



Germany

PEEREA

**Energy Charter Protocol on Energy
Efficiency and Related
Environmental Aspects**

Country Review 2003



Country: Germany

**ENERGY EFFICIENCY PROTOCOL AND RELATED
ENVIRONMENTAL ASPECTS**

REGULAR REVIEW
2003

**Part I:
Trends in energy and energy efficiency policies, instruments and
actors**

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1 EXECUTIVE SUMMARY

The Federal Government's energy policy aims at providing a sustainable development, taking into account the equal goals of security of supply, economic viability, and environmental protection. The state intervenes in areas where this seems appropriate to complement or to correct market-forces. This may be the case if externalities are not sufficiently taken into account (as in the case of cogeneration), if consumer interests have to be defended (as in the case of building codes and of energy labelling), self-regulation is not feasible and public interest is greater or market competition is in danger. It sets regulatory frameworks, but keeps the range of controls within narrow boundaries.

Options for the long-term development of the German Energy Markets until 2020 were published in an Energy Report by the Ministry of Economics and Technology in 2001. In April 2002 the Federal Government published a national strategy for sustainable development entitled "*Perspectives for Germany*". With this strategy the Federal Government specified concrete benchmarks with 21 goals and indicators for the 21st century.

Primary energy supply has hardly changed within the last decade, and fluctuations in those years were mainly due to temperature and economic changes. According to national statistical data, the per-capita supply of energy fell from 1990 by about 8% to 174 GJ per capita in 2002. In all sectors energy is used far more efficiently nowadays than 13 years ago. The total primary energy supply per unit of GDP amounted to about 7.2 GJ/1000 € in 2002. This is one of the lowest rates of energy intensity in the European Union.

The Energy Industry Act, amended in April 1998, stipulates a "networked supply of electricity and gas which is as secure, cost-effective and environmentally friendly as possible". With the new law, the electricity and gas markets were fully liberalised. Electricity prices for industrial consumers (high voltage) dropped considerably and reached their lowest level in mid 2000 (approx. 78 % of the level in April 1998). For private households the price decrease as a consequence of the liberalised electricity markets was less evident.

The Ecological Tax Reform, introduced in 1999, has been one of the central pillars of the Federal Government's climate-protection policy. The basic concept calls for energy to become more expensive, through taxation, and for "work" to become less expensive by using most of the revenue for the reduction of the regular payments for social security. Important instruments used for improving energy efficiency and reducing CO₂-emissions in industry are voluntary agreements.

The "Act on the Introduction of Distance-Related Charges for the Use of Federal Motorways by Heavy Goods Vehicles", which entered into force on April 12, 2002, is the legal basis for the introduction of a system of distance-related charges for trucks in Germany in 2004. This system with emissions-based fee categories will replace the current time-based truck fees, in order to make assignment of road-use costs more equitable.

About 75 % of all houses were built before 1978, when the first ordinance on thermal insulation was introduced. The average specific heat demand for all residential buildings was 189 kWh/m² per annum in 2001, while the energy conservation ordinance in force since 2002 sets a maximum of 70 kWh/m² for new buildings.

The share of industry within total final energy consumption decreased from 31 % to 29.9 % from 1990 to 2001. The transport sector gained significant importance between 1980 and 2001 in terms of energy consumption which increased from 22 % of total FEC up to almost 27 %. Per-capita energy consumption for transport is higher than in most other European countries. The most drastic growth was observed in air transport.

Germany belongs to the few industrial countries that can refer to a significantly reduced CO₂ emission in the 1990s. Compared to the (internationally agreed) base year 1990 the CO₂ emissions dropped by 15.3 % and, temperature-adjusted, by 15.7 %, while primary energy consumption was 4.2 % lower. In the framework of the burden-sharing between the member states of the European Union agreed upon in 1998, Germany is committed to reducing the six greenhouse gases up to 2008/12 by 21 % relative to the 1990 level. The German Government is convinced that further measures will be required at both national and international level to further reduce greenhouse gas emissions substantially, beyond the Kyoto target period of 2008/2012. International co-operation plays a more and more important role in energy efficiency policies.

The Federal Government approaches this target by introducing a number of policy measures, such as the eco-tax, the renewable energy act, the act on cogeneration, the energy conservation ordinance, energy R&D programmes, energy labelling of appliances, financial incentives for the modernisation of the railway system, the application of a new distance-based toll system for heavy trucks, cheap loan programmes for the modernisation of buildings, the provision of expert advice at reduced costs and voluntary agreements with the industry. Länder, regions, municipalities and utilities are participating in the energy efficiency and climate protection strategy by setting up their own programmes and objectives, offering funding and information and improving energy efficiency standards within their own institutions.

Energy efficiency policy has been particularly successful in improving energy efficiency in the building sector, in using labelling schemes for households appliances and to a certain degree also through eco-taxation. There still exist barriers for the further improvement of energy efficiency in existing buildings. The vast increase of demand for transport in Central Europe bears special challenges for Germany to exploit more energy saving potentials in that sector.

2 BACKGROUND: ENERGY POLICIES AND PRICES

2.1 Energy policy

2.1.1 General trends and objectives

The Federal Government's energy policy aims at providing a sustainable development, taking into account the equal goals of security of supply, economic viability, and environmental protection. The current energy policy discussion and decision-making processes in Germany concentrate on the further strengthening of the markets by liberalising the electricity and gas markets and on the protection of the environment (especially mitigating climate change).

The German energy policy is guided by the following main principles:

- a secure, cost-effective and environmentally compatible energy supply;
- self-regulation of the market forces to a large extent;
- liberalisation of the electricity and gas market with non-discriminatory grid access for energy providers and free choice of suppliers by all customers; constitution of a regulatory authority;
- security of supply based on a balanced mix of indigenous and foreign resources;
- reduction of greenhouse gases up to 2008/2012 (Kyoto) and beyond;
- phase-out of nuclear power by about 2020;
- growth of the share of renewable energy sources for electricity, heat and transport fuels;
- further improvement of energy efficiency in all sectors through legislative action, voluntary agreements, technical innovations, cheap loans, information and awareness campaigns, training and education as well as other suitable means;
- more intensive integration and full transparency within the European common market;
- support for the development and application of new technologies with promising potentials for future sustainable energy supply or efficient energy use;
- increased attention to the buildings and transport sectors as possible areas for additional energy savings.

The state intervenes in areas where this seems appropriate to complement or to correct market forces. This may be the case if externalities are not sufficiently taken into account (as in the case of cogeneration), consumer interests have to be defended (as in the case of energy labelling and of building codes), self-regulation is not feasible and public interest is greater or market competition is in danger. It sets regulatory frameworks, but keeps the range of controls within narrow boundaries.

In most other cases, German energy policy favours a mutual understanding among the various actors and takes a more supervising and guiding stand-point. The number and size of legislative acts with regard to the energy sector or energy-relevant aspects is therefore rather limited, in contrast to the preferred multitude of financial and fiscal incentives as well as information and other “soft” instruments at Federal level and within the Länder (federal states) and local authorities which are used to raise public and professional awareness and to stimulate certain investment decisions.

Important dialogues among various actors and interest groups on a sustainable energy supply and demand for Germany took place in the Working Group of the Federal Government on CO₂ Emission Reduction to prepare the Climate Change Programme of October 2000, in the forum "Energiedialog 2000" (1999/2000) and within the Study Commission of the German Bundestag on Sustainable Development (2000/2002).

In April 2000 a new Renewable Energy Act replaced the former Feed-In Act, establishing new remuneration tariffs for renewable electricity fed into the public grid. Especially for the wind sector, this new ruling has been highly successful, leading to a strong increase in installed capacity (12,000 MW until the end of 2002) and in the share of electricity produced from wind (3 % of total generation in 2002). It is the Government's objective to increase the share of renewable electricity to 12.5 % by 2010 (8 % in 2002) in line with EU targets and to raise the proportion even further thereafter.

In June 2000, the Federal Government and some large power utilities reached an agreement to phase out nuclear power by about 2020. Nuclear power stations, which have up to now been generating some 165 billion kWh every year, are to be decommissioned as soon as they have generated a declared amount of electricity. The agreement with the specific amounts for limited electricity production was transposed into national law on April 22, 2002.

The step-by-step closing of nuclear power stations must be counter-balanced and presents new challenges for climate protection and energy policy. Considerable efficiency improvements in energy conversion – for example, through expansion of cogeneration, highly efficient combined-cycle power stations and innovative coal-fired power stations – and in energy use (including rational use of energy in all relevant sectors), as well as an intensified use of renewable energy sources, will all play important roles in meeting this challenge.

Based on this new situation, the Federal Ministry of Economics and Technology published an Energy Report in 2001¹, which looks at the long-term development of the German energy markets until 2020. The Report compares two different scenarios, both of which predict a shrinking primary energy consumption by 2020 and an annual reduction of the energy intensity of between 2.1 and 2.7 %, while electricity consumption would continue to expand. In both scenarios gas and oil will play a predominant role in 2020, while the importance of coal will more or less decline.

In April 2002 the Federal Government published a national strategy for sustainable development entitled "Perspectives for Germany" (Perspektiven für Deutschland). With this strategy the Federal Government has specified concrete benchmarks with 21 goals and indicators for the 21st century. These include:

- productivity of energy and raw materials;
- emissions of the six greenhouse gases specified in the Kyoto Agreement;
- proportion of renewable energy sources in overall energy consumption;
- development of land use for housing and transport;
- balance of public sector financing;
- private and public sector expenditure on research and development;
- gross domestic product;
- transport intensity and share of the railways in providing goods transport;

¹ The former energy programme of the Federal Government, entitled "Energy Policy for the United Germany," dated back to the year 1991.

- proportion of ecological agriculture and general statement on nitrogen surplus;
- air pollution;
- EU imports from developing countries.

The official document analyses and describes the policy measures which have been carried out in the field of energy efficiency in recent years and the instruments used. The Kyoto target for Germany is defined as a reduction of GHG emissions of 21% by 2008-2012 (base: 1990). By 2001 18% had actually been achieved, and CO₂ emissions had been reduced by 14.2% which is 17.3% per capita and 23% per unit of GDP (base: 1991).

As important measures taken in Germany 1998-2002 the document mentions:

- ecological tax reform;
- voluntary agreement for climate protection with industry, including CHP agreement;
- Cogeneration Act;
- Renewable Energy Act;
- Market Incentive Programme for Renewable Energies;
- 100,000 roof programme for photovoltaics;
- energy conservation ordinance for buildings;
- incentive programmes (cheap loans) for CO₂-reducing measures in existing buildings;
- the establishment of the new national energy agency, “dena”;
- in 2003 a motorway distance-related toll for trucks will be introduced.

Specific targets of climate protection and energy policy mentioned in the strategic document are:

- reduction of GHG emissions by 21% by 2008-2012,
- doubling of the share of renewables in primary energy consumption to 4.2% by 2010,
- extended share of renewable energies in electricity consumption to 12.5% by 2010,
- doubling of energy productivity by 2020 (base: 1990),
- more CHP for additional CO₂ reduction by 10 million t by 2005 and 20 million t by 2010,
- continued development of energy conservation and efficiency, and
- more international harmonisation of policies, especially within the European Union.

In order to protect the energy-efficient CHP system from the price-reducing effects of liberalisation, the Government and the German industry agreed in May 2001 on a new support scheme that came into effect as the Cogeneration Act on April 1, 2002. It allows CHP operators, feeding electricity into the public grid, to receive bonus payments on top of the revenue at market price.

Supply and demand

According to national statistical data, total primary energy consumption decreased in 2002 against the previous year by 1.9% and reached 14319 PJ, due to the weakening economy and mild weather conditions. Taking into account the climatic influence the consumption was 0.6% lower than in 2001. The consumption of petroleum derivatives fell by 3.7%, mainly because of relatively moderate winter temperatures. The demand for gasoline decreased by 3%, while the sales of diesel remained stable. With a GDP growth of 0.2% the macroeconomic energy efficiency improved by 2.07%. With an average increase of 1.5%/year this gain was far higher in the period between 1991 and 2001, while the economy grew at about the same rate.

Primary energy supply has therefore hardly changed within the last decade, and fluctuations in those years were mainly due to temperature and economic changes. According to national statistical data, the per-capita supply of energy fell from 1990 by about 8% to 174 GJ per capita in 2002. In all sectors energy is used far more efficiently nowadays than 13 years ago. The total primary energy supply per unit of GDP was about 7.2 GJ/1000 € (2002). This is one of the lowest rates in the European Union (beaten only by Denmark and Austria).

Structure

The primary energy market is dominated by mineral oil with 37.5%, followed by natural gas with 21.7%, hard coal with 13.2%, lignite with 11.6%, nuclear energy with 12.6%, water and wind power with 0.9% and other energy sources with 2.5%. This means that Germany depends almost exclusively on fossil and nuclear energy sources, even though the weighting within the sector has shifted.

In particular natural gas has gained significant importance since 1990 (then 15% share), while the contribution of both coal types has dropped decisively from 37% (1990).

Import and export

Imported mineral oil is mainly supplied by Russia, Norway, the United Kingdom and Libya. Imported natural gas is mainly delivered by Russia, Norway and the Netherlands. Germany is therefore relatively dependent on the import of primary energy sources, with Russia and Norway playing a dominant role. In 1999 the import of all energy sources amounted to some 25.6 billion € (out of a total TPES of about 31 billion €), and is equivalent to about 6 % of all German imports. With the price increase for mineral oil this value almost doubled in 2000. The export of energy to neighbouring countries is insignificant.

Final energy consumption

The total final energy consumption was 9,456 PJ in 2001. In recent decades, the sectoral structure of final energy consumption has undergone considerable changes. The percentage share for industry has decreased considerably: its share of total final energy consumption decreased from a solid two-fifths in 1970 to about 29.9 % in 2001. At the same time, the percentage for the private residential sector has increased (from 25 % in 1970 to nearly 29 % in 2001).

Electricity and heat

In contrast to the development on the primary energy level, electricity consumption in Germany has increased continuously during the last decade.

Gross electricity consumption reached 501.8 TWh in 2001 or an equivalent of 6094 kWh per capita, a plus of 0.2 % against the previous year. Electricity productivity (kWh per unit of primary energy input) experienced an annual increase of 0.7 % on average in the period 1990 – 2001, mainly due to improved plant technology and the substitution of old plants by more efficient ones (e.g. combined-cycle with natural gas) or wind generation without conventional primary energy input and subsequent conversion losses. Primary energy input for electricity generation was therefore actually reduced by about 8.4 % between 1990 and 2001.

