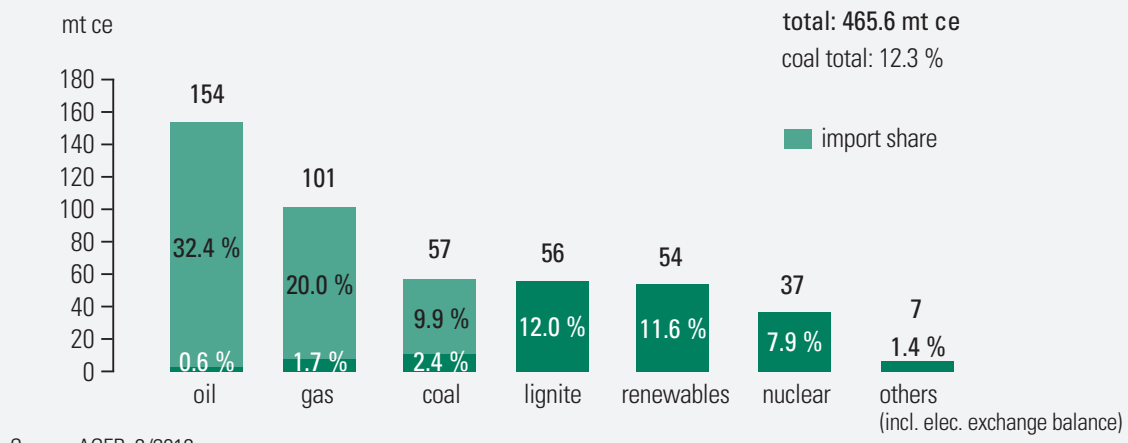
renewables' share of gross electricity consumption



One fundamental reason for this was the cooler temperatures and the increased heat requirement, which led to a rise in the consumption of fuel oil and gas. Initial estimates for 2012 point to an even greater increase in energy-related CO_2 emissions of 1.9 %, the reason being that a larger volume of cheap lignite and coal was being used than in 2011 in order to support the nuclear phase-out programme. Nevertheless, CO_2 emissions were in fact reduced by 22 % from 1990 to 2012, while the corresponding figure for all greenhouse gases was even higher at 27 %, with the result that Germany easily exceeded its international climate change obligations under the terms of the Kyoto Agreement. Oil continued to dominate the German economy's energy mix and made up some 33 % of PEC. It was followed by solid fuel at 24 % – with coal and lignite each providing 12 % – and then gas at 22 %. As a result, almost 80 % of PEC in 2012 was provided by fossil energy sources. Renewables' share of the primary energy market has hitherto remained at about 12 %. The long-term objective of the energy transformation programme, which is to make renewables the central pillar of our energy supply system, is therefore still a long way off.

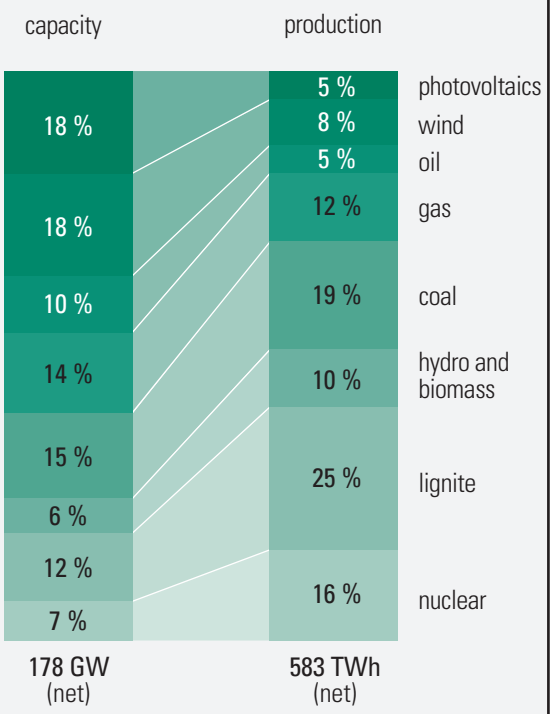
However, renewables are now making a much larger contribution to the electricity production sector. In 2012 their share of this market was around 22 %, consolidat-

Primary energy consumption in Germany 2012



Source: AGEB, 3/2013

Power station capacity and electricity generation in Germany 2012



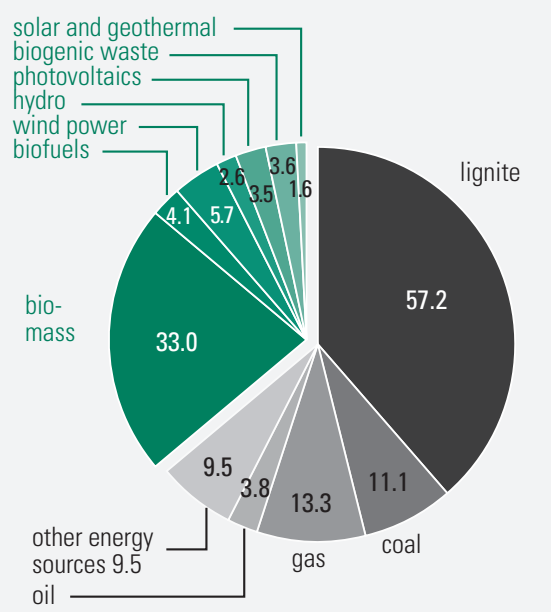
Source: BDEW, 2013

ing the number two spot after solid fuel at 45 % (lignite 26 % and coal 19 %) and well ahead of nuclear power (16 %), gas (11 %) and all other sources such as mine gas and non-renewable waste. If lignite and coal are considered separately it is likely that by 2013 or 2014 at the latest renewables will take over the top spot in the power generation market. In terms of share of power generation capacity renewables in fact achieved a figure of over 40 % in 2012. The huge discrepancy between capacities and actual renewables-based production is impressive proof of the fluctuating nature of electricity produced from renewable sources. A lack of storage facilities and an inadequate grid infrastructure mean that only a small part of this output can still be considered as secure. The energy transition will therefore have to rely on conventional balancing and reserve capacity, and this will include coal-fired power plant, for some time to come.

In 2012 the overall contribution made by renewable energy sources to German primary energy production was 36 % of the total, just slightly behind lignite (38 %) and well ahead of German-mined coal, home-produced oil and gas and all other domestic energy sources. Here too renewables are expected to take over the number one spot in 2013 or at the latest by 2014. It needs to be borne in mind that despite the growth in quasi-domestic renewables practically 70 % of PEC in 2012 still had to be met by energy imports, which resulted in purchase costs of nearly 100 bn €. More than one fifth of all energy imports come from Russia, which is now Germany's main supplier not just of gas but also of oil and coal.

Primary energy production in Germany 2012

2012 total: 149 mt ce (32 % of PEC)



renewables:
36 % of indigenous primary energy production

Source: AGEB, 3/2013

This high level of import dependence is set to continue in the years ahead and will remain a key factor in Germany's energy policy. For in addition to the phasing-out of nuclear power by 2022 and the closure of the German coal industry at the end of 2018 the nation's conventional oil and gas resources are set to run out sometime around 2025. And there are also political forces that wish to see Germany pull out of lignite production too. Whatever the case, by the next decade our entire coal, oil and gas requirements will have to be met by imports. Even if energy consumption is successfully reduced and the planned expansion of the renewables sector proceeds on schedule, and there is a sustained improvement in the cost disadvantage of this source of supply, renewable energies will only partly be able to compensate for this situation, especially as some renewables – such as biomass and biofuel – may well have to be imported in the future.

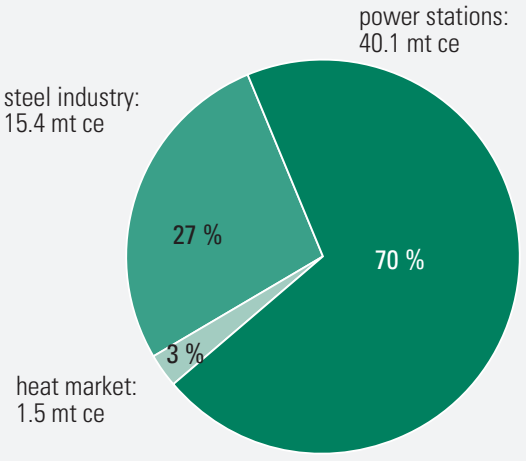
The German coal market and the position of the German coal industry

After undergoing some contraction in previous years the German coal market has once more enjoyed a degree of growth in 2012, and presumably will in 2013 too. Admittedly this does not apply, or at least not completely, to the consumption of coking coal and coke by the steel industry, where production fell by over 4 % in 2012 due to the economic downturn. In the heat market, where anthracite only plays a niche role for special commercial applications, the remainder going to the household fuel market, the volume of coal sold has remained at a low level. However, in the power generating sector – including cogeneration – which accounts for about 70 % of German coal consumption, steam coal usage has been on the increase since 2012 as in view of the favourable fuel prices and low CO_2 charges this particular fuel has recently been providing clear cost benefits when compared with gas. A major reason for this has been the fact that US coal, which on the home front has lost share to unconventional gas, has been seeking a sales outlet in the European market and has depressed the prices in this sector. It remains to be seen whether the backloading of CO_2 emission allowances being promoted at European level, namely the one-off temporary ration-

Consumption structure of the German coal market 2012

total coal sales 2012: 57.0 mt ce

of which from indigenous production:
11.4 mt ce = 20 %

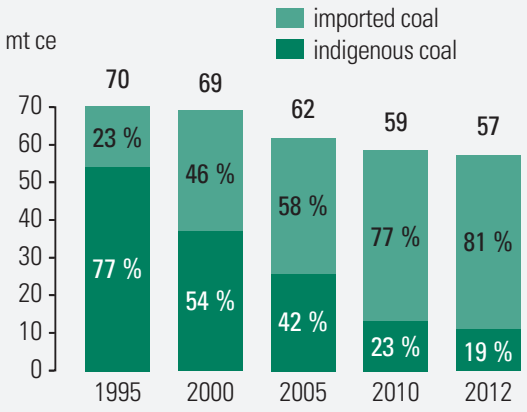


ing and subsequent recirculation of emission allowances in order to achieve price stabilisation, will have any significant impact on the price differential between coal and gas.

Coal imports from the USA to Germany in 2012 are therefore featuring prominently again alongside supplies from Russia, the CIS countries and Colombia. Australia, the world's largest exporter, only supplied a relatively small tonnage, this being made up almost exclusively of coking coal. An even smaller proportion was imported from other EU countries, mainly Poland. Overall, coal imports now account for more than four fifths of the total market. In 2012 only 19 % of the coal supplied came from the domestic mining industry and this figure will be even lower in 2013.

Even if coal imports take an increasing share of the market as domestic production declines, their long-term prospects on the German coal market are set to decline. This is because the energy transformation process will probably see a continued contraction of this sector as coal-based power generation is further driven back by the ongoing expansion of electricity input from renewable sources, and possible from gas-fired installations too. This has already emerged from the energy scenarios that were used as a basis for the Federal Government's 2010/2011 Energy Plan.

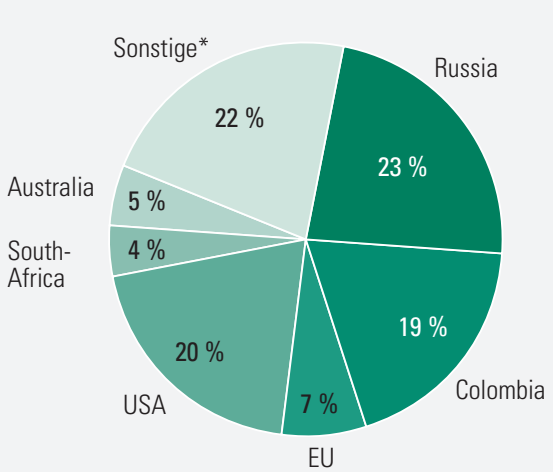
German coal market: consumption of indigenous and imported coal



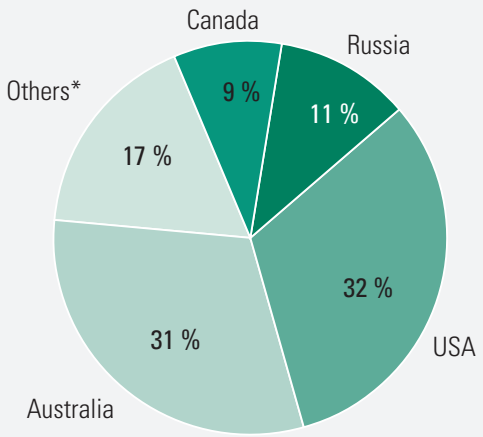
The extent to which power generation will in fact involve a fuel switch from coal to gas will depend, in purely economic terms, on the ongoing development of the price and cost ratios. German gas prices will have to fall considerably and/or the CO_2 price will have to increase significantly,

Sources of supply for German coal imports 2012

steam coal
total 34.7 mt ce

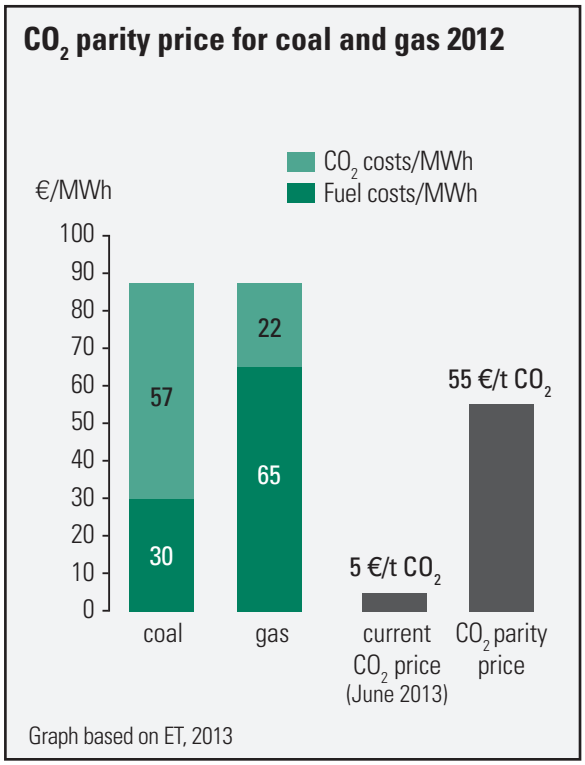


coking coal
total: 9.3 mt ce



* incl. non-assignable quantities from the named countries

Source: Coal Industry Statistics / GVSt



compared to what they are at present, if such a fuel switch is to be worthwhile. There is also a possibility that it would be forced in by regulatory requirements.

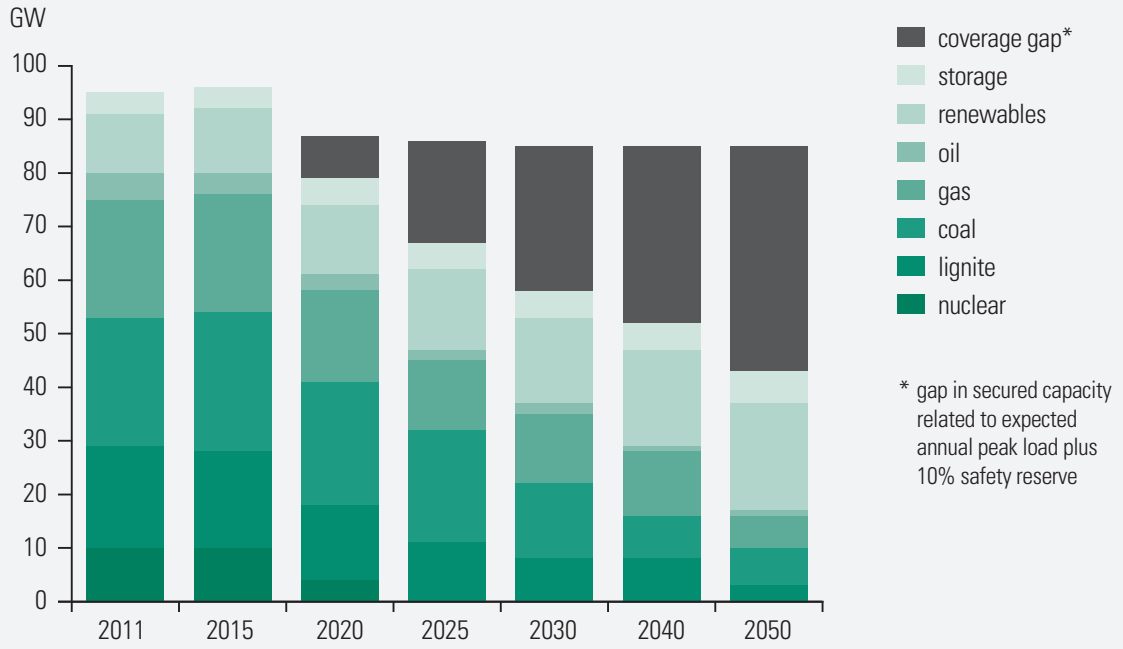
The current power-station scenarios that have been drawn up for the 2014 Grid Development Plan (NEP 2014) of the transmission system operators, and confirmed by the Federal Network Agency, anticipate that coal-fired capacities will remain stable in the short term and then will fall away significantly by the decade after next at the latest. By 2034 production from this sector is expected to be reduced to 70 % of the current capacity level. The lead scenario of NEP 2014 is in accord with the existing planning arrangements of the electricity generators in assuming that no new coal-fired power stations will be built over the next few years.

Similar estimations were also provided by the study that was published in November 2012 by the Prognos Institute, Basel/Berlin, entitled 'The importance of thermal power stations for the energy transition'. Prognos was also involved in drawing up the Federal Government's energy scenarios and their study indicates that the energy transformation process can only be undertaken with the support of coal and gas-fired power stations. Prognos has calculated the secured capacity from thermal power plant that will be required for the period to 2050. This capacity, which amounted to 72 GW in 2010, must not be reduced by more than 20 % by 2020, and by more than about 40 % by the year 2050, if power supply security is to be maintained on the generation side. This all takes into consideration well-founded estimates as to the guaranteed performance capacity of renewables, indigenous storage facilities, the load management on the demand side, the cross-border interconnectors and electricity import levels, and a contingency reserve of 10 % of the annual peak load. Without the construction of new thermal generating capacity Prognos points to the likely risk of an electricity supply gap by 2020 that could widen further in the years ahead.

According to Prognos, sufficient thermal capacity will be needed not just to offset the gap in supplies but also to provide balancing power and other technical system services. Economic reasons would suggest that for most of the thermal generating capacity a retrofit strategy would make more sense than a new-build programme, in other words existing power stations – and that would mainly mean coal-fired installations – would be overhauled and their operating life extended. There are no technical reasons preventing this, even though the Federal Environment Agency (UBA) in Dessau has claimed otherwise this year. Modernised lignite and coal-fired power stations can now be controlled with such flexibility that they can provide a low minimum load and high load cycling rates. According to Essen-based RWE AG coal-fired power stations, for example, can now be controlled down to a much lower minimum load point (20 to 25 %) than gas fired installations (60 %), while their average load cycling rate is almost as high at 3 % of nominal load per minute.

