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# First Monitoring Report “Energy of the future”

Summary

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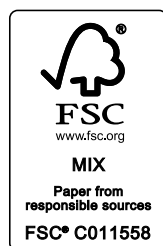
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# Summary

With its Energy Concept of September 2010 and its energy policy decisions taken in June 2011, the German government set itself the goal of making Germany one of the most energy-efficient and environmentally sound economies in the world while maintaining competitive energy prices and a high level of prosperity. There is huge international interest in Germany's Energiewende – the transformation of its energy system – especially in Europe.

The monitoring report shows that the German government has already made good progress in implementing this transformation. Energy consumption is falling, renewables are playing an increasingly large role in energy supply, greenhouse gas emissions are decreasing and a reliable electricity supply is guaranteed despite the shutdown of eight nuclear power plants. The foundations have been laid for an accelerated expansion of the electricity grids. One challenge that remains is the burden of rising energy prices. This is primarily due to global market prices for crude oil, natural gas and coal, which rose to record levels in 2011, the year covered by the report. In the case of electricity, the increasing surcharge under the Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz, EEG) also contributes to price increases. During implementation of the Energiewende the German government will focus on ensuring that the costs of energy supply can be contained.

In their opinion on the first monitoring report the independent members of the expert commission on the monitoring process highlight further need for action as well as progress made. The German government attaches great importance to the commission's comments and suggestions and thanks it for the input to date.

## 1. The monitoring process “Energy of the future”

Transforming the energy system is a major challenge, but it also opens up a number of opportunities. The Energiewende has ambitious goals and covers a broad cross section of policies. It breaks new ground in many areas. This is why it is important to monitor this development continuously and closely. To this end, the German government established the monitoring process

“Energy of the future” in autumn 2011. This process regularly reviews implementation of the measures contained in the Energy Concept and progress towards goal achievement. It is a long-term process. An *annual monitoring report* outlines the facts and status of implementation of measures. This first report takes stock of implementation to date. A detailed progress report will be published every three years, starting in 2014. The progress report will be based on a comprehensive data basis compiled over several years. It will provide an opportunity for more detailed analyses. The monitoring process has scientific support – an independent commission comprising four renowned energy experts advises the ministries.

## 2. Energy policy targets

The guiding principle of German energy policy remains a reliable, economically viable and environmentally sound energy supply. The German government has set out these three elements in its Energy Concept and within the framework of the Energiewende with a range of ambitious targets (see table).

## 3. Measures to implement the Energiewende

To achieve the ambitious energy and climate targets, major efforts are needed to lower energy consumption in all sectors, tap efficiency potential, further expand renewable energies, ensure the restructuring of Germany's power plants and advance the expansion of the grids.

Around 160 measures have been launched since the adoption of the Energy Concept. Many of them were implemented within a short period of time. The key measures include far-reaching legislative projects, for example:

→ For **grids**, the amended Energy Industry Act (Energiewirtschaftsgesetz) and the Grid Expansion Acceleration Act (Netzausbaubeschleunigungsgesetz) in 2011 laid the foundations for coordinated grid planning and for accelerating planning and licensing procedures. The transmission system operators – following broad public participation – presented

Table: Targets of the Energiewende

	2011	2020	2050		
<b>Greenhouse gas emissions</b>					
Greenhouse gas emissions (compared with 1990)	-26.4%	-40%	2030 -55%	2040 -70%	2050 -80% to -95%
<b>Efficiency</b>					
Primary energy consumption (compared with 2008)	-6.0%	-20%	-50%		
Energy productivity (final energy consumption)	2.0% per annum (2008–2011)	2.1% per annum (2008–2050)			
Gross electricity consumption (compared with 2008)	-2.1%	-10%	-25%		
Share of electricity generation from combined heat and power plants	15.4% (2010)	25%	-		
<b>Buildings</b>					
Heat requirement	no data	-20%	-		
Primary energy requirement	no data	-	around -80%		
Rate of modernisation	approx. 1% per annum	Doubling of levels to 2% per annum			
<b>Transport</b>					
Final energy consumption (compared with 2005)	approx. -0.5%	-10%	-40%		
Number of electric vehicles	approx. 6,600	1 million	2030 6 million	-	
<b>Renewable energies</b>					
Share in gross electricity consumption	20.3%	at least 35%	2030 at least 50%	2040 at least 65%	2050 at least 80%
Share in gross final energy consumption	12.1%	18%	2030 30%	2040 45%	2050 60%

the first grid development plan. The Federal Network Agency approved the plan in November 2012.