According to national statistics in 2002 the main contribution came from nuclear energy with 28.4 %, followed by lignite with 27.4 %, hard coal with 23.2 %, natural gas with 9.3 %, hydro power with 4.5 %, wind power with 2.9 %, fuel oil with 1.0 % and other energy sources with 3.3%.

In 2000 most of the electricity was being consumed in the industrial sector (48 %), followed equally by the residential (26%) and by the institutional sectors (22 %). The transport sector was, at 3 %, of minor importance.

About 12.5 % of domestic electricity generation takes place in CHP plants of various sizes, supplying industrial facilities, local networks or individual consumers with residual heat. Total installed electric capacity in CHPs was around 12750 MW in 2000.

About 75 % of the heat supplied to the 250 district heating systems countrywide was produced in CHP plants, the rest in heat-only boilers. But most of the heat production is based on individual boilers running on oil or natural gas. Forecasts show that the heat market will stagnate or decline slightly in the future.

Summary Table I: Priority of policy objectives

Please prioritise from 1 (the highest) to 5 these objectives within your energy policy.

Policy objective	Mark
Reduce total final consumption / GDP	1
Reduce dependency on energy imports	4
Diversification of fuels	1
Reduction of CO ₂	1
Increase utilisation of indigenous primary energy sources	4

2.1.2 Energy policy implementation

Responsibility for energy policy at the national level is mainly concentrated in the Federal Ministry of Economics and Labour with an involvement also of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (responsible for renewable energies since 2002, for climate change protection and nuclear safety), the Federal Ministry of Transport, Building and Housing (for measures in the construction and transport sector), the Federal Ministry of Education and Research (for basic research and pilot models) and the Federal Ministry of Consumer Protection, Food and Agriculture (in the biomass sector).

The enforcement of national laws and ordinances is in the hands of the Länder, with some exceptions as in the case of nuclear safety; in this field the Federal Government may give directives to the Länder. The granting of licenses for electricity generation and the supervision of electricity tariffs (for small-scale customers) is a matter for the Länder governments.

A relatively strong role in the field of energy conservation, use of renewable energy sources and other climate protection measures is also played by the Länder and in certain aspects by municipalities. Most Länder as well as a number of larger municipalities have set up their own energy and/or climate protection programmes, establishing strategies for future energy supplies and creating priorities and incentives for energy conservation measures.

Some Länder have also enacted their own energy saving laws, targeting for example government premises and laying the basis for funding and promotion programmes. A large number of Länder and cities have energy agencies, which are mainly dedicated to assisting the attainment of medium-term and long-term energy conservation goals at the Länder or municipal level. Many municipalities have also set up specific energy saving units that take care of the energy management of public buildings and propose and supervise energy efficiency improvements.

A number of relevant social, environment and economic research institutions are involved in policy advice and formulation; such institutions include independent private companies, non-governmental organisations, departments of universities, or are at least partially subsidised by the Länder. A prominent role for energy and environment policy is also played by the Federal Environmental Agency; in principle it acts independently of the Federal Ministry for the Environment.

In September 2000 the Ministries of Economics, Environment and Housing/Transport joined forces with the KfW to establish the German Energy Agency (dena) as a company under private law, responsible for carrying out energy efficiency initiatives, the promotion of renewable energy sources and climate protection measures, as outlined in the Climate Protection Programme. Inter alia, dena is currently organising an energy efficiency campaign in partnership with 12 Länder energy agencies and is operating an Energy Hotline service for advice on the rational use of energy and renewable energy use in buildings.

2.2 Energy prices

2.2.1 Energy pricing policy

The Energy Industry Act, amended in April 1998, stipulates a “networked supply of electricity and gas which is as secure, cost-effective and environmentally friendly as possible”.

With the new law, the electricity and gas markets were fully liberalised. The introduction of an independent regulatory agency was not originally considered to be necessary; third-party grid access (TPA) has been negotiated on the basis of Associations Agreements separately for the gas and electricity market. But from 2004 on, a new entity will regulate and supervise access to the grid and conditions for energy transport.

Ex-post regulation is carried out by the Federal Cartel Office (FCO) and the Länder anti-trust authorities, by supervising compliance with competition legislation. A special Task Force for Grid Access was created by the Federal Ministry of Economics and Labour together with representatives of the industry. The Task Force gives recommendations on third-party access and negotiating with suppliers and consumers. Disputed cases are brought to the courts.

Electricity market

Industry and electricity providers have agreed on terms for grid access and transport in a joint Associations Agreement in May 1998. This agreement was amended and revised in December 2001, introducing distance-independent transport fees. Due to the lack of transparency for determination of prices for access to the grid, the effectiveness of the Associations Agreement has raised some concerns.

Germany still counts close to 900 electricity distributors and a large number of licensed generators (incl. those private companies which operate wind farms). However, market concentration in both the generation and the transmission sector is high. In 2000 the three largest utilities owned 64 % of total installed capacity (not including ownership through participation in other companies) and supplied about 50 % of the total demand. Only about 200 distributors are not directly or indirectly owned by a transmission grid operator.

5 years after the opening of the electricity market there is a growing market concentration, although a number of new suppliers have emerged. Former demand-side management programmes of utilities have almost all been scrapped. A number of cogeneration plants have been put out of operation due to non-competitive generation costs. Willingness to change the electricity provider has been extremely low in the household sector, but relatively common among industrial consumers (between 20 – 30 %). More than 25 % of residential customers have accepted the offer of their existing provider to supply electricity at more favourable special tariffs. Tariffs for consumers connected to the low-voltage grid as well as for households are above the average in Europe.

The scheme for tariffs offered to low-voltage customers is regulated by the Federal Ordinance on Electricity (BTOEIt) of 18.12.1998. Utilities are obliged to offer their customers a tariff that reflects actual costs. This so-called mandatory tariff needs to be authorised by the Länder institutions for pricing control (normally the Länder ministries of economics) and publicly announced. However, every final customer (also private households) is allowed to conclude electricity supply contracts offered on the market by various providers and traders.

The price components include transmissions fees, levied by the grid operators. Although a common methodology for determination of transmission fees was agreed in the Associations Agreement II, transmissions fees actually vary between 1 and 7 ct/kWh.

Gas market

As with electricity, a similar Associations Agreement was adopted for the gas market in July 2000 by two industrial user associations and two associations of the gas industry. Two amendments followed in March 2001 and September 2001, defining further conditions and procedures. By signing of a new Associations Agreement in May 2002 a new pricing scheme was introduced, which determined distance-related tariffs for national and regional transmission and a “postage stamp” tariff for local distribution. Negotiations on a further improvement of the grid access failed and were cancelled without results in April 2003. Liberalisation of the gas market has so far been very slow. Customer switching up to 2001 was less than 5%. Tariffs for consumers connected to the low-voltage grid as well as for households are above the average in Europe.²

² EU Commission, First Report on the implementation of the internal electricity and gas market, 2001

Gas prices are set by the market without government intervention, but are linked to the oil price development. The FCO and Länder anti-trust authorities perform regular checks on gas prices to ensure that there is no abuse. Utilities are free to change prices periodically so as to reflect fuel oil price trends.

Concentration in the gas market is high. Only 5 intra-regional companies operate the long-distance gas pipelines and a further 13 companies own the distribution networks at the regional level. About 700 companies act only as distributors at the local or regional level. The gas market is dominated by a single purchaser and provider, Ruhrgas AG, which has a share of 60 %.

Subsidies for coal mining

In March 1997 an agreement was signed between the Federal Government, the “coal-mining Länder” of North-Rhine-Westfalia and Saarland, mining corporations and unions on the further financing of the hard-coal-mining sector until 2005. This agreement became necessary after the former coal levy on electricity tariffs for support of domestic coal use in power plants was abolished. Between 1998 and 2005 the hard coal subsidies will be reduced from 4.73 billion € to 2.71 billion € annually, of which 4.22 or 2.17 billion € respectively are paid out of the Federal budget.

For the period 1997 until 2005 the total sum of subsidies will amount to 35.37 billion €, of which 28.27 billion € will be contributed by the Government. The financing is intended to support the use of indigenous hard coal for power plants, steel production and lay-off measures in the mining sector. The Federal Government will continue to support the coal-mining sector beyond 2005, although with further-decreasing contributions.

Despite large subsidies in the past, hard coal production in Germany dropped from 70 million t in 1990 to 27 million t in 2001. This was due to increased competition from lower-priced import coal. The number of employees in the mining sector has decreased from about 130,000 persons in 1980 to about 52,600 in 2001.

Pricing policy for electricity from renewable energy sources

Based on the Renewable Energy Act in effect since April 2000, renewable electricity fed into the public grid is remunerated by the grid operator according to the technology applied and taking into account some further conditions. The respective remuneration fee reflects the average costs of producing the electricity by a specific technology and is secured for a period of 20 years. For some renewable energy sources the initial tariffs for new installations are decreasing from year to year. The extra costs resulting out of this scheme are distributed evenly among all final suppliers according to their electricity sales. They have the option of raising prices in compensation for the extra costs due to the purchase of electricity from renewable sources, but they are not obliged to do so. As an alternative they may also offer special “green” tariffs in order to sell their green electricity at an appropriate price.

According to the monitoring report on the Renewable Electricity Act of the German Government, in 2001 the additional costs resulting from the EEG were between 0.18 and 0.26 ct/kWh, based on achievable market prices for electricity from conventional energy sources and on a total remuneration volume of 1.54 billion €.

Promotion of cogeneration plants

The support for cogeneration is regulated by the cogeneration modernisation law of April 1, 2002, based on a prior agreement with German industry associations.

Specific cogeneration plants receive a premium that is paid as part of the grid-usage charge levied by the distribution grid operators. The extra charge amounted to an average of 0.26 ct/kWh in 2002 for consumers with a demand of less than 100,000 kWh/a. For demand exceeding this limit the charge is limited to a maximum of 0.05 ct/kWh. For manufacturing industries whose electricity costs in the previous year exceeded 4 % of the sales volume, the charge above the 100,000 kWh limit may not exceed 0.024 ct/kWh. These regulations apply also for railway companies.

2.2.2 Price levels

(The data in this Chapter come from national statistical sources. Differences to data in Part II are due to different methodologies.)

Energy costs of private households

In 2000 the 37.8 million private households in Germany spent about 38.6 billion € on energy consumption, not including transport fuel. Thus, average costs were about 1000 € per household. 65.5 % of these costs originated from heating and hot water, 9.5 % from cooking and 25 % from lighting, domestic appliances and other consumption. Almost the same amount (37.6 billion €) was spent on transport fuel, so that the overall costs for energy needs were about 2000 € per household or 6.7 % of the total private consumer spending (compared to 5.6 % in 1992).

Heating costs increased between 1990 and 2000 from about 6 €/m² per year to around 8 €/m².³ Spending on transport fuel has risen from 5.0 € per 100 km to about 7.3 € in the same period.

Electricity prices

With the complete liberalisation and opening of the electricity market in April 1998 prices for industrial consumers (high voltage) dropped considerably and reached their lowest level in mid-2000 (approx. 78 % of the level in April 1998). At the end of 2000 prices increased slightly and reached about 85 % of the level in April 1998. While prices for industrial customers were still among the highest in Europe in 1999 (at 39 % above the EU average), they are now down to about 10 to 15 % above average EU prices. On average (all industrial sectors) total energy costs have a low impact on the gross production value (less than 2 %) compared to the share of wages and salaries, which is about 24 %.

For private households the price decrease as a consequence of the liberalised electricity market was less evident and has been partially offset in the meantime by higher burdens due to political measures (eco-tax, renewable energy act, cogeneration act) as well as higher generation and transportation costs. Between 1998 and 2000 the prices dropped by about 8.5 % in real terms. Excluding the reversed effects of the electricity tax (introduced first in 1999) and the cost burdens of the Renewable Energy Act and the Cogeneration Act (since 2000) the net price decrease amounted to more than 20 %. Also in this sector prices have seen an upward trend again since 2001. Without the external influence mentioned above, prices

³ Real prices.

would be almost 8 % lower today than in 1998. Individual households can benefit from choosing electricity suppliers with lower tariffs.

Fuels

Gasoline and diesel as well as heating oil prices were affected in the previous decade by the trend of rising world market petroleum prices and additional taxes.

Prices for gasoline (95 oct.) and diesel oil are currently about 10 % above the average EU level, while those for heating oil are about 20 % below the average level.

Natural gas

The German natural gas market is the second largest in Europe. Due to the direct link between heating oil and gas prices and the small number of actors on the primary supply side (long-distance transport), prices have years been amongst the highest in Europe. After having increased by almost 9 % in 2002 they are currently at the level of 2.2 ct/kWh for industrial customers (120 GWh/a), 5.0 ct/kWh for private households (4.5 MWh/a) and 2.9 ct/kWh for other customers (120 MWh). The eco-tax plays only a minor role in the constitution of the price level.

In Germany gas prices vary considerably between South and North. The difference between the most expensive and the cheapest price amounts to almost 33 %.

2.2.3 Environmental levies and taxes

Ecological tax reform: new electricity tax and additional mineral oil tax

The Ecological Tax Reform, introduced in 1999, is one of the central pillars of the Federal Government's climate-protection policy. The basic concept calls for energy to become more expensive, through taxation, and for "work" to become less expensive by reducing the regular payments for social security.

The eco-tax was developed and further adapted in two stages: April 1, 1999 to January 2000 and 2000 to 2003⁴. A further revision was made as of January 1, 2003. In a total of five steps, a newly introduced electricity tax as well as an additional hydrocarbon tax were increased annually. This step, which so far is the last, went into effect on January 1, 2003.

Key points of the eco-tax are (status as of 1.1.2003):

- Electricity tax of 2.05 ct/kWh.
- An additional hydrocarbon tax of 2.05 ct/l applies to heating oil and of 0.366 ct/kWh to natural gas.
- Auto-producers of electricity (including energy service companies) with plants of up to 2 MW are exempted from the electricity tax.
- Operators of cogeneration plants with motor engines or gas-turbines are exempted from paying the additional hydrocarbon tax on natural gas, if the annual efficiency is $\geq 60\%$.

⁴ The first stage was approved by the parliament on March 3, 1999, the second stage on November 11, 1999.