However, the economic incentives for the operation of coal-fired stations, or even the addition of new-build capacity, are growing progressively weaker under current market conditions. If the feed-in priority is maintained, the expansion of the renewables sector will inevitably lead to relatively low market prices for electricity, especially in the mid and peak load regimes, and at the same time will result in a lower capacity utilisation of existing coal-fired installations. It cannot be ruled out that they too will be affected by 'power station dieback', now of growing concern in Germany, unless targeted energy-policy countermeasures are put in place. The 'Winter Laws' that were adopted in order to maintain reserve capacity for

Guaranteed power station capacity and coverage gap to 2050

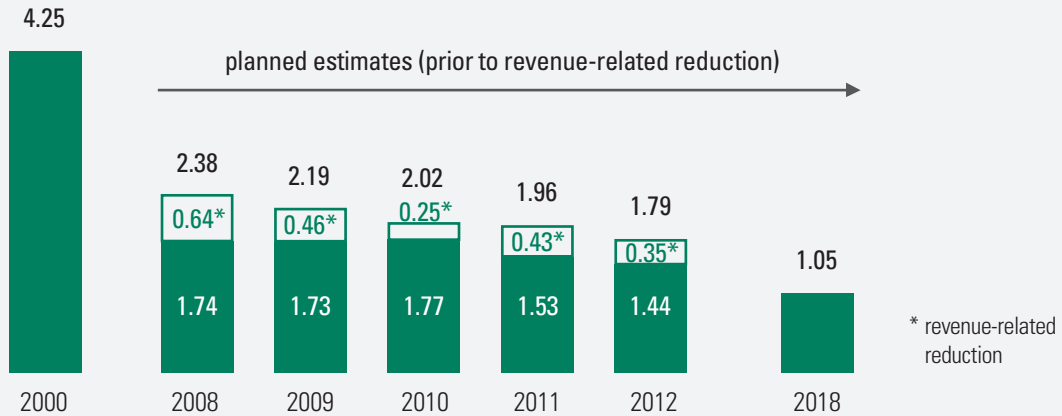


Source: Prognos, 2012

State aid for the German coal industry

(aid for disposals and closures)

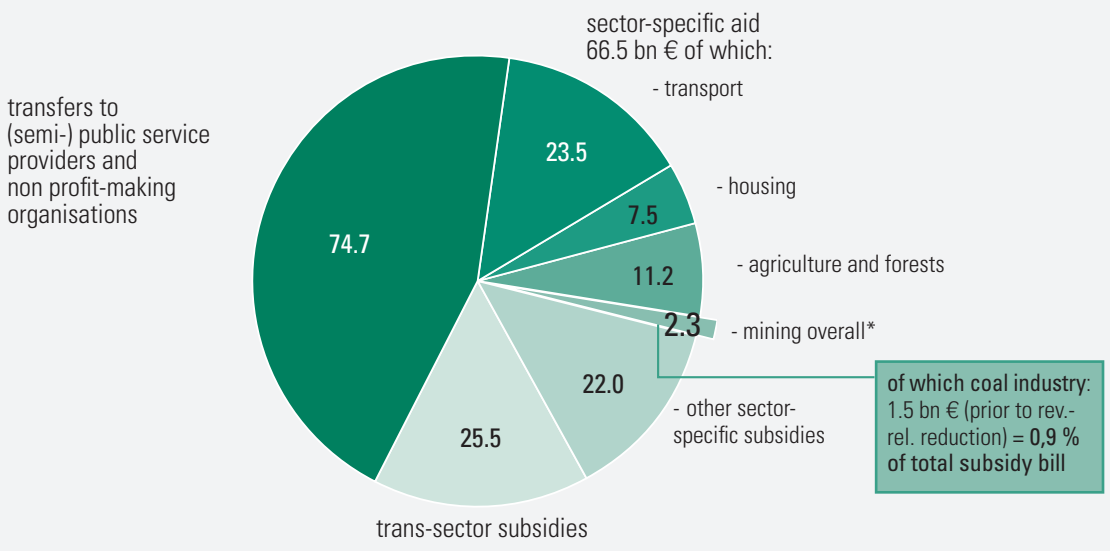
bn €



Until 2008 as in the 2003 coal-policy agreement (not considering deferred payments);
as from 2009 planned estimates according to 2007 framework agreement; from 2019 no state aid.

Subsidy payouts in Germany 2011

total subsidies paid in 2011 – financial aid and tax relief (excl. EEG differential costs): **166.7 bn €**



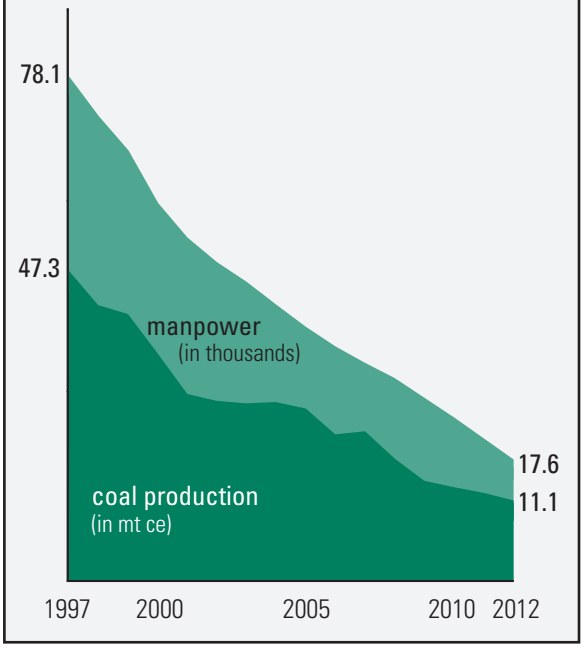
* incl. aid to Wismut and LMBV

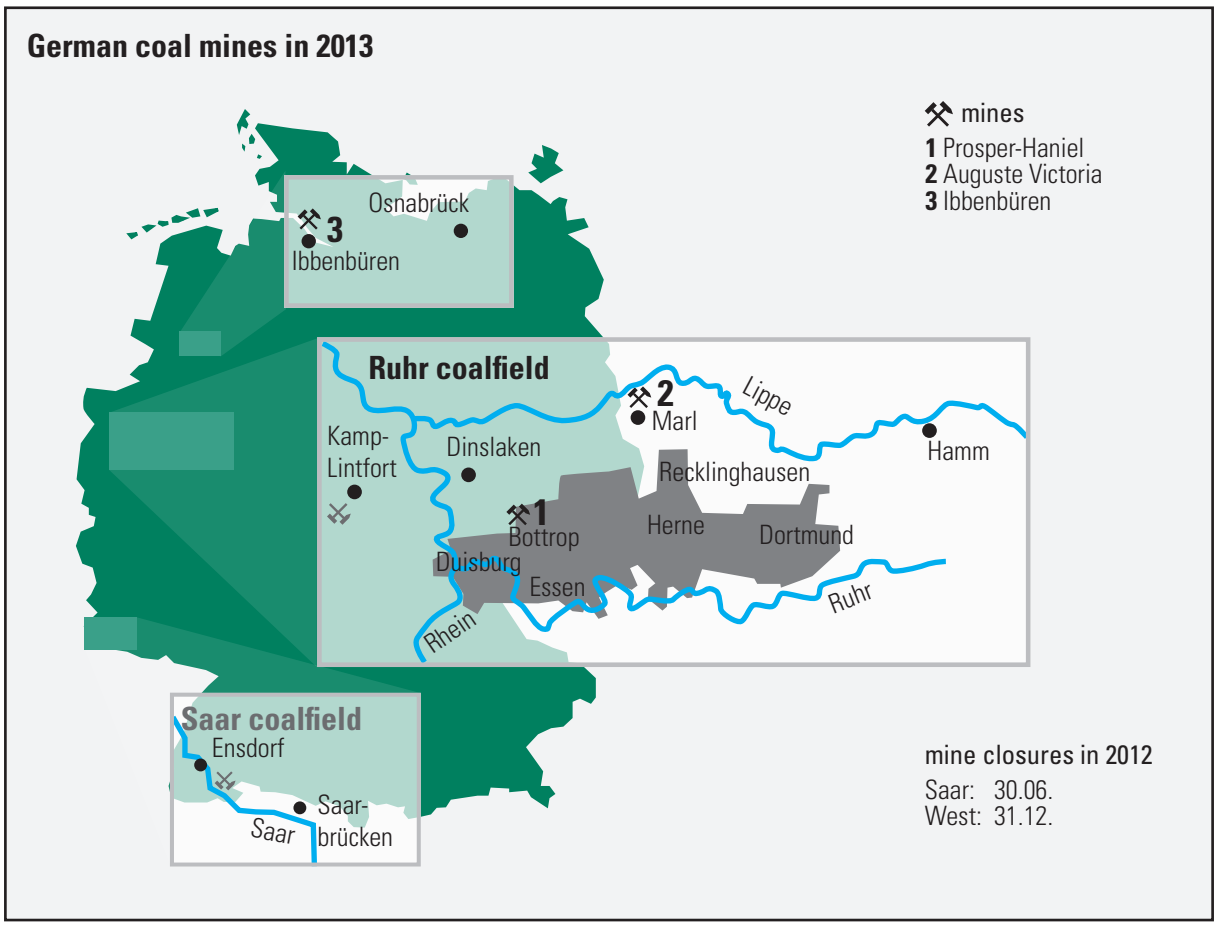
Source: IfW, 3/2013

the energy transition, and the new Reserve Power Station Regulation, have been designed as emergency measures for a transitional period and provide no real prospects for the long term.

One thing is certain: after 2018 the remaining coal demand will have to be met exclusively by imported fuel. Home produced coal will no longer be available. The coal policy agreements of 2007, the 2010 European Council Decision on state aid to facilitate the closure of uncompetitive coal mines and the 2011 deletion of the review clause from the Coal Industry Financing Act have all determined that subsidised coal mining will cease at the end of 2018. Until that deadline is reached production capacities will be scaled down in an orderly manner and the workforce will be reduced in size under socially acceptable conditions. The capped public financial support comprises aid for the disposal of indigenous coal – which now only accounts for about half of the total funding – and aid for meeting the cost of colliery closures and the inherited liabilities of the former coal mining industry. This financial support is being gradually reduced and by 2012 was already well below half its 2000 level. For a number of years now state aid to the coal industry has made up less than 1 % of Germany's total subsidy bill of 167 bn € (2011 data, without the EEG

Adaptation in the German coal industry





differential costs), as shown by the latest survey by the Kiel Institute for World Economics.

The adjustment process under way in the German coal industry has meant that Germany now only has three operational coal mines. Saar colliery closed in mid-2012, bringing the Saar coalfield's long history of mining to an end, while West colliery also ceased production at the end of the same year, thereby spelling the end of coal production in the Lower Rhine region (see this year's guest contribution, page 36). The remaining production is now concentrated in the Ruhr coalfield at Prosper-Haniel colliery in Bottrop, Auguste Victoria colliery in Marl and Ibbenbüren mine in the Münsterland area.

If the adjustment process with its fixed financial and cost framework is to be managed in an orderly and socially acceptable way in the run-up to 2018 the proven planning security that the government has provided until now must be retained and not nullified for example by unpredictable increases in electricity costs or by interfering with the existing mining legislation. This has to be taken into consideration in the current discussions on the reform of mining law, which also affects the coal industry (see section 'Is mining legislation in need of reform?', page 20).

Is mining legislation in need of reform?

The mining legislation that has been laid down in Germany has always been of fundamental importance for the exploration and extraction of energy raw materials. This also continues to apply to the deep mining of coal. Current mining law takes into consideration the impact that mining can have on the environment, on the workforce and on the local population, but also takes account of the fact that the extraction of location-bound deposits, such as indigenous coal, contributes to the economy (natural resources) and helps secure energy and raw material supplies.

If mining law sometimes appears 'outdated' to the layman this is mainly due to the fact that it has been developed from a long legal tradition and as a result has had to take account of historic case-law. And yet German mining legislation has shown itself to be effective in its present form. As far as Germany as an industrial nation is concerned it meets all the current requirements as a modern and environmentally compatible body of laws. And for the future too it ensures a fair balance between the interests of the mine operators and those of the local communities. Nevertheless, we are now hearing over and over again calls for a fundamental revision of our national mining laws, often with the aim of delaying, or even prohibiting, any further extraction of fossil-based resources in Germany. These demands are being made in a wide variety of contexts and at various levels.

One connecting factor here has been the greater penetration of environment protection principles into the current body of mining law. A number of proposed amendments to mining legislation have already been tabled in the German Bundestag and a draft bill was also presented on the harmonisation of production royalties. However, these proposals were rejected by a broad majority in early 2013, following a resolution recommendation by the Economic and Technical Committee, as being too far-reaching and too unbalanced.

Hydraulic fracturing, or fracking, has created another reference point for those calling for a change in the mining law and some consideration was given to the introduction of an obligatory environmental impact assessment (EIA) for fracking projects at statutory decree level by amending the existing EIA Mining Regulation. These attempts were abandoned in early June 2013 in view of the forthcoming autumn elections and also because of cross-party resistance from a number of federal states. One environmental organisation also filed a constitutional complaint in respect of a lignite mining project claiming that the rules governing the assignment of land for mining purposes constituted an infringement of fundamental rights to property under Article 41(1) of German Basic Law. At an oral hearing in early June 2013 the Federal Constitutional Court consequently debated a point of law concerning the constitutionality of § 77 and § 79 of the Federal Mining Law, including reference to the assignment of land for mining purposes.

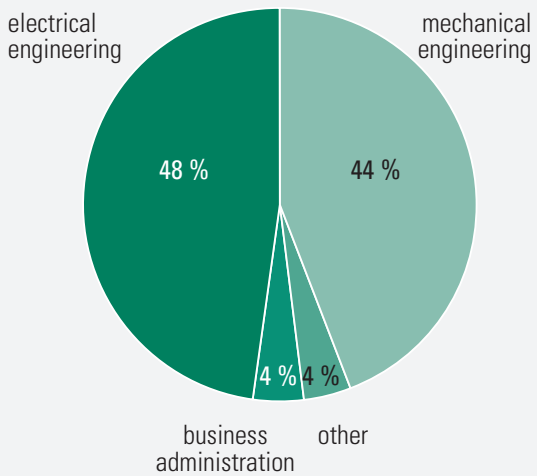
In spite of the various initiatives on amending current mining legislation it can be seen that until now Federal Governments and a large majority in the Bundestag and Bundesrat have taken the view that the interests of the environment and of those affected by the extraction of natural resources are adequately protected by mining law as it stands at present. The Federal Mining Law does not require any greater integration of environmental aspects or strengthening of the rights of those affected by mining, as the unavoidable impact of such operations is neither limitless nor uncompensated. This means that materially all environmental protection laws also apply to the mining industry by way of § 48 (2) of the Federal Mining Law. The provisions of the current Federal Mining Law are founded on the inherent rules of the mining industry and have proved their worth over many decades. The Law applies strict approval requirements to ensure that mining does not cause excessive damage and that overriding public interests do not conflict with mining projects. What this essentially means is that mining law as it is at present is in no need of radical reform.

Corporate developments and challenges at RAG

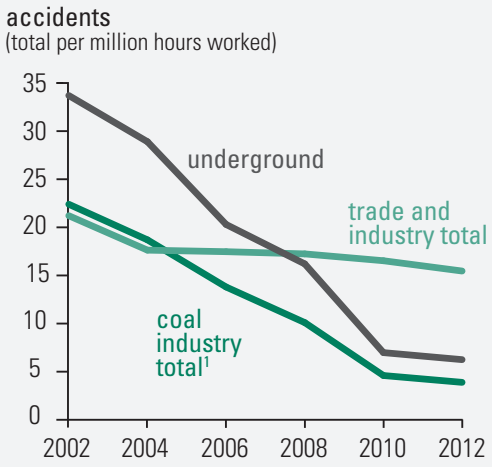
The scenario as described above presents the RAG Group, which is responsible for the German coal mining industry, with a set of challenges that are exceptional, and in many respects unique, for any company. The production and capacity of the core business are to be reduced to zero, while security of coal supply and accident safety levels have to be maintained right up to the very last day. Turnover and funding are steadily decreasing, while at the same time costs have to be kept stable. Huge staff cutbacks are required, and yet this must still be managed in a socially acceptable way, which also means no compulsory redundancy for mineworkers who are not entitled to transition payments. We are now seeing the successful outcome of the collective labour agreement that was concluded last year in order to establish socially acceptable personnel measures for the final closure of the German mining industry. During the period from the introduction of the agreement on 1 April 2012 to the 30 August 2013 the number of staff members who have no prospects of employment within the company in the post-mining era fell by 753 to a figure of 888. The instruments of the collective labour agreement have therefore proved to be both helpful and acceptable, even if media reports about individual complaints have tried to detract from the overall picture.

Vocational training in the coal industry 2013

trainees total: 728



Accident trends



[1] only corporate units under mining-authority supervision

Source: German statutory accident insurance / RAG AG

These challenges call for a huge measure of flexibility and creativity on the part of the workforce and draw on the wealth of experience that the coal industry has built up all through the adjustment and restructuring process – expertise that has also attracted a lot of attention internationally. After 2018 RAG Aktiengesellschaft (RAG) will continue to be responsible for the consequences of its coal mining activities, which means dealing with inherited liabilities (site remediation, securing disused mine shafts and shallow mine workings, processing surface subsidence claims and managing pensions and social security obligations) and the operational remit associated with long-term tasks (mine water management, groundwater purification and polder operations). In addition, RAG will join the RAG Foundation in assuming responsibility for the preservation of the historical and cultural heritage of the coal mining industries of North Rhine-Westphalia and Saarland. To achieve all this the company will have to sustain a permanent mining-based business sector devoted to post-mining activities.

RAG is also expected to play an active and future-oriented role in driving structural change in the coalfield regions. This can only usefully be achieved with established company potential by finding, for example, new ways of employing coal-industry know-how and infrastructure and by using the affiliate interests that RAG has set up outside

its domestic mining operations to develop promising new business areas. RAG Mining Solutions GmbH is now marketing field-tested German mining equipment all over the world and is developing into an internationally recognised consulting company thanks to outstanding engineering expertise based on the challenging operating conditions of the German deep-mined coal industry. When domestic coal production comes to an end the future of the sales affiliate RAG Verkauf GmbH will depend entirely on trading in imported coal and raw materials and on providing logistics services. And RAG Montan Immobilien GmbH, which for more than 30 years has been successfully engaged in preparing and developing former mining land, is now increasingly involved in using old mining infrastructure for the development of renewable-energy sites.

This latter activity is of growing interest for RAG, as it means that the company can continue to make a core contribution to the energy transformation process and can develop this further in the years ahead. Wind turbines on former spoil-tip sites and the creation of solar energy, biomass and geothermal energy systems at other disused mining facilities offer excellent prospects for expanding the renewables sector and opening up new areas of business. Another avenue that may, in certain circumstances, offer potential for the future is the combined use of technologies for storing energy using pumped-storage power plants. RAG is working with a team of scientists on a joint feasibility study that will investigate the technical and economic criteria of such technology and there have already been small-scale trials above ground, namely the Sundern project at Hamm and the Luisenthal project at Völklingen – which still await investment-ready partners – as well as larger-scale underground tests using shafts and chambers over 1,000 metres deep. In this way the industrial achievements of the 'old days' are being used to create a bridge to the future and coal could in this respect prove to be a constructive partner for the energy transition – not just on the usage side but on the production side too.

The energy transition – problems and requirements from an industry perspective

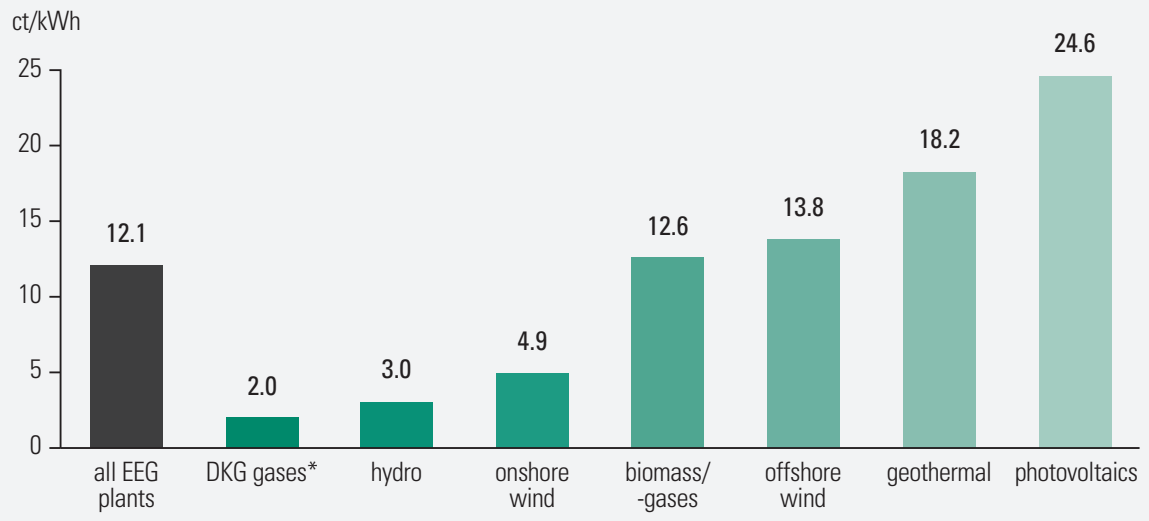
In December 2013 the Federal Government is to present the second monitoring report 'Energy for the future', which will determine the status and/or progress of the national energy transformation process and also assess the situation from the perspective of the energy-policy triad of competitiveness, security of supply and environmental sustainability. It is clear that like its predecessor, this second report can only provide indicators, rather than any clear-cut findings, as to whether the 'generation project energy transition' (Federal Environment Minister Peter Altmaier) is on course or whether a slight adjustment, or even a complete change of direction, is required. The first monitoring report of this kind was submitted in December 2012 and was presented as an 'opening balance sheet for the energy transformation process'. As well as describing the many new energy-policy measures initiated since the adoption of the Energy Plan - from the amendment of the Atomic Energy Act and the revision of the Energy Industry Act (EnWG) to the Energy Saving Ordinance and various new actions aimed at expanding the power grid - the report covers a total of 49 indicators from ten different topic areas.