- The grid connection of **offshore wind farms** is one particular focal area. Here, too, an amendment to the Energy Industry Act will ensure significant improvement in framework conditions – for greater investment security and improved coordination of grid expansion and the setting up of wind farms. The amended act regulates liability issues with regard to grid connection. It also lays the foundations for drawing up and implementing an offshore grid development plan.
- Regarding **renewable energies**, amendments to the Renewable Energy Sources Act (EEG) have improved options for market and system integration and reduced tariffs for photovoltaics.

- In the **buildings sector**, a key area for **energy efficiency**, the German government is focussing on targeted support measures and legal frameworks. Funding for the CO<sub>2</sub> building modernisation programme was increased to 1.5 billion euros per year from 2012 to 2014. Additionally, the German government has launched a revision of the Energy Saving Ordinance (Energieeinsparverordnung), which is planned for 2013.
- Support for heat-power cogeneration in **power plants** has been made more attractive with an amendment to the Combined Heat and Power Act (Kraft-Wärme-Kopplungsgesetz).

The German government has established effective structures and work flows for **steering and coordinating the transformation of the energy system**. These ensure broad participation of all stakeholders. Key elements of this are as follows:

- The German government has set up a steering group at state secretary level, which coordinates measures and monitors their implementation;
- Energy summits are held twice a year with Federal Chancellor Merkel and the Minister-Presidents of Germany’s 16 Länder, and there are regular expert and political consultations with the Länder;
- The stakeholders concerned are involved in key aspects of the Energiewende through dialogue in the grid platform, the power plant forum and the renewable energies platform.

As part of its **energy research** the German government has, for example, carried out energy research conferences, strategic talks on research and development in the field of renewables and a dialogue with the public on energy technologies.

The German government will continue to push ahead with the Energiewende next year, in close cooperation with the Länder:

- The adoption of the Federal Requirement Plan Act (Bundesbedarfsplangesetz) and a supplementary ordinance is intended to pool planning and approval procedures for cross-Länder and cross-border grid expansion routes within the competence of the Federal government.

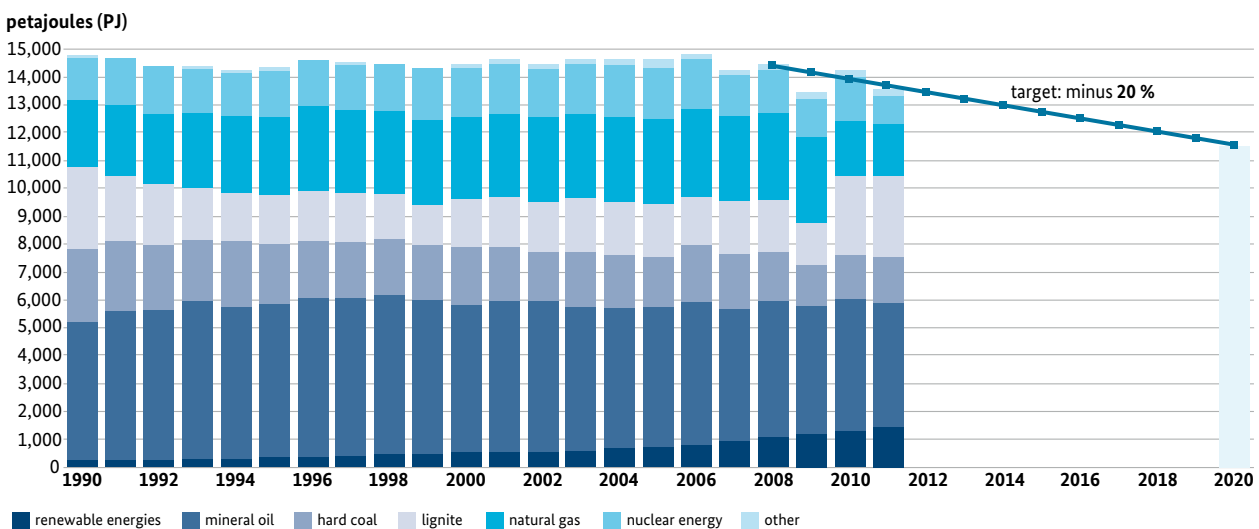
- The Federal government and the Länder have agreed to draw up a national expansion strategy for renewable energies. The goal is improved regional coordination of this expansion with stronger links to the expansion of the electricity grids. Additionally, the Federal government is working with the Länder on a comprehensive reform of the EEG.
- A further important step is the joint project of the Federal government and the Länder to draw up a coordinated proposal for a regulatory framework that guarantees a market approach to securing adequate power plant reserve capacities for the medium and long term.

