

## GERMANY

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**G**ermany possesses the world's fifth-largest economy and is one of the wealthiest nations. Its economy, however, is very flat and GDP grew by less than 0.1% in 2003. German unification is proving a lengthy and costly process and it is estimated that some US\$70 billion are transferred each year from the west to aid the modernisation in the east of the country.

### **Energy**

In 2003, primary energy consumption in Germany was at about the same level as in the previous year. This was the result of contrary influences: whereas the cyclical downturn dampened consumption, the cold weather, particularly in the first quarter, brought higher demand for energy. Adjusted for temperature factors, primary energy consumption was 1% lower in 2003 than in 2002.

The composition of primary energy consumption by energy sources has changed very little. Oil is still by far the biggest primary energy source, with a share of 36.4%. It is followed by natural gas with 22.5%, hard coal with 13.7%, nuclear power with 12.6% and lignite with 11.4%. Renewable energy sources probably accounted for about 3% of primary energy consumption. Germany was a net exporter of electricity last year, with 1.0 million tonnes of coal equivalent (Mtce), as opposed to being a net importer of 0.1 Mtce in 2002.

In absolute figures, Germany's energy balance is as follows: the consumption of oil decreased to 177.9 Mtce (-2.5%), lignite to 55.9 Mtce (-1.2%) and hydroelectricity and wind power to 4.8 Mtce (-2.1%). By contrast, consumption of natural gas rose to 110.0 Mtce (3.6%), hard coal to 67.0 Mtce (4.2%), nuclear energy to 61.5 Mtce (0.2%), and miscellaneous energy sources to 10 Mtce (+1.2%).

In 2003, domestic energy output was practically at the same level as in the previous year, at around 128 Mtce. There was a rise in crude oil, natural gas, wind power and other energy sources, but a decline in hard coal, lignite and hydro power. Measured by the level of primary energy consumption, the share of domestic energy was 26%, the same as in 2002. The most important domestic sources of energy were lignite and hard coal, followed by natural gas. Domestic production from other sources was of minor importance.

Total mineral oil consumption in 2003 was just under 122 Mt; this was about 3 Mt or 2.5% lower than in 2002. The development was mainly due to the fall in consumption of gasoline (-12.5 Mt), diesel fuels (-0.7 Mt) and naphtha (-0.7 Mt).

Natural gas consumption rose by 3.6% to 110 Mtce in 2003. Extreme temperature fluctuations in both directions characterised the development over the year: cool weather in the first quarter caused a powerful rise in natural gas consumption of 14%, whereas the very warm third quarter brought a clear fall of 11%.

Total hard coal consumption in 2003 was 67 Mt, 4.2% higher than a year before. This was mainly due to the rise in the use of hard coal in the electricity industry. As electricity generation as a whole increased, the energy source structure again developed in favour of hard coal. Both domestic and imported hard coal have benefited from this, with 48 Mt used in the power industry to generate electricity and heat in 2003, 3 Mt more than a year before. Electricity generation from hard coal rose by more than 8%.

Primary energy consumption of lignite was 1.2% lower than in the previous year at 55.9 Mtce. The share of lignite in primary energy production in Germany remained just under 44%, making it by far the most important domestic energy source. Altogether around 92% of German lignite output was used to generate electricity.

Gross electricity generation rose by 2.7% to 596 billion kWh in 2003. Electricity generation fired by hard coal and natural gas increased particularly strongly at +8% and +6.5%, respectively. Wind power again increased strongly, while hydropower showed a fall, owing to the dry weather.

Electricity generation from nuclear power remained unchanged from the previous year in 2003 at 165 billion kWh. In mid-November the Stade nuclear power station went off grid with a net output of 640 MW. That left 18 nuclear power stations in operation, with a total output of 20,640 MW (net); these power stations produced 28% of the electricity generated in Germany in 2003.

The installed output of the wind-power stations rose by about 2,500 MW in 2003 to 14,500 MW. Altogether, at the end of the year about 15,000 wind-power plants were in operation. As the 'supply of wind' fell in 2003, as it had done in 2002, which was also a bad year, electricity generation from wind power rose, solely due to the construction of new plants, by around 17% to 18.5 billion kWh.

### **Coal**

At the end of 2003, ten hard-coal mines were in operation in Germany. In May 2004, the government announced that it would close a further two mines in 2006, one in 2009 and a fourth one in 2010. In 2003, total production dropped by 1.9% to 25.9 Mt. The number of employees in the coal mining industry kept on falling, reaching 41,076 in comparison with 44,523 in 2002. Average daily output per mine dropped by 2% to 10,342 t, whereas average production per man shift stayed stable at 6.54 t. Despite the static economy, total imports in 2003, of coal, coal briquettes and coke, rose to approximately 31 Mt (+10.7%).