The independent expert commission that was set up to support the monitoring process used the first report as an opportunity to condemn a whole series of basic shortcomings in the energy transition policy. They criticised the inadequate degree of coordination with European energy policy, various inconsistencies and conflicts in the target system, the excessive emphasis that the transition process places on the restructuring of electricity generation and the absence of an adequate energy efficiency strategy, especially in the heating and transport sectors. They also found fault with the fact that environmental dimensions other than greenhouse gas emissions – such as land use – had been disregarded and that too little consideration had been given to aspects such as security of supply, for there are no indicators either for guaranteed production from electricity generating capacity or for the degree of diversification in energy imports.

A fierce public debate has also broken out on the cost and price impact of the transition. In March 2013, as part of the 'German industry energy competence initiative', the Federation of German Industries in Berlin called for immediate measures to limit costs and moreover recommended a number of structural measures to bring the energy transformation process 'back on track'. This included better coordination of the processes, greater European involvement, a gradual adjustment in the design of the electricity market, the intelligent development of the grid system, the economic improvement of energy efficiency and the targeted promotion of research and development in areas such as storage technology. In this context projects to build underground pumped-storage power plants at disused collieries, thereby allowing their infrastructure to be put to new use, were also given a favourable response.

Expected support for EEG electricity generation by energy source 2013

average differential costs per kWh generated to be paid by consumers in the EEG system
(payments minus avoided network tariffs and marketing revenue)



DKG = landfill, sewage and mine gases

Source: Data from BDEW 2013

The policy makers have conceded that there is a huge need for action to deliver the energy transformation process and have accepted that this has for the most part been appropriately addressed by the industry sector. In early 2013 energy talks between the federal and state governments reached an agreement that following the Bundestag elections efforts would be made to undertake 'a radical reform of all energy-relevant regulations'. This would apply particularly to the promotion of renewable energies, the development of a new and sustainable design for the electricity market, the extension of transmission grids and storage systems, greater energy efficiency and the arrangements in place for CO_2 emission trading. As far as any further development is concerned it is clear, however, that any decision-making in this area is not a national matter but can only be done at European level. And there are other climate protection instruments too that can only be put in place effectively by international agreement rather than by unilateral national action.

Any future electricity market design also has to take account of European framework conditions and/or convergence with the single European energy market that is to be completed by 2014. However the member states are being left with significant scope for manoeuvre, and in Germany this is to be used for the energy transformation process.

For reasons of supply security there is in any case a need at the generation stage to ensure that in future as well as actual deliveries of electrical power (the 'energy only' market) there is also recompense for services that provide conventional balancing and reserve capacity (power or capacity market). To ensure enough guaranteed power for the future effective incentives need to be provided to maintain and build an adequate number of modern thermal power stations and storage facilities. Achieving security of energy supply by way of strategic balancing and reserve capacity of this kind must become a worthwhile economic commodity, while at the same time there needs to be appropriate balancing-group responsibility that also takes proper regard of transaction costs and consumption fluctuations. A number of potential models are currently under discussion (see section 'Market design for an adequate provision of generating capacity and financing solutions for renewable-energy sources', page 24 ff.). The necessary decisions will have to be taken in this area during the next parliamentary term.

However, before any definite decision is taken on the future electricity market for conventional generating capacity we also have to be clear about how the renewables sector is to be developed in the years ahead. The current Renewable Energy Sources Act (EEG), whose success in terms of introducing renewables onto the market is generally recognised, needs to be radically reformed as far as costs, competition and financing are concerned. This must start at both the price and volume side and naturally must find acceptable answers to the financing question. From the viewpoint of much of industry, and given the specific experience of the coal industry following the 1996 abolition of the old 'coal penny' subsidy, there are sound economic reasons to support a transition from the existing system of fixed feed-in tariffs and the EEG levy and towards a 'market premium'. In other words, renewables-based electricity should be sold at the market price and under the responsibility of the plant operators with direct state subsidisation of the cost overrun. The market premium can be made technology specific, but should give priority to the more cost-effective renewable-energy sources and should be applied for a limited period only and on a degressive scale so as to drive market integration forward. At the same time, feed-in priority on the volume side would then have to be allocated in favour of need and competition based purchases. As was the case with indigenous coal after the abolition of the 'coal penny', capped public funds – whose amount would be decided according to current political and social priorities – would have to be considered for the financing of a market premium.

Market design for an adequate provision of generating capacity and financing solutions for renewable-energy sources

The introduction of capacity markets and mechanisms is currently being discussed with a view to remedying the foreseeable lack of guaranteed power generating output. Reference is often made here to the sharp increase in fluctuating power-plant capacity based on renewable energy sources. And in fact the renewables sector has not resolved this problem but has only intensified it. Basically the problem is that since the deregulation of the electricity markets there has essentially been nothing but an 'energy only' market in which the sale of electrical work alone (kWh) is rewarded. Security of supply is a public asset; you cannot put a price on it. The only factor of real relevance in such a market at any time in the pricing process has to be the short-term variable costs of the last market supplier (marginal costs). These will determine whether the other suppliers can cover their capital costs. At the moment this is difficult to well-nigh impossible for conventional power stations, depending on plant design and the type of fuel used (the 'missing money' problem).

The high priority accorded to in-feed from the renewables sector has suppressed conventional power plant operations and the number of full-load hours has fallen. Moreover, photovoltaic generation has for the most part eliminated daily peaks in Germany and in addition makes it increasingly difficult for power stations to cover their capital costs. A lower level of capacity utilisation, which would mean even tighter profit margins, will threaten the continued existence of conventional power generating installations - and also the contribution they make to energy supply security.

Without market integration of renewables the introduction of a performance obligation for a secure supply will obviously provide additional, though insufficient, financial incentives for the construction of new power stations. Such an obligation is needed in any case for regulatory reasons and provides the basis for proposals that have as their objective the market integration of renewable energies.

The Economic Council's market integration model, which has still to be published, is not intended to bring about abrupt changes to the electricity market but rather to develop the renewables sector by way of gradual market and system integration. Market price signals are to be used to achieve the expansion of renewables-based electricity generating capacity in balance with the production capacities of reserve power stations and electricity storage facilities. The power supply companies, or 'balancing-group operators', are to be responsible for this.

In April 2012 the Institute for Economic Research (EWI) at the University of Cologne proposed 'security of supply contracts' that were presented as a market-compliant alternative to state regulated 'strategic reserves'. With this concept the total required level of secure power supply is determined and then procured by auction within a certain lead time. The auction price determines the payments made for production capacity. These would be funded by a levy on electricity consumers. As the power stations would be marketing their own output there would be no intervention into the optimum power-station allocation. This arrangement could also be linked to an option system to prevent price fluctuations and the abuse of market power.

Under the auspices of the German Association of Energy and Water Industries (BDEW), Berlin, the 'export dialogue on a strategic reserve' drew up a plan for the implementation of a German strategic reserve that was aimed equally at strengthening markets and at safeguarding energy supply and which took into account some of the objections raised by the EWI. This approach was broadly favoured both in industry circles and by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). According to the basic concept power plant capacity – not on a compulsory basis but principally using old stock – would be available as a reserve in addition to the production capacity of the 'energy only' market, thereby effectively increasing electricity supply security. The appropriate reserve capacity would be procured by market tendering and would receive contractually fixed performance payments. However, the strategic reserve capacities would only be utilised in those situations where demand cannot be met on the Electricity Exchange. The need for such strategic reserve capacity would automatically be limited as a result of storage options, greater demand flexibility and the ongoing development of the 'energy only' market and may possibly disappear altogether at some time in the future. The relative merits of this concept are that it is relatively easy and cheap to implement, it does not place great demands on regulation, it maintains the functional efficiency of the electricity market and seems to be compatible with the European single market.

The proposal put forward by the Association of Municipal Enterprises (VKU) in Berlin, on the other hand, is intended not just to provide a new market design but also to establish a business model for municipal utilities going through the energy transformation process. Proposals are therefore also being submitted for the integration of renewables. Because of a lack of full-cost coverage and a decline in the operating hours of existing power stations within the 'energy only' market it is suggested that a market for guaranteed capacity be introduced. The power station operators would have to offer secure generating capacity in the form of a tradable certificate. The model also contains a proposal for the financing of renewables in which investors submit offers to an auctioneer for the build-up targets of the individual generating technologies. If their bid is accepted the auctioneer transfers an investment cost subsidy to the renewable-energy plants.

At a meeting between Federal Chancellor Angela Merkel and the federal states on 13 June 2013 various joint recommendations for action were presented the BDEW and VKU. These drew attention to the fact that any further regulation would not provide a solution in a market economy and that responsibility for energy supply security in the market had to be reorganised.

A joint study on focused capacity markets was undertaken on behalf of the World Wildlife Fund (WWF) by the Freiburg Institute of Ecology, the Berlin-based consultants LBD and Raue LLP, Berlin. While this study essentially followed the same lines in methodological terms as the EWI work, the client specified that Germany's climate policy targets should also be included in addition to the safeguarding of supply

security. There was also to be a contribution to the transformation of the power supply system so that highly flexible, low-emission power stations could be newly built to supplement variable generating capacity based on wind and solar power. In contrast to the EWI proposal for supply security contracts there is no common auction of existing and new-build power stations. Existing installations threatened with closure and controllable loads are to compete for capacity payments, over a period of one or several years, as part of an auction. New-build power stations, which would have to meet high flexibility and environmental requirements, would compete for capacity payments for 15 years. This arrangement would favour gas turbine plants. Combined-cycle power stations, which have a much higher efficiency rate, would be squeezed out, as would be modern coal-fired installations, which are even more flexible to operate than combined-cycle stations. The political preference for gas turbine plants is not more cost-effective than the use of ultramodern, flexible coal-fired installations.

Under the heading 'Compass study on market design' the German Renewable Energy Federation (BEE), Berlin, and Greenpeace energy eG, Hamburg, have developed various basic principles for a design of electricity system with a high input of fluctuating renewable energies. This raises a number of fundamental questions as to the market competitiveness of renewables due to the very low marginal costs and claims that there would therefore not be any self-sustaining commercial marketing of renewables. The market should not be the key element but rather flexibility options should have a 'serving' function and should have to adapt to the requirements of fluctuating renewable energy sources. Demand-side measures, combined-cycle power stations and CHP plants would also be included as flexibility options.

The Berlin-based 'Agora energy transition' project takes as its point of departure the idea that the 'energy only' market does not provide sufficient incentive for new-build and existing installations 'in order to ensure security of supply as a public asset in the long term'. As with the Compass Study it is assumed that wind and photovoltaics could not in principle refinance on the marginal-cost market 'even if their full costs were in future to be below those of coal and gas'. And high CO_2 prices would not change this situation. What was needed was a 'new energy transition market' that could pay for products such as 'secured flexible supply' and 'secured flexible load shifting'. A more detailed analysis was still required in order to develop such a market. However, the scepticism surrounding the market competitiveness of renewables was overstated. From a competition viewpoint it would be entirely conceivable for small undertakings that cannot cover their full costs to charge a mark-up on the marginal costs, for example to offset the fuel costs that purchasers of renewables-based electricity have managed to avoid. Selling this electricity on the futures market at above marginal costs, rather than on the spot market at marginal costs, would also have the advantage of lowering the differential costs of renewables at the market price, and hence of reducing the EEG levy.

Of course any findings derived from theoretical models only apply under ideal-type model assumptions. In practice what is important is the operability of the system and the resulting costs. The more complex the proposal, the greater is the preference for a strategic emergency reserve or winter reserve, as the latter involves very low transaction costs. A strategic reserve, as laid down in the Reserve Power Station Regulation, could therefore very much be a starting point for a regulatory framework to ensure energy supply security and flank its implementation.

A pragmatic transition scenario could contain the following elements:

» requirements governing security of supply for defined electricity suppliers ('balancing-group operators'), including contractual penalties

» flanking by an emergency reserve based on existing power stations and load decoupling, including current-regulated CHP with heat accumulators

» compulsory direct marketing for new renewable-energy plants via the futures market at a price that is also above the marginal cost level (offsetting avoided fuel costs) plus a market premium

» on a deregulated market with an obligation for security of supply a capacity market should only be established (for example the EWI or VKU proposal) when there are still no signs of an adequately secured generating capability

Selective mechanisms, on the other hand, do not serve the primary objective of providing for a sufficient level of secured power station capacity. They merely and significantly increase the complexity of any new market design.

The energy transition in an international context

The speed with which Germany introduced the energy transition process came as a surprise both to those at home who were affected and also to partner countries in Europe and around the world. Our close European neighbours in particular were rather suddenly, and without their agreement, confronted by immense problems in that this move constituted a major interference in and impact on grid stability and cross-border electricity transmission. Internationally the 'energy transition' – and indeed the original German word 'Energiewende' has now found its way into Anglo-American English as an expression in its own right – initially provoked a negative response, and later astonishment, which still persists today in many places. On 23 March 2013 USA Today was, for example, still referring to 'those crazy Germans'. And in many parts of the world there was real incomprehension as to Germany's fundamentally critical attitude to coal and modern coal technology. An international poll of experts from the member countries of the World Energy Council (WEC), which was published in March 2013, indicates that the initial scepticism towards the German energy transition has not abated at all. Indeed when compared with a corresponding survey from 2011 it even seems to have intensified. Three quarters or more of those polled still could not consider the German transition process as an energy-policy model and none could imagine Germany's current energy policy being adopted in full in their own countries. While there was clear recognition of the obvious success in increasing the contribution of renewables to electricity production, most of the experts rejected the idea of a similar conversion being implemented by their own governments. They referred in particular to the high energy costs and sharp rises in electricity prices in Germany. Moreover, they also saw risks to energy supply security (blackouts and other problems). A majority of non-German respondents also thought that in the long term the energy transition process was more likely to weaken German economic power rather than strengthen it. Nevertheless, 56 % of the experts polled were able to imagine some elements of the transition process being implemented in their own country.

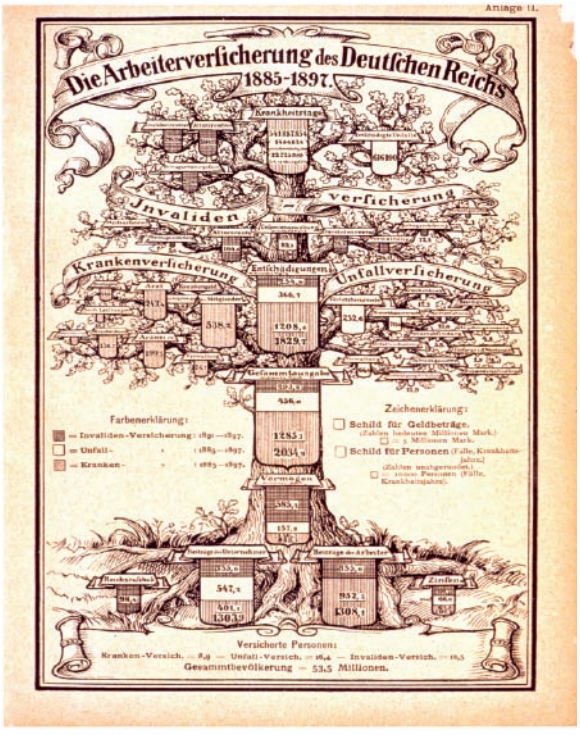
Chapter 2

Social security and self-governance

Social security in the mining industry

Germany's social security system has two essential features: on one side, its organisational structure is based on the various risks that have to be covered, such as illness, accident, old age, death, unemployment and the need for care. On the other, the provision of insurance cover is not administered by government departments but is in the hands of self-regulated social security organisations. Employers and agents for the insured parties are equally involved, in terms of direct responsibility and effectiveness, in implementing their remit within the – frequently changing – framework prescribed by the legislators.

The mining sector – and this includes the coal industry – has helped to shape and put its stamp on the development of the social insurance system. Long before Bismarck's social legislation was introduced at the end of the 19th century the key aspects of today's social insurance arrangements, including the principle of social self-governance, were developed as a result of the special risks associated with mining work and the resulting need to provide social protection for mineworkers.



'The insurance tree' – Illustration from the German Reich Workers' Insurance Catalogue on view at the Paris World Exhibition in 1900

The structures and services that constitute the mining industry's social insurance system have constantly evolved and developed, originating with the 'cash tin' provident fund in the 15th century, into which miners would pay a small contribution for colleagues who had been hurt in accidents, followed by the setting-up of some 160 miners' insurance clubs and associations at the end of the 19th century and then the adoption of Reich legislation on mineworkers' insurance on 23 June 1923 that provided for the amalgamation of all independent miners' insurance associations into the Reich Miners Insurance Union – which was to be responsible for managing pensions and health insurance for mineworkers. And the principle of self-governance has been retained throughout.

Another historic milestone was the Federal Miners' Provident Fund that was established by law in 1969 as a nationwide body to oversee mineworkers' pension and health insurance. In January 1991, following German re-unification, the Miners' Provident Fund also became responsible for the new federal states in providing social insurance cover under the mineworkers' pension and health insurance scheme. In 2010 the original miners' provident fund celebrated its 750th anniversary.

The mining industry can also look back on a long tradition of accident insurance. Initially the Miners' Insurance Associations also took over responsibility for post-accident care to some degree. However, for organisational reasons, and following Bismarck's social legislation, it was not the Miners' Associations themselves that were responsible for statutory accident insurance but rather the Mining Employers' Liability Insurance Association (BBG), which was set up in 1885 as one of the first of the 83 such associations that were eventually to be formed.

Because of the high risks involved in mining work the BBG was burdened with high compensation payments right from the outset. The reason for this was the large number of accidents incurred, particularly as a result of falls of coal and rock. This also led to the decision to establish the world's first hospital for injured mineworkers with the building of the 'Bergmannsheil Bochum' medical centre in the Ruhr coalfield. The establishment opened its doors in 1890 and was also the first hospital to be devoted to an individual profession. As the Employers' Liability Associations were at that time prohibited from financing their own hospital, this funding was initially provided by various other associations and federations. They acted as the body supporting

Employers' liability insurance hospitals Bergmannsheil Bochum – Bergmannstrost Halle

the facility and entrusted the hospital to the BBG for its permanent use. This group included the Association of Mining Interests (Vbl) that was formed in 1858 and which was later integrated into the German Coal Association.

The inclusion of occupational diseases constituted a marked extension to the statutory accident insurance scheme. This was tied in with the adoption of the first Regulation on Industrial Diseases in 1925. In 1929 silicosis was added to the List of Occupational Diseases and since that date the prevention, compensation and rehabilitation of mining-related industrial diseases (especially silicosis, chronic bronchitis and emphysema, illnesses caused by noise, compressed air tools and ionising radiation) characterised the work of the BBG.

Structural change and social insurance

Like the German coal industry itself, the Miners' Provident Fund and the BBG have, in the last ten years in particular, had to cope with the profound changes that have had to be

BG RCI and DRV KBS mergers

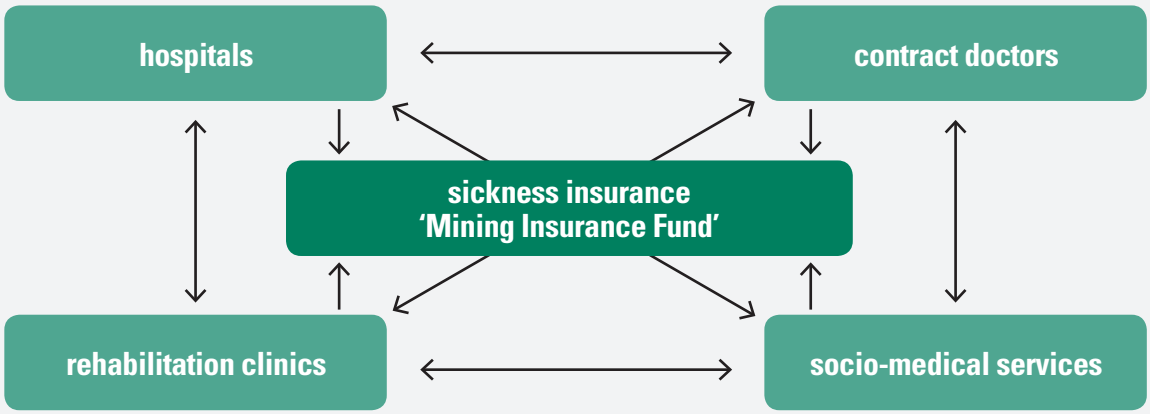
- Mining Employers' Liability Insurance Ass.
- Employers' Insurance Ass. of the Chemicals Industry
- Employers' Insurance Ass. of the Leather Industry
- Employers' Insurance Ass. Mines a. Quarries
- Employers' Insurance Ass. Papermakers
- Employers' Liability Ass. of the Sugar Industry

→ BG RCI Berufsgenossenschaft Rohstoffe und chemische Industrie

- Miners' Insurance Fund
- Railway Insurance Fund
- Maritime Insurance Fund

→ Knappschaft Bahn See

The DRV KBS medical network
better care and provision networking



made mainly as a result of the declining number of insured persons working in the coal industry. Structural change in the coalfields began back in the middle of the last century when oil commenced its triumphal march as the cheapest fuel available. The planned termination of subsidised coal mining in Germany at the end of 2018, as prescribed by the Coal Industry Financing Act, will mark the end of the phase-out process. The aim now is to achieve a successful transition to a new set of tasks and assignments, and in this respect the mining industry's social insurance organisations have also responded quickly. The self-governing management bodies and their umbrella associations, in which employers and policy holders are equally represented, submitted proposals to the legislators for reducing the number of responsible bodies, improving the level of cooperation between them and cutting administrative expenses.

