COAL 2010



Coal Annual Report 2010



'Our natural resource. Our security.' is the theme of this year's annual coal convention, and it is also the key message of the German Coal Association's Annual Report for 2010. For one thing remains clear: indigenous coal is by far the nation's most important natural resource and the door will always remain open to these deposits for as long as we have a coal mining industry. Competition around the world is growing for the planet's dwindling reserves of energy resources and industrial raw materials. Rising prices and concerns about availability are placing a strain on consumers and

industry alike and this poses a real risk for economic growth and development. This year's National Resources Summits have made this all too clear.

Unfortunately such considerations seem to be left out of the national coal debate, which tends to be dominated by critical stances on coal aid and climate policy. The Federal Government, and the coal industry along with it, have been taken aback by the proposal from the EU Commission that under the follow-up regime that will be applied after 2010 to replace the existing Council Regulation on aid to the coal industry operating aid to mines would be allowed to expire by October 2014. This would not only prematurely shut down the German coal mining industry but would make it impossible to continue the socially responsible rundown of the industry that has been agreed in Germany up until the end of 2018. Compulsory redundancies would become unavoidable both in the coal industry and in the wider economy and this would in turn place an additional fiscal burden on the public sector by way of increased unemployment and structural problems in the coalfield regions. Those working in the German mining industry are extremely grateful to the Chancellor that she has insisted in quite unequivocal terms that the present agreements should be maintained. The potential significance of coal as part of a national raw materials strategy has also been underlined in the coalition agreement made by the North Rhine-Westphalian state government. Germany and other mining countries now have huge public and cross-Party backing as they attempt to find a viable alternative to the Commission's proposal.

The German coal industry is dependent on having a reliable framework within which to operate and it will continue to abide by existing agreements and legal requirements. For it the Coal Industry Financing Act and its review clause remain unchanged. Our mine planning operations are based on these arrangements, which not only ensure that the coal industry can be scaled down in a socially acceptable manner but also keep the option open of a sustainable mining industry in the vears to come.

Herne, October 2010

Bernd Tönies

Chairman of the Management Board of the German Coal Association

Contents

Foreword	3
Our natural Resource. Our Security.	Ę
The German coal industry in restructuring mode	g
General economic situation	10
Corporate development and sector development Social support for restructuring	10 15
Decision process for the new EU regulation on aid to the coal industry	16
Technology and know-how in the German coal industry	21
Lean processing	22
Health and safety Retaining know-how	23 24
Technical development	25
Guest contribution from RAG Mining Solutions:	20
International know-how transfer in action, with a focus on China'	26
Coal use as a model for industry and sustainability	29
Developments in power-station technology	31
Environment-friendly coal utilisation The $\mathrm{CO_2}$ debate	33 34
A 'green' RAG	36
On the road to an Energy Concept	39
The German energy sector in 2010	40
Key aims of the Energy Concept	44
Problem area: security of supply (EEFA study)	47
Risk values in perspective	49
International energy and commodities markets	53
Developments on the international coal markets	59
Annex	
Statistics	64
Organisation of GVSt	68 69
List of figures and tables Imprint	70
Coal industry data Germany 2009	71

Our natural Resource. Our Security.

The German economy has overcome last year's recession far better than seemed possible even at the beginning of 2010. In spite of some ongoing risks growth rates for the year as a whole are expected to be above 3%. The production drive that has gone hand in hand with the economic recovery has also had a positive effect on energy demand in Germany. After a particularly weak 2009 German coal consumption has again being showing positive signs of movement. The upturn in consumption compared with recession-hit 2009 can mainly be attributed to the rise in demand from the steel industry as well as to the increase in electricity sales at coal-fired power stations.

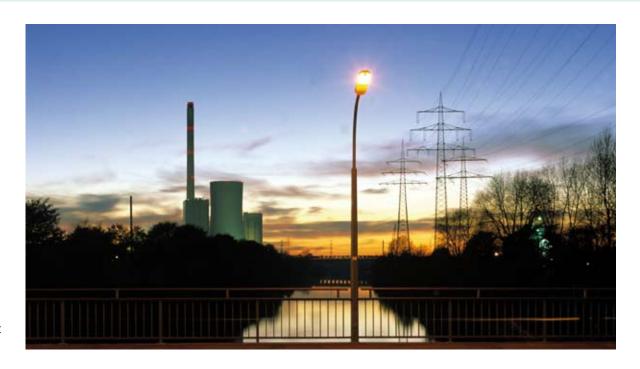
Regardless of this, the politically agreed and predetermined course of coal industry restructuring continues apace, along with the mine closures and the process of manpower downsizing that goes with it. At the same time, RAG Aktiengesellschaft continues to be a major source of employment and with more than one thousand trainees on its books the company remains one of the main training providers in the coalfield areas. As a result of unprecedented cutbacks to subsidies coal industry funding now represents a mere 1% of the entire volume of state aid in Germany.

The decision-making process for the new EU regulation on aid to the coal industry has not yet been concluded. There are no plans to extend the existing Council Regulation (EC) No. 1407/2002 on State aid to the coal industry of 23 July 2002, which is due to expire on 31 December 2010. The EU Commission has instead put forward a proposal for a regulation that provides for the closure of all non-competitive mines by October 2014. This has met with some stiff resistance in the coal producing countries concerned, most notably in Germany and Spain. The German side has been calling for the Commission proposal to be amended to bring it into line with the provisions of the Federal Government's Coal Industry Financing Act and the framework agreements on the socially acceptable rundown of subsidised coal mining in Germany. The final decision will ultimately be taken by the Council and is scheduled for December 2010.

Even within the coal industry the process of restructuring cannot simply be regarded as a 'self-

runner', for the unavoidable loss of manpower will also result in a continuous brain drain of know-how and will require existing operating procedures to be reorganised accordingly. For this reason the 'lean processing' programme has concentrated on systematic efficiency improvements by way of streamlined structures and an ongoing improvement process. Falling manpower levels – another three thousand mineworkers will leave the industry this year – and the average age of the workforce mean that additional measures have to be put in place to maintain health and safety standards. And individual accident prevention has a key role to play here. Industrywide training and know-how retention programmes, together with the technical developments that are an ongoing feature of the German coal industry, all play their part in helping to achieve the efficiency improvements and cost reductions that are now needed.





Coal power plant Herne

The industry is working with its mining supplier companies to develop and refine the machinery that is needed for the tough and challenging conditions encountered below ground. The newly established RAG Mining Solutions is now responsible for the worldwide marketing of mining know-how that has been built up over the years by the German coal industry. RAG Mining Solutions, which also operates on behalf of other mining companies, focuses particularly on Germany's special expertise in multi-seam mining at great depth and in conditions characterised by high strata temperatures and difficult geology, circumstances that are also frequently encountered elsewhere in the mining world. Some of these industries do not have the solutions needed for producing coal efficiently and the services of RAG Mining Solutions are therefore often very welcome indeed.

Germany's manufacturing base is now threatened by serious competitive disadvantages and a loss of attractiveness when it comes to raw materials and energy availability: rising import prices for raw materials, increases in the cost of electricity procurement due to the promotion of renewables by pay-as-you-go financing, stringent environmental and climate protection requirements, which include the CO₂ trading scheme that is especially relevant for the coal

burning sector, and from 2011 the much higher eco-tax and electricity tax burdens and public acceptance problems that dog almost every major new construction project. The need to stay competitive, however, means that German industry relies on having access to an affordable and reliable supply of electricity. And coal makes a significant contribution to this. The ongoing development of coalbased power station technology in Germany is now at the forefront of the drive to ensure that consumers have access to a cost-effective and reliable energy portfolio. Germany's latest generation of coal-fired power stations can operate at efficiency levels of around 50%, which is way ahead of the

international competition. Further progress in this area will depend on the realisation of planned power station projects, some of which have already been implemented, and on other research activities in the field of coal technology. The building of highly efficient 'conventional' power station capacity that takes account of coal as a fuel would also appear justified in the light of the high cost and as yet unresolved power storage problems associated with the fluctuating flow of electricity that comes from renewables.

Germany has long been using coal in an environmentally friendly way when compared to other countries. This means that as well as power station efficiency we are making full use of every other technical and practical opportunity that exists. And development efforts in this area are continuing; examples include eco-friendly combined heat and power systems (CHP) for thermal power stations, CCS projects and mine gas-based electricity generation. Against the backdrop of the Renewable Energy Sources Act (EEG) RAG is also doing its bit to advance the use of alternative energy sources through its efforts to exploit former coal industry sites by deploying existing engineering and technical know-how. Under the banner of 'Green RAG' the company is not just engaged in discussing the use of mine gas, mine water, sun and wind but is now also actively putting such

schemes into commercial practice. There are examples of this in practically every coalfield in Germany.

At first glance the new Energy Concept being drawn up by the German Government would seem to offer coal and lignite very few prospects in the long term. However if we look further into the future the concept is based on extremely ambitious and in some cases even speculative assumptions. It also makes it clear that coal remains an indispensable fuel, at least in the short and medium term, and that it should play a key role as a bridge to the era of renewable energies until 2050. Security of supply cannot be guaranteed in the long term without coal-based balancing and reserve capacity. Even though coal consumption is set to decline disproportionately in absolute terms in the benchmark energy scenarios that predict a sharp overall decline in energy consumption (a 50% fall by 2050, a 20% reduction by 2020, and so on), coal will over the next four decades continue to be an important element in German energy supply. Yet it is assumed that indigenous coal will no longer be available after 2020. In this respect it has been stated that: 'The subsidised production of indigenous coal will be terminated in compliance with national and European regulations'. Whether or not this is the end-story for the domestic coal industry will, according to the Coal Industry Financing Act, still have to be decided by the German Bundestag.

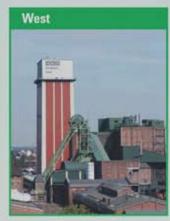
The growing import reliance of the European Union in general, and Germany in particular, poses real questions as to the medium and long-term security of raw materials supplies. In this respect the Energy Concept contains certain shortcomings in the national energy policy in this area lacks the necessary degree of balance, clarity and comparability where security of energy supply is concerned. Recent studies such as that carried out by the EEFA, which is presented in some detail in the 2010 Annual Report, reveal that there is a high and increasing risk to German primary energy supplies even when measured against that of other nations. The energy concept has shortcomings in other areas too. The energy scenarios that Prognos, the EWI and the GWS have presented for the Federal Government's Energy Concept are, according to their remit and apart from one reference case, exclusively 'target scenarios'. Unfortunately these scenarios do not identify the extent to which it will be possible to deal with the problems of implementation, transition and adaptation and their sectoral, regional and social impact.

The international commodities markets are once again entering a period of soaring prices, mainly due to the dynamic recovery under way in Asia particularly. Energy demand is rising in other parts of the world too and the global upturn in the steel industry has

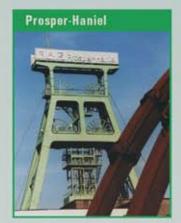
led to sharp price increases on the international coke and coking-coal markets. Top-grade coking coal is now being traded at prices of as much as 250 USD/t on a quarterly contract basis. The global iron ore markets too are showing distinct signs of growing shortages, along with an ever increasing concentration of supply. Similar trends can be observed for other metals and minerals, and for energy commodities too. In some instances the problems overlap, as in the case of rare earths and other 'high tech' raw materials that are for example of huge importance even for renewable energy technologies.

The Federal Government has taken various steps, such as the setting up of the German Raw Materials Agency, in order to keep these issues in focus and to formulate a raw materials strategy and it is keen to push ahead with efficiency improvements in the raw materials sector. The Raw Materials Congress, which has now been held on three occasions, has focused on those resources that the European Commission has classified as 'critical'. The Congress also held an in-depth discussion of China's raw materials policy, which has come under increasing criticism because of what Europe sees as an aggressive attitude on the international commodities markets combined

with that country's decision to place increased restrictions on its own exports. Yet our politicians and the public in general still appear to lack a real awareness of the often precarious situation affecting our raw materials industry and the importance of having supply options available. A shortage of primary materials can prove iust as fatal for our economy as it can for the living conditions of the people and can often trigger a very harmful chain reaction. A comprehensive national and European raw materials strategy therefore needs to be developed as a matter of some urgency.



on the Ibbenbüren mine









General economic situation

In 2009 the international financial and economic crisis plunged Germany into its deepest recession of the post-war years. GDP for 2009 was nearly 5% down on the previous year, which was a greater fall than that of most other industrialised nations, while primary energy and electricity consumption declined by about 6% and German coal consumption fell by a massive 18%. As a result of the sharp decline in economic activity, structural shifts in the energy mix and climate policy measures national CO₂ emissions also fell dramatically by an exceptional 9%.

After the German economy had reached the valley bottom of the crisis in early 2009 the beginning of the much hoped-for recovery set in during the summer of that year. The Government's broad-based stimulus programme began to take effect, the backlog of orders improved and the economic mood became much brighter. By the end of the year the economic situation still seemed rather blurred. though the second quarter of 2010, and presumably the third quarter too, have now been showing distinct signs of a relatively strong upward trend. German exports in particular have been developing in a very positive way. The most encouraging impulses have come primarily from the newly developing nations, while the debt crisis

affecting some EU member states and the austerity programmes that most European countries have introduced have tended to depress economic expectations, especially in the euro-zone countries.

Earlier in the year the economic research institutes predicted growth rates of 1.5% in 2010 and indicated that GDP would rise by 1.4% in 2011. The Federal Government's annual projection for 2010 is still based on a figure of 1.4%. Most economic institutes and analysts have now revised their predictions upwards by some margin and the Federal Bank even considers that growth this year could be as high as 3.5%. This means that 2010 appears to be shaping up much better than expected. Quite differing assessments have been made as to how things will develop further. The cautious business outlook we are seeing at the end of 2010, and the similar prospects for 2011, have been attributed not

just to the weakened demand for exports in the euro area but also to the massive rise in commodity prices and to the increasingly restrictive financial policy and social imbalance that are part of the fiscal consolidation process under way at national level. At the same time there are fears that the financial crisis has not yet been fully overcome and that the measures already introduced for the reform of the financial markets might not be enough, which means that the economic recovery witnessed during 2010 could be of short duration. Some experts have even referred to a significant and increasing danger of inflation, while other reputable economists, including Peter Bofinger and Carl Christian von Weizsaecker in Germany and the American Nobel Prize winner Paul Krugman, have warned of an imminent threat of depression or even deflation occurring some time this year. The present economic outlook therefore appears to be neither clear nor particularly stable.

Corporate development and sector development

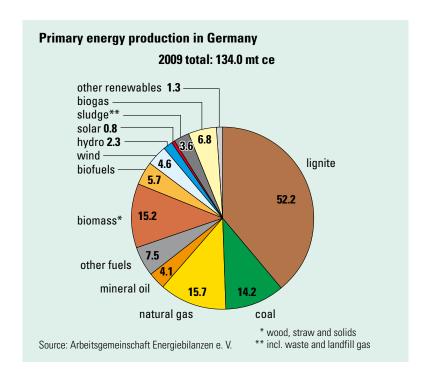
The financial and economic crisis of 2009 saw coal consumption in Germany fall that year to 51.6 million tce, a development that inevitably affected sales to the power generation and steel manufacturing sectors. More than

three quarters (77%) of Germanmined coal is sold to the German power generators, these deliveries meeting just under one third (32%) of the electricity industry's needs. Though power generation in Ger-

The German coal industry in restructuring mode

many has declined significantly, and coal burn in power stations has fallen nearly 13% overall compared with the previous year, the 2009 sales targets for indigenous steam coal — in spite of some early problems — were ultimately achieved. This can be attributed to the upturn in economic development during the second half of the year as well as to successful marketing efforts. Thanks to the ongoing economic recovery sales to the power generating sector have again remained stable through 2010.

The domestic coal industry meets about one quarter of the coal and coke requirements of the German iron and steel producers. The slump in German steel production meant that in 2009 Prosper coke works in Bottrop, which is the last RAG-operated coking plant, had to be run for several months at its lowest capacity limit of 70%. The economic recovery that set in during the late summer of 2009 saw demand for blast-furnace coke

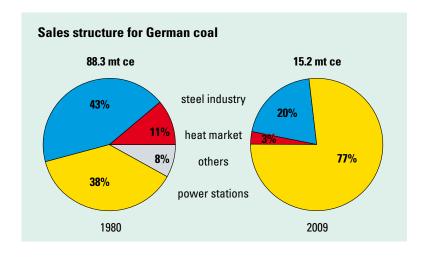


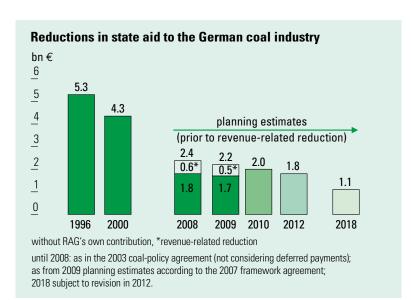
rise again, with the result that Prosper coke works was able to increase its output by October of that year. The plant has now been running at full production since the beginning of 2010 following the significant upturn in sales to the steel industry.

Relatively small quantities of coal also continue to be delivered subsidy-free to the heat market, a business that has managed to remain fairly stable over the course of recent years.

Coal is part of Germany's energy mix and remains a key primary energy source for the nation.

Measured in terms of current reserves coal could continue to play such a role for many years to come, as it by far the country's largest available energy resource



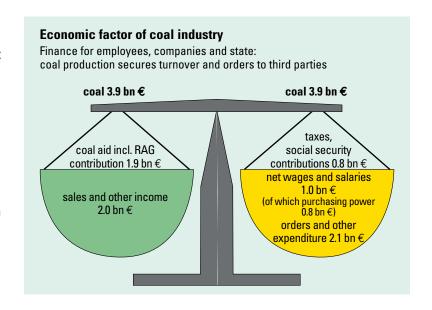


– and even surpasses lignite in this regard. Geological conditions however have made German coal expensive and difficult to mine and production costs have for decades been higher than the world market price. This is why the coal industry has required state subsidies continuously.

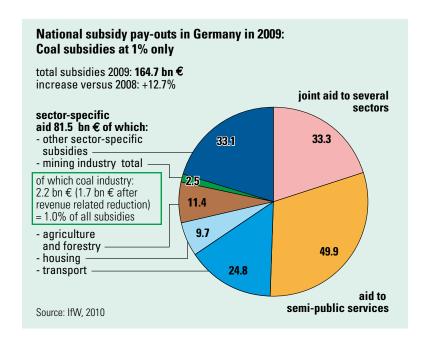
It was against this background that the German Government and the coal producing regions of North Rhine-Westphalia and Saarland, along with the IG BCE (Mining, Chemicals and Energy Industrial Union) and RAG, which is responsible for coal mining operations in Germany, came to an agreement in 2007 that subsidised coal mining in Germany would be phased out in a socially responsible way by the

end of 2018 under the terms of the Coal Industry Financing Act that came into force on 28 December 2007. This Act also contains a clause requiring the Federal Government to submit a report on the industry to the German Bundestag not later than 30 June 2012. This document would be used by the Bundestag to examine, while bearing in mind key aspects such as cost effectiveness, security of energy supply and other energy policy objectives, whether or not the coal industry would continue to be subsidised long-term (the Review Clause).