Output from German lignite mines decreased by 2.6 Mt to 179.1 Mt in 2003. Lignite consumption dropped from 55.6 Mtce to 53.3 Mtce. The biggest production share, of 97.5 Mt, came from the Rhineland field. The mining area of Lausitz decreased its output by 1.9 Mt to 57.4 Mt, whereas Middle-Germany enhanced production by 10.5% to 22 Mt, as a result of still rising demand by two relatively new power plants (commissioned in 1996 and in 2000). Most of the remaining production came from the Helmstedt field (2.1 Mt). Almost 171 Mt were consumed in 2003. Approximately 97% of this lignite consumption (166 Mt) was used for electrical power generation. In order to keep lignite power generation competitive, modernisation and structural adaptation measures are in progress. Because of these measures the number of people employed in the lignite-mining industry continued to fall, by 781, to reach 18,253 by year's end.

Germany's largest lignite producer, RWE Rheinbraun, also operates two lignite mines and an associated power plant (installed capacity of 836 MW) in Hungary northeast of Budapest. On the other hand, RWE Rheinbraun sold its 74% majority stake in Consol Energy, one of the leading hard-coal producers in the US, with annual production of approximately 66 Mt, and the second-largest US producer of coal-bed methane.

RAG Coal International achieved a total turnover of €4.0 billion (-7%) and a pre-tax profit of €62 million (2002: €80 million). At the end of 2003, the company employed more than 6,700 people (+3%) in 20 countries in mining operations, coal trading and mining equipment manufacturing. (In 2004, RAG sold its worldwide coal mining activities.)

### **Oil and natural gas**

Oil production from domestic sources reached 3.8 Mt in 2003. This is 2.7% more than the previous year and the highest output since 1989. Schleswig-Holstein contributed a 58.7% share of total German oil production, from the Mittelplate field. Lower Saxony reduced production by 6.0%, with a production share of 34.9%.

At the end of 2003, proven and probable reserves of crude oil amounted to 53.8 Mt, which is 6 Mt or 10% less than at the end of the previous year. This significant decrease is due to a downward revision of the Mittelplate field.

Production of natural gas amounted to 20.9 billion m<sup>3</sup>, slightly higher than in 2002 (20.1 billion m<sup>3</sup>). Lower Saxony had by far the major domestic production share, with 91.5% (89.2% previously). Domestic production met about 22% of German demand for natural gas.

At the end of 2003, proven and probable reserves of natural gas were estimated to be 279.0 billion m<sup>3</sup>.

Total drilling in the oil and gas sector reduced to 29,862 m (2002: 56,807 m). This included exploration as well as production drilling. Seismic prospecting covered areas of 325 km<sup>2</sup> for 3D and 211 km of 2D lines.

The annual average number of employees in the oil and gas industry decreased from 6,349 in 2002 to 6,226 in 2003.

### **Other mining**

Apart from a small production of copper-silver concentrate recovered as by-product of a fluorspar/baryte mine, there is no longer any metal mining in Germany. On the basis of extensive raw material imports, however, there is a well developed steel and non-ferrous metals industry.

Annual imports of iron ore amounted to around 40 Mt in previous years. In 2003, 33.9 Mt of iron ore were imported, mainly sourced from Brazil, Canada, and Sweden. Some 44.8 Mt of raw steel were produced of which ThyssenKrupp AG, the main producer, shipped 38%. In total, there are twelve producers of raw steel in Germany. The apparent consumption of raw steel accounted for 34 Mt.

In 2003, 1.9 Mt of bauxite and 1.05 Mt of alumina were imported, mainly from Guinea, Jamaica and Ireland. Aluminium Oxid Stade, the only producer of metallurgical-grade alumina, produced around 800,000 t in the previous year. The production of primary aluminium increased to 661,000 t and consumption reached 2.1 Mt. Last year, Germany was the third-largest consumer of primary aluminium in the world (with a share of 8.5%).

Norddeutsche Affinerie AG, the main producer of refined copper in Germany, processed 880,000 t of imported copper concentrates in 2003. Refined production totalled 598,000 t. The consumption of refined copper decreased to 1.01 Mt.

The main producers of zinc and lead in 2003 were the refineries of Xstrata AG at Nordenham, the Duisburg smelter of the Belgian company Sudamin, the Ruhr-Zink refinery at Datteln and the Berzelius refinery at Stolberg. From imported concentrates (with 170,000 t zinc content and 120,000 t lead content in 2003) about 388,000 t of zinc and 357,000 t of lead were produced in 2003. Primary metal consumption amounted to 560,000 t of zinc and 384,000 t of lead.

Production of rock salt and brine increased slightly, to 16.31 Mt in 2003, from 15.64 Mt in 2002. Production of rock salt and brine is concentrated at eleven locations, making Germany the leading producer of salt in the EU.

Kali und Saltz (K&S) produces around 38 Mt/y of potash and magnesium salts from six mines. In 2003, it produced some 3.56 Mt of K<sub>2</sub>O equivalent (2002: 3.47 Mt), making it the leading producer in Europe, and achieved revenues of €2.3 billion. The bulk of its sales are in the euro currency area, and are not, therefore, affected by currency fluctuations.