The organisational reform of the statutory pension insurance system took effect in January 2005. In accordance with the intentions of the legislators one of the aims of the reform process was to reduce the number of pensions insurance bodies. In consequence, the previously autonomous Miners' Insurance Fund, the Railway Insurance Fund and the Maritime Insurance Fund were all combined to form the German Pension Insurance Mining-Railways-Sea (DRV KBS). The DRV KBS now covers 5 % of all insured persons in the general insurance pensions sector and is still responsible for mineworkers and those previously insured under the Railway Insurance Fund and Maritime Insurance Fund. The Mineworkers' Health Insurance Scheme, which currently has more than 1.7 million registered members, is now carried on by the DRV KBS under the name 'Knappschaft' (Mining Insurance Fund), and its special features and benefits have therefore been retained. In 2003 the functions of the so-called 'mini-job centres' were also transferred to the DRV KBS. Since then this has been the central body for handling registration and contribution procedures nationwide, with some 7 million marginal employment cases currently on its books.

The Railway Insurance Fund is, after the Miners' Fund, Germany's second-oldest social insurance organisation dedicated to a single profession. As early as 1861 the railway authorities established a provident fund to provide social insurance protection for their workers. The contributions provided for sickness, invalidity, old age and the welfare of surviving dependents. The historical development of this scheme came to an end on 1 January 1994 with the creation of Deutsche Bahn AG, when the Federal Railway Insurance Fund was renamed the Railway Insurance Fund.

The Maritime Fund, which dates back to January 1907, was the pensions insurance body for all German seamen and included protection for invalids, widows and orphans. The Seafarer's Special Fund is unusual among German social insurance schemes. Set up in 1974, it helps long-serving, older seamen who have left the maritime sector by providing them with a bridging allowance until they start to receive their pension under the statutory pensions insurance system.

The amalgamation of these insurance providers, whose activities are focused on the mining, maritime and railway professions with their specific working conditions, has enabled them to continue to operate as a federal body alongside the German pensions insurance scheme and in a dramatically altered environment. Operating in this way as a nationwide body comprising statutory pensions insurance, supplementary pensions insurance, healthcare and long-term care – and with its own medical network comprising fund doctors, socio-medical services, hospitals and rehabilitation clinics – the DRV KBS is able to provide its members with comprehensive social and medical care. In this way it also, at least partially, respects the historical complexities of the German social security system, whose structures are still valid today.

The BBG has now lost its organisational autonomy and after 125 years has become part of a larger body of some 36,000 member companies representing 1.2 million contributors. On 1 January 2010 it merged with the Employers' Liability Insurance Associations representing the leather, paper, sugar, mines and quarries, and chemicals industries to become the Employers' Liability Association for the Raw Materials and Chemicals Industry (BG RCI). This merger was also very much initiated and shaped by the self-governing bodies representing the individual branches, and comprising both employers and insured members' representatives. In this way the move has taken account of the significant decline in the number of insured persons working in the coal industry. In the 1950s the BBG (Mining Employers' Liability Association) – as primarily defined by the coal industry – still represented more than 600,000 insured employees. By the time of the merger this figure had fallen to about 80,000.

The unification that created the BG RCI was not exclusively a result of industry downsizing but was also partly attributable to the Accident Insurance Modernisation Act (UVMG) that to a large degree came into force in 2008 and forced a number of important organisational decisions. One of these involved reducing the number of accident insurance providers (Employers' Liability Associations) from 26 to just nine. This was essentially caused by economic structural changes, which had resulted in upheavals in the financing of pension liabilities that had accumulated over many decades. There had, for one thing, been a huge contraction in the mining, inland waterways and textile sectors, while the construction industry too had seen its workforce decline by nearly 50 % since the mid-1990s. On the other hand, the services and healthcare sectors had recorded an above-average growth, which meant that in these areas the ratio between the fairly low accident rates and the relatively few inherited burdens had created contribution-based distortions. After intensive discussions with the legislators and the adoption of a clear position on the part of the self-governing body the Employers' Liability Associations and the then German Federation of Statutory Accident Insurance Institutions (HVBG) – now the German Social Accident Insurance (DGUV) – were entrusted with the organisation of the federation. Because of the large degree of overlap the six partner industries of the BG RCI found themselves working very much together on preventive actions, with the result that they are able to maintain a clear focus on areas such as the prevention of industrial accidents and illnesses.

The aim of the BG RCI merger process that is now under way is to create an efficient professional association, particularly in matters of prevention and rehabilitation. This is the general remit of the Association's staff and the BG RCI's self-governing management, comprising the board of directors, the representatives' committee and six industry advisory panels.

Professional rehabilitation at Bergmannsheil hospital in Bochum

The mining associations and those board members delegated to the self-governing management boards will in the years ahead still be required to look after the interests of the mining industry effectively, and this includes from within the consolidated bodies. At the same time this means participating in the decisions taken by the self-governing board in such a way as to fulfil the statutory mandate of the social insurance organisations and to take into account the interests of the mining industry as far as

possible. A key part of the associational work comprises the coordination and information activities that are undertaken in the form of meetings with the management of the social insurance bodies, preliminary discussions that are held ahead of sittings of the self-governing management boards, in-house informational events and the circulation of newsletters.

Social self-governance in social insurance

A significant portion of the contributions to the social security system in 2012, amounting to about 782 bn €, was provided by the social security organisations. As statutory bodies with a self-governing remit they carry out their duties within the framework of the law and other regulations that apply to them on their own responsibility.

It is evident from this that the self-governing management board recognises that the insurance bodies are legally independent of the immediate state administration. The state has however reserved supervisory and participation rights. The DRV KBS budget, for example, has to be approved by the Federal Government. Whereas other social security systems in Europe are subjected to more stringent regulations from the national legislators, the German social insurance system is recognised as essentially a non-governmental and pluralistic management system with the distinctive feature of voluntary self-governance by employers and members. One of the benefits of the system is the close contact that the members of the self-governing board have with their responsible bodies, on one hand, and with 'their' policy holders and companies, on the other. As the social partners have equal rights in the committees, they can only take decisions by consensus. In practice this has so far posed no problems for the DRV KBS and BG RCI, with the result that the various decisions that have to be taken, for example concerning the budget, personnel issues, investments or organisational procedures, have usually been agreed by unanimous vote after consultation with the employers' group and the insured members' group. This fairly unfamiliar form of social partnership has also helped ensure that the social insurance system in general has met with a high degree of public acceptance.

The self-governing management had a special role to play during the aforementioned mergers. These unification processes represented enormous challenges for the social insurance bodies and their members. The working routines, organisational structures and in-house philosophies of the 'old' bodies had to be adapted in such a way that the aims of the merger process – leaner administrative structures, improved performance and quality, and greater economic efficiency – could actually be achieved with measurable results. At the same time – and in the interest of acceptance on all sides – the members of staff with their own worries about job security, and the merger partners concerned for adequate representation in the new self-governing bodies, all had to be heard and appropriate solutions found. Ultimately all this appears to have been achieved, with the key factor being the unity of purpose of the social partners to ensure that the merger processes were accomplished successfully – not only without state influence or governmental demands but also without any assertion of individual interests.

Social partners in social self-governance

The institutions of social self-governance – the management board and the assembly of representatives – are composed of equal numbers of employers' representatives and members' representatives. The board members of the statutory bodies responsible for sickness, healthcare, accident and pensions insurance are chosen in social-insurance elections held every six years and on the basis of shortlists drawn up by eligible federations and associations. The employers and trade unions promote the concept of cooperation in self-governance, which provides an opportunity for real involvement at a time when social insurance is of growing importance for individuals and the national economy alike.

In the case of the mining industry's social insurance bodies the employers and members on the self-governing board always cooperated extremely well in an active social partnership. And this has continued right up to the present day: the DRV KBS and BG RCI both have in common the fact that by combining with other insurance bodies they now include the original organisations responsible for the mining industry, namely the Federal Miners' Provident Fund and the Mining Employers' Liability Insurance Association. As a result, the Mining, Chemical and Energy Industrial Union (IG BCE), Hanover, and the employer-side German Federation of Raw Materials and Mining (VRB), Berlin, are now performing their functions in a new and broader context. In both organisations the social insurance elections of 2011 were the first to be held since the amalgamation of the social insurance bodies. The various eligible organisations – on the employer side, and along with the VRB, this comprises the Federal Employers' Association of the Chemical Industry (BAVC), the German Ship owners' Association (VDR) and the Employers and Business Association of the

Mobility and Transport Services (Agv MoVe) – have reached an agreement that ensures that the composition of the bodies and committees properly reflects the interests of all merger partners and the trades and branches of industry that they represent. This was made possible by the fact that the legislators arranged that the social insurance elections should be a 'quiet' process, in other words without any of the election procedures normally associated with such business.

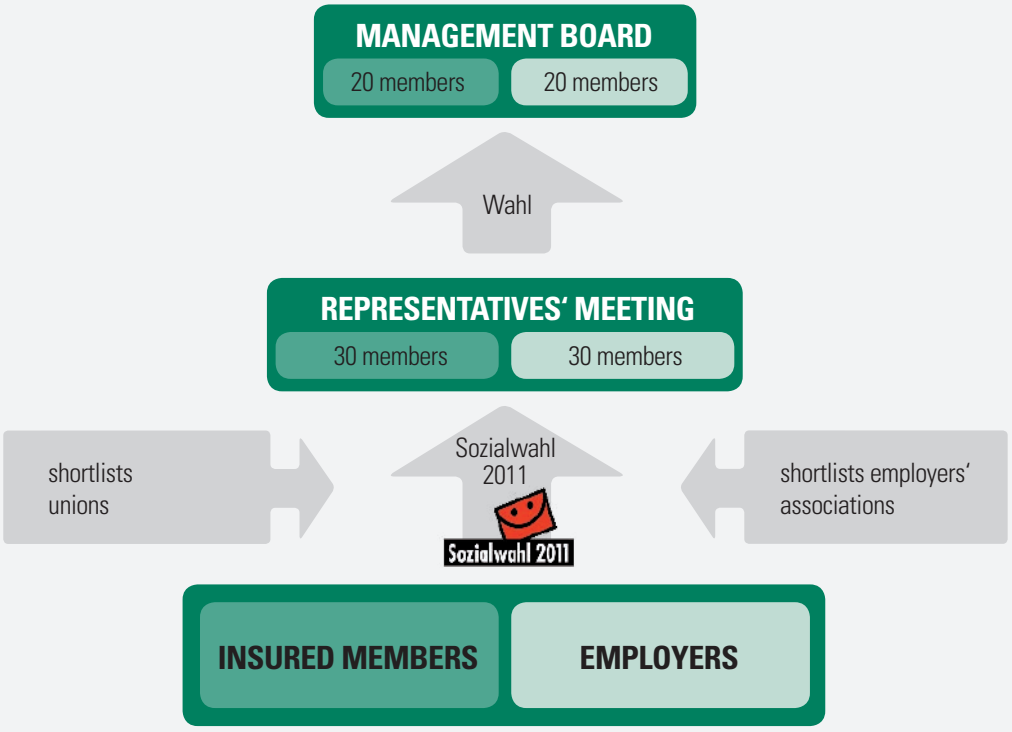
Social insurance elections in Germany

The first social insurance elections after the war were held in 1953. These essentially followed the lines of the pre-war arrangements and meant a return to the legal position as it was before 1933. The structure of the governing body was unified with the representatives' assembly and management board coming together. There were two specific features as far as the mining organisations were concerned: the Miners' Fund kept the system whereby the senior members were chosen and they in turn elected the members' representatives for the assembly of representatives. The BBG was affected in that unlike the pre-war arrangement equality-based self governance was introduced into the statutory accident insurance scheme. Because the contributions were paid exclusively by the employers the members were not originally involved in the self-governance process.

The list trusteeship of the unions and employers' associations, and the possibility of holding 'quiet elections', had already been established by this time. Up until now list trusteeship – and hence active participation in social self governance – has essentially been assigned to the trade unions and employers' associations, though not in the sense of having claim to sole representation. The Social Insurance Code in fact expressly provides that other employee-based associations and free lists, as well as trade unions, are entitled to submit shortlists. This electoral procedure is therefore legitimised in law and according to an adjudication of the Federal Social Court is in keeping with constitutional law and the principles of democracy.

Electing the self-governing bodies of the BG RCI

2011 – 2017 term



Reform of the social election process

Nonetheless, there has in the past been some criticism – both in the press and from the Federal Audit Office – of the legitimacy, low voter turnout and cost of the social insurance elections, as well as of the way responsibilities are distributed under the self-governance system. In order to strengthen social self-governance, proposals have therefore been put forward on a number of occasions aimed at promoting the importance of the self-governance system and consolidating voters' involvement. More recently the Federal Commissioner for social insurance elections submitted a number of proposals in his final report on the 2011 elections. These focused on increasing voting participation, putting in place an actual election process and in general promoting a greater public awareness of the self-governing body and the work it does. The Commissioner also proposed strengthening the role of the self-governing body so as to ensure greater participation by the members and the employers in the performance of public duties. Social self-governance will as a result be regarded as an alternative to a purely governmental or private-sector organisation of the social insurance system.

The nine social insurance bodies that held direct elections in 2011 represented a total of 47,201,509 persons entitled to vote, with some 14,158,292 votes actually being cast. This represents a voter turnout of nearly 30 %. By comparison, the turnout at the 2012 state elections in North Rhine-Westphalia was almost 60 %, while the NRW local government elections of 2009 attracted an average of 52.4 % of voters (the lowest individual figure recorded was 44.6 %) and Germany's 2009 European elections 43.3 %.

The degree of awareness of the duties and responsibilities of the bodies being elected seems to influence the decision to take part in the voting process. This was supported by the results of a study conducted by Ipsos GmbH, Hamburg, of the attitude towards social elections. This indicated that voters and non-voters were almost identical in showing a significant interest in the subject of pensions and sickness insurance in general. It was found that non-voters were much less well informed than voters about the organisational and decision-making freedom enjoyed by the self-governing body. The basic remit was therefore to make social self-governance and its duties and functions much more visible to the general public and in this way to increase voter turnout at social insurance elections.

Unveiling the memorial stone celebrating '750 years of the Miners' Provident Fund'

Generally speaking, these elections have worked effectively in their existing form and have succeeded in creating a uniform and constructive self-governing system for the benefit of both the membership and the employers. The current legal position allows the personnel and socio-political responsibilities of the social partners to be integrated. And finally, the list trusteeship of the associations helps ensure that by appropriate list creation it also becomes possible to harness the practical knowledge and experience of small-sector companies and businesses for use in the self-governance process. A direct election of candidates would make this much more difficult. There is no legal imperative for changing social electoral law or for re-organising the bodies that constitute social self-governance and any revision of the current arrangements needs to be examined very carefully.

Chapter 3

The end of coal mining on the west bank of the Lower Rhine

Guest contribution by Dipl.-Ing. Karl-Heinz Stenmans,
General manager of West Colliery, RAG Aktiengesellschaft, Kamp-Lintfort

There was a subdued mood on 21 December 2012 when at 12 o'clock precisely the bells of all the churches in the town of Kamp-Lintfort rang out to signal the end of coal mining in the Lower Rhine area. The wages room provided a meeting point for invited guests and members of the workforce still in their pit clothing – men who had just taken the last cage ride to the surface, where they were greeted by the Minister-President, the board of directors, the mine management and the works council. The end of 150 years of mining on the left bank of the Rhine was certainly celebrated in a most dignified atmosphere.

150 years of mining – the beginnings

Exactly 150 years before, the entrepreneur Franz Haniel commissioned a coal drilling project near Duisburg-Homberg. In 1854 he struck it lucky and awarded the first concession for the 'Rheinpreussen' mine, the first to be established on the west side of the Rhine. The presence of aquifers and running sand in the overlying strata posed real problems for the first shaft sinking and there were repeated interruptions caused by inflows of water and sand. Franz Haniel was not alone and a number of other individuals and companies were also searching for coal and were issuing coalfield concessions. But Haniel was the only one who actually engaged in mining operations.

There were no more new mine building projects again until the turn of the century. In 1903 the Wilhelmine Mevissen colliery was established in Duisburg-Rheinhausen and this was followed in 1906 by the founding of the Friedrich

Coalfield map of the Lower Rhine area

A farewell to coal mining in the Lower Rhine area, 21 December 2012

Heinrich AG company in Kamp-Lintfort. In 1911 the Niederrheinische Bergwerksgesellschaft set up what was to become Niederberg colliery in Neukirchen-Vluyn. A year later Diergardt colliery was sunk in Duisburg-Rheinhausen and then in 1922 work began on an extension to Rheinpreussen – initially named Rheinland – that was to develop into the independent Pattberg mine in Moers.

During the mid 19th century French mining law was in force on the west bank of the Rhine, while Prussian rule held sway on the other side. According to Prussian mining law no individual mining concession could be more than 20 square kilometres in size. This restriction did not apply on the western side. The mining concessions that were allocated were usually between 90 and 100 square kilometres. This was a major factor in the building of large, high-performing collieries on the left bank of the river.

Every mine was to experience the ups and downs of the boom years and the wars. And none more than Friedrich Heinrich colliery in Kamp-Lintfort. Right from the outset it was the French banking sector that provided most of the funds for the ambitious project of establishing a new colliery. The farming land in and around Kamp-Lintfort lacked an appropriate infrastructure. There were no roads or railways, let alone houses for the mineworkers to live in. These all had to be built before, in 1912, the first coal could actually be wound to the surface and transported away.

During the First World War the mine was expropriated and not returned to French ownership until 1921. In 1924 a more permanent change of hands took place, though the colliery remained under French control. The de Wendel company acquired more than 80 % of the shares and the mine's founders were therefore relieved of all responsibil-

ity. The new owners took over both the running of the colliery and also much of the production side of the operation.

The mine flourished under the management of the de Wendel company and coal production increased from 600,000 t in 1923 to 2.4 million t in 1939.

The colliery remained in French hands until the outbreak of World War Two, when Friedrich Heinrich again came under German administration. The Reichskommissar for Coal nominated it as an experimental mine for technical innovations. After Germany surrendered the entire Ruhr region was initially placed under the authority of the Allied Military Government and the de Wendel company did not regain full control over its property again until 1949.

Adaptation measures

Mechanisation efforts continued in the post-war years. The mine was open to technical innovation of all kinds and in 1952 the 600 metre level was equipped with trolley-wire locomotives and an extensive rail station with a signalling and control system. New technology was also introduced to roadheading and coal face operations and fully-mechanised coal winning was being practised at the colliery as early as 1958.

At the same time the first coal crisis of 1956 led to the merger of the previously autonomous collieries of Rheinpreussen and Pattberg. The 'new' Rheinpreussen mine, which was based in Moers, was the largest colliery in the Ruhr coalfield until 1969. In 1967 the continuing coal crisis resulted in the closure of Diergardt mine in Duisburg-Rheinhausen. The remaining coal deposits and the briquette plant was taken over by the neighbouring Mevissen colliery, which in turn had to be shut down a mere six years later due to the decline in anthracite sales on the heating market. In spite of the coal crisis the new Rossenray mine was opened up to the north-west of the region by Krupp AG in 1962. However its autonomy was short-lived

The extended coal crisis led to the establishment of Ruhrkohle AG in 1969 with a remit to downsize the coal mining industry in an orderly manner. The de Wendel company put Friedrich Heinrich under the Ruhrkohle umbrella, while soon after Rossenray mine lost its independent status and in 1970 was merged with Pattberg colliery, which had by then severed its ties with Rheinpreussen. All three mines

Niederberg colliery

Pattberg mine, part of the Rhineland colliery complex

– Rheinpreussen, Pattberg and Rossenray – were then merged to create Rheinland colliery in 1971. With a production of nearly 5 million t and a workforce of over 8,000 Rheinland was to remain the largest mine in Europe until 1988.

The two oil price crises in the middle and at the end of the 1970s brought about a complete turnaround, though this was not to last long. Both the government and Ruhrkohle AG set the course for expansion. For Friedrich Heinrich, for example, the shut-down that had been anticipated in some quarters did not happen and in fact the decision was taken, and subsequently implemented, to develop a new production district and extract the deposits with the reintroduction of pneumatic stowing and new shield-support technology. However the tide turned again in the mid-1980s. Oil prices did not remain at the expected high level and coal sales could not continue on the desired upward trend. As a result the plans that had been made to expand coal production in Germany had to be revised. This involved closing down a number of mines and creating several large colliery mergers.