When the Coal Industry Financing Act came into force the BAFA (Federal Office of Economics and Export Control) had already issued the relevant decisions granting public aid for the period 2009 to 2012 in order to finance coal disposals and the cost of the mine closure programme. As in previous years, these decisions, which are still subject to approval under EU law, provide for public aid to be granted on a declining basis.



The German coal industry in restructuring mode



In the event that coal sales yield higher proceeds that laid down in the grant approval decisions the amount of aid actually paid out can be much lower than the planned appropriations. This means that both the Federal Government and the Federal State North Rhine-Westphalia would have much less of a financial burden to bear. This was frequently the case in 2008 and 2009 and in 2010 too price trends on the international coal markets would seem to indicate a similar development.

The Coal Industry Financing Act and the agreements that go with it do more than just regulate state aid to the German coal industry in the years ahead — they also lay down a framework for the

corporate planning of RAG. In 2008 the company adjusted its mine planning programme to meet the requirements of the Act. This planning process requires the industry to reduce its annual output to 12 million t and downsize its workforce to fewer than 15,000 employees by the year 2012.

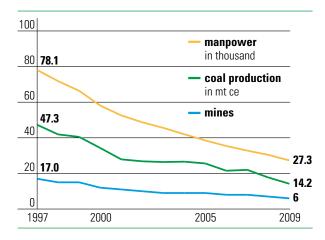
According to a report published by the Kiel Institute for the World Economy (IfW) Germany now pays out nearly € 165 bn in state subsidies. One fifth of the recorded aid is granted at cross-sectoral level, while four fifths are targeted at specific sectors of the economy, with about half going directly to companies. Aid to the coal industry, which continues to be paid out

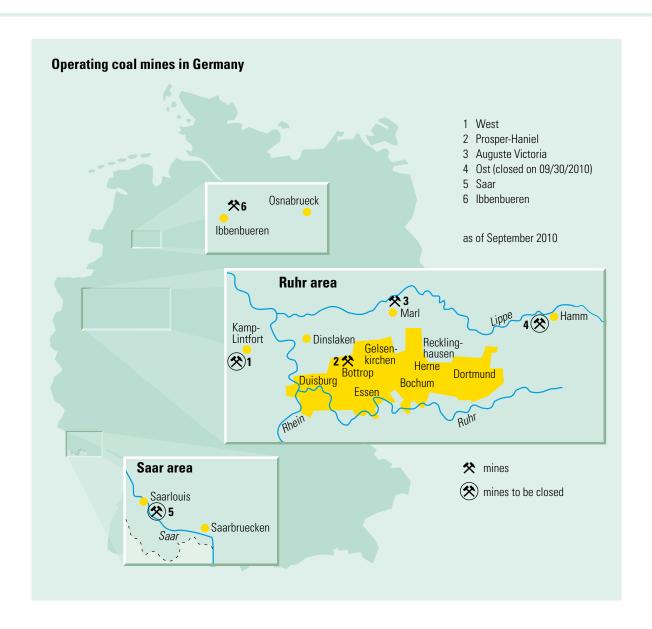
on a declining scale, now accounts for about 1% of the total subsidy handout

Germany produced 13.8 million t of coal in 2009, which was 4.9 million t less than the previous year. The industry's workforce was further downsized to some 27,000 employees. This can be attributed to measures aimed at reducing production capacity, notably the closure of Walsum mine in Duisburg (mid-2008) and Lippe mine in Gelsenkirchen (early 2009), along with a run-down of production and partial closure of Saar mine in Ensdorf in April 2008. The restructuring programme will continue this year with the closure of Ost mine in Hamm on 30 September 2010.

Concrete measures have also been agreed for the next few years in order to achieve the targets laid down in the mine planning programme. This means that coal mining will finally cease in the Saar coalfield with the closure of Saar mine on 30 June 2012. West

Adjustment of the German coal mining industry





mine in Kamp-Lintfort is also to be shut down at the turn of the year 2012/2013. As from 2013 national coal production will be concentrated on just three active mines in North Rhine-Westphalia: ProsperHaniel in Bottrop, Auguste Victoria in Marl and Ibbenbueren on the border with Lower Saxony.

The restructuring of coal mining operations to RAG has also had a direct impact on the overall group.

The closure of mines has made it necessary to find new uses for the available buildings and land space, which means that the property company RAG Montan Immobilien GmbH has had an increasing role

The German coal industry in restructuring mode

to play. RAG's property division – formerly known as Montan Grundstuecksgesellschaft (MGG) – has for more than 30 years been developing former mining sites in select locations with a view to their restoration and re-use. This company is therefore playing its part in actively helping to shape structural change in the coalfields.

RAG Mining Solutions GmbH became RAG's latest operating subsidiary in May 2009. With coal production on the increase around the world and demands for modern equipment growing apace this company has assumed responsibility for the international marketing of German mining know-how and equipment.

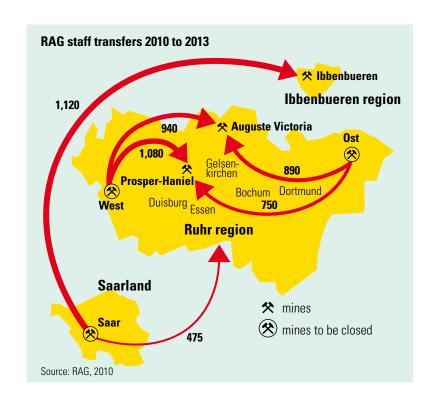
The mines have been particularly hard hit by high levels of employee turnover, a process that requires all concerned to show solidarity and flexibility of the highest degree. Over the years mineworkers affected by the closure of 'their' pit have had to accept a move to a new place of work, which for many has meant a greater distance to travel and in some cases moving their entire family to a new home. A particularly striking example of this has been the 1,700 employees at Saar mine who will have to move to Ibbenbueren or the Ruhr when 'their' pit is closed in 2012. In April this year the first group of 80 miners from Saarland made the 460 km trip to their new

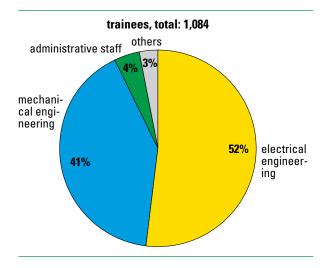
Social support for restructuring

The ongoing restructuring of the German mining industry has continued for decades without any real social disruption in the coalfield regions. In order to maintain this the parties involved in drawing up the Coal Industry Financing Act have agreed that social responsibility will be a key priority in the process of scaling down the domestic coal industry. According to an expert report produced by the auditors KPMG, and accepted by all parties to the agreement, the year 2018 represents the earliest possible date by which subsidised coal mining can be brought to an end in Germany without the need for any compulsory redundancies.

The German coal industry has had to implement a whole programme of measures, and continues to do so, in order to ensure that this policy is maintained. This includes a range of well-proven personnel instruments — transfers to other

mines or to other parts of the company, early retirement, retraining and qualification schemes, new business start-ups and the various agreements that accompany this entire process.





Job directions of trainees in coal industry in 2010

place of work at RAG Anthrazit Ibbenbueren GmbH in North Rhine-Westphalia. Restructuring has not just affected the core workforce. Even though the coal industry is having to adjust its manpower figures to lower levels of production it still constitutes one of the largest training providers in the country. While the number of training places has inevitably had to be reduced this did not prevent RAG from taking on another 280 young apprentices in 2010. The company currently has a total of 1,084 trainees on its books with the most popular courses being industrial mechanics, industrial electronics, mechatronics and business administration. This is still one area in which the German coal industry takes its social and regional responsibilities very seriously indeed.

complied with European subsidy regulations and was approved by the Commission on the basis of the Council Regulation. In December 2009 the Commission granted approval for German aid to be paid in 2010, this being based on the Council Regulation and on the 'old' restructuring plan for the German coal industry that was established in previous years. A decision still has to be reached on the legal basis that can be used for granting approval for further restructuring after 2010 and up to the year 2018, in line with the planned coal policy agenda. The Federal Government had provided early notification of the results of the 2007 coal agreement in order to secure a general safeguard for these provisions and also presented the Commission with a new restructuring plan for the German coal industry for the period 2008 to 2018, which was tied into the national coal policy decisions taken back in 2007.

to the mining industry has always

The Council Regulation was examined in 2007 by stakeholders and the Commission as part of a 'mid-term review'. During this process Germany, like other mining countries, called for the Council Regulation to be extended. RAG, the German Coal Association (GVSt) and the IG BCE joined the Government in expressing their opinion. The Commission then published a monitoring report stating that it saw no need for changes to be made to the Council Regulation and would not be submitting any

Decision process for the new EU regulation on aid to the coal industry

If the German coal industry is to continue to be restructured in a socially acceptable way in accordance with the terms of the Coal Industry Financing Act it is absolutely essential to have a legally secure state-aid regime in place at European level.

State aid was strictly prohibited during the days of the European Coal and Steel Community (ECSC) and exceptions to this rule were only permitted by unanimous decision taken in the Council. In advance of the expiry of the ECSC Treaty the provisions of the EC

Treaty were therefore examined in order to establish whether they were adequate for granting approval for state aid to coal mining. This was not the case then and is essentially still not the case today.

European Union verification and approval of coal industry aid is currently based on Council Regulation (EC) No. 1407/2002 on State aid to the coal industry of 23 July 2002 (referred to below simply as the Council Regulation), which like all previous regulations applies for a limited period of time only and is due to expire on 31 December 2010. Over the years German aid

The German coal industry in restructuring mode

proposals for amendments to this legislation after 2010. By taking steps at the end of 2007 to provide notification of the restructuring plan for the period 2008 to 2018 the German Government had already requested approval for these arrangements on an appropriate basis for the period after 2010. Other EU coal producing countries likewise called on the Commission to produce a future-proof proposal for a regulation.

In early 2009 the Commission undertook a public consultation process that dealt with the expiry of the current Regulation. The Commission put forward a consultation paper in which a number of questions were posed and key aspects of the follow-up regime addressed. The Commission at this point discussed various options as far as the future granting of aid to the coal industry is concerned. EU member states and the various organisations and associations affected also took part in this consultation process. The Commission received more than 60 comments and position statements, including seven from the coal producing countries. The overwhelming majority of the views called for the continuation of a sector-specific regulation. It was also pointed out that a legal basis for the approval of further aid to the coal industry would also be required after 2011 because any complete termination of this arrangement at the end of 2010 would be in contravention of specific objectives of general Community interest. These are already set out in the aims and recitals of the Council Regulation. A number of these objectives will retain their importance for the foreseeable future, including security of supply, maintaining regional and social balance during restructuring and the financing of inherited liabilities that the active mining industry is unable to bear and which would in any case have to be taken over by the state in the event of liquidation.

In its impact assessment the Directorate-General for Transport and Energy proposed a number of options, ranging from doing nothing to a proposal for a regulation. The notion of simply extending the current Council Regulation was rejected. In the view of the Commission previous experience with the Regulation had shown that the principle of degressivity and other conditions laid down therein were not sufficient to ensure an effective restructuring of the coal industry. The DG's assessment was accepted by the Impact Assessment Board and a proposal for a regulation was drawn up on this basis. It was established that there would be damaging social and regional fallout, and particularly significant job losses, in the event that Regulation 1407/2002 was allowed to elapse without replacement. The livelihoods of some 100,000 mineworkers would be affected all over Europe. In view of the pending European Parliament elections, and afterwards the appointment of a new Commission, this process could not be resolved for the time being.

In addition to the public consultation process the 'European Social Dialogue Committee on Extractive Industries' in Brussels was also consulted. On 4 June 2009 this committee produced a resolution on the issue of a follow-up regulation for state aid to the coal industry in Europe. The social partners representing the European coal industry and mining equipment industry expressed unanimous support for retaining the current system of aid as allowed under the terms of the Council Regulation and wanted the coal subsidies to be continued and an appropriate European follow-up regulation put in place.

At the end of April 2010 the Directorate-General for Competition (DG COMP), which is now responsible for this matter in the new Commission setup, initiated an inter-service consultation (ISC) on a new regulation for the industry. This was only placed on the Commission's agenda following an intervention by the German Government. After more than two years of preliminary work, on 20 July 2010, the European Commission presented a proposal for a new Council regulation on 'state aid to facilitate the closure of uncompetitive coal mines', this intended as follow-up legislation for the current Council Regulation. The new regulation was to take ef-



fect on 1 January 2011 and would expire on 31 December 2026. The proposal proved to be unexpectedly restrictive. In it the Commission is seeking to ensure that all non-competitive coal mines in the member states are closed down by 1 October 2014. The proposal only relates to operating aid in the form of aid for mine closures and aid to cover exceptional costs; it does not apply, as the previous Regulation did, to investment aid or to aid for accessing coal reserves.

The Commission primarily regards this aid as a means for absorbing the social and ecological consequences of the closure programme. Operating aid would clearly have to be applied on a degressive basis. If the loss-making mine in question is not closed by the end-date laid down in the new

regulation the recipient would be required to pay the money back. The Commission's proposal was met with widespread criticism in Germany and elsewhere in the EU. Even though the proposal had been preceded by intensive talks and consultations at all levels, some members within the Commission had clearly been unimpressed by the arguments in favour of a gentle phasing out of mine operating aid. The IG BCE, the GVSt, the Federal State Governments of North Rhine-Westphalia and Saarland. and every Federal State parliamentary group in NRW (except the liberal FDP) and Saarland condemned the proposal as completely inadequate. They were joined by other critical voices, including the German Bundesrat, representatives of all German parties in the Bundestag and in the European Parliament, the DGB and Euracoal.

All called for a complete reworking of the proposal by the Commission and/or the Council of Ministers. The RAG, the GVSt and the RAG Foundation took up a very definite position and along with the IG BCE launched a major series of discussions and initiatives.

The compromise for a socially responsible rundown of the subsidised coal industry within a sufficient financial framework and timeframe, as had been reached in 2007 by the Federal Government, North Rhine-Westphalia, Saarland, the IGBCE and RAG, would no longer be viable. Moreover, a regulation based on the Commission's proposal would not bring the sought-after savings for the public purse or relieve the burden on taxpayers. In actual fact it would trigger much higher fiscal and social consequential costs, as has been documented – and more recently confirmed – in a relevant study conducted by Prognos (see GVSt Annual Reports 2007 and 2008). There would be a threat of mass redundancies and major social and regional upheaval. Industrial lav-offs that would affect several thousand mineworkers, along with a significant loss of jobs in the supplier industry, would inevitably follow by the end of 2014 or earlier. Socially responsible restructuring would become impossible. This would at the same time jeopardise the RAG Foundation's funding of the long-term

The German coal industry in restructuring mode

liabilities inherited from the mining industry and there would also be the threat of a premature loss of access to Germany's main coal reserves.

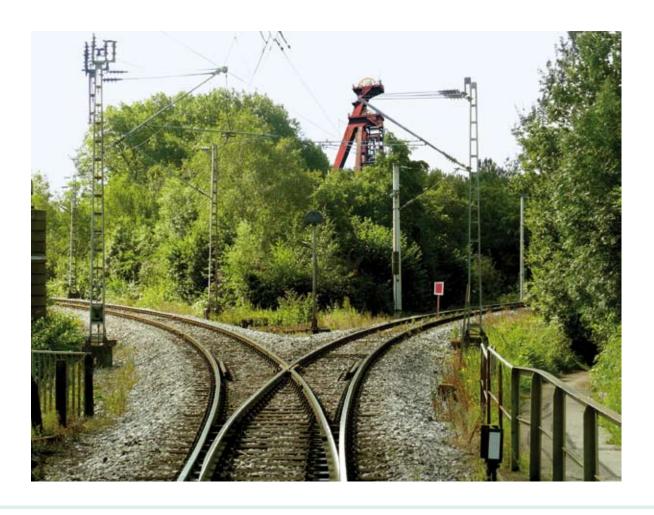
The European Council has to decide on the Commission proposal by qualified majority. The European Parliament, the European Economic and Social Committee and the Committee of the Regions will be consulted, with the position taken by the European Parliament in particular carrying consider-

able weight. As the Commission is exercising its right of initiative in presenting the proposal it is perfectly entitled to amend it at any time prior to the Council reaching a decision.

It is now up to the Federal Government to see that the Commission's proposal is significantly amended. This is the only way to ensure that the provisions of the Coal Industry Financing Act and the Framework Agreement on the socially responsible termination of subsidised

coal mining in Germany continue to apply and be safeguarded under EU law, and that the promises made in the coal policy understanding of February 2007 are recognised and honoured.

The cornerstones of the Coal Policy Understanding of 2007, the Framework Agreement and the Coal Industry Financing Act of 20 December 2007, which governs Federal aid to the coal industry after 2009, will all have a decisive influence on the future of the Ger-



man coal industry, its employees and the coalfield areas. These regulations and provisions provide the German coal industry with a reliable and calculable legal framework that was endorsed in the Coalition Treaty agreed between the CDU/CSU and the FDP after the Federal elections of 2009: 'We stand behind the agreed phasingout of the subsidised coal mining industry and will keep to the coal policy understanding of 7 February 2007'. The Federal Government has therefore endorsed the decision that subsidised coal mining in Germany will be terminated in a socially acceptable way at the end of 2018, unless the Bundestag resolves to review this process in 2012 for energy policy reasons.

The Coal Industry Financing Act gives substance to the requirement for a review by the Bundestag in that the Federal Government has to present the latter body with a report by mid 2012. This reference

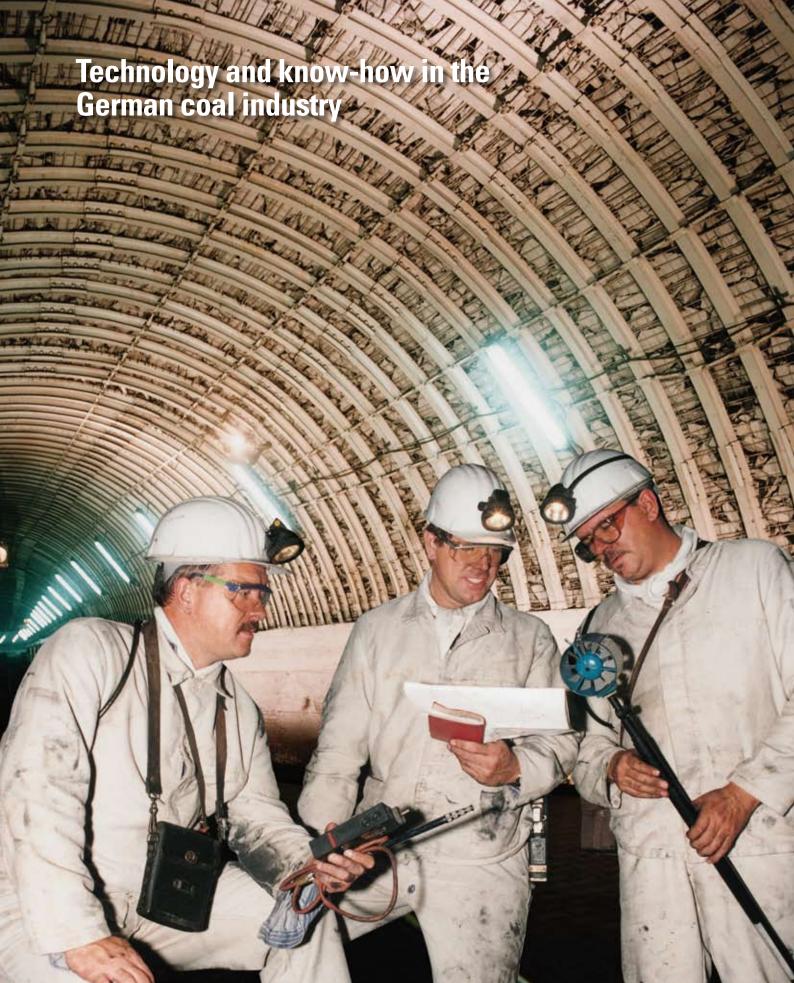
document will then be used by the Bundestag to determine whether or not coal mining will continue, taking account of parameters such as security of energy supply and other energy policy objectives.