- Operators of cogeneration plants with motor engines or gas-turbines with a monthly efficiency of at least 70 % are additionally exempted from paying any hydrocarbon tax.
- For heavy fuel oil a uniform hydrocarbon tax of 25 €/t is levied (not applicable to efficient cogeneration and combined-cycle plants).
- For the productive sector (manufacturing industry) as well as for agriculture and forestry a reduced rate of 60 % (formerly 20 %) of the regular tax on electricity, heating oil and natural gas applies. This reduction is only valid above a base level of 511 € annually, calculated separately for electricity and mineral oil tax.
- For energy-intensive companies in the manufacturing sector a special hardship clause applies, which takes into account the lowering of social security contributions with regard to the reference year 1998. Those companies which pay more eco-taxes than they have saved in social security receive a refund of 95 % of the excess amount.
- Railways and public bus transport pay only 50% of the electricity and mineral oil tax (since 1.1.2000).
- Tax reduction for use of natural gas in the transport sector until the end of 2020 (see below).
- For electricity generation in new combined-cycle plants with an efficiency of at least 57.5 %, no mineral oil tax on natural gas is charged. This regulation was in force until the end of 2002.
- Electricity for the operation of night storage heaters which were installed before 1.4.1999 is taxed at a reduced rate of 60 % (formerly 50 %). This favourable condition ends on December 31, 2006.
- Electricity from renewable energies is exempted if it is taken from a grid which is exclusively transporting such electricity. Otherwise renewable electricity is also subject to the eco-tax. As a compensation, part of the tax revenue is financing the Market Incentive Programme for Renewable Energies.

Total revenues from the eco-tax amount to some 57.7 billion € for the period 1999 – 2003. In 2003 alone total revenues will be about 18.8 billion €, which are mainly used for reducing social security contributions of companies and their employees by currently 1.7 percentage points (to 19.5 % of gross wages). Smaller portions are being used to fund the Market Incentive Programme for Renewable Energies (1999 and 2000: 102 m € each, 2001: 153 m €, 2002 and 2003: 190 m € each; 2004: 200 m €; 2005: 220 m €; 2006: 230 m €) and provide additional funding for the CO₂ building modernisation programme (160 million €/a for 2003-2005). As an exceptional measure 1 billion € is being used to finance the general budget.

Lower taxes and tax exemptions provide incentives for the promotion of efficient cogeneration plants, for rail and public transport and use of natural gas in the transport sector. According to the Federal Statistical Office the number of passengers on public transport systems has seen a continuous increase since the introduction of the eco-tax in 1999 (+0.4% in 1999; +0.8% in 2000; +0.8% in 2001 and +0.5% in 2002). On the other hand, the fuel consumption for transport and hence related CO₂ emissions in this sector has been declining for three consecutive years since 2000 (2000: -2.8 %, 2001: - 1.0 %, 2002: -2.3 %). The number of motor vehicles running on natural gas increased to 13,000 at the end of 2002.

As a further positive effect of the eco-tax, the German Institute for Economic Research (DIW) forecasts a decline of the total energy consumption of at least 2-3 % until 2005 and additional employment growth of up to 250,000 persons.

The coalition agreement of 2002 includes a provision to evaluate in 2004 if and how the eco-tax can be further developed, incorporating ecological aspects.

Emission-related motor vehicle tax

The tax on motor vehicles depends on cylinder capacity and emissions. In March 1997, the German Parliament adopted an amendment to the Motor Vehicle Tax Act which took effect in July 1997. It allows for temporary exemptions (until end of 2005) of the annual motor-vehicle tax for low emission cars (cars that meet the limits laid down in the European Commission’s proposal for the follow-up Directive 94/12 EC) and increased taxes for some high emission cars. The tax rate was also reduced for cars that have a very low specific consumption.

So-called “5-litre cars ⁵” (max. 120 g CO₂/km, equivalent to EU-norm “Euro 4”) enjoy a non-recurring tax rebate of 306.78 € (internal combustion engines) or 613.55 € (diesel engines) upon the date of first registration (must be before Jan 1, 2005).

The tax rebate for so-called “3-litre cars” (CO₂ emissions not exceeding 90 g/km) is 511.29 € irrespective of the date of first registration.

After the exemption period for low and very low emission cars the regular rates apply according to Table 1.

Through this tax system the number of cars with high emissions was reduced by two thirds between 1997 and 2001. One quarter of all newly registered cars in 2001 complied with the emission standard Euro 4, valid as from 2005/2006.

Distance-related motorway toll for trucks

The Act on the Introduction of Distance-Related Charges for the Use of Federal Motorways by Heavy Goods Vehicles (HGV), which entered into force on April 12, 2002, is the legal basis for the introduction of a system of distance-related charges for HGVs in Germany in 2004. This system with emissions-based fee categories will replace the current time-based truck fees, in order to make assignment of road-use costs more equitable.

It will support transport-policy and environmental-policy aims. With its flexible fee schedule, it will provide incentives to shift goods transports from roads to railways and waterways. It should also reduce percentages of "no-load" trips. The measure is expected to reduce CO₂ emissions by 5 million t annually.

The average toll rate should be based on the actual infrastructure costs according to a requirement contained in the relevant EU legislation⁶, and has been put at 0.15 €/km. Until planned harmonisation measures with respect to competition in the European transport sector can take place, the average rate will be reduced to 0.124 €/km with variations of 0.09 to 0.14 €/km depending on the vehicle's number of axles and emission category.

	Emission Grade		
	Category A	Category B	Category C
Fee per kilometre for HGVs			

⁵ Fuel consumption per 100 km.

⁶ Directive 1999/62/EC of 17.6.99

with not more than 3 axles	0.09 €	0.11 €	0.13 €
with 4 axles or more	0.10 €	0.12 €	0.14 €

Table 1: Planned distance-based fees for heavy goods vehicles
Source: Federal Ministry of Transport, Building and Housing

All HGVs (from 12 t upwards) using German motorways will be liable to pay tolls. This means that, for the first time, foreign motorway users will make a substantial contribution to the infrastructure costs. Thus, distortions of competition to the detriment of German vehicles will be alleviated. The toll will largely be collected automatically.

Tax deduction for private transport between living and work place

As of January 1, 2001 new regulations apply for tax deductions benefiting regular commuters and employees with workplaces not at their normal site of residence. Standardised distance-categories that cover all modes of transportation in the same way create a level playing field, in terms of taxation, between competing modes of transportation and improve the basis for local public transportation. Contrary to the former regulation, which favoured mainly the use of private cars, this change is in keeping with both environmental and sensible transport-policy criteria.

Environmentally friendly fuels

Reduced hydrocarbon taxes apply to liquified gas used as transport fuel (161.00 €/1000 kg since January 1, 2003) until December 31, 2009 and for natural gas (12.40 €/MWh since 1.1.2003) until the end of 2020.

Bio-fuels are completely exempted from the hydrocarbon tax until the end of 2008. For mixed fuels the taxes vary according to the bio-fuel share.

As of 1 November 2001, tax breaks are being given for early introduction of fuels meeting sulphur standards of 50 mg/kg ("low-sulphur"), as mandated for 2005 by the EU Fuels Directive (98/70/EC). This is being accomplished by making hydrocarbon taxes on gasoline and diesel fuel dependent on the sulphur content.

With a content of more than 50 mg/kg, they are subject to an additional 1.53 cents per litre, a measure which favours low-sulphur fuels. Since 1 January 2003, the tax exemption applies only to fuels with a sulphur content of up to 10 mg/kg ("sulphur-free"). Oil companies had already begun selling exclusively low-sulphur fuels by the time this tax incentive came into force. As a result, consumers have not suffered any price increases by this fiscal measure.

Sulphur-free fuels make it possible to use engine technologies with up to 15 % lower fuel consumption than conventional engine technologies. Another advantage is that sulphur-free fuels can help reduce emissions and soot formation even in older engines.

Green electricity

Most German utilities offer "green electricity" as a further supply option, incorporating electricity from renewable energy sources or in combination with other environmentally friendly power (mainly from cogeneration).

The definition varies, as do the conditions for different labels that certify the percentage and origin of renewable electricity and the circumstances of its production.

Green electricity is in general sold on a premium-price basis with charges of up to 5 cents/kWh above regular tariffs. Some new providers sell exclusively “green electricity” bought from external plant operators or generated in their own facilities.

Summary Table II Energy prices

Please indicate in the table the status of the following aspects of energy pricing in your country:

Energy Prices	Yes	No	Partly
Is there an independent regulator of energy prices?			x
Are there any subsidies on energy prices?		x	-
Are there any cross-subsidies?		x	-
Are the environmental costs fully internalised?			x
Do you have a tax related to energy consumption?	x		-
Do you have a tax related to CO2 emissions?	x		-

2.3 End-use sectors

Please note that the source of data for the more detailed description than in Part II derives from national statistics, which use a different methodology.

2.3.1 Residential sector

Average residence size (in terms of floor space) and average per-capita living area increased slightly. The number of single-person households is still increasing and amounted to 14.2 million out of the total number of 38.7 million in April 2002. The total living space in one- and two-family houses (1790 million m² in 1997) exceeds that in multi-family houses (1315 million m²).

About 75 % of all houses were built before 1978, when the first ordinance on thermal insulation was introduced. The average specific heat demand for all residential buildings was 189 kWh/m² per annum in 2001, while the energy conservation ordinance in force since 2002 sets a maximum of 70 kWh/m² for new buildings.

Overall final energy consumption (FEC) in the residential sector was about 8 % higher in 2001 than in 2000. Space heating was the most energy-consuming area with about 76 % of total FEC in this sector in 2001, followed by hot water production (11 %), mechanical energy (7 %), process heat (mainly cooking, 4 %) and lighting (1 %).

More than 75 % of all buildings and more than 90 % of all recently constructed buildings are now heated by either natural gas (41 % of all buildings) or oil (34 %). It is expected that this predominance will continue in the future, whilst oil is expected to lose some ground and natural gas to gain even more importance. About 12% of all dwellings are supplied by district heating.

2.3.2 Industry

Compared to 1990 the share of industry within total FEC decreased from 31 % to 29.9 % in 2001. FEC in the industrial sector dropped sharply by 18 % between 1990 and 1993 as a consequence of the closure of a number of highly energy-intensive and inefficient factories in East-Germany. In the years thereafter the consumption stabilised at about 73,327 Mtoe (2001). In the same period the value of industrial output rose by an average of 2.9 %/a. Specific energy consumption therefore decreased.

The industry uses mainly petroleum products (31.6% in 2001) and gas (28.3 %), followed by electricity (27 %) and coal (11 %).

2.3.3 Trade and services

This sector is quite heterogeneous, combining such different branches as construction, agriculture, public services and small manufacturers. Its significance declined somewhat in the 1990s. In 2001 its share of total FEC was about 16.2 %. Most energy was used for space heating (33%), followed by mechanical energy (12%), hot water production (10%), process heat (7.2%) and lighting (3.4%).

2.3.4 Transport

The transport sector gained significant importance between 1980 and 2001 in terms of energy consumption, which increased from 22 % of total FEC up to almost 27 %. Per-capita energy consumption for transport is higher than in most other European countries. Two thirds of total FEC in this sector is caused by motorised individual transport, where energy consumption stabilised at a high level until 1999. As from 2000 on energy consumption in this sector dropped slightly.

The number of motorised vehicles reached 53.7 million at the beginning of 2003, with 44.7 million of those being passenger cars (compared to 37 million in 1991). Despite the significant increase of the number of passenger cars in the 1990s, total mileage was only 3 % higher in 2001 than in 1991. The average specific energy consumption for passenger cars with internal combustion engines has dropped from 9.5 to 8.8 l/km between 1991 and 2001, for diesel engines from 7.7 to 7.3 l/km. The road transport of goods increased in the same period by 43 %, while rail transport declined by 8 % and ship transport rose by 16 %. The most drastic growth was observed in air traffic. Passenger transport increased by 85 % from 1991 to 2001.

3 ENERGY AND ENVIRONMENT

3.1 General trends and objectives

With its “end-of-pipe” legislation in the 1980s (West) Germany laid the foundations for decoupling energy consumption and negative effects on the environment, particularly in the fields of air and water pollution. Energy-related pollution of the atmosphere has been reduced significantly since the early 1990s, with the exception of the transport sector. The intensity of SO_x and NO_x emissions (kg per unit of GDP) is 65 % and 50 % below the OECD averages, respectively.

In the framework of the burden-sharing between the member states of the European Union agreed upon in 1998, Germany is committed to reducing the six greenhouse gases up to 2008/12 by 21 % relative to the 1990 level. (See also Chapter 2.1.1.)

With its decision of June 13, 1990 the Inter-Ministerial Working Group on CO₂ reduction was established, which has the task to identify greenhouse gas mitigation potentials (in particular CO₂). The Working Group is broken down into five sub-groups for the fields of energy supply, transport, buildings, new technologies, agriculture/forestry and emission inventory.

The Working Group has presented to the Government a total of five reports on strategies for climate protection in November 1990, December 1991, September 1994, November 1997 and October 2000. Based on its report of 2000, the German Government adopted a new Climate Protection Programme on 18 October 2000. The Programme contains a package of measures to reach the goal of a 25 % CO₂ reduction by 2005. Currently it is rather unlikely that Germany will fully achieve this self-imposed CO₂ reduction objective. The further development and updating of climate protection measures will be subject of the sixth report by the Working Group, with completion planned for 2003.

Within the framework of its climate protection programme, the Federal Government decided to set an example and reduce the CO₂ emissions in its own properties by 25 % by 2005 and by 30 % by 2010 relative to 1990. Also the Federal Ministry for the Environment has committed itself to lowering its energy-related CO₂ emissions by as much as 30 % by 2005. The Environment Ministry has been asked to develop a concept on how the various government ministries can achieve this objective. It shall mainly include measures which involve no or only insignificant additional costs.

Germany has elaborated and submitted its third national report under the Framework Convention on Climate Change in 2002, succeeding previous reports in September 1994 and April 1997.

The German Government is convinced that further measures will be required at both national and international level to further reduce greenhouse gas emissions substantially, beyond the Kyoto target period of 2008/2012.

As a contribution to the World Summit on Sustainable Development in Johannesburg, the Federal Government adopted on April 17, 2002 a national strategy for sustainable development. This strategy was elaborated by a government commission (“Green Cabinet”) together with a Council for Sustainable Development and was broadly discussed with civil society before and after its first presentation in December 2001. (See Chapter 2.1.1.)

Under the guidance of the Federal Ministry for the Environment, the Government has established the working group on “Emissions Trading to Combat the Greenhouse Effect”, with the involvement of industry and other interested parties. This working group initiates discussions and strategies on how to comply with the proposed introduction of emission rights trading for greenhouse gases within the European Union. Guidelines have been published recently on how to deal with the flexible instruments of the Kyoto Protocol (Joint Implementation and Clean Development Mechanism). The KfW is considering the setting up of a financing line for the purchase of certificates from JI and CDM projects.