#### 4. Key findings of the report

##### Energy consumption and energy efficiency

- There was a significant decrease in energy consumption in 2011 (-4.9 percent) despite a considerable rise in economic activity. Gross electricity consumption in 2011 was around 1.5 percent below the level of the previous year and 2.1 percent lower than in 2008.
- However, the comparatively mild temperatures had a positive influence on both developments.

**Figure 1: Development in primary energy consumption according to energy sources**



Source: Working Group on Energy Balances (AGEB)

- Energy efficiency improved in the period 2008 to 2011 (2 percent average annual increase in final energy productivity). This trend will have to continue and accelerate in order to reach the German government's goal (+2.1 percent per year up to 2020).

- The key challenges of cost efficiency and market and system integration have already been tackled to some extent through revisions of the EEG, but a comprehensive reform of the act is needed to guide the expansion of renewables.

**Renewable energies**

- All in all Germany's expansion of renewable energies is on track. In 2011, the share of renewables in gross final energy consumption rose to over 12 percent.
- In the electricity sector the expansion of renewable energies has exceeded the minimum target. In 2011 the renewables' share in gross electricity consumption surpassed the 20 percent mark for the first time, and in the first half of 2012 the renewables' share was around one quarter.
- The promotion of electricity from renewable energies under the EEG gives rise to costs which are passed on to consumers. In 2011 the EEG feed-in volume was around 91.2 TWh. Differential costs stood at 12.1 billion euros (2010: 9.4 billion euros).

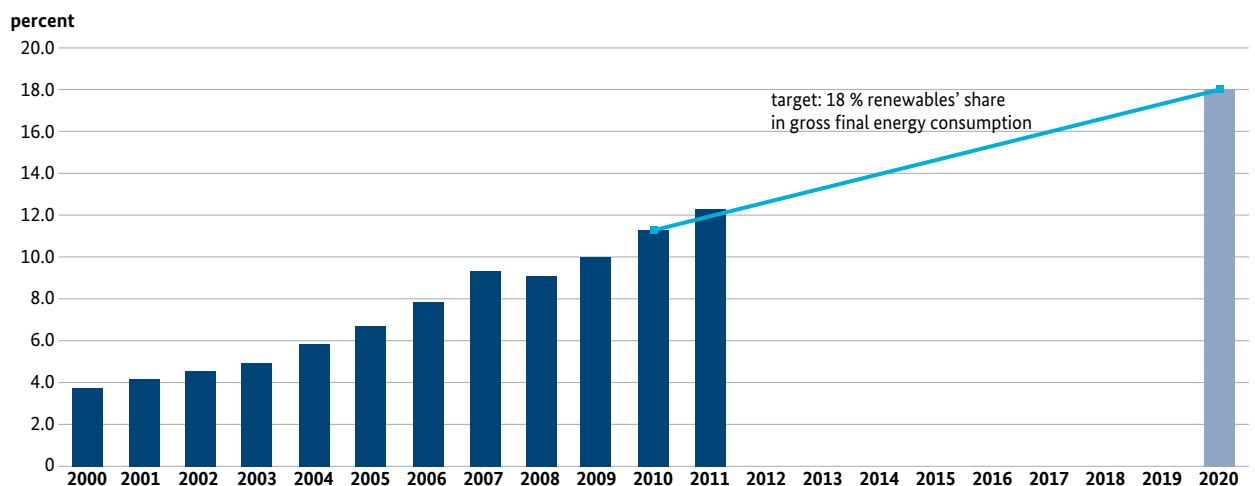
**Buildings**

- Space heating, hot water and air conditioning in buildings account for 31.1 percent of total final energy consumption. By 2011 final energy consumption in private households had fallen by around 11 percent from its highest level in 1996, despite a growth of roughly 14 percent in living area during the same period.