The decision to close the industry or alternatively to maintain an indigenous coal production base will have to be taken by the German Policy. According to Article 194 (paragraph 2, sub-paragraph 2, sentence 1) of the Treaty on the Functioning of the European Union (TFEU) it is each member state's 'right to determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply'. Appropriate support at European level is nevertheless provided by way of a new sector-specific regulation on EU aid.

This theme has been specifically included as one of the action points for the Belgian Presidency's programme and a decision is ex-

pected in December 2010. If need be, the Council may also reach a decision on this matter in early 2011, as the regulation can enter into force retroactively on 1 January 2011.

Germany needs a new and reliable basis in EU law for the continued scheduling of its Governmentbacked, socially responsible restructuring of the German coal industry and for the approval at Commission level of state aid to the mining industry - and it needs this as soon as possible. For this process of adaptation to be safeguarded under EU legislation it is absolutely essential that an appropriate Community regime on aid to the coal industry is put in place at EU level and that this enters into force at the beginning of 2011. At the time of going this annual report to publish discussions were still ongoing as to what form this would take.



The restructuring of the German coal industry has meant enormous challenges for everyone involved in the process. Already by 2012 a considerable part of the workforce at all levels will have to retire from the mining industry or take up employment in other sectors — irrespective of whether production does in fact cease completely in 2018 or, on the other hand, safeguards are put in place for coal mining to continue in the long term. Those leaving the industry take with them a huge body of

knowledge and expertise and their know-how is vital for the day-to-day running of the industry. The management is therefore faced with the task of retaining this know-how and ensuring that the remaining employees and technical equipment continue to be deployed in the most efficient way. There is now an even greater need than before for the development and implementation of an effective programme of health and safety protection measures to accompany these efforts.

Lean Processing

Following the coal policy decisions of 2007 RAG was forced to review and adapt its corporate strategy for 2012. The result was an overall programme with four key lines of action. One of the identified actions was to increase operating efficiency as part of an ongoing process of improvement. The targets that had been set would be achieved by way of permanent increases in efficiency and improvements in productivity. The 'RAG Lean Processing Programme' that was developed for this purpose is aimed at achieving process improvements both on the production side and in the area of administration. Lean Processing does not target selected improvements but rather seeks systematically to improve

procedures in an all-inclusive way by deploying a whole range of methods and instruments. The objective is to identify and eliminate waste in the system.

Organisations for managing and implementing Lean Processing were set up at all corporate levels throughout the mining industry. Here employee participation is the key factor for success. The starting point for the entire operation involves the use of process-specific performance indicators to analyse the various processes and their associated reference values. This is where the entire workforce has to apply its knowledge and experience. They can identify those factors that act as an obstacle to efficient working routines, such as

overproduction, high stock levels, unnecessary haulage and transport movements, waiting times, incorrect use of technology and defective materials. Improvements can then be planned and put into practice on the basis of the analysis results. The measures in question ultimately undergo a control and monitoring procedure. Subsequent performance figures and an analysis of the trends have indicated that the system has been a success and on this basis the improvements introduced to technical equipment, procedures and processes have now been laid down as standard practice. Introducing Lean Processing at individual mines and operating sites is not just about developing a new approach - it frequently involves adopting best-practice solutions developed at other locations. It is the role of management staff in this ongoing improvement process to support and encourage their employees in their responsibility for putting the improvement measures into practice and ensuring that the measures introduced become sustainable. By their commitment and involvement in shaping the new working routines the workforce is providing real support in another key strategic area - improving workplace health and safety and reducing pollution.

Technology and know-how in the German coal industry

Health and safety

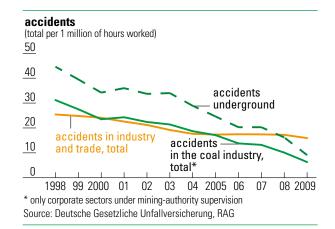
The decline in manpower and the increasing average age of the workforce, along with the requirement for greater employee flexibility, mean that we have to continue to pursue the workplace health and safety measures introduced so successfully in recent years. Present circumstances dictate that the health and safety programme has to be extended and systematically applied over a broader range of activities.

The need for more flexible deployment exposes workers to increasing risks and dangers: these include working in an unfamiliar environment and having to take over new duties where the specific risks of the job are not immediately apparent. The safety programme therefore includes as one of its key components systematic risk analyses that are aimed at identifying potential dangers and making the workforce aware of them. These risk analyses exemplify the many other individual accident prevention measures and the ongoing development of safety technologies applied in the German coal industry today. This explains why the days of serious accidents in the German coal industry are now several decades in the past. Accident rates have now been reduced significantly in every part of the industry and the 'falls of rock and coal' that typified so many accidents even in the 1970s

no longer represent a significant cause of accidents and injuries below ground.

At a special industry-wide meeting held in 2009 RAG management grades were made fully aware of just how important this particular area is for the company and the target of 'zero accidents' was laid down with a view to the complete elimination of accidents at work. This fresh impetus had become necessary at the time because in recent years the coal industry has achieved remarkable success in the area of occupational safety. While the accident figures for RAG Deutsche Steinkohle in 1995 were still above the average for industry as a whole, the number of recorded accidents per million hours worked has fallen considerably since then. By 2006 the figure had reached 13.8, which was not only lower than that of other branches of industry but was in fact below the average for Germany's entire commercial and industrial sector (17.47). In 2009 the figure fell further to 6.3 accidents per million working hours. The 'zero accident' target emphasises the fact that health and safety in the workplace continues to rank alongside productivity and efficiency as a corporate objective and as such is still a major focus of attention.

As well as improving workplace safety standards the German coal industry has made a major contribution over the years towards the



prevention of industrial diseases. Continuous improvements in working conditions — and particularly better dust control measures have resulted in no more new cases of that typical miner's disease silicosis. RAG Deutsche Steinkohle continues to work together with the mining authorities and the Berufsgenossenschaft Rohstoffe und Chemische Industrie, and with the support of the social partners, in an effort to improve the high safety standards already achieved by way of consistent preventive measures. Further possibilities have now been identified in this particular area and the company is now collaborating with the University of Clausthal-Zellerfeld where a special test rig has been set up to investigate various nozzle spectra and their effect on dust consolidation capacity.

In addition to the diverse measures for preventing workplace accidents and occupational diseases the coal industry, like other sectors, has Falling accident rate in the German coal industry increasingly been introducing various actions aimed at protecting the general health of its workforce. In an effort to help employees take responsibility for their own wellbeing and their physical and mental fitness coal mining companies now provide their staff with a whole range of possibili-

ties for maintaining and improving their state of health. With an increasingly ageing workforce the industry now has to ensure that health risks of a general nature are excluded as far as possible so that working days lost due to illness are kept to a minimum.

having to establish the framework within which this learning process can take place and providing a broad-based range of appropriate training programmes. The optimisation and standardisation of this operation under the Lean Processing Programme is now helping the industry to use its employees in the most flexible way possible.

Retaining know-how

The challenges posed by the socially responsible manpower restructuring process under way in the coal industry have become all too clear for RAG. In 2009 the company's mining division lost nearly three thousand (2,992) employees and another three thousand are set to leave the industry during the current year. This is why training and know-how retention are two areas of key interest to the company.

As the demands of such a situation were recognised some time in advance the company was able get started early in building up a central database of all its employees with their master data, qualifications and specific skills. This database means that the company is able to identify in good time at what point certain employees can leave the industry and what kind of knowledge and capabilities will be lost through their departure. By employing the

database a company-wide search can be made for know-how and for those members of staff who have the required skills so that suitable successors can be identified. The advantage of having a companywide record lies in the fact that replacement problems do not necessarily have to be solved within the mine or operating site where the vacancy has arisen, for the successor planning process can now take place on a cross-functional, cross-company basis. A comprehensive successor planning and organisation process is also used in order to replace management grade staff who leave the industry. Because of the continuing reduction in manpower the industry is now increasingly faced with the problem of being unable to find a directly suitable replacement from within the existing workforce. This means that as well as exhibiting a great amount of flexibility in having to take on different tasks and assignments employees now also have to be prepared to acquire new skills. For RAG this means

The 'Collective labour agreement on the socially acceptable introduction of flexible working arrangements in the Rhine-Westphalia and Ibbenbueren coalfields', which took effect on 1 July 2009, has been an important element in helping secure flexible manpower deployment practices within the coal industry. This collective settlement and its accompanying works agreements applies to all members of staff who will at some future date meet the relevant conditions for receiving transition and adaptation payouts. It contains various obligations that have to be met by this body of employees so that the necessary flexible working measures can be successfully introduced. They must for example take part in training programmes and may be relocated to new jobs in the coal industry anywhere in Germany. They can also be sent on temporary placements to work for outside companies. In return for this the employees concerned obtain certain contractual rights that provide extended protection from dismissal and access to a 'secured wage arrangement.

Technology and know-how in the German coal industry

Technical development

The German coal industry continues to drive forward with technical developments not just to achieve the required efficiency increases and cost reductions but also to improve workers' safety and ergonomic conditions at the workplace. In order to achieve the best possible performance under the current conditions - and especially in view of the ongoing reduction in manning levels - the industry continues to focus much of its effort on improvements in the field of automation. Given the often very demanding conditions prevailing underground the development and operation of automatically controlled machines poses a real challenge for engineers. A highly sophisticated range of equipment is now being developed in collaboration with the mining supplier companies so that the

coal industry can continue on the path towards greater automation. One such example is the SL 750 shearer loader, a machine that was designed and built as part of a research project with financial assistance from the European Union.

This coal cutting machine, which is now operating successfully underground, is fitted with an array of sensors that allow it to detect obstacles along its path without outside intervention. The latest control technology enables the SL 750 to react automatically and to take the necessary corrective action. Extensive automation relieves the shearer operators of much of the work they have to do on the coal face and this change in job functions underground increasingly means that machine steering and operation is gradually being

replaced by other tasks associated with monitoring the many automatic processes now in place.

The SL 750 received the 2010 Innovation Award at the BAUMA international trade fair, the world's largest exhibition of construction machinery, building materials machines, mining equipment, construction vehicles and construction equipment. Shearer loader technology, which employs a cutting production system, is widely used not only in the German coal industry but also all over the globe. Developments such as the SL 750 illustrate that equipment developed by the German coal industry still ranks among the best anywhere in the world and as such is very much sought after in many countries. There is also a growing international demand for consultancy and engineering services to meet the challenges posed by mining coal at ever greater depths: this is where the know-how and experience comes in that the German coal industry has built up in everyday practice over many decades.

The mine closures of recent years, and those still to come, create a supply of used mining machinery and equipment that has been tried and tested on surface and underground for many years. The newest member of the RAG group of companies, RAG Mining Solutions GmbH, was set up in 2009 in order to integrate the various aspects involved in the marketing of mining equipment and know-how and the retention of existing expertise.



Guest contribution from RAG Mining Solutions 'International know-how transfer in action, with a focus on China'

by Dr Martin Junker, Chairman of the Executive Board of RAG Mining Solutions GmbH

German mining technology and German know-how have for decades been in increasing demand around the world. Because of the demanding geological conditions encountered in German mines the industry constantly had to develop new machinery and methods for extracting coal safely and efficiently from deep working levels; this in turn has meant having to cope with high rock pressures, high strata temperatures, quite pronounced tectonics and a high excavation ratio.

The German coal industry is one of the most modern of its kind and the technical, commercial and mine-safety know-how that it has acquired over the years can be exploited by other mining regions around the world where it is most required. RAG Mining Solutions GmbH has the capacity to transfer knowledge and expertise in a targeted way and to adapt this know-how to suit the geological conditions of the client country.

Projects and consultation services from our international portfolio show that this technology transfer

can also be applied to the coal mining industry of the People's Republic of China.

Current situation in China

China's growing economy continues to require huge quantities of fossil resources. In 2009 China produced 2.95 bn tonnes of coal, which was nearly 50% of total world output that year. China and the USA together own more than 55% of the world's known coal reserves (China 24%) of some 730 bn tonnes. Huge sums have already been set aside for the construction of new mines and power stations to satisfy the growing demand for energy and steel coming from the Chinese economy and population. The technical equipment required by the coal industry is increasingly being produced by Chinese factories, with high-tech products being manufactured by globally active mining supplier companies. RAG Mining Solutions

has a portfolio of services that covers the entire spectrum of mining activities – from mine planning through production to run-down and final closure of the mine. The German coal industry has an excellent reputation in a number of key areas that include not just the control and management of complex mining systems but also significant achievements in areas such as occupational safety, ergonomics, environmental protection and automation. China has a real demand for expertise in all these fields. Due to the enormous variation in the geological and economic conditions prevailing at the different coal producing companies there is a broad divergence of markets within China as a whole

German coal mining conditioning



Operational experience

RAG Mining Solutions has the capacity to produce modular solutions for roadway design, for example, that are suitable for working depths of 400 m, 600 m, 800 m and so on down to 1,700 m. This is carried out as part of an integrated package that takes account of planning parameters, technical equipment and operating procedures, which are in turn set

against the related safety aspects. For example, the natural and additional gas emissions associated with the origins of the geological deposits and the developing rock pressures and strata temperatures all have to be included as parameters in the final design. In this context RAG Mining Solutions is able to draw on successful

Technology and know-how in the German coal industry

consultancy contracts undertaken in Poland, the Czech Republic and Ukraine that were carried out at working depths down to 1,000 m. As some of the mining regions of China exhibit geological conditions that are fairly similar to those found in Germany practical solutions can also be developed here as part of a consultation exercise. When dealing with the Chinese mining industry it is important not simply to offer the 'strongest' support solution but rather to provide custom-built designs that take account of the nature of the deposits and make allowance for the technical options available underground. The latter have to be worked out and implemented in conjunction with the Chinese mining engineers. Working at deeper levels also means coping with increasing strata temperatures. With experts in the field of mine ventilation and conditioning on its staff RAG Mining Solutions has the capacity to act rapidly in devising lasting solutions to climate problems underground, which includes everything from planning and design through to the final commissioning of complex air conditioning systems. The company is currently engaged in discussions with a Chinese client on the possibility of introducing a Y-ventilation system of the type that has been standard practice at RAG mines for years. Such a system has both safety and productivity benefits.

RAG expertise is also sought after by those operating outside the



RAG Mining Solutions: training workshop

coal industry. These specialist skills have also been used to calculate the fresh-air requirements for excavating the Gotthard base tunnel in Switzerland. The safety programmes, safety training exercises and management systems used at RAG for accident prevention and dust control purposes, for example, are based on some 100 years of experience in mining activities in Germany. The recent impact of this programme has been such that the accident rate for the German coal industry has fallen dramatically since 1995. A whole range of ready-made solutions are therefore available in the area of health and safety and pollution control. These packages can even help Chinese coal mining companies raise their occupational health and safety standards and reduce their environmental emissions.

RAG Mining Solutions can provide customer-specific answers to particular problems affecting complex cutting, roadheading and logistics systems.

By ongoing standardisation, innovation and the optimisation of methods and technology RAG has achieved major improvements and has laid the foundations for automation on an even wider scale. As part of this process the industry has now successfully interlinked the control systems that operate the coal cutting machines, face supports and face conveyor. Thanks to innovative and part-automated operating equipment developed by the German coal industry RAG Mining Solutions is now in a position to deliver optimised solutions for complex

cutting, roadheading and logistics systems. On the coal production side the coal plough training sessions that RAG Mining Solutions set up for Bucyrus Europe GmbH are now in great demand. These sessions are divided into different modules and are aimed at management, supervisors and coal plough operators. Mining companies from Poland, the Czech Republic and Mexico are now able to use a range of services covering every aspect of plough operation. This process has earned international appreciation and is now part of

RAG Mining Solutions' portfolio of services. Mines in Poland, the Czech Republic and China are now seeking help to optimise their logistics operations. By providing mine operators with an overall view of what is happening in a production unit it is possible to introduce systematic improvements to the entire operating process. At RAG this approach has now become part of the routine, involving as it does a high level of worker participation thanks to the ongoing improvement process that is 'Lean Processing'.

products originally developed by the German coal industry. Following a successful appearance at the China Coal & Mining Expo 2009 the company entered into initial negotiations with Chinese mining companies. The main topic of interest in this area is mine control room innovation, which is ultimately aimed at the technical development of the high-performance mine. Experts from RAG Mining Solutions are now working with a Chinese client to develop a technical strategy in conjunction with the operational managers that will, for example, introduce steering and control technology to the production faces. The ultimate objective is to simplify the entire control and visualisation process and in this way to achieve significant improvements in mine safety and efficiency.