3.2 Environmental policy implementation

Since June 1987 the Federal Ministry for the Environment has been chiefly responsible within the Federal Government for national environmental policy, including climate change issues, pollution prevention and nuclear safety. However, most legislative proposals and other central decisions need also to be accepted by other ministries involved before approval by the cabinet and submission to parliament, notably the Federal Ministry of Economics and Labour, the Finance Ministry, the Ministry of Transport, Building and Housing and the Ministry of Consumer Protection, Food and Agriculture.

The work of the Federal Ministry for the Environment is supported by three Federal agencies: the Federal Environmental Agency (Umweltbundesamt), the Federal Agency for Nature Conservation (Bundesamt für Naturschutz) and the Federal Office for Radiation Protection (Bundesamt für Strahlenschutz). The Federal Environmental Agency works specifically on climate change issues, on the elaboration and publication of environmental data and on environmental labelling. It publishes also regular information on stand-by losses of electronic equipment. The German Energy Agency supports implementation of respective programmes via various projects and campaigns (see also Chapter 5) and gives advice to the ministry especially in the field of renewable energies.

Several independent expert bodies, among them the Council of Environmental Advisors (Rat von Sachverständigen für Umweltfragen - SRU), the Advisory Council on Global Change (Wissenschaftlicher Beirat Globale Umweltveränderungen - WBGU) and the Reactor Safety Commission (Reaktorsicherheitskommission - RSK) have an advisory function to the ministry. They support the ministry in the form of statements, expert opinions, reports and studies.

On special issues, further independent consulting and academic institutions are called in by the Federal Government as well as by the governments of the Länder and municipalities.

Among them are:

- **Rhine-Westphalia Institute for Economic Research – RWI**; an independent institution to monitor economic developments. The RWI has been responsible for the monitoring of the voluntary agreement of the German industry on CO₂ reduction. Four reports have been published for the years 1997 - 2000;
- **Institute for Applied Ecology (Öko-Institut e.V)**; an NGO which, under the guideline of sustainable development, analyses and evaluates current and future environmental problems to point out risks and to develop and implement solution strategies;
- **German Institute for Economic Research – DIW**; is the largest economic research institute in Germany. Its department for energy, transport and environment is involved in the economic assessment of national and international energy policies as well as in the development of indicators for sustainable development;
- **Environmental Policy Research Centre – FFU**; established in 1986 at the Free University of Berlin;
- **Institute for Energy and Environmental Research Heidelberg – ifeu**; independent environmental research centre;
- **Wuppertal Institute for Climate, Environment and Energy**; develops guiding principles and concepts in the areas of energy, transport, material flows, structural change, climate policy and eco-efficient enterprises;
- **Institute for Future Studies and Technology Assessment – IZT**; independent research institute that works on strategies for rational and renewable energy use, in addition to other topics;

- **Prognos**; consulting company producing analyses and developing strategies for enterprises, organisations and the public sector.

For additional institutions see 4.7. Many institutions are involved both in environmental and energy efficiency issues.

At Länder level, the ministries responsible for environment protection are normally in charge of climate change programmes and respective measures, air pollution control and licensing procedures for industrial and power plant emissions. Some environment ministries also have under their umbrella the responsibility for rational use of energy, renewable energies and energy planning.

The **German Environmental Foundation** (Deutsche Bundesstiftung Umwelt – DBU) was established in 1990 by the Federal Government in order to promote innovative and exemplary environmental projects. The DBU concentrates on environmental technology and research, nature conservation, environmental communication and cultural assets. So far, 5,500 projects have been funded (the financial support totalling about 1 billion €).

3.3 CO₂ emissions

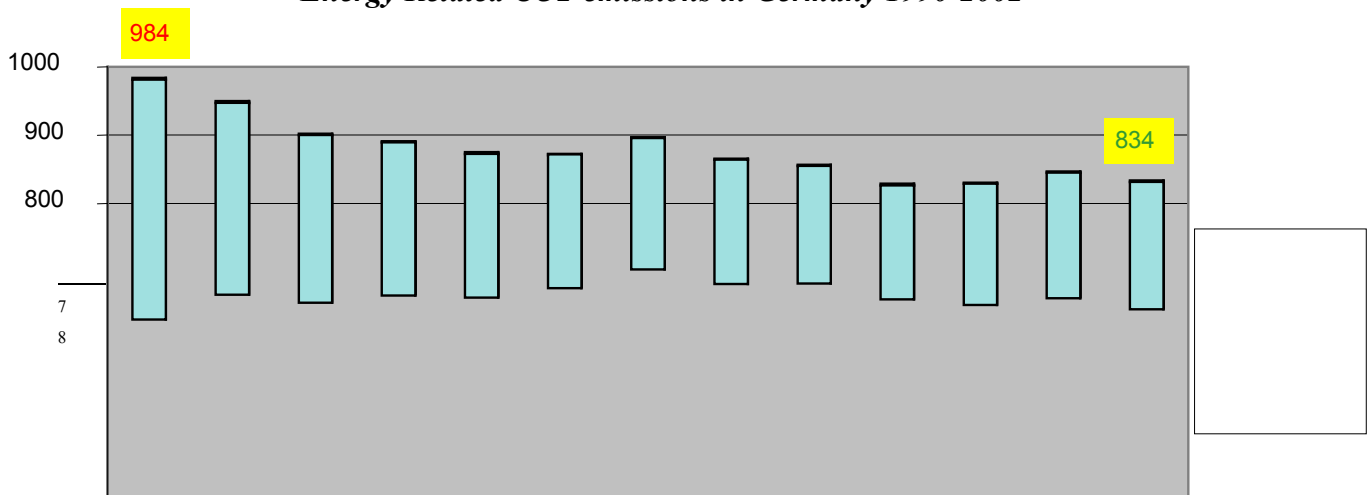
(The data in this Chapter come from national statistical sources. Differences to data in Part II are due to different methodologies.)

Energy related CO₂ emissions in Germany amounted to roughly 834 million t in 2002. That was 1.5 % less than in 2001. Reasons for this decline were mainly the weak economic situation and the mild weather conditions. Adjusted for temperature, the decrease of energy related CO₂ emissions was only 0.2 %.

Germany belongs to the few industrial countries that can refer to a significantly reduced CO₂ emission in the 1990s. Compared to the (internationally agreed) base year 1990 the CO₂ emissions dropped by 15.3 % and, temperature-adjusted, by 15.7 %, while primary energy consumption was 4.2 % lower. Most of the reduction (13.1%) was achieved in the first half of the 1990s, i.e. right after German reunification, which brought major changes in the East German industrial sector and in the substitution of lignite for heating purposes by natural gas and mineral oil with a much lower specific CO₂ content ⁷. Up to 1995 about 60 % of the CO₂ reductions resulted from the structural changes in Eastern Germany.

During the period 1990-2001, CO₂ emissions fell by 28.8 % in industry, by 16.6 % in the energy sector and by 31.0 % in the services, trade and commerce sector. However, emissions from the residential sector rose by 2.0 % and in the transport sector by 10.2 %.⁸

Energy Related CO₂-emissions in Germany 1990-2002



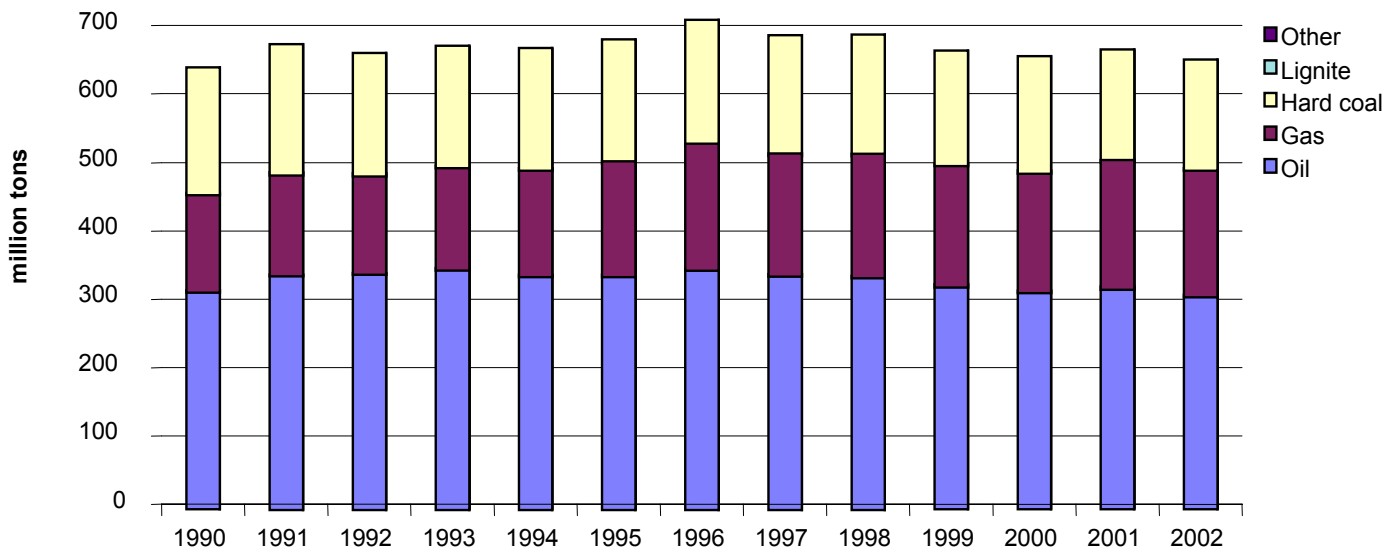


Figure 1 Energy related CO₂ emissions in Germany

Recent years have even seen a stagnation in the downward trend with figures for CO₂ emissions being slightly higher in 2002 than in 1999 (see Figure 1). It was estimated that the target of a 21 % reduction by 2008/2012 for all greenhouse gases combined, relative to 1990, agreed in the frame of the European “burden-sharing”, can be achieved. However, in order to reach the self-proclaimed objective of a 25% reduction by 2005, Germany would have to lower CO₂ emissions by an average of 3.8 %/a, which would be far above all figures since 1991.

More convincing is the development of the overall emission intensity (relation between CO₂ emissions and GDP), which was about 29 % lower in 2002 (429 t CO₂ per 1 million € GDP) than in 1990. But it was observed that progress has slowed in recent years. In terms of per capita emissions the result is also significant: 12.7 t CO₂ in 1990 and 10.4 t CO₂ in 2002.

In 2002 about 18.6% of the total amount of CO₂ emissions came from hard coal, 21.5% from lignite, 36.8% from mineral oil and 22.8% from natural gas (all figures temperature-adjusted). The share of CO₂ emission-free energy sources (mainly nuclear power and renewable energy) in total primary energy consumption was 15 % (compared to 11.7 % in 1990).

The main polluters were the energy industry with an overall share of 42% of total German CO₂ emissions, followed by the transport sector with 20 %. German households contributed 15 %, the manufacturing industry 13 % and commerce and services about 7 % to the total amount of CO₂ emissions. In particular, the share of road traffic has increased significantly from 14.8 % (1990) to 19.2 % (2002), while the importance of industry as well as trade and services has diminished.

4 ENERGY EFFICIENCY POLICIES

4.1 Energy efficiency policy

The former West Germany launched an energy efficiency policy right after the first oil crisis in 1973. Three years later a basic energy conservation law came into effect, serving as a framework for subsequent ordinances on thermal building codes, on installation and

regulation of (central) heating systems and the distribution of costs among apartment users in the case of such common heating systems.

At about the same time anti-air-pollution measures were enforced as a reaction to severe problems with smog and acid rain throughout Central Europe. Some of those measures required stricter standards and controls for heating systems, including minimum efficiency standards and regular inspections, and provided funds for the construction of new local heating systems, preferably based on residual heat from cogeneration plants.

The application of political and financial instruments, new technologies and a growing awareness in the population of energy-related aspects resulted in an almost stable level of total primary energy supply, despite continued economic growth (s. chapter 2.1.2).

In the late 1980s, a growing concern about future climate change caused by the increased concentration of greenhouse gases in the earth's atmosphere arose as a further driving force for the implementation of a diversity of new energy efficiency policies. As early as in 1990, the German Government approved a comprehensive CO₂ emissions reduction programme and target, with 25 to 30 % less by 2005 compared to 1987⁹. As a result of an international agreement and as a consequence of reunification in 1990 this ambitious commitment was later revised to a 25 % cut in CO₂ emissions between 1990 and 2005.

The Federal Government approaches this target by introducing a number of policy measures, such as the eco-tax, the renewable energy act, the act on cogeneration, the energy conservation ordinance, energy R&D programmes, energy labelling of appliances, financial incentives for the modernisation of the railway system, the application of a new distance-based toll system for heavy trucks, cheap loan programmes for the modernisation of buildings, the provision of expert advice at reduced costs and voluntary agreements with the industry. Länder, regions, municipalities and utilities are participating in the energy efficiency and climate protection strategy by setting up their own programmes and objectives, offering funding and information and improving energy efficiency standards within their own institutions.

Further driving forces for the German energy conservation and climate change policy include the decision on phasing out nuclear power which produces additional challenges attached to curbing electricity consumption growth and related CO₂ emissions.

4.2 EE targets

No specific energy efficiency targets have been formulated within the national energy strategy, but objectives for energy conservation are incorporated within the goals for CO₂ emission reduction as a more global and environment-related indicator. Quantifications exist for the possible emission reductions stimulated by individual measures.

As part of the national climate protection objectives, voluntary agreements with associations of German industry and the car manufacturers include separate targets within defined timeframes.

⁹ This commitment was a direct result of recommendations from the Study Commission on "Precautions for the protection of the earth's atmosphere", established in late 1987 by the West German parliament.

The voluntary agreement with the German industry was first signed in 1995 and was modified and extended in 1996 and 2000. It involves 5 umbrella organisations and 16 individual sectors. In the current version of the agreement, industry has committed itself to reduce the combined greenhouse gas emissions (defined within the Kyoto Protocol) by 35 % between 1990 and 2012 and to eliminate 28 % of the CO₂ emissions by 2005, compared to 1990.

The Association of the German Automotive Industry committed itself in 1995 to reduce the average fuel consumption of new passenger cars by 25 %, relative to 1990. By 2000 a reduction of 17 % had been achieved (7.2 l/100 km in comparison to 8.8 l/100 km in 1990). In this context the Federal Government favours an initiative to further reduce the maximum CO₂ emissions of new cars by 2010 to 120 g CO₂/km (currently 140 g CO₂/km until 2008) within the existing voluntary commitment by the European car manufacturers.