For the Lower Rhine area this meant the abandonment of its oldest production site at Rheinpreussen and the merger of Friedrich Heinrich colliery in Kamp-Lintfort and Rheinland colliery in Moers on 1 July 1993 to create the combined mine Friedrich Heinrich/Rheinland with its operating base in Kamp-Lintfort. Pattberg colliery was closed down.

Technical innovation was driven forward after the merger too. The introduction of modern face technology led to the establishment of high-performance longwall faces over 400 metres in length, which drew worldwide attention. In 1998 the German coal industry was for the first time achieving daily outputs of more than 10,000 t over a monthly average. In 2002, as part of the political decision to adjust production levels in the German coal industry, the colliery was finally merged with Niederberg mine in Neukirchen-Vluyn and the last remaining coal mine on the left bank of the Rhine was renamed West Colliery. The focus of production at West colliery remained at the Friedrich Heinrich site in Kamp-Lintfort, while the Niederberg facilities were closed down. As a result of the change in the mine planning framework following the adoption of the Coal Industry Financing Act in 2007 RAG announced in 2008 that it intended to close West colliery at the end of 2012. This decision was ultimately confirmed in a meeting of the supervisory board in November 2011.

Looking to the future

With the end of coal mining on the west bank of the Rhine the industry now has to extend to Kamp-Lintfort the process of structural change that has been under way for some time with the establishment of mainly small and medium-sized enterprises and the provision of land for residential development on former mining sites. Right from the outset the town of Kamp-Lintfort, working in collaboration with RAG Montan Immobilien GmbH, was able to develop a plan for the post-utilisation of the colliery land. This 'master plan' was discussed with the local community in five 'arenas'. The result was an urban development concept for the site that was situated right in the heart of the town. The aim now is for the company and local government to work closely together to find investors prepared to take over the site and its buildings. RAG Montan Immobilien GmbH and the town of Kamp-Lintfort hold out great hopes of developing a logistics park on the former coal storage depot. The site benefits from having good connections to the current motorway network and an existing rail link. The project will create much needed jobs in the region.

Brick facade at West colliery in Kamp-Lintfort

The development plans also intend to preserve historic buildings as permanent reminders of the mining industry. As a result, the brick-lined facade along Friedrich Heinrich avenue and the buildings behind, along with the headframe at number two shaft, are to be put under a preservation order. The former harness yard located to the south of the main colliery had long served as a training centre. This set of buildings is also worth saving and is to be placed on the protected list. Since 2012 part of the complex has been used by Rhein-Waal college as a project workshop. In addition, the 'Association for the promotion of the mining traditions of the left bank of the Lower Rhine' is working to preserve the old practice gallery that is located near this group of buildings.

Plans for innovation are therefore in place when coal mining finally comes to an end in the Lower Rhine area and it is hoped that this will bring fresh prosperity to the region. At the same time there is still much historical heritage to be preserved in memory of 150 years of mining on the west bank and 100 years of coal production in the town of Kamp-Lintfort.

Chapter 4

Coal and the environment

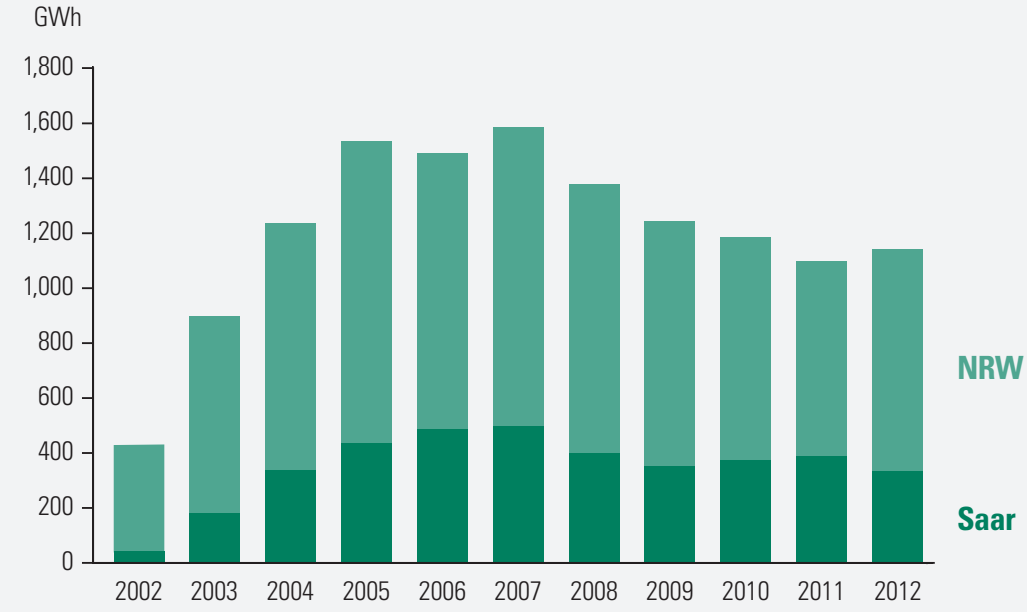
The climate protection agreement

On 30 May 2002 the German Coal Association, acting on behalf of the German coal industry, acceded to the Climate Protection Agreement between the Federal Government and German industry. Under this agreement the German coal industry had committed to a 75 % reduction in carbon dioxide (CO_2) emissions in Germany by 2012 as compared with the reference year 1990. In actual fact the mining industry was to achieve a 90.2 % cut in CO_2 emissions, a target attainment of 120.3 %. The reason for this was that when the voluntary targets were being drawn up they were based on an assumed production volume of 20 to 22 million t in 2012. The new mine planning criteria that became necessary as a result of the adoption of the Coal Industry Financing Act, and which provided for a reduction in annual output to less than 12 million t by 2012, also led to a decline in CO_2 emissions.

The dramatic reduction in CO_2 emissions is therefore mainly attributable to the closure of collieries and ancillary installations. Between 1990 and 2012 the number of active collieries was cut from 27 to four as a result of closures and mine mergers. At the same time coal production fell by 84.6 % to 10.8 million t. The fact that CO_2 emissions could be cut more than production levels is due to the improvement in specific energy consumption. In 2012 this factor was at its lowest since 1990. In 2011 energy consumption in the coal industry was 21.6 % down on the previous year's figure, while a further 18.4 % cut was achieved in 2012. This could be attributed not only to the end of post-working operations at those collieries that had closed in previous years but more so to the introduction of innovative technology aimed at developing and improving the performance of stripping and cutting winning machines, face conveyors and belt conveyor systems, material transport installations and ventilation and air-conditioning plant.

The Climate Protection Agreement also commits the coal industry to achieving a 70 % reduction by 2012, as against 1990 levels, in the methane gas (CH_4) emissions released from disused collieries. As a result, CH_4 emissions released into the atmosphere were cut from 19.7 million t CO_2 equivalent in 1990 to 3.0 million t in 2012, a reduction of about 85 %. This represented a target attainment of 121.1 %, which was well above the original goal. During the same period CH_4 emissions from active collieries fell by 83.8 %, while the equivalent figure for closed mines was nearly 95 %.

Electricity generation from mine gas



Methane gas processing technology has improved enormously in recent years. While about 70 % of the gas was utilised in 1990, by 2011 this figure had gone up to nearly 95 %. In 2012 the methane marketing companies operating at closed collieries in the Ruhr and Saar coalfields extracted and marketed a total of 3.5 million t CO_2 equivalent of gas. As mine-gas extraction permits are now being widely issued it can be assumed that 98 % of the existing resource can be recovered and that residual emissions will no longer be a factor.

In 2012 the active and non-active collieries of North Rhine-Westphalia and Saarland had a total installed capacity of some 226 MW and generated about 1,140 GWh of electricity and more than 440 GWh of heat energy. Using the mine gas in this way also helped avoid greenhouse gas emissions amounting to over 5 million t of CO_2 equivalent. The contribution thus made to climate protection and resource conservation was about 8 % higher than in the previous year.

Revision of peak equalisation arrangements after 2013

In November 2012 the Bundesrat approved the amendment of the German Electricity and Energy Tax Acts that contained a follow-on regulation on 'peak equalisation'. At the same time the Federal Government and German industry, as represented by BDI and BDEW, signed an agreement on energy efficiency – which from 2013 replaced the existing voluntary commitments on climate protection undertaken by the industry sector. Under this agreement the peak equalisation arrangement introduced under the eco-tax reforms for the manufacturing sector, which provides for an easing of electricity and energy tax and in its current form expired at the end of 2012, is to be extended initially for a period of ten years.

In return, German industry undertakes from 2013 to achieve continuous improvements in specific energy efficiency up to the year 2022, as measured against the average energy intensity (represented by the total energy consumption divided by real gross output) of the manufacturing industries for the period 2007 to 2012. These efficiency improvements are not company specific but must be demonstrated by the beneficiary sectors in general (the 'bubble' solution). The energy savings targets require companies to make tangible efforts to increase energy efficiency levels and the improvements that are to be achieved, that is to say the verifiable target level, will increase over time: from 1.3 % for the reference years 2013 to 2015 to a figure of 1.35 % for the reference year 2016. In 2017 the results are again to be evaluated in an open and unbiased way so that if necessary new targets can be set for the 2019 to 2022 period.

Energy-intensity reduction targets
(set against the reference period 2007 - 2012)

Claim year	Reference year	Target (in %)
2015	2013	1,30
2016	2014	2,60
2017	2015	3,90
2018	2016	5,25
2019	2017*	6,60
2020	2018*	7,95
2021	2019*	9,30
2022	2020*	10,65

* provisional

If efficiency targets are not met the amount of tax relief is reduced and if target attainment falls below 92 % the relief is waived entirely. This is determined on the basis of a monitoring report produced by an independent scientific institute and expressly acknowledged by the Federal Government. The industry sector also accepts the obligatory introduction of energy and environment management systems for all industrial and manufacturing undertakings up to 2016. The German Government is assuming that if undertakings are to retain the benefits of peak equalisation after 2012 they must increase their efficiency efforts more than threefold compared with the period 2007 to 2012. Companies are therefore being called upon to make efforts that go well beyond a 'business as usual' scenario.

10-year follow-up regulation for the continuation of peak equalisation from 1 January 2013:

Agreement between the Federal Government and German industry on increasing energy efficiency

Requirements:

- Introduction of an energy or environment management system
- Evidence of system introduction to 2014, certification after 2015
- Establishment by the Federal Government that the energy-intensity reduction target set for the year in question has been at least met
- 'Bubble' solution, the collective energy-efficiency target for the manufacturing sector

Energy management system

The international DIN EN ISO 50001 standard specifies requirements for an energy management system and is aimed at helping companies to improve energy efficiency, reduce emission levels of greenhouse gases and other environmental pollutants and determine the potential savings that can be made. In September 2012 RAG introduced an energy management system based on DIN EN ISO 50001. The objective is to develop the company's energy policy, implement this with appropriate measures and monitor the progress of implementation. In view of the limited resources available RAG is to operate the energy management system on the principle of 'producing energy and using it carefully'. To this effect the company undertakes regular assessments of its energy-intensive installations and processes and investigates the deployment of alternative technologies in terms of their economic viability. As a dynamic process the energy management system is subject to a constant annual cycle. The system applies to all collieries, water pumping stations and management points, central workshops and other RAG auxiliary plants. In this way the company continues to make its contribution to environmental protection, even during the phase-out process.

European emissions trading

On 1 January 2013 the European emissions trading system (EU ETS) entered its third trading period, which is due to run until 2020. The scheme places restrictions on the release of carbon dioxide and, beginning in 2013, other greenhouse gases too. The ETS covers more than 11,000 installations operating in the power and heat generation and manufacturing sectors in the EU zone, as well as in Iceland, Liechtenstein and Norway. In this way controls are applied to about 45 % of the greenhouse gas emissions released by the participating countries.

In the current trading period the national upper limits on emissions have been replaced by an EU-wide emission upper limit (CAP) for certain specific sectors. The CAP is based on the average total quantity of emission allowances allocated in the second trading period (2008 to 2012). It also takes into account any additional activities and gases. The allocation of emission permits is now to be managed centrally by the EU, a move that is designed to achieve a higher level of consistency in regulating the number of allowances. Operators of industrial installations and heat generating plants will initially still receive a large portion of their certificates free of charge on the basis of benchmarks. The proportion of free allowances allocated falls from 80 % in 2013 to 30 % in 2020 and then to 0 % in 2027. The emission rights that are required will then have to be purchased in full by auction, beginning with the third trading period, as is the case in the electricity sector. The quantity of emission rights allowed decreases continuously from year to year by a linear reduction factor of 1.74 % until the target year 2020, so that by then greenhouse gas emissions will have been reduced by 21 % below the 2005 levels.

Emissions trading is an economic instrument of environmental policy, as it uses the market as a control instrument for the allocation of emission rights. The price of the emission rights adjusts itself as a function of supply and demand. This means that emission reductions are implemented at those points where they can be most favourably achieved in overall economic terms. Although emission rights trading ensures that the CO_2 emission upper limit is observed by the operators of the installations concerned, some politicians and a number of market participants believe that the proper functioning of the market for emission rights is no longer assured. The reason for this is seen in the low price of emission rights that has applied for some time. When adopting the EU Emissions Trading Directive

the European Commission originally started with a CO_2 certificate price of 30 €. However, this dropped to around 18 € in mid-2001 and then in 2013 temporarily fell to below 3 € for a time due to the low level of demand. Revenue from the emissions trading scheme has therefore failed to materialise. In Germany this income was supposed to have been paid into the Energy and Climate Fund – to support energy-focused building refurbishment, storage projects for green electricity, energy efficiency measures, national and international climate and environment projects and the development of electro-mobility.

The European Commission believes that only a higher certificate price will create an incentive for participating undertakings to invest in environmentally friendly technologies, improved processes and energy efficiency. The Federal Environment Ministry also takes the view that the low certificate prices do not provide the incentive that is needed for the climate-friendly conversion of the energy supply system. However, this is inconsistent with the efforts being made by German industry to ensure that all companies introduce an energy management system, or something similar, by 2015.

In actual fact the drop-off in the price is not a sign that the system has failed. On the contrary: the market has given the correct price signals, as derived from the general economic situation. The demand for emission allowances has ultimately declined for a positive reason. In 2012 power stations and industrial installations emitted 2 % less CO_2 than the previous year because of the economic crisis. Moreover, emission levels also declined as a result of improved energy efficiency and the politically driven expansion of the renewable-energy sector. And in addition, during 2008 to 2011 actual emissions of around 7.8 bn t CO_2 were matched against emission allowances and international emission credits to the value of about 8.7 bn t CO_2. This means that an emission rights surplus of some 1 bn t CO_2 has built up that can be used by plant operators in the third trading period and which will furthermore continue to increase.

To counteract this the European Commission presented a proposal in July 2012 to amend Emission Rights Trading Directive 2003/87/EG. According to this the timetable for auctioning greenhouse-gas emission allowances is to be altered from 2013 in that the existing oversupply of allowances is to be temporarily reduced (the 'backloading' proposal). In the first three years of the third trading period a total of some 900 million allowances are to be taken from the quantity available. These are then to be restored in the last two years of that period – 300 million in 2019 and 600 million in 2020. The Commission hopes that by reducing the amount of allowances available their price will be stabilised or even increased significantly, thereby favouring investment in climate-friendly technologies. This would put the Commission in a position to adjust the timetable in each trading period. The reasoning behind the proposal was that it would bring clarification to the required legal certainty and predictability of the market. However, according to the aims set out Article 1 of the Emissions Trading Directive, a scheme should be established for greenhouse gas emission allowance trading in order to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner.

No other objectives are specified and the Directive certainly does not plan for any statutory price targets or additional quota reductions with a view to a subsequent, politically endorsed price correction. The emission upper limits were laid down by mutual agreement of the European Council and Parliament on a proposal from the Commission. A certain minimum price for emission allowances was not mentioned in this context and is not a decisive factor when it comes to the reduction target, which can be attained more effectively by way of the CAP and is also set to be achieved by 2020. When the European Parliament assented to the Commission's proposal in a slightly revised form it was nothing less than a mistake of historic magnitude: a planned-economy intrusion into a market based system. Trialogue negotiations on the amendments to be made had not been concluded when this Annual Report went to press.

If the aims of a market-economy instrument like the EU ETS are to be achieved, the price paid for emission allowances should only be determined by the interaction of supply and demand and not by controlling the quotas available. The operating framework for allowance trading must be clearly staked out with reliably established allocations before each trading period commences. Planned-economy interventionism runs counter to the principles of free trade, breaks down trust, promotes legal uncertainty and violates the ex ante principles. The agreed timetable for the auctioning of emission allowances has so far guaranteed predictability and planning certainty for those undertakings that come under the EU ETS. There is cause to fear a significant distortion of competition that will impact on member states

in their choice of energy sources, not least when it comes to electricity generation. For some member states any additional burden on electricity prices that this would cause would be hard to accept, given their already precarious economic situation.

Power station emissions

The European Commission is currently working with member states, which includes full stakeholder involvement, on a revision of EU clean air policy. Stricter limits, including those for nitrogen oxide and particulate matter, have already been laid down in the 13th Federal Emission Control Act as part of the implementation of the Industrial Emissions Directive. This represents a contribution towards compliance with the emission ceilings for these substances. In May 2013 the Federal Government responded to a question from the parliamentary group ALLIANCE 90/THE GREENS by pointing out that any overrun of the threshold values for nitrogen dioxide and high particulate-matter concentrations, which occur particularly in areas with a high traffic density, were mainly caused by traffic emissions. Emissions from large combustion plants, such as coal and lignite fired power stations, are of subordinate importance compared to emissions from other sources. It is therefore incomprehensible that environmental pressure-groups launched their attacks on one of the smallest emitters.

The post-mining era

After the end of active coal mining in Germany the RAG Foundation will provide support to the industry in dealing with long-term liabilities. The specialised personnel needed to undertake this work commenced their training in the summer of 2013. One of the relevant study paths, and the only one of its kind anywhere in Germany, is the 'Geo-engineering and Post-mining' course that is offered at the Georg Agricola University of Applied Sciences (TFH) in Bochum. This part-time degree course combines science-oriented and technical qualifications that relate to the interface mining – mine surveying – geotechnics. The study programme focuses primarily on the mining industry's long-term duties, including water management, shaft stabilisation and contaminated-land remediation.

As well as dealing with risk issues the study course also examines the opportunities that will present themselves in the post-mining era, since the development of practical follow-up plans for former mining sites opens up a range of sustainable future prospects for the regions concerned. If the towns in question are to have a sustainable future

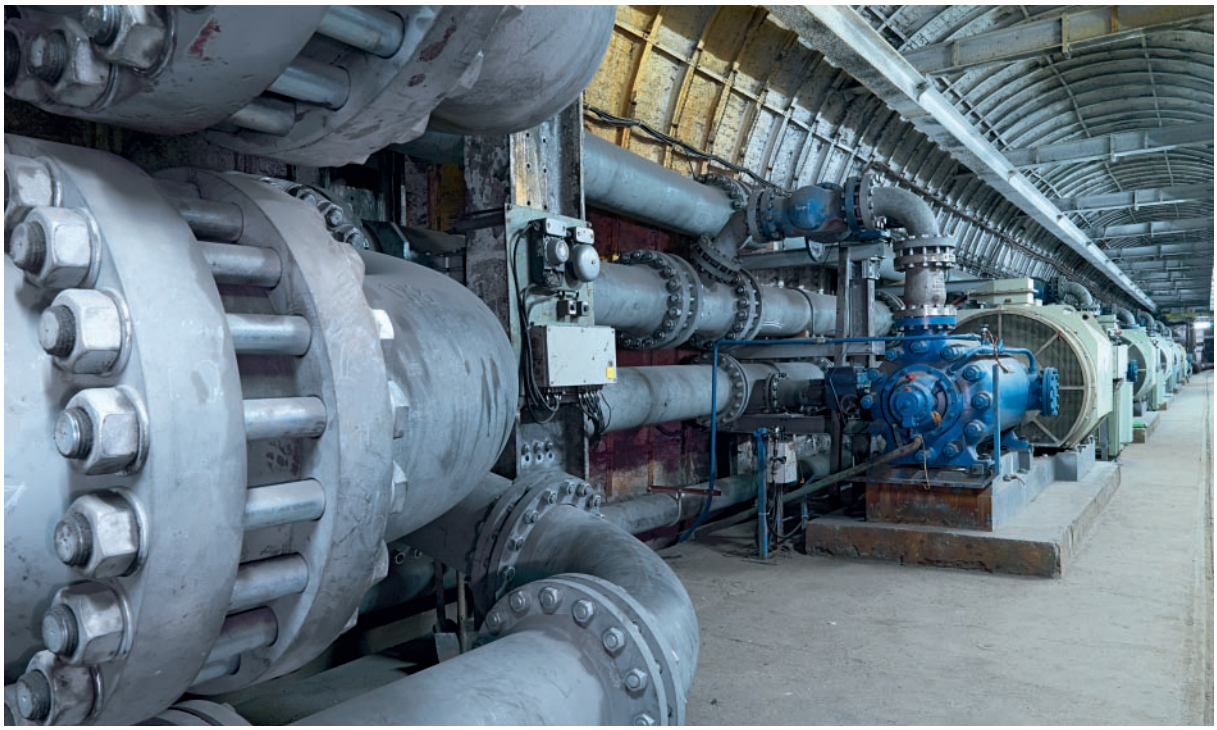
Redevelopment of former mining sites

Mellin in Saarland

Minister Stein in Dortmund

Niederberg in Neukirchen-Vluyn

Friedrich Heinrich in Kamp-Lintfort



Main water pumping station at Zollverein colliery

as attractive economic areas their development potential has to be used to the full. Urban development implies a need for land, and yet future land use must not be at the expense of nature and landscape. The reactivation of brownfield sites is therefore an urgent necessity, and this includes the revitalisation of former industrial land and the recycling of contaminated soils.