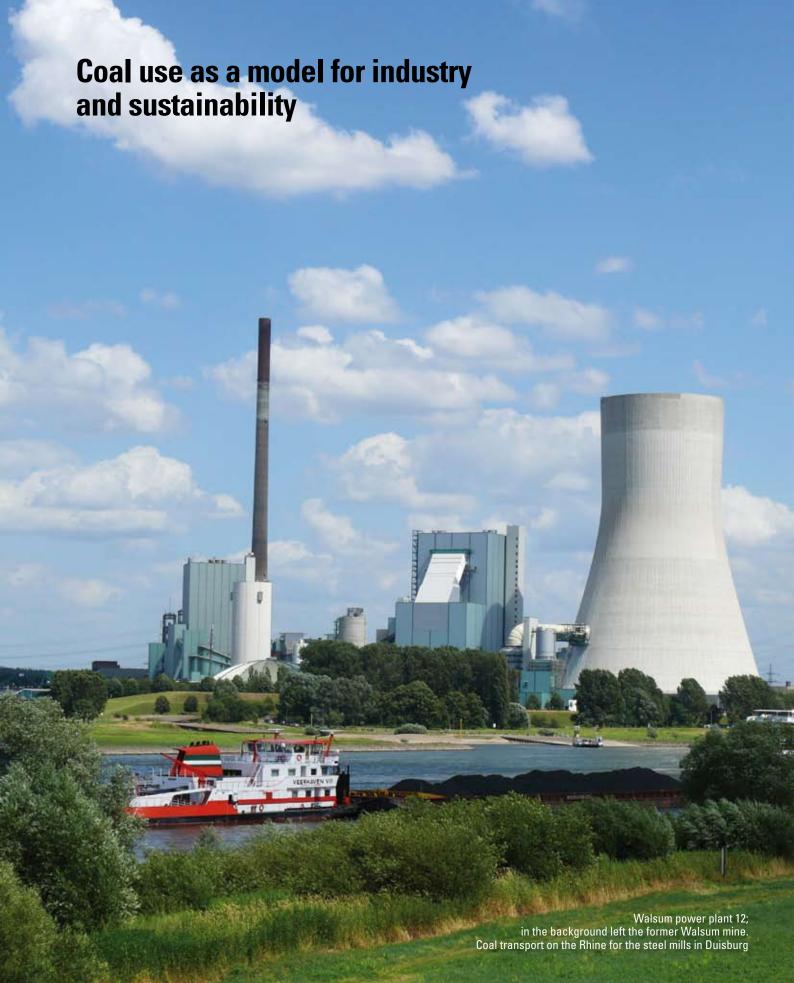
Automation

As a result of technical advances made in Germany huge opportunities currently exist for an international transfer of know-how in the

field of automation. RAG Mining Solutions has now set up an international marketing operation with partner PSI AG to distribute

Automation and control room technology for the international mining market





Because of its high economic performance Germany's industrial base relies on the proper functioning of a competitive primary-industry sector. As well as the availability of sufficient and cost-effective supplies of various raw materials, semi-finished goods and intermediate products, access to a highly efficient and affordable national power supply is essential for those operations that generally involve the energyintensive production of raw materials and their processing to create exportable high-end products. Rising electricity costs in Germany are now placing an excessive strain on certain sectors such as the steel and aluminium industry, the copper producers and the chemicals and automotive industries. This situation has been caused by a number of quite different factors, including higher procurement costs (supplies of fossil fuels), the EEG (Renewable Energy Sources Act) levy for the promotion of renewables, stricter environmental legislation and the CO₂ trading scheme. According to figures from Aurubis AG (Europe's

largest copper producer) the company's electricity costs now make up more than half its total energy bill of over € 150 million, and that was for an operating profit (EBIT) of some € 111 million in 2009. Aurubis has for years been complaining about the increasing size of its energy bill, which has been caused by the additional cost of the CO₂ and renewable-energies tax. In order to secure its electricity supplies well into the future Aurubis has acquired a 'slice' of the Moorburg coal-fired power station in Hamburg. This plant is scheduled to come on stream in 2012 and will be supplied with imported coal in the long term. In the midst of the public debate on environmental sustainability and arguments over the retention of the required operating permits under the Federal Law for the Protection against Emissions (BimSchG) Aurubis and Hamburg's other two major electricity consumers — the aluminium company Trimet and the ArcelorMittal steel works - have more than once posed the location question: 'Without the coal-fired

power station the companies will not be in a position to secure their basic energy needs once the nuclear plants at Brunsbuettel and Kruemmel have been shut down'. The coal-fired installation will meet the aim of providing industry with the reliable and plannable supply of energy it needs in the long term, and it will do so at competitive prices and in an environmentally sustainable way. This example is a striking indication of just how important coal-based electricity is for Germany's industrial base.

A number of factors are weighing against coal-based power generation and the benefits it can bring - and these include the current energy and climate policy agenda, local acceptance problems and the anti-coal campaigns waged by the environmentalists. This is not only threatening coal-based power generation in general but, more particularly, is jeopardising the construction of new coal-fired power stations. Recent years have seen the cancellation of new coal-burning installations in Germany and no final decision has yet been taken on any further projects of this kind.

The uncertainty surrounding the building of coal-fired power plants in Germany's industrial heartland has grown further this year. The global debate on the substantial decarbonisation of the global economy, which both preceded and followed the UN Climate Conference in Copenhagen at the end of 2009, naturally poses specific problems for carbon-intensive fuels like coal. In Germany the expan-

German plans for new coal-fired power stations up to 2015

	No.*	Capacity increase in MW	Plants under construction
approved and under construction	10	11,331	Walsum: 700 MW (Steag, NRW) Datteln: 1,100 MW (E.ON, NRW) Hamm: 1,530 MW (RWE, NRW)
in approval process	4	3,050	Neurath: 2,100 MW (RWE, NRW) Lünen: 750 MW (Trianel, NRW)
planned	10	11,659	WHaven: 750 MW (GDF-Suez) Moorburg: 1,600 MW (Vattenfall)
new projects partly postponed	13	23,570	Boxberg: 650 MW (Vattenfall) Karlsruhe: 875 MW (EnBW) Mannheim: 900 MW (GKM)

^{*} of the planned, in approval process or already approved and under construction projects some are classified as jeopardized (e.g. Datteln case)

Source: dena, VDI, RWE and other company information

Coal use as a model for industry and sustainability

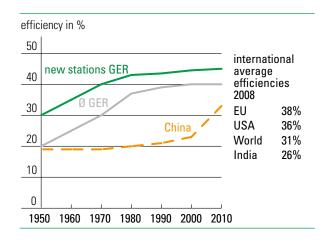
sion of renewables-based power generation – supported by the EEG and other state subsidy measures – is now being pursued practically unchecked. And in the wake of these projects plans are now being pushed forward to build more gas-fired power stations to provide balancing and reserve generating capacity.

Many of the details surrounding the implementation of the new EU Climate Package of December 2008 have still to be clarified, including the transposition of the European CCS Directive. The German Government's proposal to extend the operating life of the country's nuclear power stations, which is part of the new Energy Concept, will also have major repercussions for further power-station planning in Germany and the future demand for coal in the generating sector. The GVSt (German Coal Association) is keen to see a real balance established between the three key energy policy objectives of security of supply, competitiveness and environmental sustainability. If obstacles continue to be put in the way of plans to build efficient new coal-fired power stations or to implement innovative CCS technologies this will, in the medium and long term, not only result in a drop in growth and rising unemployment but will place Germany's energy security under an even greater threat; it will in reality also have a much greater impact on German industry and on the environment, due to the building of less efficient coal-based power stations in other countries.

Developments in power-station technology

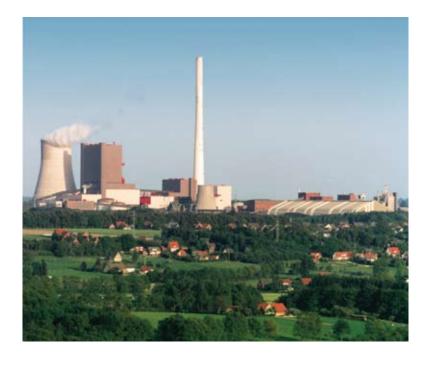
German industry leads the way in the development and implementation of modern coal-fired power station technology. According to the latest figures from the VGB (Association of Large Power Plant Operators, 'Facts and figures on power generation 2009/2010') global average efficiency rates for coal-burning power plant are just over 30%.

The fact that this is a global average figure means that there are many power stations around the world still operating at even lower efficiency rates. Just a few years ago, for example, Chinese power stations were said to be operating at a specific average efficiency



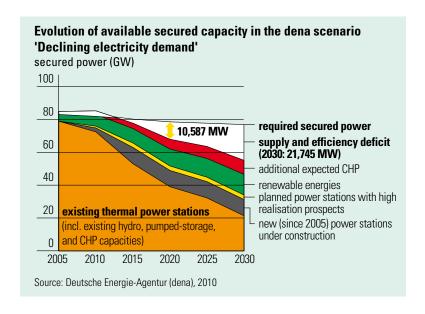
level of 23% (see Schilling 2004). The large-scale building of new coal-fired installations, which has resulted from the huge investment

Developments in efficiency levels at coal-fired power stations



Coal-fired power plant Ibbenbüren of the RWE Power AG and modernisation programme being driven by the Chinese economy, has now pushed the average efficiency rate up to 33% (IEA 2010). However, 23% is still the typical figure for all the older coal-fired power stations still operating in China. And similarly low efficiency levels can be applied to installations in Russia and India. The VGB gives a figure of 38% average efficiency for coal-fired installations in the EU and Germany. The oldest of Germany's coal-fired plant and block-unit power stations (more than 40 years old) have efficiency levels of only 30% or so. However, according to information from the operators the latest generation of Germany's coal-fired installations can achieve efficiency rates of 45 to 46%: this includes the Evonik STEAG power station in Walsum, the new E.ON plant in Datteln, which is nearing completion, and the new RWE power plant in Hamm, which is scheduled to come on stream in 2011. Current developments also include coalfired generating capacity with efficiency rates of more than 50%; one such example is the '50 Plus Project' being built by E.ON in Gelsenkirchen-Scholven, which is based on the innovative COMTES 700 concept. Research also indicates that efficiency levels of 55-65% will be possible in the longer term, particularly from combined cycle power plant. The introduction of CCS (Carbon Capture and Storage) for coal-fired power stations will reduce the high efficiency rates now being achieved by the new-build projects.

Yet in spite of all this the future of coal-based power generation in Germany is once more being increasingly called into question. There are a number key reasons for the difficulties associated with the building of new coal-fired installations. For one thing, the aftermath of the global financial crisis has meant an overall deterioration in the financial conditions for capital-intensive investment projects. Moreover, the unpredictably large increase in the amount of cheap gas available has temporarily affected the competitiveness of coal-based projects. Add to this the continuing uncertainty surrounding the future framework of our energy and climate policy, particularly as far as solid fuel is concerned. Environmental organisations have got together with local lobby groups to wage campaigns against any investment in coal. But the building of efficient new power stations would do more to prevent climate change and protect the environment than the other option, namely the otherwise unavoidable continued operation of older installations. In this connection it is necessary to point to the technological progress that has been made by the power-plant construction sector. These advances, which originated in Germany, form the basis for the international transfer of 'Clean Coal Technologies' and this makes a major contribution to reducing global CO₂ levels. And the other benefits of new coal-fired power station projects are also very rarely discussed. The employment and value-added impact of these new-builds - especially in the immediate area – is usually only appreciated at regional level. Nationwide too the energy debate does not adequately take account of the fact that coal as part of the



Coal use as a model for industry and sustainability

overall energy mix for power generation is a significant factor for Germany's security and economic efficiency.

This situation has prompted the German Energy Agency (dena) to issue a warning: In the latest update of its analysis on power station planning, which was published in February 2010, the Agency refers to the danger of an 'efficiency gap' arising in German power generation capacity over the next 10 to 20 years. If no new high-efficiency fossil-fuel power stations are built, and in particular no new coal-fired installations, we will either have an undersupply - in other words the generating capacity will no longer be sufficient to meet the annual peak load

at any time — or we will be forced to continue operating the older inefficient plants, which will mean higher electricity costs and higher CO₂ permit prices.

In its consumption scenarios dena puts the 'electricity shortfall' at 14 GW or more (assuming electricity demand remains constant) and alternatively at nearly 11 GW (if electricity demand falls off). This assumes that plans to expand renewables-based energy and cogeneration (CHP) proceed as planned, in accordance with the reference scenario drawn up in 2009 by the BMU (Federal Environment), and that nuclear energy is phased-out in line with the existing legislative shift away from nuclear power.

Thermal power stations generate heat using eco-friendly CHP (combined heat and power) technology that allows the input energy to be converted simultaneously into heat and electricity as part of a coupled system. While a 'normal' power station releases more than 50% of the input primary energy into the environment as non-usable waste heat a thermal power station, on the other hand, uses much of this energy to supply district heating systems. This output is either used for heating purposes or is supplied to industrial installations as process heat for manufacturing operations. This district heating technique is much more energy efficient and produces far fewer emissions than separate heat and power generation systems. As a result these efficient coal-fired installations are making an active contribution to a reliable and sustainable energy supply.

Environment-friendly coal utilisation

Coal currently makes a major contribution to the nation's baseload energy supply system and will in future have to continue to play a key role as part of a balanced fuel mix for electricity production. One main objectives of climate policy is therefore to improve plant efficiency so that less coal has to be burned and emission levels can be cut. As well as building new coal-fired power stations the generating industry is also engaged in a successful retrofit programme. This means that by modernising and upgrading existing coal-burning installations efficiency levels

can be raised and CO2 output levels reduced. The success of such a programme can now be seen in operation: the Evonik Steag power station in Bergkamen, for example, is now saving as much as 180,000 tonnes of CO₂ a year - which is equivalent to the amount of CO, that a city of 50,000 people emits each year for heat and electricity alone. In addition, upgrades of this kind boost power station output by 30 MW; that is enough to supply an extra 30.000 households with electricity. Further positive examples include the use of district heating for communities in North Rhine-Westphalia and Saarland.

The installation operated by Evonik Fernwaerme GmbH produces more than 90% of its thermal output from generating units that use the principle of co-generation (CHP). With an annual output of some 2.1 bn kWh of heat energy, which corresponds to the heating requirements of more than 300.000 households. Evonik Fernwaerme GmbH is the largest provider of district heating in the whole of North Rhine-Westphalia. And Germany's achievements in demonstrating the compatibility of coal and the environment are also proving successful overseas.

Efficient and eco-friendly power plant systems have enormous potential when it comes to cutting CO₂ emissions and techniques developed and tested in Germany are now helping to install technology of this type around the world. In the Chinese province of Zhejiang, for example, a Siemens AG-built coal-fired power station with four 1,000-MW generating units is achieving an efficiency of 45%. This is a huge advance on China's average efficiency rate of about 33%, while its older coal-burning power stations only manage 23%. This record-breaking level of power-station efficiency can be attributed from a technical point of view to the use of ultra-supercritical steam turbines running at steam temperatures of 600°C and pressures of over 260 bar. The next generation of coal-fired plants will operate at steam temperatures of 700°C and pressures in excess of 300 bar. Running at nearly 50%

efficiency these installations will generate significantly fewer CO₂ emissions. And the figures speak for themselves: the new Walsum 10 coal-fired power station, which has an output of 790 MW, generates enough electricity to supply

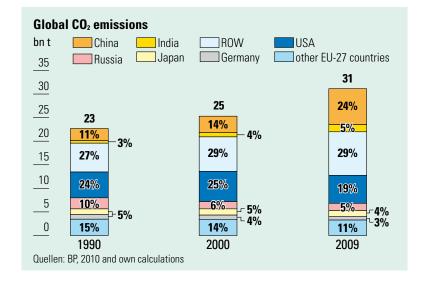
about 1.5 million households. When operating at full capacity it requires about 20% less fuel, and emits 20% less CO₂, than older coal-burning installations delivering the same power output.

The CO, debate

Germany's ongoing environmental debate has seen political figures and environmental organisations question the use of coal as a fuel because of its association with CO_2 emissions. Local resistance to the building of new coal-fired power stations is growing and is now also directed against the efforts of energy supply companies to devise methods for separating CO_2 during the power plant process and storing it in specially designated geological formations. This CCS system provides for the

capture, transport and long-term storage of the greenhouse gas ${\rm CO_2}$ in underground reservoirs.

Industrialised nations and newly emerging countries around the world, where coal consumption levels are much higher than in Germany, are now working on the commercial exploitation of CCS. According to a status report published in 2009 by the Australian Government more than 275 CCS projects have been identified around the world. With only 20 CCS projects to its name Europe is currently lagging far behind in the development of this innovative technology. The G8 nations have now set themselves the target of building larger demonstration plants in order to lay down the foundations for commercial CCS to go into operation after 2020. The European Union is planning to complete a total of 10 to 12 fully-integrated installations by 2015 - these will include the entire value-added chain from separation at the power station through transport to the storage of CO2 underground. With the



Coal use as a model for industry and sustainability

introduction of the CCS Directive Europe has now put in place a broad-based legal framework for the application of CCS in the European Union. This directive is to be transposed into national law at member state level by the summer of 2011. The UK has already done this by introducing CCS legislation of its own: the Netherlands has started down this road and the German Government has presented a first draft bill to this effect. However, the need for German demonstration projects is proving to be a contentious issue, not least because it is feared that CCS will reduce the pressure that is being applied for the expansion of renewables-based power generation. This argument does not seem to hold much water given the high level of subsidies being paid out to promote renewable energy in Germany. The Federal Economics Ministry and the Federal Environment Ministry have presented a joint draft bill aimed at introducing an 'Act for the demonstration and application of technologies aimed at the capture, transport and permanent storage of carbon dioxide (KSpG)'. This provides for CO₂ transport and storage to be initially tested and demonstrated on a limited scale and the findings then to be assessed in a post-trial study. Even if the energy supply utilities continue to demonstrate their commitment towards investing in CCS technology one thing is clear: the draft bill as presented requires some fundamental amendments if trials with CCS technology are to be given a chance. For even legislation that is initially directed at testing and demonstrating CCS technology has to lay down a reliable legal framework for the transport and permanent storage of carbon dioxide so that a proper basis is created for real investment decisions to be made.

The make-up of the emissions trading system is now increasingly coming under the spotlight as efforts are made to cushion the impact on German industry of the increasingly stringent regulations on ${\rm CO}_2$ emissions and to prevent the competitive disadvantage that goes with it. A study carried out by the Eco-Institute, the Fraunhofer ISI and the DIW Berlin on behalf of the Federal Environment Office comes to the following conclusion: The European emissions trading system particularly compromises those undertakings that are exposed to a relatively high cost burden from emissions trading and a high amount of competitive pressure at international level. This essentially comprises the iron and steel industry, the fertiliser industry, some parts of the chemicals industry, pulp, paper and board manufacturers and the aluminium industry. Full auctioning of emission allowances is not expected to become mandatory for industry until 2027. Moreover, industries that can prove direct serious hardship due to 'carbon leakage' (relocation of production facilities overseas in order to avoid ${\rm CO_2}$ emissions at home) will continue to receive

emission allowances free of charge. Discussions are still ongoing as to the ultimate scale of such provisions and the type of industry or undertaking that would be included. For the power generating industry this signifies that trading certificates would have to be purchased in full from 2013. That means that a system of full auctioning will be introduced - with a few exceptions and transitional arrangements for east-European member states - that will have a huge impact on coal-fired power generation in particular, and hence on those countries that have a sizeable coal-based generating industry, and as a result will be detrimental to competitiveness.

Nevertheless, the European Union's CO₂ emissions trading system is seen internationally as a model for an active environmental policy. Countless studies and initiatives have now been launched with a view to introducing similar 'capand-trade' systems outside Europe and establishing a global carbon trading system as soon as possible. It is probable that in future the EU emissions trading system can be linked up to other CO2 trading schemes already in existence around the world. The advantages of such an arrangement lie in the higher market liquidity, the heterogeneity of the market players (potential for low-cost emission reductions), the global standard price for CO₂ emissions and the removal of international distortions of competition. The first successes in this area were achieved some

time ago by way of CO2 marketspanning emission credits that were part of the (bilateral) Joint Implementation scheme (JI) and the Clean Development Mechanism (CDM). In actual fact the results of the fifteenth UN Climate Conference in Copenhagen can be regarded as rather disappointing, for the outcome that many had hoped-for of a legally binding final agreement on the Kyoto Protocol, which is due to expire in 2012, did not materialise. The setting of medium- and long-term reduction targets in the main emitting countries of the USA. China and India will be critical for the functioning of any future global CO₂ trading system. The conference therefore merely concluded with a declaration of intent that was to be known as the 'Copenhagen Accord'. This was negotiated by the government representatives of the USA, China, India, Brazil and South Africa without any direct involvement on the part of the European Union and Germany – and was subsequently taken note of by the UN plenary as a non-binding agreement. Nevertheless it has to be pointed out that Copenhagen did produce a number of substantial results. These include for example the agreements to hold the increase in global temperature below 2°C and to announce legally binding commitments on CO₂ reduction by 2020. This has admittedly given rise to certain variations in interpretation: the emission reduction targets accepted by the EU (-20%) and Japan (-25%) relate to the

year 1990, whereas the USA is proposing a 17% reduction in emissions from 2005 levels, as based on the existing Waxman-Markey climate bill. The EU has offered to increase its emission reduction targets to 30% on condition that other developed nations commit to similar reductions.