Self-imposed targets have been set up by the Federal Government for the energy consumption of the new administrative buildings in Berlin, with the requirement of 15 % higher efficiency than regular standards.

In 1978, a voluntary agreement was signed in the state of Berlin between the housing and energy supply industry on the one hand and the state government on the other hand to reduce annual CO₂ emissions in the building sector.

4.3 EE priorities

German energy efficiency policy addresses all energy production and end-use sectors alike, but certain preference is given to the large residential sector due to its importance for the CO₂ reduction strategy. Future policies will continue to concentrate on the building sector, in particular on the existing building stock, and on transport.

Technical energy saving potentials in the building stock are huge and are vastly unexploited, due to a large share of buildings that were constructed before the first energy building code came into force. There is a need to increase the annual modernisation rate of buildings, incorporating improved energy standards, and to increase the quality of modernisation within usual renovation cycles. Market transparency should also become a key issue to increase the amount of savings which can be utilised at economic terms.

Energy and carbon savings in the transport sector will be essential for the success of any national strategy to curb energy consumption and reduce CO₂ emissions. In the past decade, the increase in private motorised transport and the sharp rise in road transports of goods have caused major growth in energy consumption and CO₂ emissions, threatening Germany's self-imposed climate protection objectives. Forecasts predict that the tendency of growing energy consumption in the transport sector will at least continue until 2010 (in particular freight transport and air traffic).

But all other sectors and sub-sectors deserve further attention as well, in particular those related to electricity use, which is constantly growing. The German strategy equally to phase out nuclear power, to limit the dependency on imported energy and to reduce greenhouse gas emissions can only be successful if electricity consumption is lowered considerably. The following measures and activities will be crucial:

- further shaping the legal framework, in particular better implementation of the legal framework at the Länder level and assessment by carrying out spot checks;

- extension of energy efficiency standards (labels) to additional appliances not yet labelled and further promotion of existing labels;
- enforcing targeted programmes for electricity saving, specifically in alliance with the private sector (for example in the fast growing information and communications sector).

4.4 Legal framework

The framework Energy Conservation Act became effective in 1976, followed by the first ordinances on thermal insulation of buildings and on heating systems, which entered into force in 1977 and 1978 respectively.

At present, energy efficiency is mainly targeted and stimulated by the following acts and ordinances on the national level:

- Ordinance on Energy Conservation in Buildings (since 2002)
- Ordinance on Heat Consumption Metering (since 1981)
- Energy Consumption Labelling Act and Ordinances (since 1997)
- Cogeneration Act (since 2002)
- Motor Vehicle Tax Act (since 1997)
- Act on the Introduction of Mileage-based Toll for the Use of Motorways by Heavy Goods Vehicles (since 2002)
- Acts on the ecological tax reform (since 1999).

Some Länder have also enacted their own laws on energy conservation, targeting mainly efficiency measures in public buildings, the obligation for the development of energy concepts and reports and the introducing of funding for the public and private sector.

For further information please refer to chapter 5.

4.5 EE budgets

The Federal Government's energy efficiency policy uses an extensive mix of instruments, such as a comprehensive legal framework, taxation, information campaigns, voluntary agreements and other means mentioned above. Therefore specific financial budgets do not play a prominent role in the implementation of energy efficiency and energy related environmental policies in Germany. Moreover, many budgets and funds for further developing energy efficiency are integrated into budgets and funds which have been established for other purposes (e.g. the modernisation of buildings, the modernisation of the East German infrastructure, the wider use of renewable energy sources) or other institutions and organisations (Länder, municipalities, associations, foundations, agencies). For this reason and because Germany is a country with strong federal and other decentralised structures, the Federal Government's budget reflects only a small fraction of the financial means which are invested into energy efficiency measures by non-private sources.

The Federal Government's budget for support for renewable energies and energy efficiency amounted to 184 million € in 2003. Additional support is given by various programmes of the KfW (see Chapter 5).

There is no contribution of EU or other external funds to the implementation of national policies or plans. On the level of the Länder and regions some programmes and individual

projects are being co-financed by the EU (e.g. European Regional Development Fund, SAVE Programme).

4.6 International co-operation

The German Government and the Länder as well as organisations, institutions and private companies participate actively in many bilateral and multilateral co-operation programmes.

Significant multinational projects on energy efficiency are carried out in the framework of programmes set up by the European Commission (5th/6th Framework Programme, SAVE programme, Synergy programme, PHARE etc.) and the International Energy Agency. EU accession countries are being supported with administrative assistance to comply with European legal and normative requirements. Twinning projects concerning energy efficiency are being carried out with neighbouring countries and Russia.

Germany provides technical and financial assistance in a number of bilateral co-operation projects on energy-efficient production and building agreed with Eastern and South-Eastern European countries and developing countries.

Germany committed itself at the World Summit on Sustainable Development in Johannesburg to provide 500 million € for developing countries during the next five years to improve energy efficiency.

4.7 EE institutions

The Federal Ministry of Economics and Labour is responsible for energy policy with the exception of renewable energy policies, which are allocated to the Federal Ministry for the Environment. Responsibility for special fields of energy efficiency policy is shared among various ministries. The Federal Ministry of Transport, Building and Housing takes care of energy efficiency in its respective sectors. The Federal Ministry of Consumer Protection, Food and Agriculture is in charge of defending the interests of final consumers. For climate change issues the Federal Ministry of the Environment is mainly responsible.

As described earlier, the Länder and municipalities play a leading role in energy efficiency policy. The Länder have adopted their own energy laws and strategic concepts and have established a large number of funding programmes. They are in charge of approving electricity and gas tariffs and they issue generation licences. The Federal Cartel Office and the Länder anti-trust authorities supervise competition in the energy market. According to the latest decisions of the Parliament and the Federal Ministry of Economics and Labour an institutional arrangement for regulating the markets for electricity and gas will be established in 2004. It is still an open question whether the new regulatory authority will be concerned with energy efficiency tasks.

Municipalities have influence primarily on the urban planning and construction sector, where they have a regulating and controlling function. Some municipalities have set up their own energy building codes, exceeding national requirements. Building permits or the sale of public property are often linked to the condition of energy-efficient construction and supply. The German Energy Agency (dena) assists the Federal Government in implementing its climate change and energy efficiency policy. dena is mainly targeting the private and commercial sectors with information campaigns, concerted actions and advisory services to the Federal Government and decision makers within the economy. dena is engaged in developing nation-wide energy efficiency marketing and strategies to motivate the final customers as well as introducing contracting into public buildings. In its projects dena co-operates with the local and Länder energy agencies in order to utilise synergies of skills.

Regional and local energy agencies are primarily active in consultancy and advisory services, mainly for small and medium enterprises. They also provide training for professional target groups as well as assistance to the public sector at the local and regional level and to Länder or municipal administrations.

In addition, several research institutes are also responsible for energy efficiency issues.

Among them are:

- **Fraunhofer Institute for Systems and Innovation Research – ISI**; analyses technological developments, their market potential and their impact on commerce, government and society,
- **Institute for Ecological Economy Research – IÖW**; non-profit-making public limited company targeting ecological economics and environmental policy, sustainable consumption, ecological product policy and further subjects,
- **Institute for Housing and Environment – IWU**; research institution of the state of Hesse and the city of Darmstadt; engaged in all aspects of the building sector, mainly residential,

- **Bremen Energy Institute**; founded by the Senate of Bremen for research and advice in the fields of energy industry and policy in Bremen and beyond,
- **Institute of Energy Economics at the University of Cologne - EWI**; financed by the university and companies from all branches of the energy industry,
- **Institute for Energy Economics and the Rational Use of Energy – IER**; Institute for research and education at the University of Stuttgart,
- **Programme Group Systems Analysis and Technology Evaluation at the Research Centre Jülich – STE**; the section “Energy Supply and Demand” on energy-economy strategies.

Many of the institutions mentioned in 3.2. also work in the field of energy efficiency.

4.8 EE monitoring

Monitoring of national energy efficiency policies and individual programmes mainly takes place through the benchmarking of certain indicators, such as energy consumption and CO₂ emissions. (Germany is participating in the European project to develop a Database on Energy Efficiency Indicators.) However, this does not always allow a detailed assessment of the success of specific measures and programmes. A clear linkage between individual measures, outlined for example in the national climate reports, and the results achieved by the individual measures cannot be drawn.

A regular monitoring takes place within the reports on strategies for climate protection (see 3.1.). Five working groups report on development in relevant sectors. Within the voluntary agreement with the German industry an independent external monitoring took place to verify the achievement of the emission reduction objective.

For CO₂ and other greenhouse gases a comprehensive inventory has been established and is being further improved, presenting detailed information on individual sectors and for various industrial branches. An annual monitoring report on all greenhouse gases is submitted to the European Commission.

Monitoring of the success of specific energy efficiency programmes has been carried out in certain cases, for instance concerning the cheap loan programmes of the state-owned bank KfW for CO₂ reduction in buildings or the on-site energy advice programme, which is provided by the Federal Ministry of Economics and Labour. In some crucial policy fields, like the ecological tax reform, a constant observation and monitoring process has already been set up.

Some funding programmes require detailed proof of the effects on energy consumption or emission reduction to be accomplished by the proposed measure or project.

The national Sustainable Development Strategy calls for a transparent and regular monitoring on the basis of 21 key indicators. A first report will be published in 2004.

Summary Table III Energy efficiency policies

Please indicate in the table (x) what status is applicable regarding the following issues on energy efficiency policies.

Energy efficiency Policies	Yes	No	Partly
Has an energy efficiency policy been developed?	X		-
Is energy security a driving force for energy efficiency?	X		
Is climate change/environment a driving force for energy efficiency?	X		
Is sustainable development a driving force for energy efficiency?	X		
Is employment creation a driving force for energy efficiency?			X
Is industrial competitiveness a driving force for energy efficiency?	X		
Is export of technology a driving force for energy efficiency?			X
Is comfort perceived as a priority for improving energy efficiency?		X	
Are international obligations a driving force for energy efficiency?	X		
Is there a special fund for energy efficiency?		X	-
Is there an energy efficiency law?			X
Is energy efficiency incorporated in other legislation?	X		
Have national targets been formulated?	X		
Is there international co-operation in the field of energy efficiency policies?	X		

5 ENERGY EFFICIENCY INSTRUMENTS AND MEASURES

5.1 Various sectors

Table 5.1 Measures and instruments with relevance for various sectors

TYPE OF INSTRUMENTS	PROGRAMME DESCRIPTION AND AIMS	IMPLEMENTATION STATUS	BUDGET IN €	(EXPECTED) RESULTS
Legislative Instrument; mandatory	Energy Conservation Act (EnEG) of 22.07.1976, last amendment on 20.06.1980; act on energy saving and energy efficiency in buildings	In force	--	Framework law for energy conservation
Legislative Instrument; mandatory	Ordinance on Energy Conservation (EnEV) from 21.11.2001; combines requirements on thermal insulation of buildings with regulation on heating installations and introduces new maximum annual primary energy values for heating. Requires replacement of older boilers and the issuance of consumption "certificates" for new buildings.	In force since Feb. 1, 2002	Related costs have to be carried by building owners	Reduction of required energy demand (heating, air-conditioning, hot water) of new buildings by 25- 30 % Some 2 million boilers installed before October 78 have to be replaced Max. annual heat consumption for new buildings: 70 kWh/m ² (formerly 100 kWh/m ²)
Legislative Instrument; mandatory	Energy Certificates for New Buildings (AAV) according to § 13 EnEV; administrative regulation for the verification of the energy demand of buildings	In force	Related costs have to be carried by building owners	Implementation of a certificate of energy demand of new buildings for constructors and owners
Legislative Instrument; mandatory	Eco Tax Energy taxation in the frame of the ecological fiscal reform <ul style="list-style-type: none"> ▪ Tax increase for mineral oil, fuel and gas ▪ Implementation of an electricity tax ▪ Tax exemption for fuels for CHP ▪ Tax exemption for biofuels 	5th step in force since Jan. 1, 2003	Expected revenues of 18.8 billion in 2003	Increases energy prices and makes efficiency measures economically viable. Reduces labor costs by using revenues for social security 20 million t CO ₂ reduction expected for 1990-2010 Reduction of energy consumption by 2-3 % by 2005
Legislative Instrument	Renewable Energy Act (EEG) of 29.3.2000; Law on sustainable energy supply and the promotion of renewable energies	In force	Included into prices for all final customers	Doubling of renewable energy share in electricity production until 2010 (base year 2000 about 6.2%)

TYPE OF INSTRUMENTS	PROGRAMME DESCRIPTION AND AIMS	IMPLEMENTATION STATUS	BUDGET IN €	(EXPECTED) RESULTS
Regulation	Ordinance on the Fees for Architects and Engineers (HOAI) ; the 5 th amendment - effective since 01.01.1996 - provides for fee-based incentives for planners to foster the efficient use of energy in dwellings.	In force	--	Incentive for planners to choose the most efficient instead of the most expensive technical solution
Information / Awareness	“Environmental Certification Label” (Blauer Engel) ; was established in 1977 to certify energy-efficient and environmentally friendly products. Similar to the European Eco-Label.	On-going	--	Marketing incentive for producers using verifiable and approved standards
Information	Energy labelling for information and consumer electronics ; Participation in the European Group for Energy-Efficient Appliances (GEEA) on voluntary labelling for such equipment (www.energielabel.de).	On-going	N/A	Saving potential of up to 50 % is explorable
Information / Funding	Various promotion programmes of the German Länder support the rational use of energy. The Federal Ministry of Economics set up an Internet database on national and European promotion programmes in October 1997.	On-going	N/A	Incentives for investors to overcome financial barriers, in some cases facilitating market introduction of innovative technologies
Research	Research on rational use of energy ; National funding programmes by Ministries for Economics and Environment.	On-going	184 million € in 2001 (incl. clean use of fossil fuels)	Supporting the development of new energy saving technologies
Information / Advice	Energy Agencies have been established at national level (German Energy Agency - dena), in Länder and at local level. Some of them are partially co-funded by the SAVE programme of the EU Commission.	On-going since late 1980s	N/A	Support of energy planning, execution of public campaigns, advice to private investors and small and medium enterprises, elaboration of training programmes etc.
Information	Promotion of “Energy Star” as a voluntary label for office equipment on the basis of EU agreement; promotion to be carried out by dena	In preparation	N/A	Reduced average energy consumption for office equipment