RAG alone owns more than 11,000 hectares of land and well over 1,000 buildings. Essen-based RAG Montan Immobilien GmbH has devoted itself to the restoration of disused mining land and the development of sustainable follow-on projects for more than 35 years. These post-utilisation concepts not only have to be in line with market requirements but must also satisfy people's needs. The re-designation of land for new uses, including residential and recreational areas as well as business and logistics parks, is undertaken in close consultation with neighbouring residents and local authorities. There is a huge diversity of after-use projects in the Ruhr area. The Zollverein World Cultural Heritage Park in Essen, the Nordstern landscape and business park in Gelsenkirchen on the site of the old Nordstern colliery and the Lippepark in Hamm on the former Ost colliery site are just some of the more prominent examples.

The TFH Master Degree course is not limited to coal mining, for all extraction industries now face similar challenges. The RAG Foundation supports the TFH through the sponsorship of a Foundation Professorship. The TFH and the RAG Foundation also want to cooperate in establishing a research-oriented competence centre for the post-mining era that will address scientific themes and issues associated with the industry's inherited liabilities. New initiatives are to be developed for the ecological utilisation of existing potential, for example the construction of wind turbines on disused colliery spoil tips, where wind conditions often match those of coastal areas, and the recovery of waste heat from spoil tips. Mine gas is already being extracted commercially, while studies are still under way into the feasibility of building pumped-storage power plants below ground (see Chapter 1). Mine water management is another area with potential. This underground water has a temperature of 20 to 25° C and could be used for heat recovery purposes.

Former mining sites offer all kinds of potential for future utilisation. As well as giving an important stimulus to structural change in the coalfield regions, such projects can make a contribution to Germany's future energy supplies.

Taking responsibility

The Economics Ministry of North Rhine-Westphalia has launched an acceptance initiative for the mining industry that is aimed at ensuring maximum transparency by mine operators and mining authorities towards the communities in question. And RAG has also been participating in this programme.

Transparency in handling subsidence claims and delivering reliable services throughout the industry run-down process – these are also RAG's objectives. And the company has acknowledged its responsibilities at media talks and via promotional material. The company recently held a press conference to report on the measures being put in place to tackle the problem of abandoned mine workings – the remnants of a coal industry that some 150 years ago heralded the start of industrialisation in this part of Germany. And RAG intends to take its responsibilities for inherited liabilities very seriously.

RAG is required under mining law to bear the cost of any subsidence remediation work in those areas where the company holds the mining concession. This obligation remains in place irrespective of whether RAG is still actively engaged in mining coal or has already closed down its production capacity. It is the job of specialist building engineers and architects to assess whether mining subsidence has occurred or not, and the amount of compensation to be paid, if any. When the subsidence damage is attributed to mining activities the claim is in most cases settled amicably with the owners of the property. The average period of time needed to settle subsidence claims has reduced considerably over the years. In cases where the damage has not been caused by mining operations the company rejects the claim and gives grounds for its decision. Where the claim cannot be settled by agreement between the owners and RAG the former can enlist the free services of the arbitration body for mining subsidence. In North Rhine-Westphalia this service is provided by the Regionalverband Ruhr (Ruhr Regional Association) and in the Saar by IHK Saarland. In 2012 there were about 40,000 damage claims of this kind, 130 of which involved the services of the arbitration body. Only some 15 % of the cases involving the arbitration body required a judicial clarification.

As with independent, publicly appointed experts and specialists, and public notaries, mine-plan surveyors are required to carry out their work, in accordance with the principles of their art, in an impartial, reliable and conscientious manner and to the required level of professional competence. The independent status of mine-plan surveyors is guaranteed by way of contractual arrangements, with the result that they are not bound by instructions when drawing up their maps. This legal stipulation is applied nationwide. The mining maps prepared by RAG mine surveyors are also regularly inspected by the Arnsberg District Authority. In individual cases that have been made public the supervisory authority will also check the accuracy of the mine plans in situ. Organisational separation ensures that subsidence claims are not handled by the colliery's own mine-plan surveyors.

From 2018 on RAG will also be required to remedy and settle all claims for subsidence damage incurred or caused and has built up a reserve fund for this purpose. The company therefore assumes full responsibility, without fuss or quibble, for the settlement of mining subsidence claims.

Chapter 5

European and international energy and raw materials markets

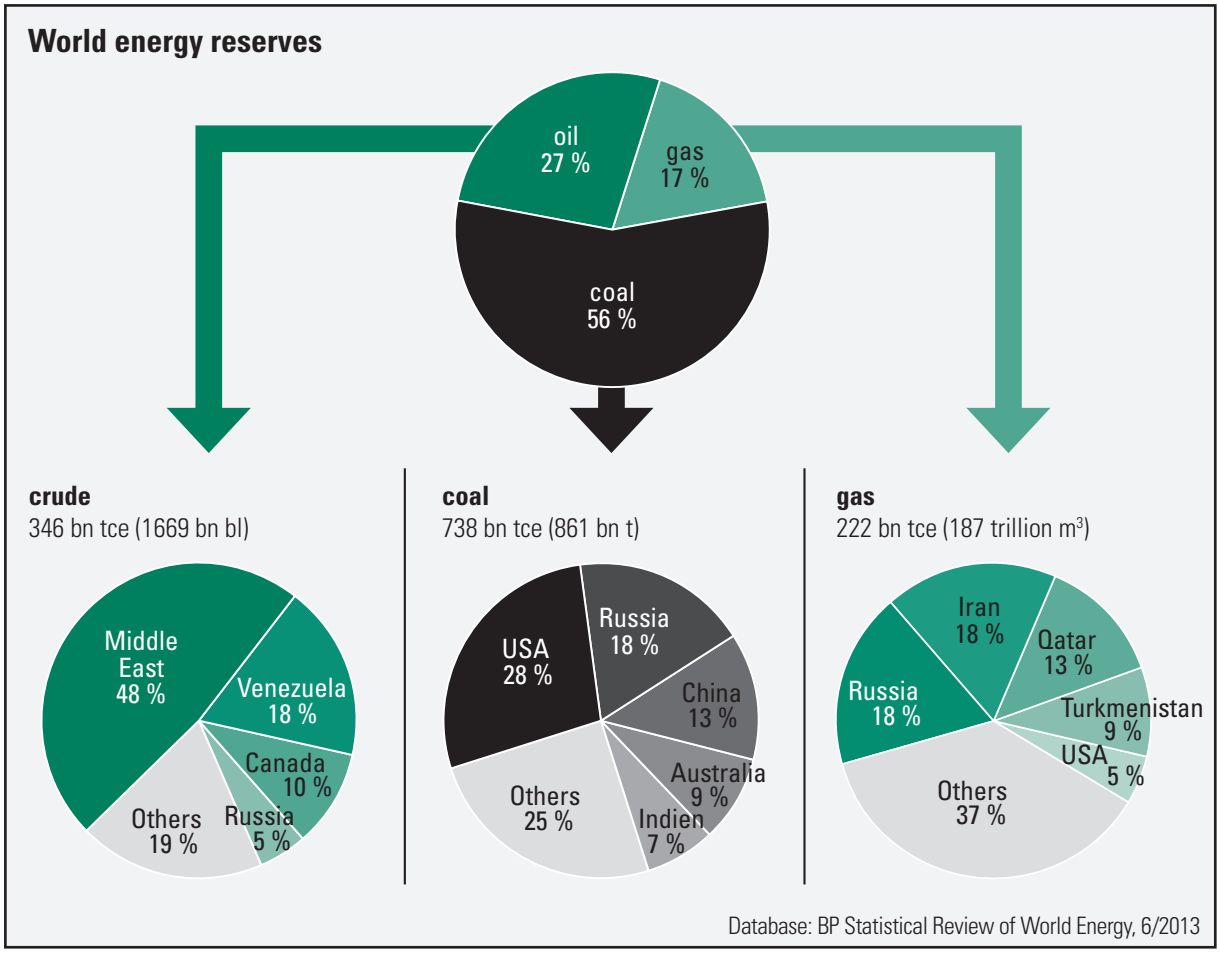
World population growth

World population growth is accelerating again faster than earlier projections have predicted. According to the fairly conservative estimates developed in the United Nations 'medium' population projection the world's population will increase over the next 12 years from 7.2 bn in mid-2013 to about 8.1 bn by 2025. Three years later, according to this scenario, India will have 1.45 bn citizens and will overtake China as the world's most populous nation. Soon after that China could also be surpassed by Nigeria. By 2050 there will be in the region of 9.6 bn people on the planet. And by 2100 this will have grown to 10.9 bn. According to the latest prognoses practically all of this growth will take place in the developing countries. The population of Africa, for example, will nearly quadruple to a figure of 4.2 bn. In Europe, on the other hand, the population is expected to fall by 14 % by the year 2100, while Germany will see its population shrink by as much as a third.

A wake-up call from the Club of Rome

In mid-2013 it was not just the expected population explosion that sounded the alarm bells at the Club of Rome. This international network of independent leading personalities was founded in 1968 and since then has concerned itself with issues relating to the future of mankind. Its 33rd report 'Plundering the planet', which echoes the message of the 1972 publication 'The limits to growth', is intended as a wake-up call. As the world's population continues to rise, and energy consumption levels go on increasing, we will in the not too distant future see a depletion of those global raw materials that can still be extracted at a reasonable cost and this in turn could well threaten the long-term survival of our civilisation in an 'age of diminishing natural resources'. The authors of the report are of the opinion that the data on fossil-fuel availability do not correctly reflect the reality of the situation and that actual shortages are in fact more serious than previously thought. The report

World energy reserves



Database: BP Statistical Review of World Energy, 6/2013

specifically refers to the dramatic reduction in German coal deposits reflected in the figures of the BP Statistical Review that was published several years ago. The Federal Institute for Geosciences and Natural Resources (BGR), Hanover, had adjusted the figures for economically recoverable reserves of German coal to align with the coal-policy decisions, which provided for the cessation of all coal mining in Germany by the end of 2018.

Global fossil-fuel reserves

The data on world reserves of fossil fuels as presented in the BP Statistical Review of World Energy show changes from year to year, as indeed do the official statistics. Some of these can be attributed to corrections or additions resulting from new discoveries, such as the oil and gas finds made in Brazil's Santos Basin in November 2007. Changes are also occasionally made to the demarcation between reserves and resources. Technical progress and higher market prices have made natural resources more economic to extract and so they are classified as reserves. One dramatic intervention, for example, involved the integration of 'unconventional' oil deposits in the global oil reserves category in 2010. The inclusion of the heavy-oil deposits of the Orinoco Oil Belt has made Venezuela the world's most important oil producing country. Taking account of that country's long-recognised oil shale deposits has at a stroke made Canada the world's third-largest oil country after Saudi Arabia, which previously had topped the oil reserves list. The BP Statistical Review, in presenting this year's data for fossil-fuel reserves, has made significant changes in particular to the figures for the natural gas reserves of Russia and Turkmenistan. The reserves situation of the two other fuels, oil and coal (including lignite), has remained almost the same. Moreover, the relationship between the figures for available reserves of the three fossil fuels – oil, gas and coal – shows little or no change.

The energy resource markets

Even if, against this backdrop, the dramatic depiction presented in the Club of Rome's report appears exaggerated, there is no doubt that energy resources will become increasingly scarce over the longer term and will also in time become more expensive. And while mineral resources can be used and re-used several times, even they are becoming much more difficult to obtain. Until June this year at least there seemed to be a sufficiency of world supplies on the different fossil-fuel markets. Low demand for steel combined with the ongoing euro crisis and the relatively low growth rates in China have led to moderate demand, high stock levels and over-supply on the international coal markets. And while the oil market has generally reacted with extreme sensitivity and volatility to real and feared supply disruptions, it has remained well supplied around the world.

The Organisation of Petroleum Exporting Countries (OPEC), Vienna, recently saw little reason to increase its production quotas. US oil stocks have also been at record levels. In mid-May 2013 the Paris-based International Energy Agency (IEA) stated in its medium-term Oil Market Report 2013, which covers the period 2013 to 2018, that the USA and Canada could be self-sufficient in oil and gas at some point in the future. New technologies will provide additional yields from oil sources previously believed to be exhausted - referred-to as 'light tight oil' (LTO). Oil production from Canadian oil sands is also increasing, while fracking has led to a huge rise in shale-gas output in the USA. This technology uses a mixture of chemicals, water and sand, which is pumped in at high pressure, to create a series of hydraulic fractures that triggers the release of the gas and oil bound up in the rock strata.

These new exploration techniques will continue to bring major changes to the world trade in energy resources in the years ahead. The shale-gas glut in the USA, for example, has also resulted in a worldwide rise in gas availability, mainly due to the fall in US demand on the world market for liquid natural gas (LNG). In just a few years US shale gas could also be exported in the form of LNG, thereby directly increasing its availability on the world market. The USA is already considering plans to build a number of LNG export terminals. An installation being developed by Cheniere Energy is already at the planning and approval stage and is scheduled to commence operations in 2015.

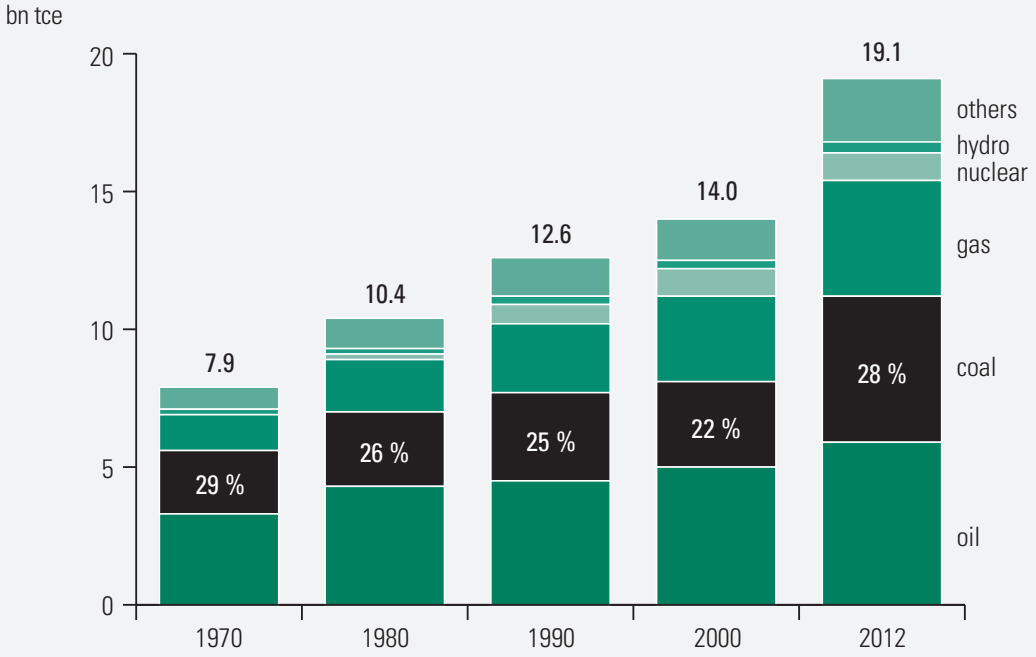
In north-west Europe gas prices have remained comparatively high and this has favoured the use of coal for electricity production. Coal is becoming less expensive in Europe, though this is also partly due to the increased supply from the USA, in particular. In America coal is being forced out of the electricity market by cheaper gas. EU Energy Commissioner Günter Oettinger sees fracking as an opportunity for European energy supplies rather than a threat to the environment. In an interview with Focus on 29 May 2013, and in response to a question on Germany's rejection of fracking, he is quoted as saying ‚We have to accept certain risks'.

All these interactions and interdependencies in and between the international (energy) resources markets illustrate how susceptible these markets are to crises. Sooner or later we will start to see longer-lasting supply shortages; demand-driven competition would then increase massively and the extraction of raw materials will become much more expensive than at present.

As the IEA indicates in the central scenario of its World Energy Outlook (WEO) 2012, the world's growing demand for primary energy will still have to be met by a high consumption of fossil fuels. This 'New Policies Scenario' proceeds on the assumption that political commitments and the plans that have already been announced to limit greenhouse-gas emissions and improve security of supply will actually be implemented in the period under review. Of all the four scenarios presented in World Energy Outlook, the 'New Policies Scenario' looks to be more like an actual prognosis than any of the others. This assumes that global primary energy consumption (PEC) will increase by 35 % from the reference year 2010 to the end of the review period in 2035. This would represent an average annual rate of increase of 1 %. Gross power generation, on the other hand, is expected to increase by 70 % and its annual growth rate will be twice as fast at 2 %. Most of this growth will take place in the threshold and developing countries, which will account for 93 % of PEC and 84 % of gross electricity production. The contribution made by fossil fuels to PEC and power consumption will decline in relative terms, though these resources will continue to dominate the market. In 2035 fossil fuels will still account for nearly 76 % of PEC (the 2010 figure was 81 %), while 57 % of global gross electricity production will be based on fossil energy sources (68 % in 2010).

The European Commission has been making great efforts for a number of years to steer Europe's PEC and electricity production on what it considers to be a more sustainable path. While initial steps have been taken in this direction, the EU will continue to remain dependent on fossil fuels for decades to come. According to the IEA's 'New Policies Scenario' 71 % of PEC and 44 % of power generation in EU-27 will still have to be met by fossil fuels in 2020. Fifteen years later their share of the PEC and power generation markets will have reduced to 64 % an 35 % respectively. According to current data, and without

World energy consumption by energy source



Source: World Energy Council Germany, 2013

allowing for new exploration methods (fracking, LTO), the EU will have to go on importing a large percentage of its energy resources.

In its presentation at the meeting of the European Council on 22 May 2013 the European Commission referred to the EU's growing reliance on energy imports and, moreover, on just a small group of supplier countries. It saw and continues to see Europe in a global competition for energy sources. The Commission described this as one of the most important challenge facing the energy sector. According to its figures some 406 bn €, or 3.2 % of GDP, is being spent on the import of oil, gas and coal – and the trend is upwards.

The BRICS states

Another long-term development is the ongoing shift in global raw-materials trade from the industrialised countries towards the emerging nations. This will intensify as the USA and Canada continue to withdraw from the world oil market. China and some other newly industrialising countries have gained a large degree of influence over both the demand and the supply side of the market. These countries, collectively referred to as the BRICS states (Brazil, Russia, India, China and, since the end of 2010, South Africa), are characterised by higher than average annual economic growth rates of 5 to 10 %. About 40 % of the world's population – some three bn people – now live in this economic area and produce one quarter of world GDP. These countries are also rich in natural resources, but at the same time are developing a growing appetite for raw materials sourced outside their borders. The BRICS states held a summit meeting in Durban, South Africa, in late March 2013 and were united in their goal of making themselves economically independent of the western industrial nations. The summit meeting essentially reached an understanding on the establishment of a joint development bank that would act as a counterweight to what is, in their view, a western-dominated World Bank and International Monetary Fund and would in the main be used to fund infrastructure projects in the Third World. However the meeting ultimately failed to reach a conclusive agreement on this point because of a difference of views on the location and financing of such a development bank.

European energy and raw materials policy

As energy markets become tighter and increasingly dominated by the BRICS states and other emerging nations, Europe is now becoming more and more aware of its vulnerability to an insufficiency of raw-materials supplies. In 2008 the WEC even published a study entitled 'Europe's Vulnerability to Energy Crises' and security of supply in the energy and raw materials sectors has been on the EU agenda ever since.

Energy costs too are again coming under serious consideration. At a meeting of the European Council on 22 May 2013 the EU Heads of State and Government placed special emphasis on providing the economy and the private sector with 'affordable and sustainable energy' and to this end agreed on setting guidelines in four key areas. As before, the completion of an effective internal energy market was highlighted as a priority objective and the Commission was asked to produce a report in early 2014 detailing the progress achieved in this area. Development of the grid interconnections also had to be driven forwards and in general significant investments in new and intelligent energy infrastructures were to be facilitated by way of an appropriate package of measures. There would be greater diversification of European energy supply, this to include the development of local energy resources along with measures to further increase energy efficiency. The European Council also considered that it was necessary to work on the impact of high energy prices and costs.