The Petersberg Climate Dialogue that was hosted this year by the Federal Government clearly stated its intention to transform the policy agreed at Copenhagen into a binding climate treaty. The aim is to gain support primarily from the ranks of the developing and threshold nations at the next World Climate Conference

to be held at Cancún in Mexico at the end of 2010 so that a legally binding agreement can be reached on the adoption of a climate treaty with ambitious reduction commitments, particularly on the part of the industrialised countries. In a report headed 'Climate policy caught between emission reduction and adaptation' that was completed in January 2010 the scientific advisory board to the Federal Ministry of Finance reached the following conclusion from a fiscal and economic viewpoint: A rational climate policy needs to focus more on adaptation measures rather than on emissions reduction.

A 'Green' RAG

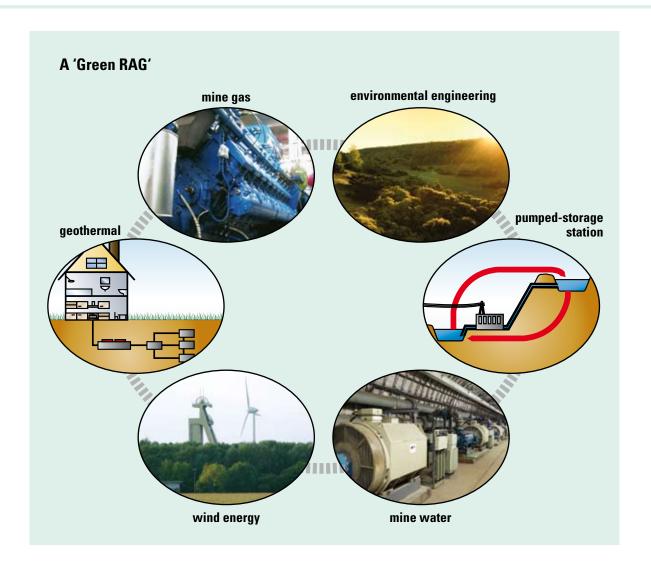
RAG is one of the biggest landowners in the Ruhr and Saar areas. With the gradual run-down of the active mining industry this land is being released from mining authority control, in accordance with statutory regulations, and is being made available for restoration and reuse within the general economy.

One potential land-use scheme being considered is the generation of energy from renewable sources, for in addition to the actual land and installations practical use can also be made of the existing engineering and technical know-how. As well as the obvious activities based on the use of mine gas and mine water increasing considera-

tion is now being given to other sources of energy such as sun and wind. RAG itself cannot carry out projects of this kind: as a recipient of public aid the company is not allowed to use its own financial resources for such purposes. In reality such schemes require the participation of outside partners and investors, ranging from local authorities and municipal utilities to housing associations and energy supply companies.

Exploiting mine water as a heat source involves using the existing mine shafts to pump the water up from the warmer, deep-lying

Coal use as a model for industry and sustainability



strata at temperatures of 30°C to 40°C. The total volume of mine water that can be used in this way amounts to about 100 million m³/a. By effective and consistent exploitation sufficient heat can be recovered to supply the needs of 5,000 to 10,000 households. And there are further opportunities for using

renewable energies in addition to those sources that are closely associated with underground mining. For example there are extensive areas of land, and more particularly the roofs of large industrial buildings, that can be used for solar-based power generation. This is already being done in many other industries and increasingly

on private residential property too. One operating example of such a project is the 10,000 m² solar collector that has been installed on the former coal blending shed at Pattberg mine. This building was sold by RAG to private investors in 2002. Wind-turbine power genera-



Wind turbine at the Hoppenbruch dump in Herten

> tion systems are now also being set up on former mining sites. Though wind power generation is particularly effective in coastal and offshore areas installations of

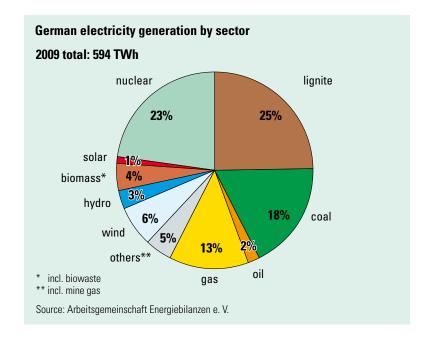
this kind can also be set up inland on suitably contoured hills and ridges. Here the wind potential is often comparable to that of the coastal locations. The coal industry has created many elevated areas of this type in the form of the spoil tips that are a common feature of the coalfields. The Ruhr region alone has as many as 40 tips that would be suitable sites for wind power generators and indeed such an installation was built and put into operation on the Hoppenbruch spoil tip in Herten in 1997. Just this year the foundations were laid for two wind turbine systems on the Oberscholven spoil tip in Gelsenkirchen. Because of their elevated position coalindustry spoil tips are essentially suitable locations for the building of pumped storage power plants. Wind generated energy can be used to pump water from ground level into a large storage reservoir located high up on the tip. The controlled release of this water produces hydro energy for generating electricity on demand. This year has also seen the start-up

of the new Hugo Biomass Project in Gelsenkirchen, which is a joint venture being undertaken by RAG and RAG Montan Immobilien in conjunction with the Ministry for the Environment and Conservation, Agriculture and Consumer Protection and the Forestry and Timber Department of North Rhine-Westphalia. The aim of this initiative, which is a pilot project for the biomass scheme 'Bioenergie.2020. NRW', is to set up a 22-hectare operation on the site of the former Hugo 2/5/8 mine, which was closed in 2000, with a view to recovering alternative fuels in the form of fast-growing trees such as poplar and willow — in other words a quick-turnround plantation. The site preparation work is expected to be completed by 2012. This project combines land re-use for the generation of renewable resources with the revitalisation of a brownfield site – to create a facility that can also be used for leisure and recreation purposes.

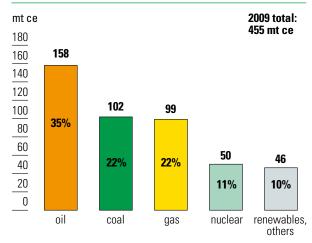


The German energy sector in 2010

Germany's primary energy consumption (PEC) in 2010 is expected to increase significantly from the level of the previous year. This is not a risky prognosis: in 2009 PEC fell to 455 million tce, the lowest on record since German unification, due mainly to the serious financial and economic crisis that plunged the country into the deepest recession of the post-war era. As a result, PEC for 2009 was well down on that of 2008 and this fall in consumption - recorded at 6.0% - was even more pronounced than the decline in gross domestic product (-4.9%). Gross electricity consumption fell to about 597 TWh in 2009 and also declined more sharply than GDP, namely by 6.3%. Energyrelated CO₂ emissions in Germany fell by 9% in 2009 to a figure of 760 million t, this representing a



Primary energy consumption in Germany



Source: Arbeitsgemeinschaft Energiebilanzen e. V.

decline of 26.5% compared with the 1990 levels. As a result of the general economic upturn 2010 is expected to show a marked rise in PEC and in electricity consumption (which will in turn mean an increase in CO2 emissions). A broad-based fuel mix continues to be needed to meet Germany's total primary energy needs. This sector is still dominated by fossil fuels, which combined made up nearly 80% of the market in 2009, namely coal (50.3 million tce) and lignite (51.5 million tce), plus even larger quantities of oil (158.0 million tce) and gas (99.2 million tce). Nuclear power (50.2 million tce)

and renewables (40.3 million tce) together barely meet 20% of Germany's total primary energy needs - and these are the two energy sources that are currently at the centre of the public debate on energy. Incidentally, and contrary to popular opinion, it is not the two headline-grabbing icons of renewable energy - wind and solar power - that play the greatest role in this sector, for in fact bioenergy (biomass, biogas and biowaste) makes up at least two thirds of the input from renewable sources.

The German electricity generating sector has a quite different fuel

On the road to an Energy Concept

make-up from that of the primary energy market, particularly since oil, so dominant in the heat market and transport sector, plays little or no role here. Yet even the power generation industry continues to be structured around a relatively diversified energy mix. Figures for 2009 show that solid fuel (coal and lignite) was still the biggest contributor with nearly 43% of this market. The input from nuclear power that year was about 23%, with all renewables combined contributing just below 16% (one third from wind power and one percent from solar) and gas nearly 13%.

Many of the current energy scenarios — including the national Energy Concept being proposed by the Federal Government and the European Commission's long-term energy strategy - are looking well ahead some forty years to the period up to 2050. A new energy and climate policy agenda is expected to bring radical changes to the energy mix during this time, and the extended use of low-CO₂ or even CO₂-free energy sources will effectively bring 'decarbonisation' to this sector. In this context it seems appropriate to have a look back at developments over the last forty years. If we go back to the year 1970 it can be seen that while the energy mix has noticeably changed since then this transformation has by no means been dramatic. At that time the fossil fuels dominated this sector with a 96% share of the primary-energy market; oil led

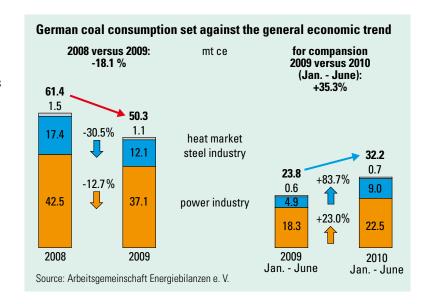
the way (44%), followed by lignite (25%) and then coal (24%). Gas was much less important (4%), while nuclear power was still in its infancy (< 1%). Renewables, which in this case primarily meant large-scale hydroelectric power plants, were already contributing about 2% to this sector — and a further seven percentage points have now been added to their tally.

Back to the present, and especially to coal and other key aspects of energy supply: the crisis of 2009 hit coal consumption in Germany particularly hard and brought it to its lowest level for a century (18% fall to 50.3 million tce). This was mainly attributable to the aforementioned slump in steel production and the resulting drop in demand for coking coal and coke (down 32%). For the first time coal imports to Germany recorded a downturn on nearly the same

scale as indigenous production, the latter being part of a planned rundown. This year the German coal market is therefore expected to register a relatively strong growth rate compared with 2009, which has already been confirmed by quarterly figures.

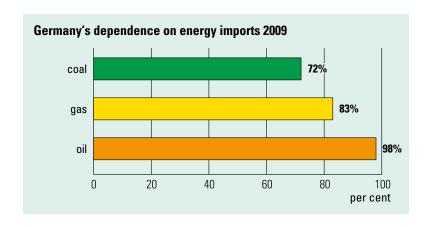
Nevertheless, in the long term coal's contribution to the energy mix in particular is set to go on declining. Several new-build projects for coal-fired power stations have recently been withdrawn or postponed because of unfavourable economic developments combined with energy and climate policy uncertainties.

The prospects for Germany's security of primary-energy supplies appear to be increasingly precarious given the country's high and presumably increasing reliance on



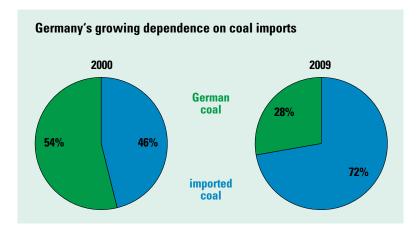
imported energy. In 2009 imports to this sector, including uranium supplies, accounted for 71% of PEC. This high level of dependence on imports applies especially to oil and gas, but coal is increasingly falling into this category too. In the case of oil and gas this is unavoidable because indigenous production is limited and national reserves are relatively low and will run out by 2020. As far as coal is concerned economic circumstances and political decision-making will determine to what extent the country's large and technically recoverable deposits will remain available in the long term.

Being part of the EU and the single energy market does little to relieve the problem of import dependence, for this is increasing throughout EU-27. The European single market obviously leads to better integration of the energy markets of the member states and provides certain load balancing options for peak demand periods — but it does little to create new energy

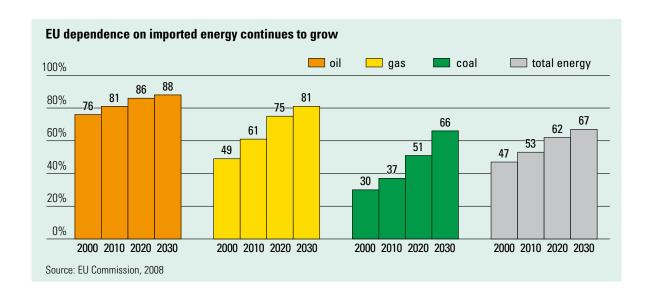


reserves. Most energy imports to Germany come from third countries, with one third of the total coming from the Russian Federation alone. Russia has long been the main supplier of both oil and gas (respectively 35% and 32% of imports). This situation now also applies to coal imports, with one quarter or more of these supplies now being sourced in Russia. This all adds up to the fact that Russia supplies one fifth of Germany's total primary energy demand.

The high dependence on imports not only translates into a corresponding volume risk but also presents a price risk and therefore affects the external energy bill. While the crisis year 2009 saw expenditure on energy imports fall by more than 30% on the previous year, the figures for 2008 had already reached an all-time high of € 112 bn as a result of the price explosion in the energy and commodities market. In spite of the difficult recession German expenditure on imported energy in 2009 - amounting to some € 77 bn, of which € 45 bn was spent on oil imports - was well above the average for every year prior to 2006. And despite the collapse in prices and volumes the € 3.9 bn spent on imported coal was - with the exception of the peak year 2008 - the highest on record. The trend rise in world market prices for energy and raw materials would again indicate that levels will continue to increase significantly in the years ahead; this is already apparent in 2010.



On the road to an Energy Concept

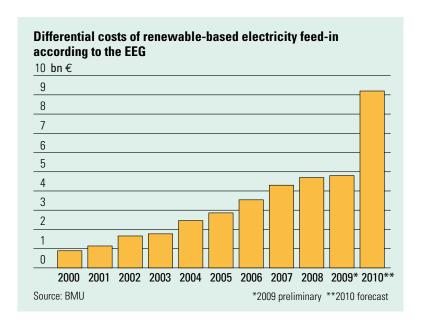


Yet Germany still runs on coal, as borne out by the figures for indigenous primary energy production. The 131 million tce produced in 2009 was sufficient to meet 29% of the nation's primary energy demand. Indigenous solid fuel accounted for just over half of the primary energy produced in Germany in 2009 (40% lignite and 11% coal). All renewables combined now make-up 31% of the nation's primary energy output.

An analysis of Germany's indigenous energy resources shows that solid fuel accounts for 99% of the available reserve. Most of this energy resource is coal, despite the statistics published by the BGR (Federal Institute for Geosciences and Natural Resources) in recent years showing that, as a result of definition changes, German has relatively little in the way of

'economically recoverable' coal reserves. This concept of 'reserves' fluctuates with world market prices and political decisionmaking and therefore says little about the quantity of indigenous reserves that can actually be extracted. Whatever the case, they have certainly not vanished.

The import dependence of the primary energy sector can be reduced not only by exploiting indigenous energy resources but also by expanding the renewable energy sector – provided that the renewables in question are really of domestic origin and are not displacing other indigenous fuels. It is still too early to say exactly when renewable energies will be capable, in economic terms, of playing a leading role, or indeed the leading role, in the area of energy security. There are good technical, resource-related and environmental reasons for remaining committed to an expansion of the renewables sector and seeking to exploit the full potential of this resource. The huge quantities of raw materials and amount of land space required for the operation of renewable-energy plant will of course also impose physical and ecological limits on any expansion of this resource on a broad front. There is also the question of whether national environmental targets could not be achieved at less cost by means of other instruments and of how far these aims are compatible with other key energy policy objectives, namely competitiveness and security of supply. The EEG average payment has risen continuously in recent years. This currently stands at 14.0 Ct/kWh - the subsidy equivalent (differential cost at the exchange price for electricity) amounts to between 8 and



9 Ct/kWh — and the figure is expected to go on rising.

The level of the subsidy is no argument against the merits of promoting renewable energy sources until

they have developed economic and competitive production conditions of their own. However the level of criticism being directed at other subsidies in the energy sector has to be put into proper perspective.

Key aims of the Energy Concept

In its Coalition Treaty of autumn 2009 the Federal Government, as well as acknowledging Germany's leading role in the field of climate protection, also declared its support for an 'ideology-free, technology-neutral and market-oriented energy policy'. This would include the whole spectrum of potential applications (electricity, heat, mobility) and would at the same

time help prepare the way for the 'renewable-energy age'. Extended use was to be made of renewables, in conjunction with a further increase in energy efficiency, so that this resource would be in a position to take over the 'lion's share of the energy supply market' in the long run. According to the Coalition Treaty this would see 'conventional fuels being continuously replaced by alternative forms of energy as part of a dynamic energy mix'.

Nuclear power in particular was classed by the Federal Government as a 'bridging technology' to be used until it could be reliably replaced by renewable sources of energy. For this reason the Coalition Treaty signalled its readiness to extend the operating life of Germany's existing nuclear power stations which would be done under certain conditions and would be subject to strict safety standards, while providing for the safe disposal of the radioactive waste. The ban on the building of new nuclear plant, as laid down in the Atomic Energy Act, would still remain in place. However the agreement would allow the construction of highlyefficient coal fired power stations. For this reason, and according to the terms of the Coalition Treaty, the European CCS Directive was to be transposed into national law as soon as possible and used by the Federal Government to promote the acceptance of CCS technology. Research would also be stepped-up into developing techniques for the commercial exploitation of CO₂.

Against the background of these and other objectives the Federal Government announced a new Energy Concept that was to run until October 2010 and would 'formulate scenario-based guidelines for a clean, reliable and affordable energy supply'. In early 2010 the Federal Government — under the joint auspices of the Federal Economics Ministry and the Federal Environment Ministry, which con-

On the road to an Energy Concept

tinue to be responsible for energy policy matters — commissioned a consortium of three scientific institutes (Prognos, EWI and GWS) to draw up energy scenarios for the Energy Concept with a time horizon of 2050.

The scenarios that were then submitted show that the transition to a renewable-energy age seems to be 'technically and economically' feasible in the long term. However, such a development would be contingent on a number of 'fundamental conditions': these primarily include product, process and system innovations in the energy sector of the future and the removal of many of the current legal, social and economic barriers, which could be done by establishing an integrated Europe-wide electricity market or by concluding a new and binding global climate agreement. The scenarios do not indicate exactly how the associated implementation, transitional and adjustment problems would be resolved, particularly from a sectoral, regional and social viewpoint. Neither do they take into account the impact all this would have on the German coal industry – which would be dramatic to say the least.