5.2 Residential

Table 5.2 Measures and instruments in the residential sector

RESIDENTIAL SECTOR TYPE OF INSTRUMENTS	PROGRAMME DESCRIPTION AND AIMS	IMPLEMENTATIO N STATUS	BUDGET IN US \$*	(EXPECTED) RESULTS
Legislative, Mandatory regulation	Ordinance on Heating Installations (amended version as of May 4, 1998); Determines requirements for new room and water heating installations according to technical rules and standards as well as control devices for central heating and duties of operators.	Incorporated into new energy conservation regulation since Feb. 1, 2002	Related costs have to be carried by users	Increased efficiency of heating installations by reduced operating and thermal transfer losses Preference for low-temperature and heat condensation boilers
Legislative, Mandatory regulation	Ordinance on Heat Consumption Metering; Regulates the distribution of heating and hot-water costs among occupants of multifamily houses with central heat supply	In force since 1981	Costs carried by occupants	Incentives for reduction of heat and hot-water consumption
Funding Programme / Advice	On-site consultation; Advice on heat insulation, heating installations and use of renewable energies in existing buildings (mainly used for residential purposes) for all owners; grant is paid depending on type and size of building.	On-going ; extended until 31.12.04	2 million €	Energy consumption reduced in existing buildings Large energy and CO ₂ -saving potential (~ 25 %) exploitable
Funding Programme	KfW CO₂ Building Modernisation Programme; Soft loans for complex CO ₂ -reducing modernisation measures for building envelope and heating system; special conditions for extremely highly-efficient buildings and significant CO ₂ reductions. Partial release from credit repayment.	In force since Feb. 2001; on-going until 2005	2001/2002: 200 million €/a; 2003-2005: 360 million €/a	Energy consumption reduced in existing buildings
Funding Programme	KfW Programme for CO₂ – Reduction; Soft loans for individual energy conservation measures in existing residential buildings (thermal insulation, replacement of boilers, windows, installation of cogeneration plants etc.); renewable energy use also for new buildings; construction or purchase of energy saving buildings	On-going since 1.1.96	1996-2000: credits of almost 6 billion € Since 2001: 1 billion €/a available	Energy consumption reduced in existing buildings 1996-99: 23.3 million m ² modernised (equal to 0.22%/a of total floor space). 900,000 t CO ₂ /a saved Energy saving of 7.3 PJ/a possible Additional employment of 34,000/a per 1 billion € credits

RESIDENTIAL SECTOR TYPE OF INSTRUMENTS	PROGRAMME DESCRIPTION AND AIMS	IMPLEMENTATION STATUS	BUDGET IN US \$*	(EXPECTED) RESULTS
Funding	KfW Programme for modernisation of living space; Funding with long-term interest-reduced credits of different measures for modernisation and rehabilitation of dwellings	On-going	2/2000 – 12/2002 about 5 billion € credits; about 20 % for energy saving measures	Energy consumption reduced in existing dwellings
Funding	Act on Subsidies for Home-owners; Income tax refund for energy saving measures, such as solar-thermal systems, heat pumps and heat recovery in buildings; additional benefits for new low-energy houses	Terminated at the end of 2002; prolongation under question	N/A	Energy consumption reduced below current standards in new residential buildings
Legislation	Labelling of Household Appliances as stipulated by EU directives was transposed into German law by act of July 1, 1997 (amended Jan. 30, 2002) and subsequent Energy Consumption Labelling Ordinance. Covers washing machines, dryers and refrigerators/ freezers since Jan 1, 1998; dishwashers since March 1, 1999; lamps since July 1999; air-conditioners and electric ovens since Jan. 1, 2003. Additional Ordinance on Maximum Energy Consumption in effect since June 13, 1998. Participation of manufacturers and dealers in European “Energy+” project.	On-going	N/A	Specific energy consumption of household appliances reduced
Information/ Awareness	Campaign to enforce the implementation of labelling of household appliances at the point-of-sale by the German Energy Agency	On-going since 2002	About 225,000 €	
Funding	Market Incentive Programme for Renewable Energies; supports the use of renewable energies, above all in the heat market (solar collectors); launched on 01.09.1999 and runs until 2004. Grant of 125 €/m ² for solar collectors in 2003, 110 €/m ² in 2004.	On-going	Up to 2002 funds of 445 million € were appropriated. 2003: 190 m €, 2004: 200 m €, 2005: 220 m €,	Reduced input of conventional energy sources for low-temperature needs; substitution of oil, gas and electricity by renewable energies

RESIDENTIAL SECTOR TYPE OF INSTRUMENTS	PROGRAMME DESCRIPTION AND AIMS	IMPLEMENTATIO N STATUS	BUDGET IN US \$*	(EXPECTED) RESULTS
			2006: 230 m €	
Information	Solar Heat Campaign “Initiative Solarwärme Plus” ; Targeting installers and final customers; supported by solar companies, Ruhrgas, Association for Heating and Sanitation and Environment Ministry; executed by German Energy Agency.	On-going since 2002	About 750,000 €	Increasing use of solar- thermal systems
Information / Awareness	Initiative on Energy Efficiency ; Awareness and information campaign on electricity use in households especially for the point of sale, targeting stand- by consumption, white appliances and lighting; jointly carried out by electricity associations, Ministry of Economics, German Environment Foundation and the German Energy Agency	On-going since 2002	13 million €	High saving potential exploitable, for example for lighting estimated at about 75 %. Stand-by losses account for about 5 % of total electricity consumption.
Information / Awareness	Action Climate Protection ; Broad campaign targeting private consumers with practical hints for energy saving and background information on climate change issues; carried out by German Energy Agency	On-going since 2002	About 2.85 million €/a	Support of national Climate Protection Programme by raising general awareness
Information	Energy hotline and Internet information platform ; Call-Centre for information on rational use of energy in the electricity and building sector, on cogeneration and renewable energies supported by an additional website; carried out by German Energy Agency (dena).	On-going since 2001	about 0.3 million €/a	Support measure for funding programmes mainly in the residential sector
Information / Advice	Stationary and mobile energy saving advisory services by consumer associations ; supported by Ministry of Economics.	On-going	4.5 million €/a	Increase awareness and knowledge of private energy consumers
Information	Various brochures on energy-efficient new buildings and heating ; published by dena and the Federal Ministry of Building	On-going	N/A	Dissemination of information mainly for private home- owners
Information/ Awareness	Campaign “Future House” ; Awareness and information campaign on energy-efficient renovation and modernisation	In preparation	13 million € for 2002- 2004	Attracting additional investment into efficient modernisation of buildings

RESIDENTIAL SECTOR TYPE OF INSTRUMENTS	PROGRAMME DESCRIPTION AND AIMS	IMPLEMENTATIO N STATUS	BUDGET IN US \$*	(EXPECTED) RESULTS
	of buildings, involving owners, technicians and planning experts; carried out by dena in co-operation with private sector			
Preparation of legislative initiative	Energy labelling and certification for existing and new buildings	On-going	--	Establishing a market tool for effective marketing of energy-efficient buildings and implementation of the EU Directive on Buildings
Advice/awareness	Low energy standard houses within building stock; Carried out by dena and the German industry	In preparation	N/A	Implementation of super-efficient standards of new buildings within the existing building stock

5.3 Industrial

Table 5.3 Measures and instruments in the industrial sector

INDUSTRIAL SECTOR TYPE OF INSTRUMENTS	PROGRAMME DESCRIPTION AND AIMS	IMPLEMENTATIO N STATUS	BUDGET IN US \$*	(EXPECTED) RESULTS
Legislative Instrument; mandatory	Energy Industry Act (EnWG) of 24.04.1998; law on power and gas supply; rules for an economical and rational use of energy	In force	No state budget involved	Liberalisation of the electricity and gas market, cost-effective power generation
Voluntary agreement	In 1995 first voluntary agreement signed by 14 industrial sectors to increase energy savings and reduce CO ₂ emissions. These sectors cover two-thirds of industrial energy consumption. Results are evaluated and monitored by an independent research institution.	Updated	Costs to be covered by industry	Objective: reduction of specific CO ₂ emissions or specific energy consumption by up to 20 % between 1987 and 2005
Voluntary agreement	In March 1996 the German industry updated the voluntary agreement in the frame of its "Declaration on Global Warming Prevention". The agreement now covers more than 70 % of industrial energy consumption and 99 % of public electricity production.	Updated	Costs to be covered by industry	Objective: reduction of specific CO ₂ emissions or specific energy consumption by 20 % between 1990 and 2005. CO ₂ -mitigation target achieved by most industrial branches in 2000 (last monitoring report)
Voluntary agreement	A further update of the voluntary agreement for climate protection was concluded in November 2000, incorporating the commitment to support the expansion of CHP (followed by commitments of	In force	N/A	Reduction of specific CO ₂ emissions by 28 % by 2005 compared to 1990. Reduction of all greenhouse gases named in the Kyoto Protocol by 35 % by 2012 relative to 1990.

INDUSTRIAL SECTOR TYPE OF INSTRUMENTS	PROGRAMME AND AIMS	DESCRIPTION	IMPLEMENTATIO N STATUS	BUDGET IN US \$*	(EXPECTED) RESULTS
		individual branches of industry).			
Legislative Instrument; mandatory	Cogeneration Act of 19.03.2002; Law on sustaining, modernising, and expanding cogeneration.		In force	N/A	Reduction of CO ₂ emissions by 10 million t by 2005 and 23 million t by 2010. Securing the existence of CHP and increased use of cogeneration; energy saving potential 12-15 % in comparison to separate production of heat and electricity.
Legislative Instrument; mandatory	The Small-Scale Combustion Plant Ordinance (1. BimSchV) of 14.03.1997, updated 27.07.2001; limits heat losses and pollution levels for small ¹⁰ combustion facilities. Moreover it defines the heat loss requirements in new gas fired heating systems. Heat losses in existing facilities must be reduced to these levels after a transitional period.		In force	Costs carried by users	Reduced heat losses through continuous maintenance and control and replacement of out-dated systems
Financial incentive	KfW Environment Programme ; supplements the above mentioned voluntary agreements by low interest loans for SMEs investing in energy savings.		On-going	N/A	Incentive for energy saving investments in SMEs.
Financial incentive	ERP - Environment and Energy Saving Programme ; supports energy saving measures, the rational use of energy and the use of renewable energy sources by granting soft loans to SMEs.		On-going	N/A	Incentive for energy saving investments in SMEs
Financial incentive	DtA Environment Programme ; provides capital for investments in environment protection measures. Operated by the Deutsche Ausgleichsbank it is to be seen as a complement to the ERP - Environment and Energy Saving Programme. Up to 100 % of investment costs for energy saving measures could be funded for SMEs by soft loans.		On-going	N/A	Incentive for energy saving investments in SMEs
Financial incentive	The DtA Environment		On-going	N/A	Incentive for energy saving

¹⁰ Heat output less than 1 MW for solid fuels, less than 5 MW for liquid fuels and less than 10 MW for gaseous fuels.

INDUSTRIAL SECTOR TYPE OF INSTRUMENTS	PROGRAMME DESCRIPTION AND AIMS	IMPLEMENTATION STATUS	BUDGET IN US \$*	(EXPECTED) RESULTS
	Guarantee Programme; targeting producers of energy saving (and environment protection) technologies. The programme offers soft loans and guarantees for SMEs of up to 80 % of the loan.			investments in SMEs
Financial incentive	Environment Ministry Programme for the Support of Demonstration Projects; Programme to support energy saving, the rational production of energy and the use of renewable energy sources with soft loans and investment allowances for innovative energy saving technologies of SMEs.	On-going	N/A	Incentive for pilot energy saving investments in SMEs
Information / Advice	German public utilities support a number of “ demand side management (DSM) projects ”. These DSM projects consist mainly of advising consumers on energy savings.	On-going	N/A	Information for final electricity and gas consumers on energy saving equipment and behaviour
Information	Information campaign on energy and cost efficient provision of compressed air in industry and service sector; run by German Energy Agency, Association of Machinery Manufacturers and Fraunhofer Institute	On-going since 2001	About 1.5 million €	Technical saving potential of 48 % and economic saving potential of 30-35 %

5.4 Services

Table 5.4 Measures and instruments in the services sector

SERVICE SECTOR TYPE OF INSTRUMENTS	PROGRAMME DESCRIPTION AND AIMS	IMPLEMENTATION STATUS	BUDGET IN US \$*	(EXPECTED) RESULTS
Financing measure	The Federal Government has initiated third-party financing projects in order to implement energy-saving and energy efficiency measures in its own properties. Before that, several Länder like Hesse, Baden-Wuerttemberg, Berlin had already implemented such schemes. Others like Bavaria, Brandenburg, North-Rhine/Westphalia, Rhineland-Palatinate and Thuringia are looking into similar projects.	On-going	Costs are split between owners and energy service companies	Exploiting energy saving potential in the public and private sector with external financial and technical support.
Financial Incentive	To promote energy saving in schools some Länder have implemented special incentive programmes. Most popular are the so called fifty/fifty projects : all costs saved by energy saving measures are shared equally between the respective school and the school authority.	On-going	No costs	Stimulating the participation of students and teachers in saving energy
Information	The German Länder (or their energy agencies) have published a whole series of Energy Saving Guidelines for various applications, like administration buildings, hospitals, sports centres, manufacturers, and technologies (heating, lighting, electricity use etc.). They usually can be ordered from the relevant Länder ministries or they are ready for download via the Internet.	On-going	N/A	Dissemination of technical know-how among public and private actors
Training / Education	Some energy agencies have set up so-called Impulse Programmes to facilitate the training of professionals, like industrial energy managers, architects, plant operators, municipal officers etc.	On-going	N/A	Enhancing know-how on energy saving design, construction and operation among professionals

SERVICE SECTOR TYPE OF INSTRUMENTS	PROGRAMME DESCRIPTION AND AIMS	IMPLEMENTATION STATUS	BUDGET IN US \$*	(EXPECTED) RESULTS
Information / Advice	A growing number of municipalities employ specialised energy managers for energy bookkeeping, operation and supervision of all aspects related to energy use in the public sector.	On-going	N/A	Detecting and exploiting energy saving potential in the public sector
Self-commitment	Reduction of energy-related CO ₂ emissions by 25 % by 2005 and by 30 % by 2010 (base year 1990) for all federal ministerial buildings; Federal Environment Ministry will reduce by 30 % by 2005.	On-going	N/A	Energy saving at government level (includes purchase of green electricity); pilot model for other administrations
Information	Guideline for sustainability in federal buildings, including energy criteria.	Published in 2001	--	Coping with the commitment of the federal ministries to reduce CO ₂ emissions in federal buildings
Advice	Preparation of tenders for energy services in federal buildings; dena	On-going since 2002	300,000 € in 2003	Support for introduction of energy services in federal buildings in order to reduce energy consumption