**Transport**

- By 2011, final energy consumption in the transport sector had declined by around 7.5 percent from its highest level in 1999, even though passenger kilometres travelled rose by around 7 percent and freight tonne kilometres by about 31 percent during the same period. One reason for consumption falling while kilometres travelled increased are improvements in energy efficiency in the transport sector. Overall, energy consumption fell by 0.5 percent compared with 2005.

**Figure 2: Development in the renewables' share in gross final energy consumption (in percent)**



Source: BMU 2012 according to AGEE-Stat. As at: July 2012

Figure 3: Grid development plan: approval by the Federal Network Agency



- From 1990 to 2010, average specific energy consumption in passenger and goods transport fell by an average 3.1 percent annually.
- Average fuel consumption of newly registered passenger vehicles and estate cars declined from 8 litres per 100 km in 1998 to 5.9 litres per 100 km in 2011. This is equivalent to an overall drop of around 26 percent over the period 1998 to 2011.

**Supply security**

- As in the previous years, in 2011 Germany’s supply of energy raw materials was not at risk.
- The electricity sector is currently undergoing radical change brought about by the shutdown of nuclear power plants with a total capacity of 8.4 GW and the intensive expansion of renewable energies.



- In 2011 supply security in Germany remained high, but the grid in southern Germany is under strain. For this reason the latest revision of the Energy Industry Act lays down new legal provisions for securing power plant reserve capacities. In addition, the Federal government and the Länder plan to draw up a coordinated proposal for a regulatory framework that will ensure a market approach to securing adequate reserve capacities for the medium and long term.
- To facilitate the switch to renewable energies and at the same time guarantee a high level of supply security, expansion of the extra-high voltage grid systems is essential. The attractive grid investment conditions offer a good foundation for this. New laws such as the Grid Expansion Acceleration Act entered into force in summer 2011 to determine the grid expansion requirement and approval procedures. The new legislation will speed up the grid expansion and lead to greater public participation. After extensive public consultations the Federal Network Agency submitted the first grid development plan which then formed the basis of the Federal Requirement Plan Act, which the German government adopted in December 2012 (see figure 3).
- Overall, Germany has one of the most reliable electricity supplies in Europe.

- In recent years, Germany has achieved a quantitative surplus in electricity exports.

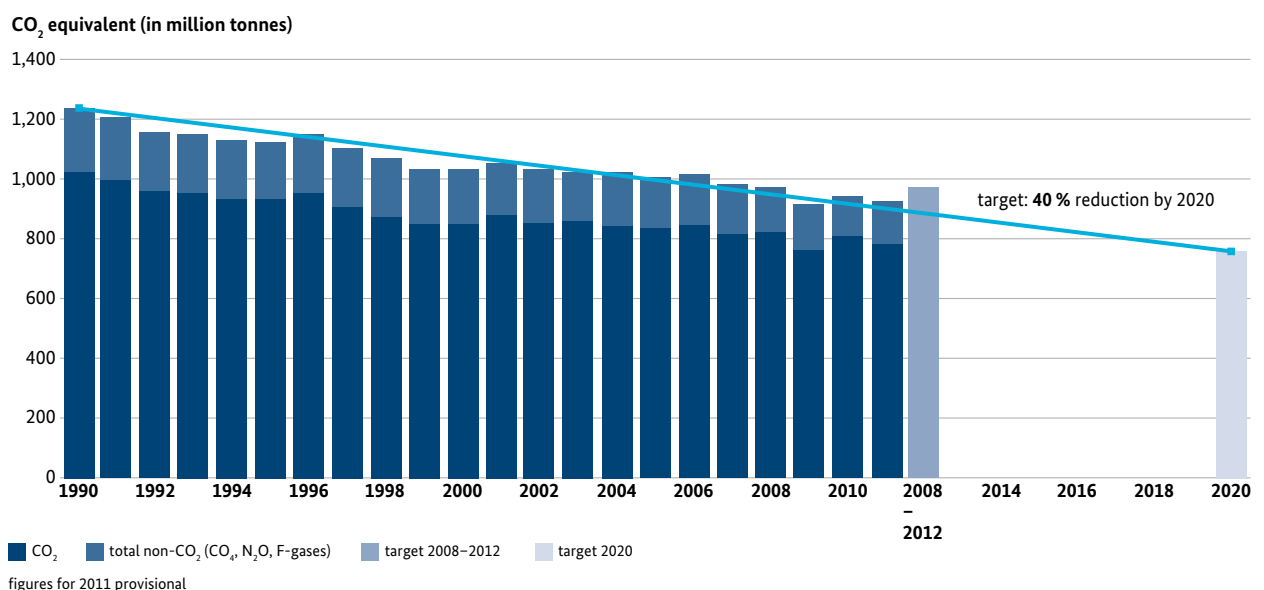
**Greenhouse gases**

- By 2011 Germany had achieved an overall reduction in greenhouse gas emissions of 26.4 percent against 1990 levels.
- At over 80 percent, energy-related greenhouse gas emissions are by far the most significant source. Other sources are industrial processes, agriculture and waste management.