The energy scenarios expressly point out that the calculated findings 'as yet do not state how realistic it will be to achieve these goals in practice'. It is also made clear that the feasibility of the

proposed aims and measures will be governed by the aforementioned 'fundamental conditions': it is in some respects still too early to foresee these requirements being met and the probability of this happening is not specifically discussed. And yet their macroeconomic impact has been calculated and presented more on a speculative rather than on a reliable basis. However the study did highlight a number of critical sensitivities in the economic results: a continuation of the favourable international climate for the German economy and the development of 'green markets' worldwide, stable trends in international energy prices with no feedback effects, especially for fossil-fuel prices, and the expansion of Europe's electricity supply networks with a cost-reflective division of effort between renewables (with wind power coming more from northern Europe and solar energy more from southern Europe). It is assumed throughout that all the major investments required for the targeted transformation of the energy industry (about € 20 bn a year) can and will be provided by the (mainly private-sector) market players themselves. The study also assumes that, for as long as it takes, no funding obstacles will be placed in the way of the additional finance and level of subsidies needed for the expansion of renewable energies. The various scenarios provide no clear answers as to the overall cost of the renewables expansion programme and the way in which this burden would be shared out.

'The Cabinet decision'

Soon after the submission of the energy scenarios the Berlin Coalition obtained an agreement on prolonging the life of Germany's nuclear reactors and the modalities for this. The life expectancy of these nuclear plants is to be extended by an average of 12 years from the previous provisions of the Atomic Energy Act (measured in terms of 'residual electricity volumes'). This programme will of course be staggered according to the age of the reactors. Older nuclear power stations (built before 1980) will be allowed a life extension of eight years, while more recent installations could be extended by as much as 14 years. This means that Germany's last nuclear plant may not be retired from the grid until sometime around 2037. In return, a fuel-element tax (amounting to about € 2.3 bn a year) will be raised as a 'profit supertax' from the continued operation of the nuclear installations during the period 2011 to 2016. From 2011 the operating companies will also have to pay a contractually agreed 'special contribution' to promote renewable energies and energy efficiency; no additional safety requirements have been laid down and no plans have been drawn up to resolve the problem of storing spent fuel rods. This 'nuclear compromise' brought heated protest from the German opposition parties, a number of Federal State governments and the

environmental organisations. There was talk of a constitutional complaint and the threat that these decisions would be revoked following a change of government. There was also strong criticism from competing sectors, particularly the public utilities, which now see themselves at a disadvantage as they battle it out with the major energy suppliers. At the same time they are worried about investments made in new coal-fired power stations, for example, with a number of such projects having been started or being planned on the basis of existing framework conditions in the energy market

On 6 September 2010 the Federal Economics Ministry and the Federal Environment Ministry then jointly presented their draft Energy Concept ('Nine points for an environmentally-friendly, reliable and affordable energy supply'), which has now been approved by the Cabinet with only a few

instrumental amendments. As well as agreeing to extend the life of nuclear power plants the Concept identifies the following action areas: 'renewable energies as a cornerstone of future energy supply', 'the key issue of energy efficiency', 'fossil-fuel power stations', 'an efficient network infrastructure for electricity and the integration of renewable energies', 'energy-focused renovation and energy-efficient building', 'the mobility challenge', energy research for innovation and new technologies', 'energy supply in a European and international context' and finally 'acceptance and transparency'.

The Energy Concept seeks to pursue a new path towards a renewable-energy age that will be dominated by climate protection targets. A range of objectives have been laid down as milestones along the way. These include a 40% cut in Germany's energy-related greenhouse gas emissions by 2020

and a further reduction of at least 80% by the year 2050. At the same time primary energy consumption is to be drastically reduced from 2008 levels, with a 20% cut by 2020 and a 50% cut by 2050. Electricity consumption is also to be reduced by 10% by the year 2020 and by 25% by 2050. The share of renewables in total final-energy consumption is to be increased to 18% by 2020 and to 60% by 2050. The Federal Government also plans to increase renewables' share of the electricity generating market to 35% by 2020 and to 80% by 2050. In addition there are specific targets for energy consumption in the transport sector and for the rate of progress to be achieved in the renovation of the building stock.

The scenarios commissioned by the German Government were to have confirmed that this course of action was 'possible and practicable'. Yet, as is expressly pointed out, they are 'not predictions'; in actual fact they can only be described as 'rough route maps or as a compass that points in the direction of the target, subject to certain assumption and lists the measures that have to be taken'. The scenarios also indicate that there is 'still much to be done in every sector' and that 'the necessary conditions have to be created for a fundamental reorganisation of the energy supply system'.

The wide-ranging measures being put forward also contain proposals for the further development of fossil-fuel power stations, including coal-burning installations, into a

Rope pulley



On the road to an Energy Concept



'flexible power-plant fleet' to serve as 'balancing and reserve capacity' for renewables-based power generation. Investment in new, high-efficiency coal and gas fired power stations is to be supported by, among other things, exploiting the opportunities afforded by the EU Energy and Climate Package: this provides for new CCS-capable power station projects to be supported by financial subsidy, though admittedly only under restricted conditions. The development of CCS technology is also given considerable long-term significance. This applies not just to the decarbonisation of fossil-fuel power stations but also to the capture and storage of process-related CO₂ emissions from energy-intensive industries (chemicals, steelmaking, the cement and limestone industries, oil refineries, etc.). With many countries planning to use coal well into the future CCS technology also provides German

industry with promising export opportunities. However, emissions trading remains the key instrument for achieving the environmental targets that have been set for the power station sector. Complementary instruments such as CHP funding are also to be 'examined in turn to see what additional benefits they bring and what additional costs they generate'.

The draft Energy Concept devotes a separate section to the 'Phasingout of coal production'. This states that: 'The subsidised production of indigenous coal will be terminated in line with national and European regulations.' This says nothing new from a coal industry point of view and the fact that the existing legislation is to be adhered-to would appear to be self-evident. Yet the Federal Government is making it plain, however, that it has no intention of bothering with the 'review clause'. This means that any contribution from home-produced coal is to be dispensed within the coming decade, with lignite then also to be phased-out gradually. The longterm future of the entire coal-based power generation sector will then be called into question. In order to secure raw materials for the energy industry the Federal Government merely intends – as is stated elsewhere in the Concept - to join with industry in stepping-up the dialogue with EU third countries. It also proposes setting up a German Raw Materials Agency within the BGR, which will act as an information and advice centre for questions relating to natural resources, and will provide 'political support' to German companies engaged in large-scale infrastructure projects (such as Northstream, Nabucco and Desertec). The draft Energy Concept does not refer to any other challenges facing security of energy supplies, notably the short- and medium-term problems that will arise during the next ten years or the security issues associated with the price rises and shortages that even now are starting to affect many energy resources, a topic that was examined in the Peak Oil Study conducted by the Bundeswehr in the summer of 2010.

Problem area: security of supply

Security of energy supplies is one of the key aims of German and European energy policy. The issues and problems arising in this area have been intensively debated for many years and a whole range of national and international risk provisioning measures have been put in place as a result. More recently, however, supply security has been

pushed into the background of Germany's energy debate and even in the new Energy Concept it does not appear to feature largely in the policy-makers' thinking. Yet only fairly recently a number of supply interruptions and energy crises have been witnessed: for example the gas dispute between Russia and Ukraine in early 2009 and be-

tween Russia and Belarus in mid-2010, the black-outs that affected US power supplies and those of other countries too, serious signs of 'cyber terrorism' against energy systems, bomb attacks against pipelines and oil-tanker highjackings off the coast of Africa. A global study by the IEA has identified a dozen similar incidents in the last decade alone.

This policy vacuum can probably be explained in the following terms: when it comes to security of supply energy policy often lacks the clarity and comparability that comes from having objective yardsticks and also suffers from having few really meaningful quantitative indicators. This has always been a problem in respect of efforts aimed at making the energy industry competitive (especially in terms of prices and costs); at the same time it has become increasingly significant in recent years as regards measures aimed at improving environmental compatibility (threshold limits, emission levels, etc.). However this does not mean that there has been a fundamental improvement in Germany's energy security situation. The fact is that Germany and the EU in general have become increasingly reliant on energy imports from third countries, especially Russia. Of course import dependence is of itself not an adequate indicator for measuring economic supply risks and the level of vulnerability. In fact what is much more important are

the actual political and economic risks prevailing in the supplier and transit countries, the degree of supplier diversification and also the equalisation factors that are present in the home country. In an attempt to reduce the deficit that has hampered any quantified assessment of energy supply security a new approach has now been adopted to the problem of measuring supply risk, including for example various relevant studies carried out by the RWI (see GVSt Annual Report 2009, pp. 74 et seq.)

In June 2010 the World Energy Council Germany published a study entitled 'Security of energy supply - indicators for measuring vulnerability and risk', which it commissioned from the EEFA Institute. Muenster/Berlin. This presented the first broad-based concept for assessing vulnerability and supply risks in the energy sector. The European Section of the World Energy Council had already submitted a study in early 2008 (also co-written by the EEFA Institute) entitled 'Europe's vulnerability to energy crises'. This provided the first comprehensive set of indicators for assessing the energysupply vulnerability of Europe and individual EU member states. This study was specifically prompted, on one hand, by the short-term disruptions to certain fuel supplies and, on the other, by the dramatic price rises witnessed in some energy sectors in recent years, a development that has imposed an enormous burden on the national economy as a whole and indeed

on some consumer groups too. Following on from this the World Energy Council Germany instructed the EEFA Institute in 2009 to produce a study that would take this analysis approach further by applying it to the national situation in Germany and how this compared internationally. This new EEFA study on energy supply security, which has now been published, is based on a broad methodical concept that uses a structural economic and energy model along with a comprehensive empirical database. The aim is to use the model to make the risk to primary energy supplies in Germany (using actual risk scores for each energy source) just as quantifiable as the economic vulnerability risk associated with it.

This was achieved by drawing up a reference scenario that updates future changes to the energy supply risk in Germany under statusquo energy conditions for the years 2020 and 2030:

- withdrawal from nuclear energy,
- phasing-out of indigenous coal production (by end 2018),
- increasing renewables' share of the power generation market to 30% by 2020,
- gradual transition to full auctioning of CO₂ emission permits after 2013,
- reduction in greenhouse gas emissions in Germany by 30% from 1990 levels by the year 2020 (and by 40% by 2030).

On the road to an Energy Concept



Four alternative policy scenarios were set against this reference scenario and comparisons were then established in terms of the impact on economic vulnerability and supply risks in the energy sector:

Scenario I:

Extending the life of nuclear power stations to 40 or 60 years.

Scenario II:

Maintaining a core coal industry after 2012 (8 or 12 million t) and using auctioning revenues to fund investment subsidies for new higherficiency power stations between 2013 and 2016.

Scenario III:

Extended use of renewable energies for power generation in accordance with the 2009 reference scenario produced by the German Environment Ministry, i.e. 50% of gross electricity needs to be met by renewables by the year 2030.

Scenario IV:

Tougher national environmental targets, which specifically would mean a 50% reduction in ${\rm CO_2}$ emissions by 2030 compared with 1990 levels.

The essential aim of the selected scenarios was to reveal the isolated impact of the relevant energy and environmental policy decisions on Germany's energy vulnerability and supply risks. The study also

analysed the country and fuel specific risk of supply interruptions at primary energy level, these being assessed and compiled in the form of a specific risk index.

The study then goes on to examine the vulnerability risk in terms of the growth and employment losses that could result from the associated cost and price increases at end-user level. This looks at the balancing effects of the energy mix, the level of energy efficiency achieved in each case and the energy infrastructure facilities (storage, networks, power plant parks).

The individual characteristics of the formal concept were quantitatively evaluated for several OECD regions (Germany, the UK, Sweden, Poland, Italy, France and the USA) using a comprehensive empirical database and reduced to a single indicator for assessing energy supply vulnerability. Part of the database used comprises historical observations for the period 1978 to 2008.

Risk values in perspective

An empirical evaluation of the vulnerability indicator system in the ex-post period yielded the following key results: In Germany risk to primary energy supplies has increased perceptibly since the late 1970s and has more than doubled between 1990 and 2008 alone. An international comparison shows that only Italy and Poland currently

post a higher supply risk at primary energy level. The supply situation is considerably better in the UK, France, Sweden and the USA. The main reason for Germany's elevated supply risk is its growing dependence on imported energy and the associated rise in demand for imports from supply regions

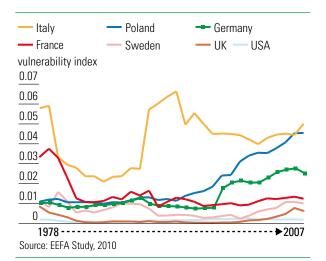
with a high or growing geopolitical risk classification.

Germany's impressive energy efficiency record and excellent energy infrastructure have done much to reduce its vulnerability at end-user level, though have not prevented this from increasing. Measured in terms of the index value used in the study the supply risk grew by around 18% in the period from 1990 to 2007.

Risk-value trends in future scenario

The scenario calculations also indicate that Germany can expect the potential threat to its energy supply to grow significantly in the years ahead. If the energy policy of recent years continues to 2030 the country will experience a substantial increase in both its vulnerability and its supply risk. In the reference scenario the vulnerability index in 2030 would be 47%

Risk to primary energy supply



higher than in 1990. This would be driven by the depletion of some indigenous energy sources (oil and gas) and the closure of mines, in spite of the level of available coal deposits, which would in turn mean an increasing reliance on energy imported from high-risk regions, combined with the longstanding decision to phase-out the use of nuclear power. Here it is being assumed that the German lignite industry will continue to operate unchanged, that energy efficiency will continue to improve in line with trends and that renewables use will expand in line with targets. Failing this German energy security would be placed at an even greater risk.

An unchecked increase in the energy supply risk is of course not inevitable for Germany. In fact the alternative scenarios also produced in the study confirm that security of energy supply can be increased by way of appropriate energy policy decisions taken at national level. According to the calculations drawn up in the study extending the life of nuclear power stations to 60 years would have by far the greatest impact on improving Germany's energy security - implicit in this is the assumption of plant safety and a satisfactory solution to the problem of nuclear waste disposal. Such a measure could more than halve the rise in vulnerability from 47% to 21%, when set against the reference scenario. Continuing with indigenous coal mining after 2018 (in conjunction with the building of

new high-efficiency coal-fired power stations) and actively promoting the development of renewable energy sources could also make a significant contribution to reducing the energy supply risk. Using these two measures in the relevant scenarios would reduce the vulnerability increase by 2030 by, respectively, 6% and 2%. When interpreting these results it has to be remembered that indigenous coal's contribution to the power generation sector is about one third that of nuclear energy, a fact that reflects the planned reduction already achieved in coal output.

Introducing tougher CO₂ reduction targets, on the other hand, would only increase the vulnerability risk (by 9% in this particular scenario) because of the high costs involved, the displacement effect and the resulting expansion in gas imports. In every single case this argues against an excessive climate bias in the way energy policy is aligned and illustrates the conflict of objectives in this area. The study also makes something else guite clear: exit scenarios increase the vulnerability and supply risks – and this applies to more than just nuclear power. None of the examined options, when viewed in isolation, would be capable of reversing the trend of growing supply risks and greater vulnerability. The best that can be hoped for is some degree of risk alleviation. In the least favourable case (tougher CO₂ reduction targets) the risk levels will in fact

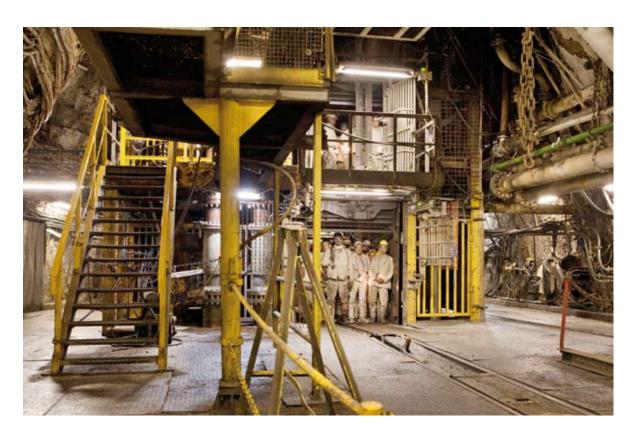
On the road to an Energy Concept

increase further. This is why it is vital to implement as broad-based a range of measures as possible. Various options therefore have to be kept open so that a high overall contribution can be made towards improving security of energy supply and reducing the level of vulnerability.

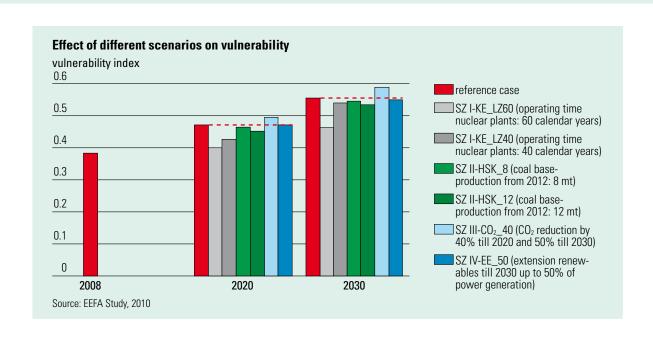
From coal's point of view of course it is especially worth noting that in the medium-term horizon to 2020/2030 the level of risk can be reduced somewhat more effectively by maintaining a core mining industry of whatever size (8 or 12 million t/year), in addition to the building of new coal-fired

power stations, than would even be possible by any above-target expansion of renewables. Looking to 2030 the same could also be applied when set against a 40 yearextension to the operating life of the nuclear installations. The 'domestic coal' scenario can therefore be attributed with a positive GDP effect of 0.09 - 0.11% in 2020 and with 0.03 - 0.05% in 2030. While the expansive investment and employment impact generated by the building of new coal-fired power stations would also play a role here, this would of course only last to 2020 and then peter out. The positive GDP effect obtained in the coal scenario may be surprising to

many: while the subsidies paid out to preserve the mining industry have as a rule long been recognised for their positive social and regional impact, they are considered in other respects as having a curbing effect on growth. However the study makes it clear that the economic relationships involved produce a somewhat different assessment. This is explained as follows (page 58 et seq.): 'On this premise the continuation of domestic coal production within the context of a core mining industry (12 million t or 8 million t), as opposed to the situation presented in the reference scenario (cessation



Prosper Haniel mine landing location shaft 10



of coal production by 2018), would have various macroeconomic consequences over and above maintaining access to the national coal deposits. For one thing, not having to phase-out coal production — in contrast to the reference scenario - would not only have a direct impact on growth but, through the purchasing of goods and services and the effect of investment and increased income levels, would also indirectly provide a stimulus on a macroeconomic and sectoral level. In 2030 a core mining industry (along with an investment subsidy for power stations) of 12 million t capacity could still directly maintain about 17,000 jobs.

These would all be lost if coal mining were to cease completely. Because of the aforementioned growth stimulus every coal-industry job that is preserved also means additional employment in the wider economy, with the result that by 2030 - in contrast to the reference scenario – the jobs of some 37,000 people could be saved. The reduction in subsidy levels and the loss of jobs, as presented in the reference scenario, would impose an additional financial burden on the public purse that will in some respects more than offset the savings made by withdrawing state aid to the industry. This can be attributed, on one hand, to the inherited liabilities associated with inactive mines - which will

continue to exist in spite of the premature pit closures — and, on the other, to the social cost of the job losses. The higher employment levels presented in scenario II will provide the treasury with additional income in the form of taxes and social welfare contributions. Add to this the fact that the state will not have to pay out additional unemployment benefits (the fiscal impact of this would be € 1.3 bn in 2020 and € 1.1 bn in 2030). The additional revenues received would be set against an increased expenditure on subsidy pay-outs of roughly € 940 million.'