5.5 Transport

Table 5.5 Measures and instruments in the transport sector

TRANSPORT SECTOR TYPE OF INSTRUMENTS	PROGRAMME DESCRIPTION AND AIMS	IMPLEMENTATIO N STATUS	BUDGET IN US \$*	(EXPECTED) RESULTS
Legislative instrument	Motor Vehicle Tax Act; In March 1997, the German Parliament adopted an amendment. It allows for the differentiation of the motor vehicle tax according to the emission performance (promotion of vehicles with lower fuel consumption).	In force	Costs carried by users	Incentive for purchase of low-emission and less fuel-consuming cars - 1 million t CO ₂ emission expected in 2005 (against 1990)
Voluntary agreements	In a voluntary agreement between the German Government and the automobile industry, the industry committed itself to reduce the fuel consumption of new cars produced and sold in Germany by 25 %.	On-going	N/A	-4 to 7 million t CO ₂ expected in 2005 (against 1990); -10 million t CO ₂ by 2010 Average consumption for new cars down to 6 l/100 km in 2005
Legislation	Act on the Introduction of Mileage-based Toll for the Use of Motorways by Heavy Goods Vehicles of 12.04.2002; A new mileage and emission based toll system, which is planned to be started in 2004	In force; toll system being established	Costs carried by users	Change of transport modes, shift from road to rail Improved internalisation of environmental and infrastructural costs -5 million t CO ₂ expected in

TRANSPORT SECTOR TYPE OF INSTRUMENTS	PROGRAMME DESCRIPTION AND AIMS	IMPLEMENTATION STATUS	BUDGET IN US \$*	(EXPECTED) RESULTS
				2005 (against 1990)
Legislation	Regular controls of emissions for all kinds of motor vehicles have been mandatory since 1993.	In force	Costs carried by users	Lower energy consumption and emissions
Legislation	The “ Municipal Transport Financing Act ” (GVFG) of 27.04.2002 and the “ Regionalisation Act ” contain provisions for financial assistance for investments to improve traffic and transport in local communities.	In force	> 8 billion €/a	Change of modal split in favour of public transport
Financial instrument	In the framework of the “ Future Investment Programme ” the German Government decided to invest an additional 3.1 billion € in railway infrastructure in order to reduce greenhouse gas emissions and energy consumption in the transport sector.	In force	3.1 billion € from 2001 to 2003	Gaining higher acceptance among potential passengers by higher comfort and speeding up connections
Education/training	Drivers’ training: in co-operation with the automobile industry as well as car and environmental associations the German Government implemented a broadly designed information campaign for good and energy-efficient driving habits. Requirements for energy-efficient driving within the curricula of driving schools have been enhanced. The German Council for Traffic Safety has participated in the European Project “Eco-drive” in 1998-2000 and offers training courses on energy-efficient driving.	On-going	N/A	Lowering consumption of motor vehicles
Information	Information on fuel consumption and CO₂ emissions of motor vehicles as stipulated by EU directive 1999/94/EC. The Energy Consumption Labelling Act has been amended for provision of such information; subsequent ordinance in preparation	In preparation	N/A	Further reduction of fuel demand in transport by purchasing of new cars with specific low consumption (Shell: average of 3.7 l/km achievable in 2020) Annual publication of information on consumption and CO ₂ emissions of all new cars on the German market
Fiscal incentive	Emission-oriented take-off and landing fees for	Proposed	N/A	Curbing further air traffic growth rates

TRANSPORT SECTOR TYPE OF INSTRUMENTS	PROGRAMME AND AIMS	DESCRIPTION	IMPLEMENTATIO N STATUS	BUDGET IN US \$*	(EXPECTED) RESULTS
	German airports				
Fiscal incentive	Emission-related and distance-related levies for aviation sector in Europe		Proposed	N/A	Curbing further air traffic growth rates
Fiscal incentive	Tax deduction for commuters; amended so that all traffic participants are treated equally.		In force	N/A	Reducing individual traffic in favor of public and non- motorised transport.

Summary Table IV Measures and instruments

Type of instruments can include:

1 = information/ awareness (brochures, handbooks, consulting, advice centres etc)

2 = education/training/advisory (consultancy, training on the job, audits)

3 = voluntary (declarations of intent, sector agreements, certification)

4 = research and development (basic research if clearly oriented to energy efficiency in specific sector, applied research, experimental development)

5 = financial (subsidies, loans, fiscal measures, third party financing)

6 = normative/legislative (laws, permits, labelling, standards, inspections)

Please indicate with a mark (x) per sector which kind of measures is applied.

	1	2	3	4	5	6
Residential	x	x		x	x	x
Industry	x	x	x	x	x	x
Services	x	x			x	
Transport	x	x	x	x	x	x
Covering some sectors	x	x		x	x	x

6 ACTORS IN ENERGY EFFICIENCY

Table 6.1 Intermediary organisations in the residential sector

RESIDENTIAL SECTOR INTERMEDIARIES	INTEREST IN KEYWORDS	ACTIVE ROLE IN EE (YES/NO)	IF YES, WITH WHICH INSTRUMENTS
German Energy Agency (dena)	Assisting in achieving national targets	yes	Offering information and advice services for households, building owners etc.; implementation of information and awareness campaigns
Regional and Local Energy Agencies	Assisting in achieving regional or local targets	yes	Offering information and advice services for households, building owners etc.
Consumer associations	Protection of consumer interests	yes	Providing energy advisory service for general public
Tenants associations	Protection of tenants rights; social responsibility	yes	Offering advisory services, mainly on heat consumption, billing and saving
Association of Energy Consumers	Information of members; lobbying	yes	Publication of regular magazine, Internet information, seminars etc.

Table 6.2 End users in the residential sector

RESIDENTIAL SECTOR, END CONSUMERS	INTEREST	ATTITUDE	ABILITY
Real estate companies	Offering low-cost housing in a competitive market	positive	Participation in pilot programmes on low- and passive-energy housing
Housing associations	Reducing operational costs of dwellings (mainly for heating)	mainly positive	Dissemination of information to tenants, influence on building rehabilitation measures

Table 6.3 Intermediary organisations in the industrial sector

INDUSTRIAL SECTOR INTERMEDIARIES	INTEREST IN KEYWORDS	ACTIVE ROLE IN EE (YES/NO)	IF YES, WITH WHICH INSTRUMENTS
Consulting companies	Selling auditing services and planning of EE measures	yes	Providing professional services and external know-how
Regional energy agencies	Assisting in achieving regional targets; strengthening of industrial competition	yes	Providing initial audits and information on no-cost or low-cost basis

Table 6.4 End users in the industrial sector

INDUSTRIAL SECTOR, END CONSUMERS	INTEREST	ATTITUDE	ABILITY
Equipment Manufacturers	Increasing competitiveness	mainly positive	Technological improvement of energy consuming equipment, stimulated by labelling schemes

Table 6.5 Intermediary organisations in the services sector

SERVICES SECTOR INTERMEDIARIES	INTEREST IN KEYWORDS	ACTIVE ROLE IN EE (YES/NO)	IF YES, WITH WHICH INSTRUMENTS
Energy agencies and private energy advisors	Assisting in achieving targets in the public and service sector	yes	Providing back-up for public administrations and fee-based advice for service sector
Energy service companies	Selling professional energy provision services	yes	Approaching industry and service sector with cost-effective and energy saving solutions in combination with favourable financing schemes
Energy suppliers	Raising public acceptance and competitiveness	yes	Providing energy saving information and funding.

Table 6.6 End users in the services sector

SERVICES SECTOR END CONSUMERS	INTEREST	ATTITUDE	ABILITY
Public service sector (schools, hospitals, offices etc.)	Reducing operation costs caused by energy consumption	mainly positive	Limited ability due to lack of own financial resources and know-how
Private service sector (banks, insurance companies etc.)	Reducing operation costs caused by energy consumption	positive	Exploitation of energy saving potential mainly with external assistance

Table 6.7 Intermediary organisations in the transport sector

TRANSPORT SECTOR INTERMEDIARIES	INTEREST IN KEYWORDS	ACTIVE ROLE IN EE (YES/NO)	IF YES, WITH WHICH INSTRUMENTS
Training schools for drivers	Compliance with national requirements	no	Extended curricula on energy saving driving
Association of car manufacturers	Increasing competitiveness	yes	Reduction of specific energy consumption of cars by technological innovation
Car dealers	Improved information for customers	no	Labelling on energy consumption of cars

Table 6.8 End users in the transport sector

TRANSPORT SECTOR END CONSUMERS	INTEREST	ATTITUDE	ABILITY
Local public transport systems	Gain in modal split on the local level	positive	Limited own financial resources
Railway companies	Gain in modal split	mainly positive	Limited own financial resources, depending on government budget
Air companies	Improving competitiveness	mainly negative	Limited ability beyond operating more efficient airplanes and improved logistics
Individual car owner	Spending less money on transport fuel and taxes	mainly positive	Purchase decision influenced by fuel consumption of car

7 ASSESSMENT AND FUTURE PLANS

7.1 Successful instruments

In the building sector the step-by-step tightening of statutory energy efficiency standards for new buildings since the late seventies and the parallel support for research into new technologies and pilot projects has been a viable and successful approach. The first thermal insulation ordinance (1977-1984) set the upper limit of annual energy consumption levels at 200 kWh/m², the second ordinance (1984-1995) implemented a standard of below 150 kWh/m², the third (1995-2002) of 100 kWh/m², and the current ordinance requires a standard of below 70 kWh/m². A number of programmes promoting low energy houses (so-called “passive” energy houses) have already demonstrated that an energy consumption for heating and ventilation of less than 40 kWh/m² is technically and economically feasible.

Motivated by legal requirements for the modernisation and for extension of buildings, the average energy consumption of existing buildings has dropped considerably through improvements within the building envelopes (additional thermal insulation, new windows with low heat-transfer) and in the heating system as well as through the introduction of incentives for energy saving behaviour (obligatory metering of heat consumption). As early as in the 1970s investment funding programmes focusing on the improvement in window insulation led to an enormous demand for new technology in this area.

For more than a decade Germany became the leading producer of insulated windows within the EU. Heating systems (boilers and control equipment) have been improved constantly, so that system efficiency has been raised remarkably. Stimulated by legal requirements for replacement and by financially attractive funding programmes the average age of such crucial equipment is relatively low. This is also a good example showing how implementation of stricter legal standards in a certain area, complemented by incentive programmes, can have a considerable impact on energy efficiency and at the same time create new jobs.

A suitable instrument, which has been used on a limited scale due to financial limitations, has been the so-called "on-site advice" to owners of buildings, providing advice on energy conservation measures at reduced costs.

A considerable contribution to energy efficiency improvements of the building stock comes from soft loan schemes provided by the KfW, a state-owned bank. About half of all dwellings in East Germany have been modernised and to a large extent supplied with better thermal insulation and modern heating systems with the support of these loans.

The labelling scheme for energy consumption of household appliances has also turned out very successful. The positive results have been achieved by at least two factors: first, the introduction of the label as such combined with a quick adjustment by the manufacturing industry, and second, the implementation of an effective information policy by consumer associations, utilities and advisory institutions. For most types of equipment, energy efficiency has been raised enormously, so that most products now range in the upper categories. Especially for dishwashers (50 % less electricity consumption today than in 1988) and for washing machines (110 % less) the technical improvements have been significant.

In 2001 the Federal Ministry of Economics and Technology (now Federal Ministry of Economics and Labour) commissioned a study entitled “Evaluating the Implementation of the Energy Consumption Labelling Ordinance”. The study analysed the size of the market shares

of energy-efficient "white goods"(refrigerators and freezers, washing machines, driers and dishwashers) and the extent to which manufacturers and retailers fulfil the requirement to place EU energy labels on the appliances in a way that consumers can easily see them.

The results of the study showed that, since the Ordinance was introduced in Germany, the manufacturing and sale of large, more energy-efficient household appliances (efficiency classes A and B) has increased significantly.

- Germany has now taken a leading position in the sale of energy-efficient large electrical household appliances of classes A and B.
- CO₂ emissions have been reduced by roughly 453,000 t owing to the share of more efficient appliances on the market. If the trend persists, the experts forecast a possible CO₂ reduction of just under 3.8 million t for the period 2000 to 2010.

But the study also revealed deficits in certain retail sectors with labels missing or providing incorrect information.

The development of energy efficiency standards by the Group of Efficient Appliances (GEA) for consumer electronics and office equipment is very important and should be promoted. The voluntary labelling programme for the Energy Star, set up by the European Commission Energy Star Board, has not been as successful as had been expected. Updating of standards has not been achieved as originally planned. This should be given higher priority by the EU Commission.

The Federal Environmental Agency (UBA) issues an eco-label ("Blue Angel") promoting a number of ecological as well as energy-efficient products. This label is very well known in Germany and in many other countries.

Also, eco-taxation has been a successful instrument, having reduced the fuel consumption of the transport sector since the year 2000. The Renewable Energy Act has proved to be an internationally recognised instrument for the support of renewable energies, for instance resulting in capacities to generate electricity from wind power which are the most extensive worldwide at more than 12,000 MW.

In addition, awareness raising for energy efficiency among all groups of final customers, support of marketing for new technologies (i.e. LED) and implementation of energy performance contracting in the public sector have proved successful and should be intensified.

There are positive energy saving outcomes in the public sector for the appointment of specific energy managers and the application of improved energy information systems to supervise and control consumption and billing in public properties. These measures should be enforced at a nation-wide level. Also the use of benchmarking schemes has resulted favourably in showing remarkable weaknesses and scaling priorities for action needs.

7.2 Barriers

Examples of main barriers include:

- A lack of market transparency and information on the energy demand of buildings;
- for existing buildings, statutory requirements are difficult to implement because of common rights (the owners' rights);

- difficulties in implementing the Ordinance on Energy Conservation (EnEV) at Länder level because of reduction of staff and weak approval rules for new buildings;
- a lack of knowledge among architects, planners and technicians about energy saving construction of buildings;
- a lack of financial means in the public sector and insufficient knowledge on how to handle energy performance contracting schemes (third-party financing) within the public sector;
- a high percentage of rented apartments with conflicting interests between owners and tenants (user-investor dilemma);
- insufficient knowledge on the part of customers about fuel consumption of passenger cars and about tax advantages for low-emission vehicles;
- energy efficiency is not a top priority for almost all groups of final customers;
- tariff systems do not appropriately stimulate energy efficiency measures and energy conserving behaviour (for example, there are still tariff systems in place which stimulate energy consumption by decreasing tariffs for increasing amounts of consumption);
- a lack of information about the connection between energy efficiency and climate change issues, about opportunities to change behaviour concerning energy consumption etc.;
- development of new standards for existing labels and of labels for presently non-labelled goods is proceeding too slowly;
- market competition often prevents energy-efficient solutions for consumer goods, as long as efficiency is not regarded as an additional sales argument (for example through labelling).