Environment and climate protection, and the provision of a low-carbon energy supply for Europe, have long been at the forefront of the European Commission's agenda. The other elements in the energy-policy triad have only recently been given more importance. This can no doubt be explained by the need for an appropriate reaction to the euro crisis in order to prevent any further negative impact on the economy, and indeed on the people of Europe too. In its Green Paper 'A 2030 framework for climate and energy policies', which was presented at the end of March 2013 and accompanied by a public consultation, the Commission logically conceded that the 2008/2009 framework for climate and energy policy would have to be adjusted to deal with the unforeseeable developments that had occurred in the interim. However this did not mean breaking with the targets that had been set for 2020. Quite the contrary, even more ambitious efforts were warranted in areas such as the extension of renewables and the lowering of greenhouse-gas emissions. And the guidelines on efficient and cost-effective follow-up regulations for renewable energies and on ensuring an adequate power generation capacity that the Commission presented in July 2013 will also impact on energy prices in the EU.

World coal market

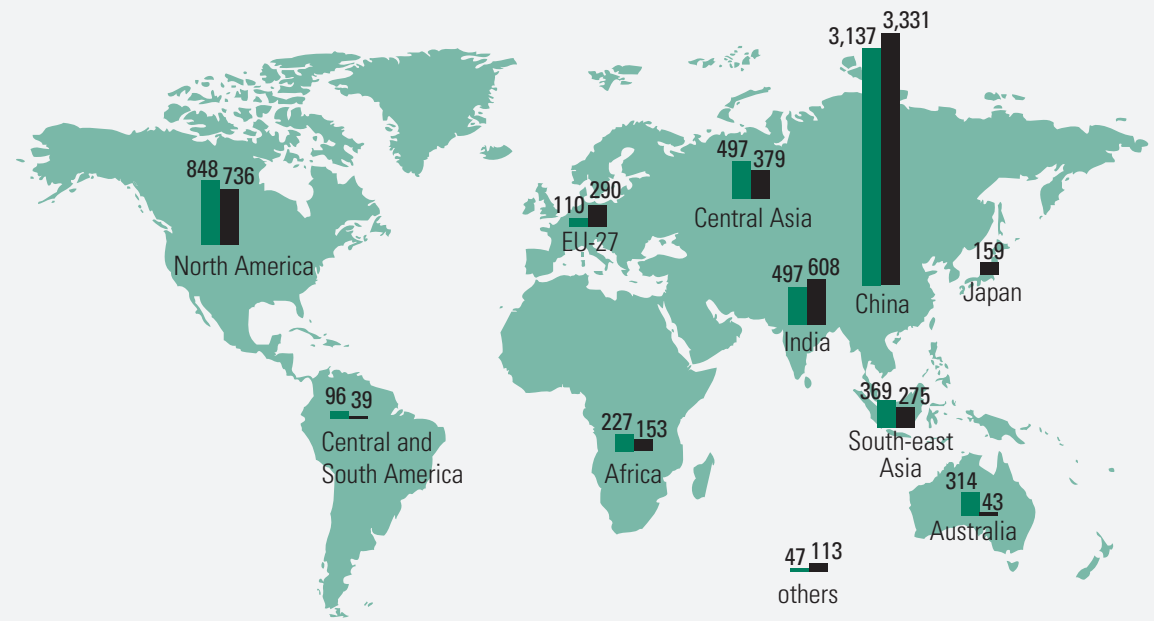
Last year global coal production significantly exceeded the 7 bn mark for the first time. This tonnage comprised 87 % steam coal and 13 % coking coal. Much of the additional output came from China (+ 60 million t) and Australia (+ 40 million t), which at the start of 2011 was still coping with production losses as a result of serious flooding. About one seventh of world production – approximately 1 bn t – was traded on the international markets. This figure is only for seaborne trade and does not include inland movements by road and rail. About 76 % of this fuel was steam coal, while coking coal accounted for the remaining 24 %.

There was a surplus of steam coal in north-west Europe up to mid-2013, in spite of high levels of coal-based power generation. A high level of supply from Colombia and South Africa, in particular, dominated the relatively stable demand for steam coal. Along with Indonesia, which has for a number of years tended to concentrate more on the Pacific market, Colombia and South Africa are now among the cheapest suppliers of steam coal in the world.

In Colombia the miners' strike, which persisted into the early part of 2013, was finally settled after 32 days and the export ban imposed on mine operators Drummond for an infringement of environmental protection legislation was lifted. Since then Colombian exports have generally been able to flow uninterrupted and have been pushed increasingly on to the markets with the aid of price concessions. However, fresh strikes were announced again at the end of June. In South Africa internal unrest and disruptions to domestic transport services have continued, though these have so far failed to have any significant impact on coal exports. In the middle part of the year China imposed an import ban on steam coal of low calorific value, the aim being to strengthen the position of domestic suppliers in this particular market segment. This has mainly affected Indonesian exports, which now have to seek out new markets elsewhere in the world. Add to this the fact that since the start of the shale-gas glut and the collapse of the coal markets at home US coal producers have had to search for new sales outlets overseas. This has further intensified the existing over-supply in Europe and driven the price of steam coal further

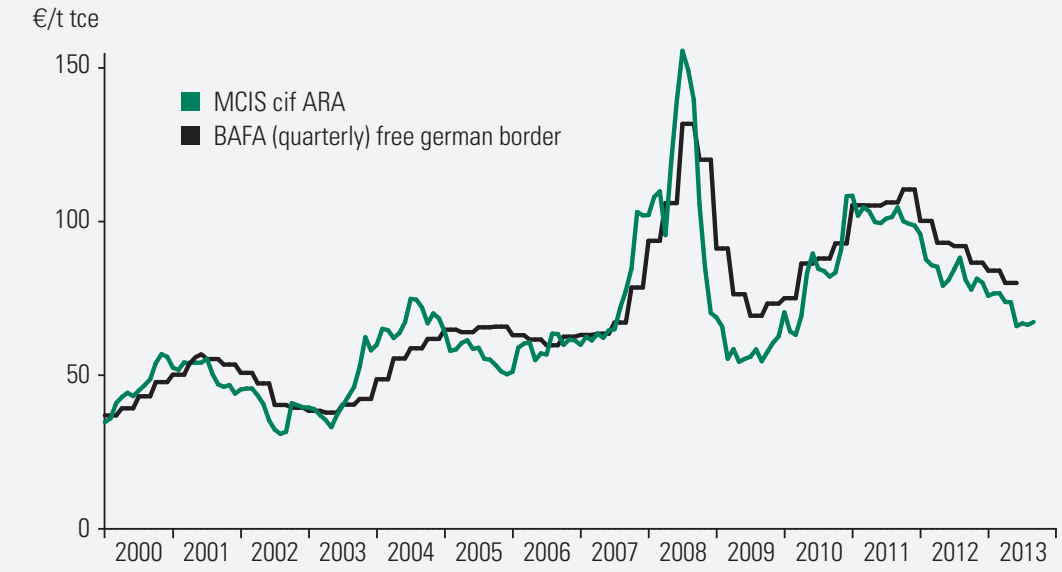
World coal production and consumption 2012

production: 6,142 mt ce
consumption: 6,126 mt ce



Sources: VDKi / IEA / BP / EIA

Price trends: steam coal cif north-west Europe and free German border



Database: IHS McCloskey Coal Report, editions 01/2000 to 09/2013 / BAFA, third-country coal prices by quarter

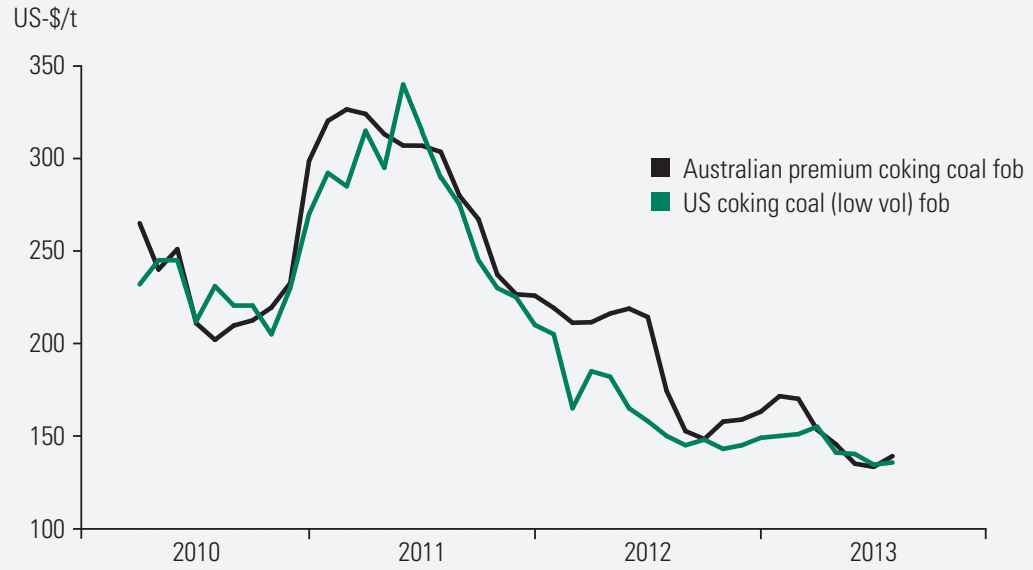
downwards, which has also impacted on the German market. The situation has essentially been the same in Asia, where this year China's slightly restrained economic growth meant a decline in demand. Coking coal too was in plentiful supply, mainly as a result of the sluggishness in the steel markets of those states bordering the Atlantic and Pacific.

The low coal prices came up against high electricity prices, particularly in Germany. This was translated into favourable 'dark spreads', which represent the relationship between the electricity price and the cost of coal. A favourable scenario also developed between the cost of electricity and coal, on one hand, and the price of CO_2 emission certificates, on the other. This is referred to as 'clean dark spread', while 'spark spread' denotes the relationship between the electricity price and the cost of gas. The associated differences are in essence nothing other than electricity price margins. The resulting financial derivatives are traded on the stock markets and are used as a hedge for underlying transactions and also for speculation. They therefore complement the trading in futures – with coal also being one of the commodities – that secures the prices for the future (hedging) or enables speculation to take place on price differences at different points in time. Such transactions rarely involve holding the physical commodity itself and simply comprise paper contracts known as 'futures'.

The trade in such financial arrangements has increased considerably in recent years, particularly for steam coal on the Atlantic market. After a downturn in 2011 the volume of trade in steam-coal futures rose by 18 % in 2012 to a figure of around 2.3 bn t, thereby exceeding the corresponding trade in the physical commodity many times over. Because of the deregulation of the electricity market European power station operators have for many years had a much higher hedging requirement than power suppliers in the Pacific market. Moreover, as a result of the high level of uncertainty surrounding fuel price trends some US power plant operators have halved their contractual coal purchases so as to buy-in the other half on the spot market, depending on the relationship between gas and coal prices. They have then in turn hedged the price of these tonnages by futures trading.

The high over-supply situation worldwide is not destined to last long. China, the world's largest coal producer, has also recently become the biggest coal consumer and has for a number of years been buying-up natural resources from around the world that are then no longer available to the international trade. India is planning to build a large

Price trends: premium coking coal fob Australia (Queensland) and USA (east coast)



Database: IHS McCloskey Coal Report, April 2010 to September 2013

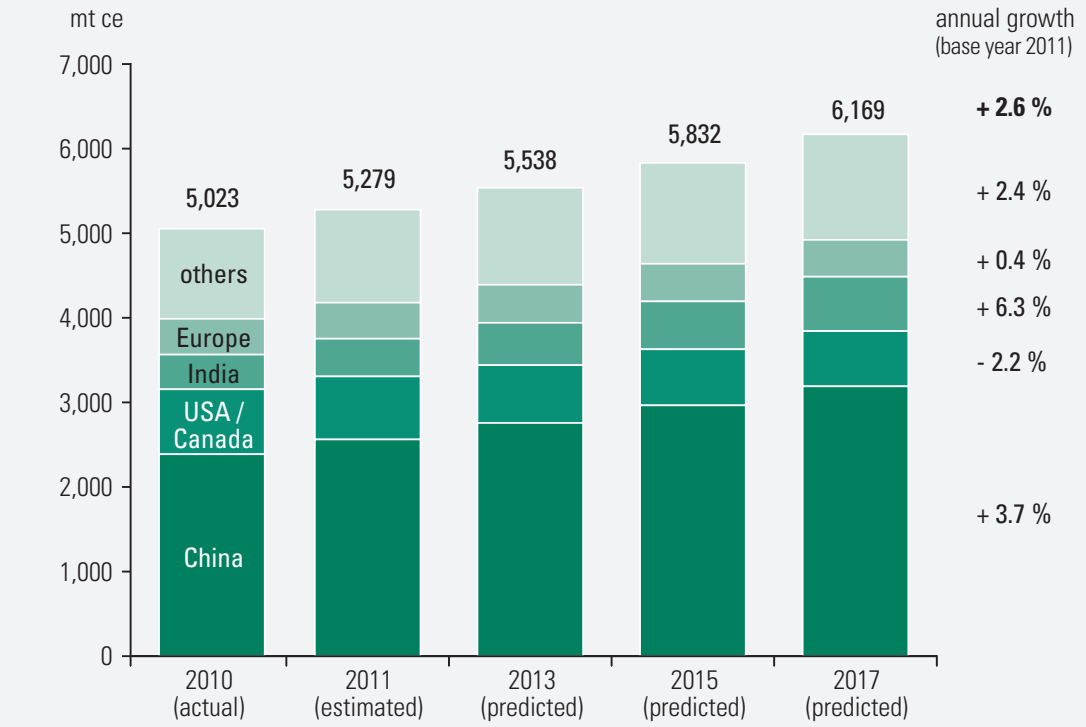
number of new coal-fired power stations and will soon have a much stronger presence on the demand side of the global coal market than is currently the case. Then again, the shale-gas boom in the USA could soon come to an end if gas prices in that country start to rise again as a result of higher production costs. This was how the 11 June 2013 edition of the Berliner Tagesspiegel interpreted the statements of IEA chief economist Fatih Birol. Such a development would make coal competitive again for US power generation and the level of US coal exports would fall.

Here it should not be forgotten that the Obama administration wants to bring about an energy transition in the USA as well. As part of this move the US Environmental Protection Agency will be laying down strict limit values for carbon dioxide emissions from power stations. The US coal industry has labelled this as a 'war on coal', as it would be extremely difficult for coal-fired installations to meet these regulations. This would have a major impact on the US energy industry, as the country's power generating sector is more than 37 % reliant on coal (2012 figures). It is still too early to say just what this would mean for American coal exports.

World steel production appeared to be recovering slowly by the middle of 2013. In the medium term this should result in an increased demand for iron ore, coke and coking coal. It would also have an impact on the market for bulk carriers of 120,000 to 180,000 dwt, which has been over-supplied for years. Such vessels are mainly used for carrying coal and ore. This would to some extent delay the eventual exit of these capesize vessels from the market, but would not remove this threat in the long term. While panamax bulk carriers, which are only half the size, are also used for shipping coal, their main business lies in the seasonal market of grain transportation (grain harvests in the USA, Latin America and South America). Cargo rates for capesize and panamax vessels are in this respect often widely divergent. The growing demand for coal and ore is likely to see an upturn primarily in capesize freight costs, which are currently very low.

The low price of steam coal and, more particularly, coking coal in the second half of 2012 and in the first six months of 2013, combined with the glut of shale gas in the USA, has caused real hardship for a number of coal producers, especially in the USA and Australia. Collieries have been temporarily closed or in some cases shut down completely, administrative offices downsized and merged together, management personnel removed and replaced and investment projects cancelled or suspended. The market was slimmed down a number of years ago and significant capacity stream-

IEA medium-term forecast: developments in coal demand



Source: IEA, Coal Medium-Term Market Report 2012, Paris 2012, Base Case Scenario, incl. inland trade and own consumption

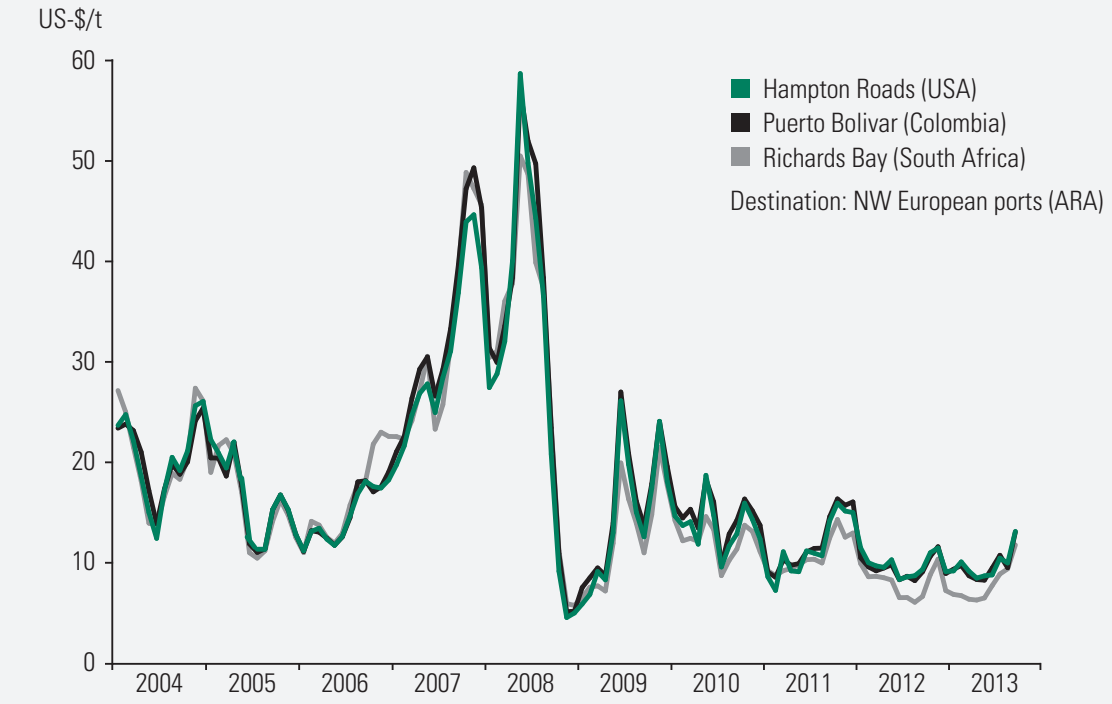
lining and deferred investment have meant that it cannot respond as quickly and as flexibly to any future short-lived or sustained changes in demand, as was still the case in the wake of the commodity price boom of 2008. This means that dramatic price jumps cannot be ruled out. At the same time, coal production costs have been rising continuously at international level for many years. The IEA report 'Resources to reserves 2013', which came out in the summer of 2013, shows that average coal production costs worldwide have increased considerably, particularly as a result of stricter environmental and safety requirements and because of the increase in working depths in the deep mining sector. In fact costs doubled during the decade 1999 to 2009 alone. This restricts any leeway for bottom price levels.

The Bettercoal initiative

Coal has an image problem around the world. While it is comparatively cheap and has the most abundant reserves of all the fossil fuels, it is at the same time considered dirty and has been labelled a 'climate killer'. Working conditions and respect of human rights in coal producing countries are also increasingly being called into question. Nevertheless, as has been mentioned above, coal will remain an essential global resource for many decades to come.

The international coal industry is aware of all this (see chapter on 'El Cerrejon – responsible mining in Colombia', page 58 ff.). It is now taking measures to improve environmental protection standards in coal utilisation by increasing energy efficiency levels at coal-fired power stations and by introducing technologies for carbon dioxide capture and storage (CCS) and carbon dioxide capture and usage (CPU). At the same time, seven major European coal-fired power plant operators launched the Bettercoal initiative in 2006 (founding members are Dong Energy, EdF, Enel, E.ON, Fortum, GdF Suez, RWE and Vattenfall) to provide information and assurance to coal purchasers and consumers alike about the working conditions in the coal industry. They also want to introduce an internationally accepted standard for socially and environmentally ethical coal mining (the Bettercoal Code of

Price trends: sea freight rates to Europe



Database: IHS McCloskey Coal Report, editions 01/2004 to 09/2013

Practice). A website was set up to this effect last year to provide updates on the progress of the standard and a public consultation process on this theme was completed in June 2013.