The global financial and economic crisis of 2009 hit the world's energy markets and left them in a badly damaged state. According to calculations by the International Energy Agency (IEA) and BP the OECD countries recorded a 5% drop in oil, gas and coal consumption — and in some cases this was far worse than the fall in GDP. With energy consumption in the developing and emerging nations rising by 2.7%, even during the economic crisis, the net upshot was a decline in global energy demand of 1.1% - the first time this had happened since 1982. Here it is important to note that last year. taken overall, the industrialised countries consumed less energy than was the case just a decade ago. At the same time there has also been a massive fall in the level of investment in the energy sector. The IEA is now predicting that a continuation of this downturn, or the cancellation of a large number of new investment projects, will have an adverse

tion and transport) at the same time as demand starts to pick up again over the next few years. There will therefore be a real risk of 'temporary supply shortages', especially where the industrialised countries are concerned. Some signs of this can in fact be seen at the present time, occasionally triggering sharp price increases on the energy markets for short periods. Moreover, this unusually high level of price volatility, which was relatively unknown in years gone by, is tending to depress, and indeed jeopardise, the global economy recovery. There is therefore a pressing need for action to be taken, not just in developing energy efficiency and improving the environmental sustainability of our energy production systems but in the area of energy provision and security of supply too.

The now recovering global steel market has already provided a foretaste of possible future developments. The raw materials required in this sector (ore, coking coal, coke and scrap), and in some cases the production facilities too, are now becoming increasingly scarce and are becoming more and more expensive as a result. There is therefore a real danger that prices will rise significantly in 2010 and in the course of next year too. The principal cause of this remains the high level of demand in China, a country that is now importing a large proportion of the raw materials it needs - especially

knock-on effect on energy supplies

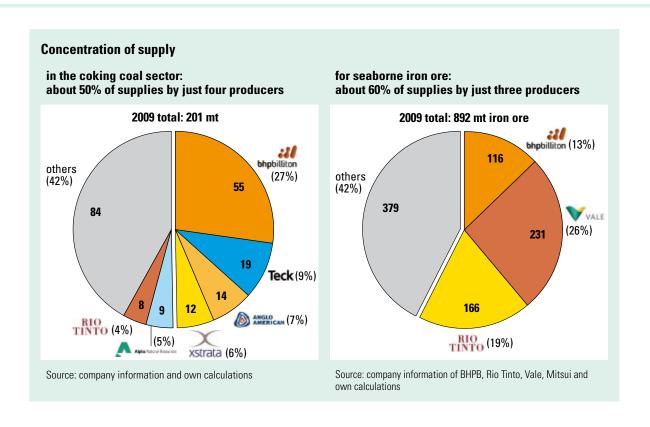
(exploration, processing, produc-

iron ore. The amount of ore being imported has now grown to almost 70% of the global market and the spot market prices for iron ore have doubled as a result - from the lowest quotations in April 2009 of something like 64 USD/t to a figure of more than 130 USD/t in February 2010. The cost of coking coal too has risen enormously from a low of about 130 USD/t for premium grades in 2009: spot market prices have since grown to an average level of 250 USD/t. Moreover, the world's leading producer of iron ore and coking coal, BHP Billiton, has now succeeded in pushing through a new set of rules for the pricing of coking coal following negotiations with Japanese steelmakers earlier in the year. The more than 40-yearold benchmark system of annual pricing has been given up and has been replaced by a quarterly price setting arrangement. This means that contractual raw-material prices will henceforth tend to follow the spot market quotations much more closely than before. The change in the pricing system comes at a time of rising demand, which is linked to the expectation of higher prices. In the same context Chinese steel producers are now also calling for a return to the earlier benchmark pricing system: in periods when prices are rising on the iron-ore market there are certain benefits to be gained, from a buyer's point of view, by having this arrangement as compared with the spot-market pricing mechanism. However,

GuQiao coal mine of Huainan Coal Mining Group



International energy and commodities markets



given China's huge import needs of around 680 million t of ore in 2010 and the current market power of the big international producers it seems more than questionable whether this demand will be met. In actual fact the leading international raw-materials producers are moving towards increasing their market power further and we are now seeing both the iron ore and the coking coal market being concentrated around just a few suppliers.

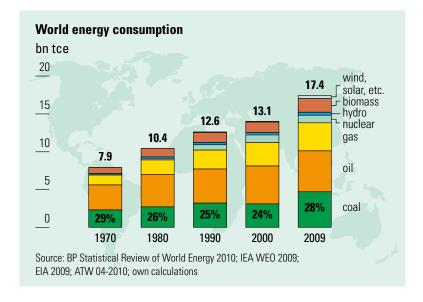
About 50% of the global trade in coking coal is now controlled by just four producers. BHP Billiton dominates this sector with a

30% share of the market, as was convincingly demonstrated during the price negotiations held earlier this year. The trade in seaborne iron ore, which currently amounts to more than 800 million t, is also controlled by only three leading market players - namely Vale (33%), Rio Tinto (20%) and BHP Billiton (17%). The iron-ore joint venture being planned in Western Australia by Rio Tinto and BHP Billiton will further increase the market power of these two mining companies. However the Western Australian Government and international cartel authorities have not yet given the necessary clearance for such a project and the official launch of the proposed joint venture has been put on hold. The establishment of a number of smaller producers in the Australian iron ore sector, for example Fortescue Metals Group (FMG) and Mount Gibson, gives cause for hope that there will in future be some relaxation in the level of market concentration. Yet the fears of the steelmakers still essentially remain that looming increases in the cost of procuring raw materials will impose a huge additional burden on the industry and will in particular have a lasting impact on the competitiveness of German and European steel producers.

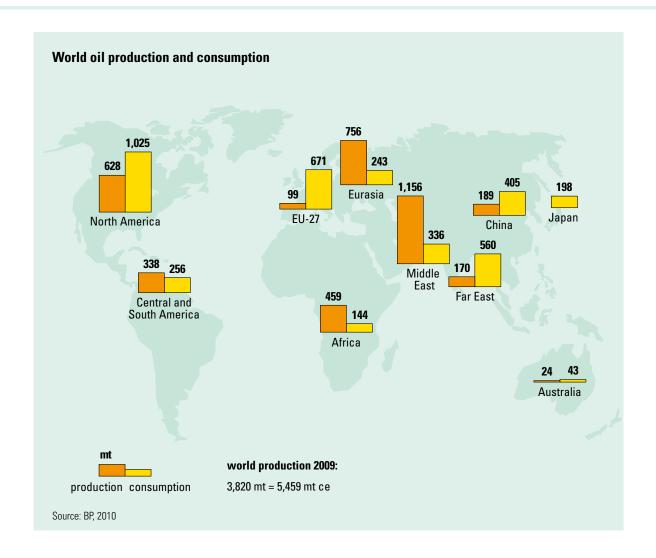
The Federal Government has responded to the deteriorating situation on the international commodities markets by taking a number of measures, including setting up a German Raw Materials Agency and initiating an ongoing raw materials dialogue. The Raw Materials Agency, which will come under the Federal Economics Ministry, is to be embedded within the existing structures of the BGR (Federal Institute for Geosciences and Natural Resources) - its remit is to carry out specific assignments related to the provision of basic information. Partnerships will also be established with German industry as part of the raw materials dialogue with developing countries, the ultimate aim being to create a 'win-win situation'. This process will also involve the EITI (Extractive Industries Transparency Initiative), which seeks to create fair standards in the development and distribution of natural resources for the benefit of people living in developing countries. The BDI also held its third Raw Materials Congress in October 2010, where the agenda included a discussion of those resources that the European Commission has now classified as being of critical importance, namely antimony, beryllium, cobalt, fluorspar, gallium, germanium, graphite, indium, magnesium, niobium, PGMs (Platinum Group Metals). rare earths, tantalum and wolfram. There is now a real need for action, particularly as far as the rare earths are concerned: more than 90% of these metals are currently extracted in China, which because of its rich reserves has now practically assumed a monopoly status. There is therefore a growing focus on raw materials supply as a decisive factor for the future viability of German industry.

Even two years after the outbreak of the crisis we are still a long way from overcoming the effects of the financial and economic crash. The energy and commodities markets have changed in all kinds of ways, particularly in terms of price volatility, ecological targets, supply risks, strategic raw materials planning (take China for example) and the balance of global demand. There is now a dramatic structural transformation under way in the fossil fuel sector. for the developing and emerging nations - particularly China - have already overtaken the OECD countries as primary-energy consumers. This will become even more pronounced in the years ahead, so it can be assumed that the trend will be towards even greater price volatility in the period to come. The challenge as far as energy security is concerned is therefore to ensure affordable supplies while at the same time, for reasons of global climate change, engineering a structural switchover to higher levels of energy efficiency and a reduced carbon footprint, especially in the non-OECD countries.

The fall in primary energy consumption to around 17.4 bn tce in 2009 can essentially be attributed to the lower economic growth recorded in the OECD countries. While growth in the OECD zone showed a downturn ranging from 2% to 8% (for example, USA -2.4%, Eurozone -6.8%, Russia -7.9%), emerging countries like China and India continued to report



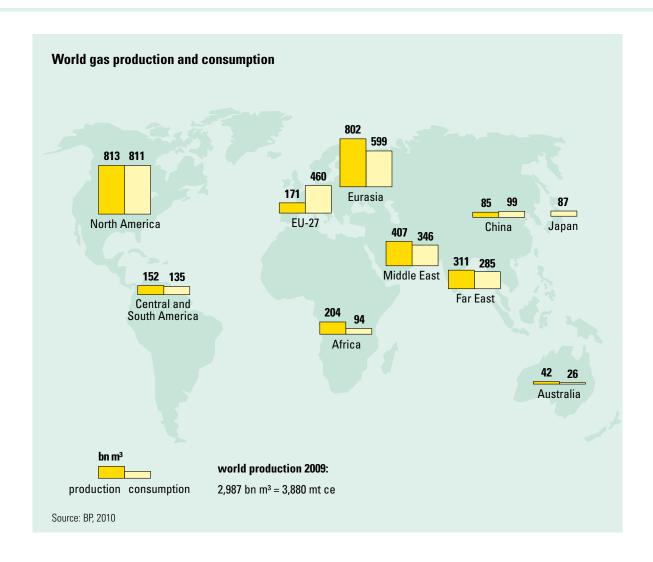
International energy and commodities markets



a rise in GDP (China +8.7%, India +6.5%). Energy consumption in all the conventional fuel markets, apart from the renewables sector, was therefore significantly down. Initial conservative estimates indicate that the collapse was greatest in the oil and gas markets, while coal had in some cases to contend with a drop in consumption of more than 10% in the OECD

countries and in the CIS zone. In Germany alone coal consumption was 18% down overall (domestic production plus imports). Global energy consumption will continue to develop irregularly. According to the IEA (in its World Energy Outlook) much of the uncertainty surrounding global energy supplies can be linked to the increasing demand for energy from China and India. The key developments of re-

cent years confirm this assumption and support the latest predictions from both the EIA (Energy Information Administration, part of the US Energy Ministry) and the WEC (World Energy Council) on global energy trends. The World Bank has also identified shortages in European energy supplies. According to its assessment primary



energy demand is likely to increase 50% by 2030 as a result of the comparatively greater economic growth being anticipated in Eastern Europe. While efforts are being intensified around the world to develop renewable energies, with an annual growth rate of 7% being projected for this sector, the World Bank is predicting that fossil fuels (oil, gas and coal) will still have to

make by far the largest contribution to world energy demand (80% of the global rise in demand by 2030).

In the highly competitive fossilfuel market the first signs are now appearing in the USA of coal being replaced by gas. Developments in the extraction of unconventional gas resources in North America, combined with the recessionrelated collapse in demand, have resulted in an acute oversupply of gas. Over the last 20 years there has been a significant increase in the proportion of natural gas being extracted from so-called 'unconventional sources' (Unconventional gas is an umbrella term covering for example coalbed methane, shale gas and tight gas). There is also potential for this

International energy and commodities markets

source to be exploited in Europe, particularly given the reserves of coalbed methane available in the traditional coalmining countries - notably Germany, but also in the UK, Poland and the Czech Republic. In the USA gas supplies from unconventional sources now account for 40% of consumption. This development has been driven by the comparatively high gas prices, which have trebled in America over the last 10 years. There have also been intensive efforts under way in Australia to develop coalbed methane deposits. This is now complementing the steady flow of LNG supplies (Liquified Natural Gas for transport by tanker) that has built-up since 2000 on the basis of gas from conventional sources (Qatar. Algeria, Nigeria and Trinidad). This is also affecting the structure of the gas markets and the pricing mechanism for the gas trade in Europe and in the Asia-Pacific region. According to IEA estimates the interregional gas trade worldwide will more than double from 440 bn m³ to 1 trillion m³. Natural gas is also likely to become an increasingly important factor in the private transport sector of the future and LNG-based fuel is expected to account for about two thirds of this market by 2030.

It still has to be noted, however, that coal consumption fell markedly last year — this being attributable to the downturn in energy demand following the global financial and economic crisis and the partial substitution by cheaper gas. For the US market this was translated

into a production cutback of nearly 100 million t. A similar collapse in coal production and consumption was seen in Europe, notably in Russia and, more particularly, in Germany. Export-oriented countries like Australia and South Africa only made slight gains, with the largest rise in production being achieved in Asia, where China and India both recorded a 5% growth in output. Yet even here the rise in consumption was fairly restrained, leading at times to a sharp increase in stock levels and high price volatility on the internal Chinese market. Coal production in China has been on the rise for a number of decades and doubledigit growth rates have been

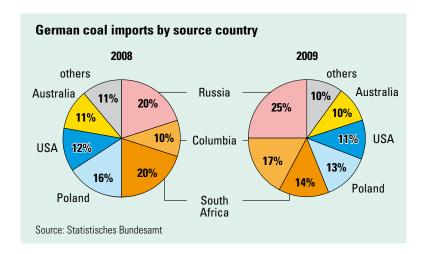
recorded in the past. The rate of growth has now slowed down, though remains at a high level, with China's coal industry producing about 50% of the total world output in 2009.

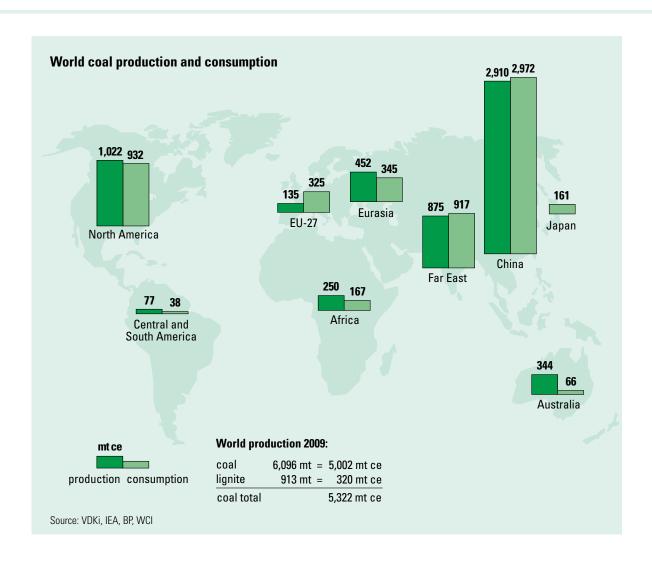
Similar events have been taking place in the oil and gas markets — though admittedly their impact has been less dramatic. Oil consumption worldwide was 1.7% down on average, with a relatively large fall of 4.8% being recorded in those OECD countries hardest hit by the financial crisis. In the gas sector the average drop in consumption was on the whole higher at 2.1%. Here the CIS recorded the largest fall of 7.3%.

Developments on the international coal markets

World coal production in 2009 increased by 4% to nearly 6.1 bn t, which was some 250 million t up on the previous year's figure. The biggest producers were China

(2.9 bn t) and the United States (0.98 bn t). Australia was still the world's leading coal exporter with 273 million t, closely followed by Indonesia with 230 million t.





Only 15% of world production was traded internationally (by land and waterway), with about 14% being shipped overseas. In total some 859 million t was traded by seaborne routes, of which 25% was coking coal and 75% steam coal.

The individual coal markets also displayed a quite different pattern

of development from geographic region to region, with a pronounced shift from the Atlantic to the Pacific market. While exports on the Atlantic steam-coal markets were on the decline the Pacific market was able to show a slight upturn, mainly as a result of the continuing growth in demand from China. The previous year China had gone against the worldwide trend

by producing and also importing coal on a much larger scale (net imports were around 100 million t), while the country's exports fell to an all-time low. It is predicted that coal imports to China will increase further in 2010 to something like 170 million t. The main suppliers here will be Indonesia (steam coal) and Australia (coking coal).

International energy and commodities markets

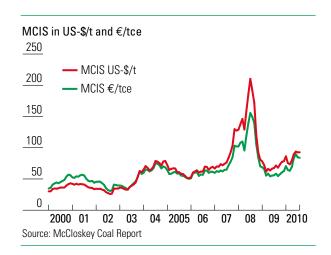
The picture looks quite different on the Atlantic market: the low level of demand in Europe, which even in 2010 has failed to show any significant signs of an upturn, has led to a translocation of coal exports. This trend has mainly affected shipments from South Africa: these are increasingly heading for the Asiatic markets (with more than 50% now going in this direction, particularly to India) and as a result are no longer available for European buyers. This development has led to a change in the German import situation, with the gap now being increasingly filled by imports from Russia and Colombia. For some time now there has essentially been low liquidity on the northwest European steam-coal market, a condition that can mainly be attributed to the relatively weak demand in Europe. While coal-based power generation in northern Europe has declined due to the impact of the recession we have also seen coal being replaced by other fuels (such as gas) in the electricity production sector.

After last year's downturn the international coking-coal market experienced something of an unexpected revival in 2010. With orderbooks now filling up at steelmakers around the world the demand for coking coal has risen by around 30%. The steelworks are currently operating at 70 to 80% capacity, which is still below their pre-crisis level. According to an assessment

by the German Steel Federation the Chinese steel industry is in need of a major structural overhaul, not least because of the high level of surplus capacity. With the coking coal deposits being located increasingly to the north of the country (for example in Inner Mongolia) the ability to compete against imported fuel is impaired by the huge distances the coal has to travel to reach the consumption centres in southern China. The global trade in coking coal is expected to increase by 30 to 40 million t in 2010.

The global coke market underwent a fundamental restructuring in 2009. Although China holds a prominent position because it has the world's largest coke production industry (world capacity: 527 million t: China: 345 million t) the introduction of a 40% export tax - which is a politically driven protectionist measure - has massively restricted coke exports to the extent that supplies from China have practically come to a grinding halt. An additional control instrument in this area has been the irregular approach to the issuing of coke export licences. With demand for raw materials rising again this development has tended to push up export shipments from other coke producers, including those based in North America.