Some of the barriers have already been addressed in the past (see Chapter 5.), but the methods involved need to be enhanced, disseminated and systemised.

Germany is one of the few EU countries that has not yet introduced a procedure for the information on fuel consumption of cars. A respective ordinance and subsequent campaigns should be implemented as soon as possible.

7.3 Improvements

Due to its growing importance for the climate change issue the transport sector needs to be targeted more specifically. This includes mainly a drastic reduction in the specific fuel consumption of individual motor traffic through technological improvements, but also a change of the modal split (relation between different transport modes) for the transport of persons and goods. To achieve radical changes in this field, a more comprehensive energy-related and emission-related strategy is required.

In order to improve the application of the various instruments a more detailed monitoring and evaluation process seems necessary. This relates specifically to the CO₂ emission reduction targets formulated in the Climate Protection Programme of 2000 and the respective measures. It would be helpful to evaluate different measures in order to compare them and to identify the most useful and successful ones. The Federal Government has started this kind of monitoring.

Existing funding programmes for the building sector need to be closely attached to advisory services in order to stimulate the purchase or installation of best-practice technologies and to link the approval of grants or loans to the most energy-efficient solution in every individual

case. Linking the "on-site advice" of experts scheme with KfW financing programmes for the modernisation of buildings, the Federal Government has started doing this.

Of specific importance is the strengthening and expansion of national, local and regional information and advisory services, in particular for private households and small and medium-sized enterprises. The expertise of staff responsible for energy in the public sector and in enterprises needs to be further enhanced with respect to energy management and energy-efficient technologies and improvements. Energy performance contracting should be extended and be implemented also in the Federal public sector.

7.4 Recommendations

The International Energy Agency formulated the following recommendations in its latest in-depth report on Germany in 2002:

- ensure that energy intensity continues to decrease and energy efficiency to improve,
- enhance measures to address energy efficiency in buildings, particularly in existing buildings,
- develop a national energy strategy for the transport sector without delay and take into account the cost-effectiveness of measures,
- ensure adequate funding for cost-effective DENA programmes, and support its co-operation with the private sector (industrial and financial sectors) and the Länder.

In the course of the elaboration of the national strategy on sustainable development (cf. Chapter 3.1), the working group on "Energy and Climate Protection" of the Council for Sustainable Development has proposed two pilot projects to exploit further energy saving potential: the redevelopment of old buildings using low-energy building methods (40 kWh/m².a) and the application of energy efficiency contracting in Federal Government property. As for the crucial transport sector, the Council proposes to implement a pilot project for a comprehensive communications strategy to deal with sustainable transport.

In its biannual environmental report in 2002 the Expert Council on Environmental Issues (Umwelt-Sachverständigen-Rat) has expressed the following recommendation to the Government:

- continue to slowly increase the tax-rates under the ecological tax reform,
- replace in the medium term the electricity tax by a system related to CO₂ intensity,
- make the tax exemptions for the industry dependent on energy intensity of the production process and application of energy audits,
- design a tax system with benefits for public transport,
- extend the premium payment of the Cogeneration Act to large cogeneration plants and make the amount of the premium dependent on CO₂ efficiency.

To a certain extent the recommendations have been included in the agreement of the two coalition parties which form the present Government. They decided to address the following topics and to develop further some measures during the current legislative period (2002 – 2006):

- Funding programme for the construction of passive-energy houses with a total of 30,000 dwellings.

- Follow-up programme for the modernisation of the building stock with grants or tax-deductions instead of low-interest credits.
- Doubling of the solar-collector surface area.
- Reduction of the value-added tax for railway tickets to 7 %, starting in 2005.
- Substitution of short-distance flights by railway transport.
- Promotion of natural gas for motor vehicles.
- Introduction of a distance-based European emission levy on air transports.
- Charges for take-off and landing at airports according to emissions.
- Increasing share of bicycle transport.

In its final report in 2002 the Study Commission on Sustainable Energy Supply gave long-term strategic recommendations concerning objectives for a sustainable energy supply to be pursued up to the year 2020:

- to improve the macroeconomic energy productivity by 3 %/a in the next 20 years,
- to reduce national greenhouse gas emissions by 40 per cent by the year 2020,
- to increase electricity generation from renewable energy sources by a factor of 4 by the year 2020 and to increase the use of renewable primary energy sources by a factor of 3.5 by the year 2020,
- to increase electricity generation from CHP by a factor of 2 by the year 2010, and by a factor of 3 by the year 2020,
- to decrease the average specific final energy consumption of recently modernised older buildings to 50 kWh/m² by the year 2020,
- to decrease the fleet consumption of new passenger cars to between 3.5 and 4 litres per 100 km by the year 2020,
- to increase research and development expenditure for the non-nuclear energy sector by at least 30 per cent, while at the same time focusing research programmes on sustainable technologies.

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Country

REVIEW

ENERGY EFFICIENCY PROTOCOL AND RELATED ENVIRONMENTAL ASPECTS

Part II: Indicators on Energy, Energy Efficiency, Economy and Environment

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a. Introduction

Conversion of units

Units were converted to Mtoe using specific factors for the energy content of each quality of coal, oil etc. In general the net calorific value is used.

Electricity data are converted using the relationship: 1 terawatthour = 0.086 Mtoe.

b. Macro-economic data

Table b.1 Gross Domestic Product (billion USD, in 1995 prices and 1995 USD exchange rate)

The figures presented should be based on 1995 prices and 1995 USD exchange rates (use OECD data, where available).

	1990	1995	1996	1997	1998	1999	2000	2001
GDP	2221.563	2458.281	2477.114	2511.642	2560.772	2613.178	2687.828	2703.250
GDP (PPP)	1579.547	1747.900	1761.246	1785.795	1820.727	1857.988	1911.065	1922.029

Source: Energy statistics & Balances of OECD/NON-OECD countries 1998-1999, OECD/OCDE 2001 Edition

Table b.2 Number of inhabitants (millions)

	1990	1995	1996	1997	1998	1999	2000	2001
Population	79.364	81.661	81.896	82.052	82.029	82.087	82.188	82.340

Source: Energy statistics & Balances of OECD/NON-OECD countries 1998-1999, OECD/OCDE 2001 Edition

c. General Energy Data

Table c.1

	1990	1995	1996	1997	1998	1999	2000	2001
Total Primary Energy Production (Mtoe)	186.157	144.856	143.099	143.424	135.817	137.000	135.162	133.745
Net imports (Mtoe)	189.830	218.791	233.204	234.042	238.720	231.088	236.765	246.375
Total Primary Energy Supply (TPES)(Mtoe)	356.218	342.255	353.706	351.062	349.110	341.604	343.433	351.092
Total Final Consumption (Mtoe)	247.275	240.508.	250.671	248.084	247.559	243.080	242.340	246.022
Total Electricity Consumption (TWh)	455.2	451.3	458.4	461.8	466.2	467.1	490.3	501.8

Source: Energy statistics & Balances of OECD/NON-OECD countries 1998-1999, OECD/OCDE 2001 Edition

d. Sector consumption: parameters and energy efficiency indicators

Table d.1 Total Final Consumption of Energy (TFC) by end-use sector (MToe)

	1990	1996	1997	1998	1999	2000	2001
Residential	63.279	72.623	71.562	70.539	66.218	65.298	70.462
Industry	83.186	71.272	71.578	71.739	70.626	74.730	73.328
Services	28.538	28.515	25.391	24.735	23.560	22.574	24.199
Transport	60.037	64.600	65.131	66.278	68.372	67.414	66.032
Agriculture	3.081	2.738	2.722	2.754	2.703	2.767	2.714
Non-specified	2.873	5.098	5.153	4.881	4.823	4.389	4.479
Total (TFC)	247.275	250.671	248.084	247.559	243.080	242.340	246.022
TFC/GDP (toe/1000 US\$)	0.11	0.10	0.10	0.10	0.09	0.09	0.09

Source: Energy statistics & Balances of OECD/NON-OECD countries 1998-1999, OECD/OCDE 2001 Edition
NB industry non-energy use is not added to sector industry

Table d.2 Energy efficiency indicators for households: Final Consumption of the residential sector by energy source (Mtoe)

	1990	1996	1997	1998	1999	2000	2001
Total	63.279	72.621	71.561	70.539	66.218	65.297	70.462
a. Electricity	11.787	11.537	11.250	11.221	11.290	11.086	11.962
b. Heat	6.740	7.319	7.013	7.239	7.124	5.929	6.151
c. Oil products	18.402	24.216	24.894	23.917	20.256	19.829	22.614
d. Gas	14.440	24.817	22.814	23.047	22.701	23.424	24.714
e. Coal	9.723	2.507	1.871	1.248	1.053	0.945	0.890
f. Combust. Renew. & Waste	2.180	2.188	3.674	3.814	3.744	4.027	4.050
g. Others	0.007	0.037	0.045	0.053	0.050	0.057	0.081
Floor Area (1000m ²)	2774304	3054302	3106251	3153846	3201599	3245491	3289383
No. of dwellings (x 1000)	33856	36492	37050	37529	37984	38384	38682
Residential use per dwelling (toe/dwelling)	1.87	1.99	1.93	1.88	1.74	1.70	1.82
Residential use per surface (toe/1000m ²)	22.81	23.78	23.04	22.37	20.68	20.12	21.42

Source: Energy statistics & Balances of OECD/NON-OECD countries 1998-1999, OECD/OCDE 2001 Edition

Table d.3 Final Consumption of the industry sector by energy source (2001, Mtoe)

	Mining	Manufacturing							Construction	Total
		Iron and steel	Chem. and petrochem	Non-ferrous metals	Food and tobacco	Paper pulp and print	Non-metallic minerals	Other		
Coal	0.063	4.860	0.643	0.110	0.307	0.327	1.629	0.207	0	8.146
Crude oil	0	0	0	0	0	0	0	0	0	0
Petroleum products	0.089	0.054	18.614	0.135	0.875	0.220	0.997	1.751	0.453	23.188
Gas	0.137	2.468	6.825	0.818	1.951	2.072	2.601	3.732	0.171	20.775
Nuclear	0	0	0	0	0	0	0	0	0	0
Hydro	0	0	0	0	0	0	0	0	0	0
Geothermal. Solar etc.	0	0	0	0	0	0	0	0	0	0
Combust. Renew. & Waste	0	0	0	0	0	0	0	0.476	0	0.476
Electricity	0.177	2.041	4.171	1.597	1.269	1.879	1.280	7.320	0.070	19.811
Heat	0.005	0	0.245	0.008	0.076	0.048	0.027	0.516	0	0.934

Total	0.471	9.423	30.507	2.668	4.478	4.546	6.534	14.009	0.694	73.330
Value added per sector 1990 USD (USD x 10 ⁶)										
Energy/value added (PJ/USD 10 ⁶)										

Source: Energy statistics & Balances of NON- OECD countries 1998-1999, OECD/OCDE 2001 Edition
NB industry non-energy use is not added to sector industry

Table d.4 Final Consumption of Services (commercial and non-commercial) by energy source (Mtoe)

Service sector	1996	1997	1998	1999	2000	2001
Total	42.177	39.816	39.004	37.864	34.899	36.200
a. Electricity	9.161	9.268	9.569	9.804	9.964	9.999
b. Heat	0	0	0	0	0	0
c. Oil products	19.996	18.189	17.750	16.678	13.983	14.945
d. Gas	11.633	11.115	10.835	10.683	10.272	10.551
e. Coal	1.358	1.211	0.813	0.664	0.636	0.647
f. Combust. Renew. & Waste	0	0	0	0	0	0
g. Others	0.029	0.033	0.037	0.035	0.044	0.58
No. of employers (mil.)						
Floor area (1000m ²)						
Value added in (10 ⁶ USD)						
Energy/value added (MJ/10 ⁶ USD)						
GJ/Employee						
GJ/m ²						

Source: Energy statistics & Balances of NON-OECD countries 1998-1999, OECD/OCDE 2001 Edition

Table d.5 Transport indicators (2001)

	Freight	Travel	Total
FC (Mtoe)	19.83	44.21	64.03
10 ⁶ Tonne-km	492.84		492.84
TFC/10 ⁶ tonne-km	40.23		40.23
10 ⁶ Person-km		916.70	916.70
TFC/person-km (TFC/10 ⁶ person-km)		48.22	48.22
Number of cars/1000 inhabitants	123.61	506.57	630.18

e. End-use energy prices for various market sectors.**Table e.1 Energy prices end use sectors 2000 (USD/toe)**

	Un-leaded gasoline 95 RON	Light fuel oil	Diesel	Heavy fuel oil	Nat Gas	Steam Coal	Electricity
Industry	x	374.54	732.87		208.81	..	471.55
Households (Incl. 16 % VAT)	1159.21	434.50	849.54		414.90	..	1402.85
Electricity generation	x	x	x		170.49	67.86	x

* Gross calorific value

Source: Energy prices & taxes, quarterly statistics OECD/IEA

Note: Please indicate the exchange rate used if figures need to be updated/corrected.

f. CO₂ emissions

Please complete the following table on CO₂ emissions. If available please supply the data on emissions per sector as well.

Table f.1 CO₂ emissions

	1990	1996	1997	1998	1999	2000
Total CO ₂ emissions (Mtonnes/year)	964.14	908.36	879.68	861.86	830.66	832.95
Share residential sector (%)	13.3	15.6	15.5	15.3	14.3	14.3
Share industrial sector (%)*	61.4	57.4	57.6	57.4	57.3	58.3
Share transport sector (%)	16.6	18.7	19.4	20.1	21.5	20.9
Share other (%)	8,7	8,3	7,5	7,2	6,9	6,4
Total CO ₂ /GDP (kg CO ₂ per 1995 US\$)	0.42	0.37	0.35	0.34	0.32	0.31
Total CO ₂ /capita (tonnes/inhabitants)	12.15	11.09	10.72	10.51	10.12	10.14
Total CO ₂ / TFC (tonnes/toe)	3.90	3.62	3.55	3.48	3.42	3.44

* Industrial sector including energy and heat producing sector