However, doubts have been raised as to the objectivity of the initiative. In a study entitled 'Bittercoal' the members of various environmental and human rights groups (including Urgewald and Fian) rejected the Bettercoal initiative as 'greenwashing'. This opinion is also shared by church organisations such as 'Bread for the World' and 'Misereor'. The Stuttgart-based aid agency Bread for the World and the Church Development Service in Bonn have published a study entitled 'Implications for sustainable development, poverty reduction and climate change', which was produced by the author Heike Meinhardt-Gibbs who works for the World Bank Group and other bodies. In this the author calls for a new strategy that will provide those living in developing countries reliable access to sustainable energy supplies.

Coal from Colombia in particular has been coming under increasing criticism. Stefan Ofteringer, the human rights expert at the Catholic aid agency Misereor in Aachen, has accused the Colombian mining industry of being 'blood-stained', in reference to the frequent reports of the forced expulsion of communities from potential opencast mining land. It is claimed that these people are not usually given adequate compensation and even those families that have been compensated stand no chance of resuming their normal lives after relocation. Coal dust from the mines makes workers and local residents ill, while in many cases strikes have been brought to an end by force. However, the El Cerrejón company, for one, is making efforts, a fact that has been conceded by Oliver Krischer of the Bundestag parliamentary group ALLIANCE 90/THE GREENS. In contrast, other mining undertakings have simply responded to the criticism in formal tones declaring that they are complying with government regulations.

El Cerrejón – responsible mining in Colombia

GVSt member company STEAG GmbH is one of Germany's major operators of coal-fired power stations and is therefore reliant on fuel imports. The company's compliance rules do not permit child labour and are against any form of forced and compulsory work. Suppliers are expected to share these principles and to abide by recognised minimum standards as developed and laid down in the UN Global Compact and in the code of practice of the International Labour Organisation (ILO). It is STEAG's procurement policy to carry out independent inspections of the company's main coal suppliers. This also includes conducting checks on how the mining operations are carried out and assessing what, if any, impact these activities are having on the environment. To this end personnel from STEAG travel out to inspect the facilities in question, including sites operated by the major producer company El Cerrejón. The company is a major producer in Colombia – a country that is one of the most important suppliers of coal to the European Union.

El Cerrejón is an integrated mining undertaking situated in the La Guajira region in the northern part of the country. The major international mining groups Anglo American, Xstrata Glencore and BHP Billiton are all equal shareholders in the venture. The company owns an opencast mine that produces some 34 million t a year, the seaport of Puerto Bolivar and a 150 km-long railway connecting the mine to the port. It employs about 10,000 people, 99 % of whom are Colombian in origin. More than 62 % of the workforce come from the La Guajira region. El Cerrejón is Colombia's biggest private export company and the largest private taxpayer. Between 2002 and 2012 the company paid some three bn US$ in taxes and a further two bn US$ in licence fees. The mine's entire production goes for export. In 2012 El Cerrejón accounted for 3.9 % of the total global exports of steam coal. The El Cerrejón opencast mine is one of the largest and most modern in the world.

The following report shows that El Cerrejón applies high standards as part of company policy:

Social commitment

The coalfield areas are among the poorest regions of Colombia. The company is socially committed to maintaining four of its own foundations in which it invested around 10 million US$ in 2010 alone. These foundations are intended to bring about sustainable improvements in living standards in the region and to help ensure that the area has a future when mining operations come to an end. In 2008 El Cerrejón achieved a top-three place in the 'Emprender Paz' awards, which are bestowed by the Konrad Adenauer Foundation, St. Augustin and the GTZ (International Cooperation Enterprise) in recognition of special commitments to peace.

Average wage levels are ten times the national minimum in Colombia, which means the workers are very well paid in comparison with the rest of the country. More than 60 % of the workforce are members of a trade union, compared with the average union membership in Colombia of only around 7 %.

Resettlement and integration of village communities

Information provided by El Cerrejón shows that families in line for resettlement are actively consulted as part of

the relocation process. Villagers are involved in the selection of new parcels of land and in the design of new houses that the company builds for them. Although, according to Colombian law, the new plot of land is deemed to be sufficient compensation, El Cerrejón also voluntarily pays out a sum of money as additional recompense. The company abides by the standards of the World Bank and the International Finance Corporation (IFC) and complies with ILO Convention 169, which is specifically designed to protect the rights of indigenous peoples. El Cerrejón also provides support to those who have been moved as they acclimatise to their new surroundings, this including psychosocial counselling.

El Cerrejón is also one of the pilot companies selected for projects run by the UN Special Representative on Human Rights and Transnational Corporations that deal with the introduction of complaints mechanisms for local residents and employees.

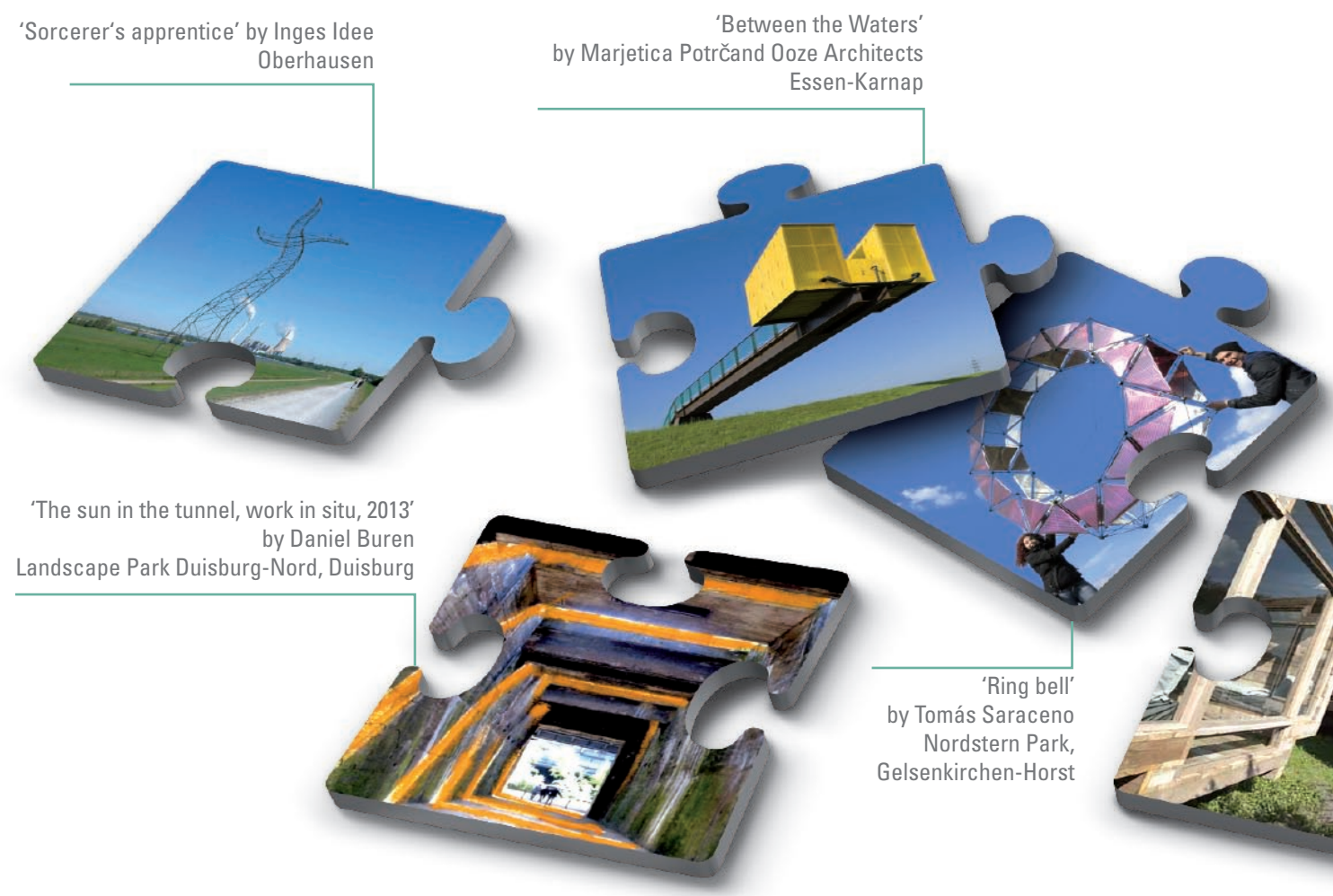
Industrial health and safety

Health and safety issues are taken very seriously at El Cerrejón. Equipment such as ear defenders, respiratory protection, safety helmets and safety shoes are all obligatory and checks are carried out to ensure compliance. These rules also apply to outside contractors. The accident figures submitted by El Cerrejón are low by industry standards. Sprayer trucks are also used to reduce dust levels along the transport routes. Dust formation levels and other parameters are monitored at various measurement stations. According to company information all internal environmental thresholds are continuously maintained at 10 % below the legally prescribed limits. In 2009 the company was recognised for its 'environmental responsibility in research and projects' in a prize supported, for one, by the United Nations Development Programme (UNDP).

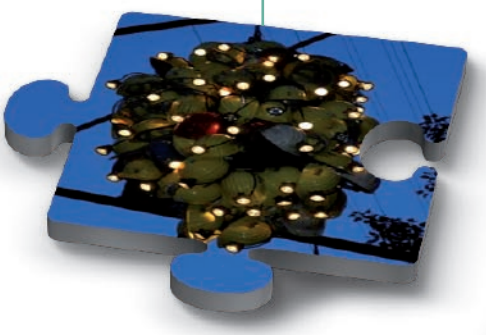
Independent body draws up recommendations

At the instigation of its shareholders El Cerrejón has, since 2007, been participating in an 'independent third-party review' that examines the company's efforts in the area of corporate social responsibility (CSR) and its dealings with adjacent local communities. This audit has yielded 24 recommendations, of which 20 have already been implemented. Every six months El Cerrejón presents a report on the company website setting out the progress of the projects.

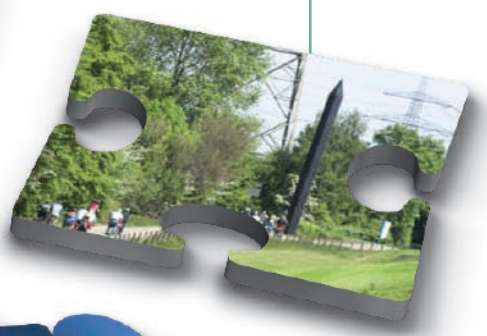
Annex


'Sorcerer's apprentice' by Inges Idee
Oberhausen
'Between the Waters'
by Marjetica Potrčand Ooze Architects
Essen-Karnap
'The sun in the tunnel, work in situ, 2013'
by Daniel Buren
Landscape Park Duisburg-Nord, Duisburg
'Ring bell'
by Tomás Saraceno
Nordstern Park,
Gelsenkirchen-Horst

‘Safety helmets’ by Sujin Do
Landscape Park Duisburg-Nord, Duisburg

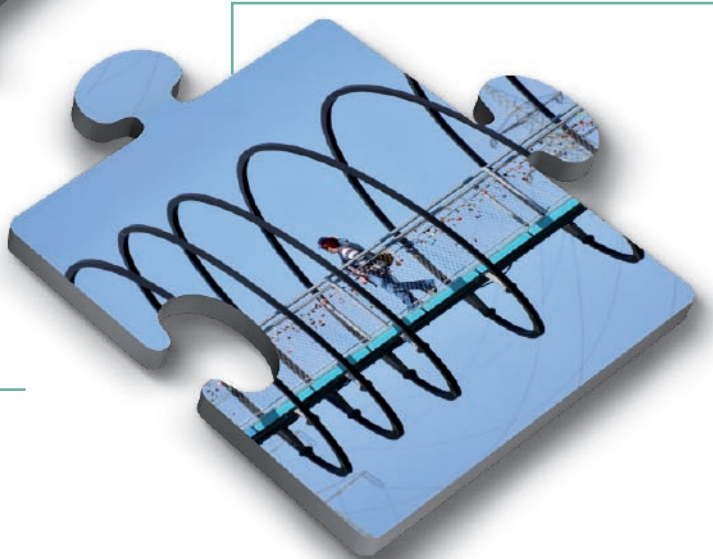


‘Carbon Obelisk’ von Rita McBride
Essen-Altenessen



‘Hercules’ by Markus Lüpertz
Nordstern colliery, Gelsenkirchen

‘Slinky Springs to Fame’ by Tobias Rehberger
Oberhausen – Neue Mitte



‘Waiting for the river’ by Observatorium
Oberhausen-Holten

Statistics

World primary energy consumption

		non-renewable energies			renewable energies		
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	959	5,157	5,836	4,016	441	2,285	18,694
2012[1]	1,000	5,300	5,900	4,200	440	2,300	19,140
2020	1,284	5,837	6,374	4,670	555	2,618	21,338
2035	1,627	6,032	6,658	5,872	698	3,705	24,592

[1] estimated

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

Sources: GVSt, 2013; BP Statistical Review 2013; WEC, 2013
IEA New Policies Scenario, 2012

Global CO_2 emissions

	1990 (base year)	2000	2005	2010	2011	2012	changing rates 2012 vs 2011	changing rates 2012 vs 1990
regions/countries	mt						%	
Annex-I-Countries[1]	14,978.8	14,422.2	14,904.2	14,904.2	14,083.8	13,896.4	-1.3	-7.2
EU-27	4,413.5	4,119.5	4,254.4	3,900.7	3,753.4	3,693.0	-1.6	-16.3
thereof EU-15[1]	*3,373.6*	*3,380.8*	*3,492.8*	*3,165.1*	*3,012.8*	*2,981.3*	*-1.0*	*-11.6*
thereof Germany[1/2]	*1,041.9*	*891.4*	*864.7*	*826.1*	*798.1*	*810.7*	*1.6*	*-22.2*
Australia[1]	277.9	349.4	384.7	406.2	406.6	398.4	-2.0	43.4
Canada[1]	459.3	564.6	579.0	554.0	555.6	551.9	-0.7	20.2
USA[1]	5,100.7	5 962.7	6,100.4	5,727.0	5,603.8	5,401.9	-3.6	5.9
Russia[1]	2,498.5	1,471.3	1,524.8	1,598.2	1,684.4	1,680.2	-0.2	-32.8
Ukraine[1]	719.0	293,5	320.6	289.7	305.5	309.5	1.3	-57.0
Japan[1]	1,141.1	1,251.5	1,282.1	1,191.1	1,240.7	1,326.9	6.9	16.3
Korea	229.3	437.7	469.1	563.1	594.5	602.4	1.3	162.7
India	582.3	972.5	1,164.8	1,625.8	1,678.4	1,798.8	7.2	208.9
China	2,244.1	3,077.2	5,103.1	7,258.5	7,907.0	8,400.7	6.2	274.3
rest of Far East	696.5	1,162.3	1,455.8	1,704.8	1,771.5	1,802.6	1.8	158.8
Middle East	557.1	912.3	1,198.9	1,546.3	1,583.7	1,657.6	4.7	197.5
Africa	544.4	678.8	826.0	929.7	923.7	963.7	4.3	77.0
Brazil	194.3	303.5	322.5	387.7	399.8	410.9	2.8	111.5
Mexico	264.9	349.3	385.5	416.9	430.9	450.6	4.6	70.1
r.o. Latin America	383.8	511.7	577.8	677.7	703.3	726.1	3.2	89.2
Other States	1,677.7	1,647.1	1,899.6	2,157.2	2,287.5	2,327.8	1.8	38.7
World	21,984.4	24,064.9	27,849.1	30,934.6	31,830.3	32,503.0	2.1	47.8

[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 9/2013 and ET 5/2013

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	8,932	2,835	1,028	4,929	4,327	22,051
2012[1]	9,156	2,888	1,008	4,998	4,461	22,511
2020	10,860	3,576	713	6,020	6,712	27,881
2035	12,035	4,658	533	7,923	11,101	36,250

[1] estimated

Sources: GVSt, 2013; BP Statistical Review, 2013; WEC, 2013; IEA New Policies Scenario, 2012

World reserves of coal, lignite, mineral oil and natural gas 2012

	coal and lignite	mineral oil	natural gas	total
regions	bnt ce			
EU-27	48	1	2	51
rest of Europe and Central Asia[1]	213	28	69	310
Africa	28	26	17	71
Middle East	1	167	95	263
North America	210	46[2]	13	269
Central and South America[3]	11	69	9	88
China	98	4	4	106
India	52	1	2	55
Indonesia	5	1	4	10
Far East	6	2	3	11
Australia[4]	66	1	5	72
World	738 56%	346 27%	222 17%	1,306 100%

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

Source: BP Statistical Review, 2013

World reserves and production of coal 2012

	reserves[1]	production[2]
regions	bnt ce	
EU-27	14.212	0.110
rest of Europe and Central Asia	106.287	0.497
Africa	25.971	0.227
Middle East	1.031	0.000
North America	198.458	0.848
Central and South America	7.822	0.096
China	154.800	3.137
India	63.968	0.497
Far East	14.146	0.416
Australia	37.543	0.314
World	624.238	6.142

[1] Data of 2010 [2] Data of 2012

Sources: DERA/BGR, 2011 / VDKi Annual Report, 2013 / BP Statistical Review, 2013

Primary energy consumption in EU-27

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	404	913	583	293	218	2,411
2012[1]	420	873	570	286	242	2,391
2020	356	704	633	315	392	2,400
2035	209	596	724	309	550	2,388

[1] estimated

Sources: BP Statistical Review, 2013; IEA New Policies Scenario, 2012

Power generation in EU-27

year	coal and lignite	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	849	74	727	907	723	3,280
2020	761	43	723	845	1,112	3,484
2035	340	21	960	830	1,627	3,778

Sources: EU-Commission: Energy in Figures – Statistical Pocketbook, 2013; BP Statistical Review, 2013; IEA New Policies Scenario, 2012

Coal and lignite production and imports in EU-27 in 2012

country	production			imports
	coal	lignite	total	coal
	mt ce			
Poland	67	19	86	9
United Kingdom	14	–	14	38
Germany	10	55	65	37
Czech Republic	10	13	23	1
Spain	5	–	5	18
Bulgaria	2	9	11	2
Romania	2	9	11	1
Greece	–	19	19	–
Hungary	–	3	3	1
Slovenia	–	1	1	–
Slovakia	–	1	1	3
Italy	–	–	–	22
France	–	–	–	15
Netherlands	–	–	–	11
Finland	–	–	–	3
Denmark	–	–	–	3
Belgium	–	–	–	3
Sweden	–	–	–	2
Portugal	–	–	–	4
Austria	–	–	–	3
Ireland	–	–	–	2
EU-27	110	129	239	178

Source: EURACOAL, 2013

Primary energy consumption in Germany

year	mineral oil	coal	lignite	natural gas	nuclear energy	wind energy	hydro and others	total
	mt ce							
1980	206.7	85.2	115.7	73.9	20.7	0.0	5.9	508.1
1990	178.0	78.7	109.2	78.2	56.9	0.0	7.6	508.6
1995	194.1	70.3	59.2	95.5	57.4	0.2	10.2	486.9
2000	187.6	69.0	52.9	101.9	63.2	1.2	15.6	491.4
2005	176.3	61.7	54.4	110.2	60.7	3.3	29.4	496.0
2010[1]	160.0	57.9	51.6	107.1	52.3	4.6	48.3	481.8
2011[1]	154.8	55.3	53.3	99.3	40.2	6.0	52.3	461.2
2012[1]	154.0	57.0	56.1	100.8	37.0	5.7	55.0	465.6

[1] preliminary

nuclear energy and renewables evaluated by efficiency method

Source: AGEB, 3/2013

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

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
	in 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

[1] workforce including short-time workers and trainees

Power generation in Germany

year	coal	lignite	nuclear energy	mineral oil	natural gas	wind energy	hydro 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
1995	147.1	142.6	154.1	9.1	41.1	1.5	41.3	536.8
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[1]	116.1	161.1	99.5	8.0	75.7	50.7	117.6	628.7

[1] preliminary

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

[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

Coal production in Germany

year	area				total
	Ruhr	Saar	Aachen	Ibbenbüren	
	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

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Coal industry data for 2012

Mines (as at 01.01.2013)	**3**
Workforce[1] total	**17,613 employees**
- Ruhr coalfield	13,795 employees
- Saar coalfield	1,214 employees
- Ibbenbüren	2,604 employees
Coal production total	**10.8 mt saleable**[2]
	≙ 11.1 mt ce[3]
- Ruhr coalfield	8.4 mt saleable
- Saar coalfield	0.4 mt saleable
- Ibbenbüren	2.0 mt saleable
Technical statistics	
output per production unit	3,739 t saleable/day
average seam thickness	195 cm
average face length	348 m
average winning depth	1,174 m
deepest shaft	1,465 m
Sales total	**11.4 mt ce**
- electricity industry	9.9 mt ce
- steel industry	1.1 mt ce
- heat market	0.4 mt ce
German coal's contribution	
- to primary energy consumption in Germany	3 %
- to electricity generation in Germany	6 %
- to coal consumption	20 %
- to coal-fired electricity production	29 %

[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

German Coal Association