**Energy prices and costs**

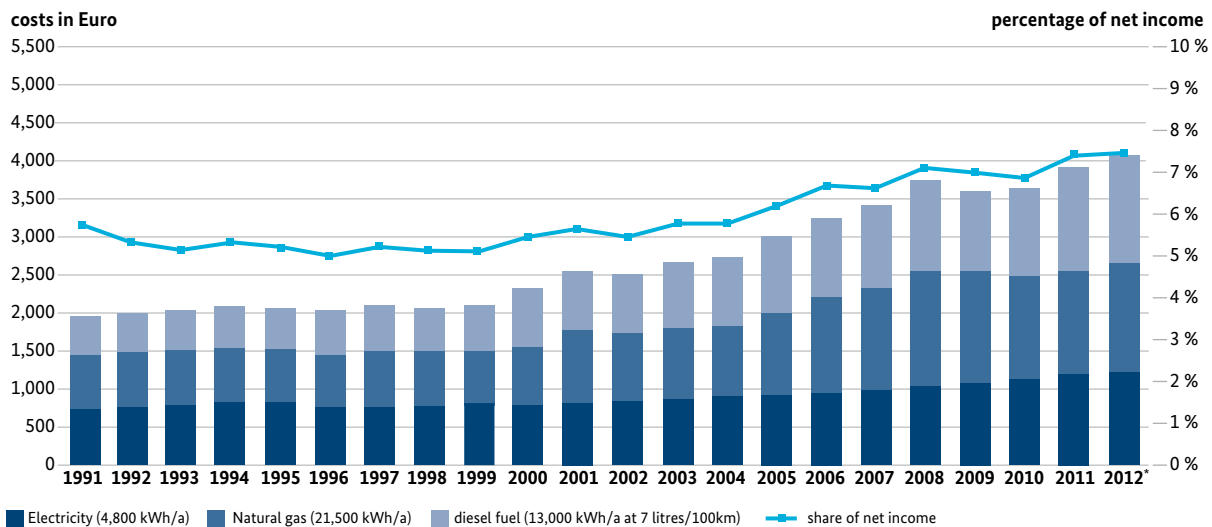
- As in previous years, in 2011 there was a considerable increase in some consumer prices for energy and hence energy costs for households and companies. The share of energy costs in national value added also rose. While in some cases the capacity to pay was stretched to its limits among certain consumer groups, on the whole the competitiveness and affordability of the energy supply was maintained.

**Figure 4: Greenhouse gas emissions 1990–2011 and targets**



- The German government is monitoring trends in energy prices and will continue to ensure that they remain affordable in the future for both private consumers and businesses.
- However, the trend towards rising energy prices and costs is apparent throughout the world. This is primarily caused by the rising prices of energy raw materials on the international markets, especially crude oil. This has led to some heavy price increases on the domestic market for fuels, heating oil and gas.
- Electricity prices also climbed considerably in 2011 compared with the previous year. Traditionally, electricity prices in Germany are higher than those of some of the neighbouring countries, and are generally above the European average. There are structural reasons for this, particularly Germany’s high level of supply security and stringent environmental and climate standards.
- In 2011 the EEG surcharge contributed to price increases for end users. However, due to greater volumes of electricity generation from renewables, wholesale prices on the electricity exchange fell in some cases. To limit the impacts of the continued renewables’ expansion on the price of electricity, the Federal government is working with the Länder on a comprehensive reform of the EEG.
- Due to the brief implementation period a full analysis of the macroeconomic impacts of the transformation of Germany’s energy system is not yet possible. Sub-indicators suggest that the transformation is having a beneficial impact on innovation, investment and employment and helping to avoid energy imports and external costs. Opposing these advantages is the dampening effect that rising electricity prices have on consumption.

Figure 5: Annual shares of energy costs in net income (Four-person sample household)



\* 2012: assumed

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