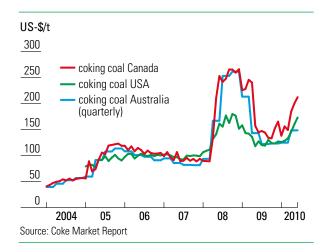
The strong demand from China and India, especially for coal and ore, has created an interesting situation since the first half of

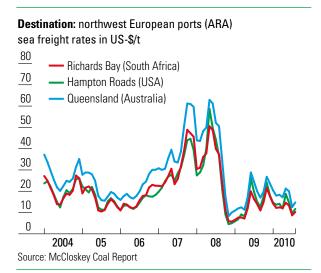


2010 with long lines of bulk carriers standing off Australian ports waiting to be loaded. This is tying up shipping space, which creates capacity shortages elsewhere, and has sporadically led to rising cargo rates in all markets. From a cost standpoint freight charges overall have been at a fairly low level because of the relatively low price of oil. At the same time the amount of shipping space now available in

Price trends of steam coal cif northwest Europe

Price trends of coking coal for Canada, USA and Australia





Price trends of sea freight rates to Europe ARA

the Capesize and Panamax class is 10% greater than the previous year because of the new vessels

being put into service. Even given the increase in business activity there is therefore unlikely to be any significant or lasting change in freightage charges over the course of this year.

With the international raw-materials producers tending to hold back on investment activities during the crisis year 2009 there is likely to be a corresponding temporal deferral of new mining projects. This development will have an impact on international coal markets in coming years and the resulting stagnation on the supply side will inevitably lead to rising prices as demand increases. Costly company takeovers and attempts to strengthen market position by targeted acquisitions (for example the Peabody bid to acquire Macarthur

Coal) will place a considerable strain on the cost structure of the coal producers. Additional tax burdens will also lead to higher raw materials costs, one example being the 30% supertax on mining companies being proposed by the Australian Government, which seeks to skim off profits above a 12% margin.

Coal will continue to play an important role at international level for years to come. The Coal Industry Financing Act provides the German coal industry with a framework for future planning and keeps the option open of Germany continuing to produce coal after 2018. This year's Annual Report presents clear arguments in support of this.



	World primary energy consumption							
		noi	n-renewa energies			wable rgies		
	nuclear energy	coal and lignite	mineral oil	natural gas	hydro	other fuels	total	
year				mt o	се			
1970 1980 1990 2000 2006 2007 2008 2009	28 247 738 955 1,047 1,024 1,020 1,005	2,277 2,724 3,205 3,123 4,418 4,544 4,724 4,670 5,466	3,262 4,320 4,477 5,005 5,575 5,653 5,619 5,404 6,046	1,326 1,853 2,525 3,091 3,682 3,772 3,898 3,756 4,000	146 206 271 329 387 375 380 387 453	827 1,066 1,420 1,534 2,030 2,120 2,150 2,190 2,139	7,866 10,416 12,636 14,037 17,488 17,493 17,791 17,412 19,261	

nuclear energy and renewables evaluated by efficiency method Source of forecasts for 2015/2030: International Energy Agency, 2009

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

	coal and lignite	mineral oil	natural gas	total
regions		bn	tce	
EU-27	37	2	3	42
Eurasia*	148	24	68	240
Africa	28	25	18	71
Middle East	0	149	86	235
North America**	214	48	11	273
Central and South America	10	42	10	62
China	158	2	3	163
Far East	80	4	12	96
Australia	48	1	3	52
World	722 59%	297 24%	214 17%	1,233 100%

^{*} other Europe and CIS, ** including Canadian oil sands Source: BGR 2009 / EIA 2010 / BMWi 2010 / BP 2010

World reserves and production of coal

regions	reserves bn tce	production mt ce
EU-27 Eurasia* Africa North America Central and South America China Far East Australia	17 105 28 201 8 153 70 34	135 483 261 1,011 78 2,910 874 344
World	616	6,096

^{*} remaining Europe and GUS Sources: BGR 2009 / VDKi 2010

Global electricity generation								
	coal and lignite	nuclear energy	mineral oil	natural gas	hydro and others	total		
year				TWh				
1970 1980 1990 2000 2005 2006 2007 2008 2009	2,075 3,163 4,286 5,759 7,040 7,370 7,950 8,160 7,750	80 714 1,989 2,407 2,640 2,670 2,580 2,620 2,558	1,625 1,661 1,216 1,402 1,240 1,280 1,120 950 910	976 1,632 2,664 3,750 3,950 4,290 4,380 4.360	1,175 1,802 2,212 2,968 3,550 3,650 3,955 4,090 4,240	4,955 8,316 11,335 15,200 18,220 18,920 15,605 20,200 19,818		
2015 2030	10,580 15,210	3,230 3,620	820 610	5,160 7,060	4,560 7,790	24,350 34,290		

Source: BP Statistical Review 2010 / Prognosis by IEA reference scenario 2009

$\textbf{Global CO}_{2} \, \textbf{emissions}$

regions/	1990 (base year)	2000	2005	2009	growth 1990 - 2009
countries		CO ₂ emiss	ions in mt		in %
Annex I Countries*	14,961.5	14,419.8	14,889.2	13,570.2	- 9.3
EU-27	4,406.7	4,119.1	4,247.0	3,834.9	- 13.0
thereof EU-15*	3,368.3	3,366.1	3,474.5	3,111.8	- 7.6
thereof Germany*	1,231.8	1,024.7	977.6	877.2	- <i>28.8</i>
Australia*	277.9	349.3	381.8	399.1	+ 43.6
Canada*	455.8	559.9	569.1	538.9	+ 18.2
USA*	5,092.7	5,968.4	6,099.5	5,516.5	+ 8.3
Russia*	2,499.7	1,471.4	1,526.1	1,475.5	- 41.0
Ukraine*	716.4	289.3	322.6	274.7	- 61.7
Japan*	1,143.4	1,254.3	1,286.0	1,068.9	- 6.5
Korea	229.3	431.3	469.1	504.8	+ 120.1
India	589.3	976.4	1,153.6	1,537.0	+ 160.8
China	2,244.0	3,077.6	5,099.1	7,056.3	+ 214.5
rest of Far East	689.8	1,151.8	1,454.8	1,599.3	+ 131.8
Middle East	588.2	975.1	1,236.2	1,548.1	+ 163.2
Africa	546.2	688.3	828.0	911.9	+ 67.0
Latin America	604.0	866.7	934.6	1,023.5	+ 69.5
Other States	1,960.0	1,981.4	2,271.2	2,424.6	+ 23.7
World	22,043.4	24,160.3	27,878.7	29,714.0	+ 34.8

^{*} Annex I Countries according to United Nations Framework Convention on Climate Change (see also http://unfcc.int) / Source: Hans Joachim Ziesing in ET 9/2010

Prima	Primary energy consumption in EU-27						
	coal and lignite	mineral oil	natural gas	nuclear energy	hydro and others	total	
year				mt ce			
2005 2006 2007 2008 2009	431 458 455 431 381	1,003 1,032 1,006 1,005 979	606 627 615 631 604	367 371 347 350 296	123 132 144 138 108	2,530 2,620 2,567 2,555 2,368	
2015 2030	410 340	822 796	638 742	333 280	295 441	2,498 2,599	

Source: BP Statistical Review 2010/ Prognosis by IEA reference scenario 2009

Powe	Power generation in EU-27							
	coal and lignite	mineral oil	natural gas	nuclear energy	hydro and others	total		
year				TWh				
2005 2006 2007 2008 2009	990 995 1,040 990 832	160 140 110 95 92	660 710 710 780 768	930 966 935 920 928	440 474 515 587 576	3,180 3,285 3,310 3,372 3,196		
2015 2030	907 862	69 43	746 995	874 736	837 1,330	3,433 3,966		

Source: BP Statistical Review 2010/ Prognosis by IEA reference scenario 2009

Powe	Power generation in Germany							
	coal	lignite	nuclear energy	mineral oil	natural gas	wind power	hydro and others	total
year				1	Wh			
1980 1990 1995 2000 2005 2006 2007 2008 2009 ¹⁾	111.5 140.8 147.1 143.1 134.1 137.9 142.0 124.6 109.0	172.7 170.9 142.6 148.3 154.1 151.1 155.1 150.6 146.5	55.6 152.5 154.1 169.6 163.0 167.4 140.5 148.8 134.9	27.0 10.8 9.1 5.9 11.6 10.5 9.6 9.2	61.0 35.9 41.1 49.2 71.0 73.4 75.9 86.7 77.0	0.0 0.1 1.5 9.5 27.2 30.7 39.7 40.6 37.8	39.8 38.9 41.3 50.9 59.6 65.9 74.5 76.8 79.1	467.6 549.9 536.8 576.5 620.6 636.8 637.2 637.3 596.8

¹⁾ preliminary

Prima	Primary energy consumption in Germany							
	mineral oil	coal	lignite	natural gas	nuclear energy	wind power	hydro and others	total
year				n	nt ce			
1980 1990 1995 2000 2005 2006 2007 2008 2009 ¹⁾	206.7 178.0 194.1 187.6 176.3 174.7 157.8 167.3 159.3	85.2 78.7 70.3 69.0 61.7 67.0 68.8 61.4 50.3	115.7 109.2 59.2 52.9 54.4 53.8 55.0 53.0 51.5	73.9 78.2 95.5 101.9 110.2 111.3 106.5 104.4 100.2	20.7 56.9 57.4 63.2 60.7 62.3 52.3 55.4 50.2	0.0 0.0 0.2 1.2 3.3 3.8 4.9 5.0 4.6	5.9 7.2 10.2 15.6 29.4 31.6 36.7 38.6 41.0	508.1 508.6 486.9 491.4 496.0 504.5 482.0 485.1 457.1

1) preliminary

nuclear energy and renewables evaluated by efficiency method

Coal and lignite production in EU-27 in 2009					
	coal	lignite			
country	mt	ce			
Germany	14.2	50.6			
United Kingdom	15.0	_			
France	_	_			
Greece	_	12.1			
Ireland	_	_			
Italy	_	_			
Spain	5.8	_			
Finland	_	_			
Austria	_	_			
Poland	62.5	17.0			
Hungary	-	2.7			
Czech Republic	6.6	19.5			
Slovakia	-	1.1			
Slovenia	-	1.4			
Estonia	_	_			
Bulgaria	_	5.8			
Romania	3.2	6.8			
EU-27	107.5	117.0			

Sources: BP Statistical Review 2010 / VDKi 2010 (data status: 9/2010)

Germ	an coal sa	ales					
		domestic		EU cou	ntries		
	heat market	power stations	steel industry	steel industry	others	third countries	total sales
year				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
2006	0.3	18.3	3.7	0.0	0.1	0.0	22.4
2007	0.3	18.8	4.1	0.0	0.1	0.0	23.3
2008	0.3	15.0	4.1	0.0	0.1	0.0	19.5
2009	0.5	11.7	3.0	0.0	0.0	0.0	15.2

	output per manshift underground	output ¹⁾ per working face	mines ²⁾	working faces
year	kg saleable ³⁾	t saleable³)	nı	ımber
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
2006	6,409	3,686	8	21
2007	7,071	3,680	8	22
2008	6,309	3,740	7	18
2009	5,597	3,375	6	15

	worl		white-			
L		workers		-collar oyees	staff (workers and white-collar employees)	
by end _	under- ground	surface	under- ground	surface	total	thereof apprentices
of year				in 1000		
1957 1960 1965 1970 1975 1980 1985 1990 1995 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009	384.3 297.0 216.8 138.3 107.9 99.7 90.1 69.6 47.2 25.6 23.0 21.6 20.0 19.6 17.7 16.2 15.1	169.3 140.2 110.5 75.6 60.9 55.8 47.4 35.9 25.7 18.2 16.2 14.4 13.6 10.9 9.9 9.1 8.5 7.6	16.3 16.8 15.6 13.0 11.5 10.2 8.9 6.1 3.8 3.4 3.1 2.8 2.8 2.6 2.4 2.3 2.0	37.4 36.2 34.1 25.8 22.0 20.7 18.5 15.9 13.6 10.5 9.6 9.2 8.0 7.3 6.9 6.3 5.8	607.3 490.2 377.0 252.7 202.3 186.8 166.2 130.3 92.6 58.1 52.6 48.7 45.6 42.0 38.5 35.4 32.8 30.4 27.3	48.2 22.7 15.2 11.5 14.1 16.4 15.7 8.3 2.9 2.3 2.2 2.4 2.7 2.9 3.2 3.0 2.4 1.8 1.3

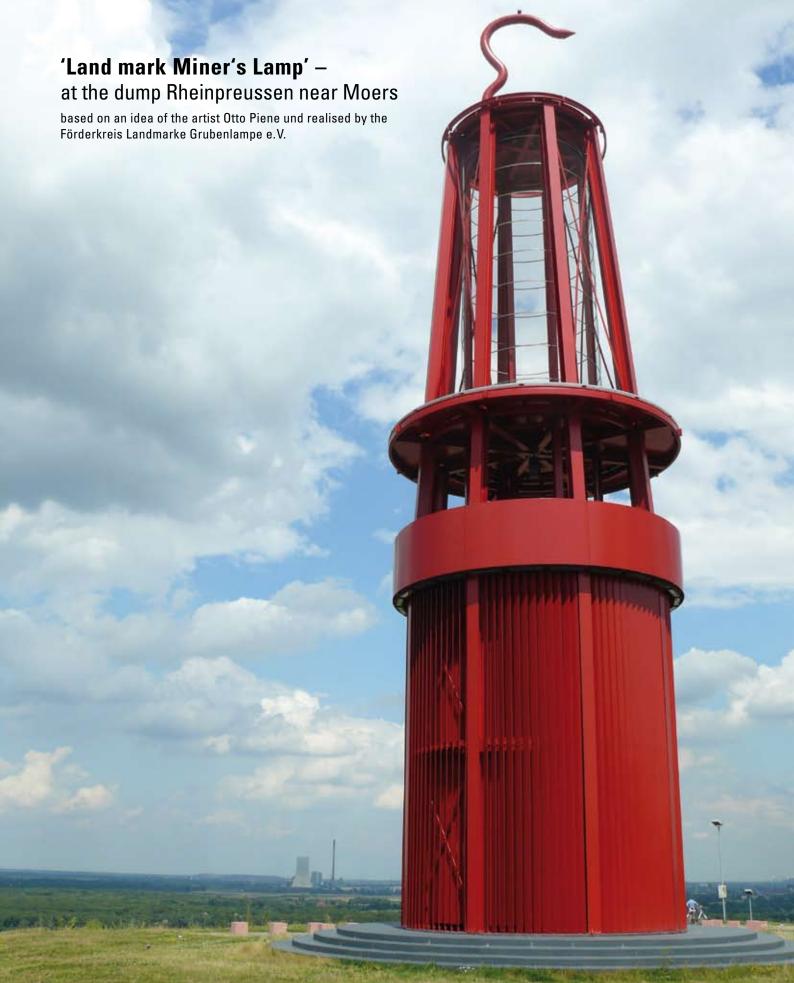
¹⁾ workforce including short-time workers and trainees

Coal	prod	luction	in	Germany
------	------	---------	----	---------

	Ruhr	Saar	Aachen	Ibben- bueren	Germany
year					
1957 1960 1965 1975 1975 1980 1985 1990 1995 2000 2001 2002 2003 2004 2005 2006 2007	123.2 115.5 110.9 91.1 75.9 69.2 64.0 54.6 41.6 25.9 20.0 18.9 18.2 17.8 18.1 15.2	16.3 16.2 14.2 10.5 9.0 10.1 10.7 9.7 8.2 5.7 5.3 5.4 5.6 6.0 4.7 3.6 3.5	7.6 8.2 7.8 6.9 5.7 5.1 4.7 3.4 1.6 — — —	2.3 2.4 2.2 2.8 1.8 2.2 2.4 2.1 1.7 1.7 1.7 1.8 1.8 1.9 1.9 1.9	149.4 142.3 135.1 111.3 92.4 86.6 81.8 69.8 53.1 33.3 27.1 26.1 25.7 25.7 24.7 20.7 21.3
2008 2009	14.2 10.9	1.0 1.0	_ _	1.9 1.9	17.1 13.8

until 1996: Saar figures in t=t

¹⁾ daily face output
2) data status: end of year excl. small mines
3) until 1996: Saar figures in t=t



Organisation of GVSt

Vorstand	Geschäftsführung	Mitglieder	
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List of figures and tables

German coal		On the road to an Energy Concept	
Sales structure for German coal	11	Primary energy consumption in Germany	40
Primary energy production in Germany	11	German electricity generation by sector	40
Reductions in state aid to the German coal industry	12	German coal consumption set against the general	
Economic factor of coal industry	12	economic trend	41
National subsidy pay-outs in Germany in 2009: Coal subsidies at 1% only	13	Germany's growing dependence on coal imports Germany's dependence on energy imports 2009	42 42
Adjustment of the German coal mining industry	13	EU dependence on imported energy continues to grow	43
Operating coal mines in Germany RAG staff transfers 2010 to 2013	14 15	Differential costs of renewable-based electricity feed-in according to the EEG	44
Job directions of trainees in coal industry in 2010	16	Risk to primary energy supply	50
Job directions of trainees in coal industry in 2010		Effect of different scenarios on vulnerability	52
Technology and know-how in the German coal industry Falling accident rate in the German coal industry	23	International energy and commodities markets Concentration of supply in the coking coal sector and for seaborne iron ore	55
Coal use as a model for industry and sustainability		World energy consumption	56
German plans for new coal-fired power stations up to 2015	30	World oil production and consumption	57
Developments in efficiency levels at coal-fired power stations	31	World gas production and consumption German coal imports by source country	58 59
Evolution of available secured capacity in the dena scenario 'Declining electricity demand'	32	World coal production and consumption	60
Global CO ₂ emissions	34	Price trends of steam coal cif northwest Europe	61
A 'Green RAG'	37	Price trends of coking coal for Canada, USA and Australia	61
		Price trends of sea freight rates to Europe ARA	62
		Statistic	64

For further charts go to www.gvst.de

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Coal industry data Germany 2009

Mines	6	
coking plant (owned by mining company)	1	
Workforce total ¹⁾	27,317	employees
Ruhr coalfieldSaar coalfieldIbbenbüren coalfield	3,971	employees employees employees
Coal production total	13.8	M t saleable ³⁾
Ruhr coalfieldSaar coalfieldIbbenbüren coalfieldcoke production	10.9 1.0 1.9	M t ce ²⁾ M t ce M t ce M t ce M t ce
Technical characteristics		
production at working face mean thickness of coal seam mean face length mean depth of extraction maximum depth of shafts	3,375 189 334 1,183 1,750	m m
Sales total	15.2	M t ce
power plantssteel industryheat market	3.0	M t ce M t ce M t ce
Portion of German coal		
 in primary energy consumption in Germany in electricity production in Germany in consumption of coal in electricity power generation by coal 		• •

 $^{^{\}mbox{\scriptsize 1)}}$ End of the year; man power inclusive those with status structural short times and qualification

ce = coal equivalent; 1 Kg ce = 29,308 K Joule

³⁾ saleable = production excluding moisture and ash content