According to Bundesverbandes der Deutschen Kies und Sandindustrie (BKS), production of gravel, sand and silica sand decreased from 316.9 Mt in 2002 to 308.3 Mt in 2003. Production of crushed rock by companies in the Bundesverband der Deutschen Naturstein-Industrie group (BVNI) decreased

from 131 Mt in 2002 to 124 Mt in 2003. Raw limestone products as reported by Bundesverband der Deutschen Kalkindustrie, decreased from 31.3 Mt in 2002 to 30 Mt. Domestic sales by the German cement industry amounted to 24.6 Mt; 4.7 Mt of clinker and Portland cement were imported. The industry dropped from being tenth-largest producer of cement globally in 2000, to thirteenth place. Per capita consumption of cement rose from 348 kg in 2002 to 351 kg in 2003.

Bavaria remains the largest producer of kaolin in Germany. Production decreased slightly, from 3.7 Mt in 2002 to an estimated 3.6 Mt in 2003. The main kaolin deposits are located in the Upper Palatinate (Bavaria), Hesse, North Rhine-Westphalia, Rhineland-Palatinate, Saxony and Saxony-Anhalt.

Germany continues to be a leading producer of bentonite in Western Europe, with a production of 479,000 t in 2003 (2002: 495,000 t). The only producing deposits are located in southern Bavaria and are owned by Süd-Chemie and IKO Minerals.

The production of barytes was reported to be 109,506 t in 2003 (2002: 100,993 t). Mining of barites takes place at Wolkenhügel mine (Harz Mountains) and Clara mine (Black Forest), Dreislar mine in North Rhine Westphalia was closed down at the beginning of 2002.

The only fluorite-producing mine is Clara mine (Black Forest). Production in 2003 was 33,289 t, compared with 34,429 t in 2002 and 30,381 t in 2001. At Clara, barytes is a by-product of fluorite mining.

The only graphite producer in Germany is Graphit-Kropfmühl AG in Bavaria which relies on imports of graphite from its mines abroad for the bulk of its production. Production of graphite in Bavaria amounted to just 2,840 t in 2003 and 3,312 t in 2002. Graphit-Kropfmühl concentrates on ultra pure graphite for high technology applications.

Tables following pages.

<b>Fuel Mineral Production (Mt except where stated)<sup>1</sup></b>				
	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
Hard Coal	33.3	27.4	26.4	25.9
Lignite	167.7	175.4	181.7	179.1
Oil	3.1	3.4	3.7	3.8
Natural gas <sup>2</sup> (Bm <sup>3</sup> )	20.1	20.3	20.1	20.9
Primary energy consumption (Mtce)	486	494	489	489

<sup>1</sup> Useable production.

<sup>2</sup> One cubic metre of natural gas equates to 9.7692 kWh

### **Production of primary metals ('000 t)**

	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
Raw Steel	46,376	44,809	45,015	44,803
Alumina	826	715	720	800
Aluminium	644	652	653	661
Copper	710	694	696	598
Zinc	357	361	379	388
Lead	353	387	373	357

### **Production of industrial minerals and rocks (Mt except where stated)**

	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
Rock salt <sup>1)</sup>	6.56	6.71	7.33	7.22
Brine (NaCl content) <sup>2)</sup>	8.50	7.62	8.32	9.09
Potash (K <sub>2</sub> O equivalent)	3.41	3.55	3.47	3.56
Sand and gravel	343.2	324.2	303.5	269.9
Silica sand	11.9	11.5	11.4	11.4
Crushed natural rock <sup>6)</sup>	157 (210)	137 (192)	131 (188)	124 (179)
Limestone and dolomite <sup>3)</sup>	36.4	34.4	31.3	30.0
Limestone <sup>4)</sup>	58.7	54.3	51.3	52 <sup>e)</sup>
Clay <sup>5)</sup>	5.5	5.5	4.7	4.5 <sup>e)</sup>
Kaolin	3.6	3.8	3.7	3.6 <sup>e)</sup>
Bentonite ('000 t)	464	447	495	479
Gypsum, anhydrite	2.3	2.0	1.8	1.8 <sup>e)</sup>
FGD-gypsum	7.1	6.8	7.1	7.0 <sup>e)</sup>
Pumice ('000 t)	161	124	043	05 <sup>e)</sup>
Dimension stone ('000 t)	275	282	224	220 <sup>e)</sup>
Barytes (t)	111,790	108,111	100,993	109,506
Fluorite (t)	31,124	30,381	34,429	33,289
Graphite (t)	3,414	3,190	3,312	2,840
Siliceous earth (t)	54,309	50,361	53,711	54,517

In *italics* = change in reporting as compared with previous year

<sup>e)</sup> estimate

<sup>1)</sup> including brine for food industry

<sup>2)</sup> brine for industrial purposes

<sup>3)</sup> excluding raw material for cement manufacture

<sup>4)</sup> for cement and lime manufacture

<sup>5)</sup> refractory and ceramic clays

<sup>6)</sup> figures in brackets indicate estimates of total production by the industrial association.