



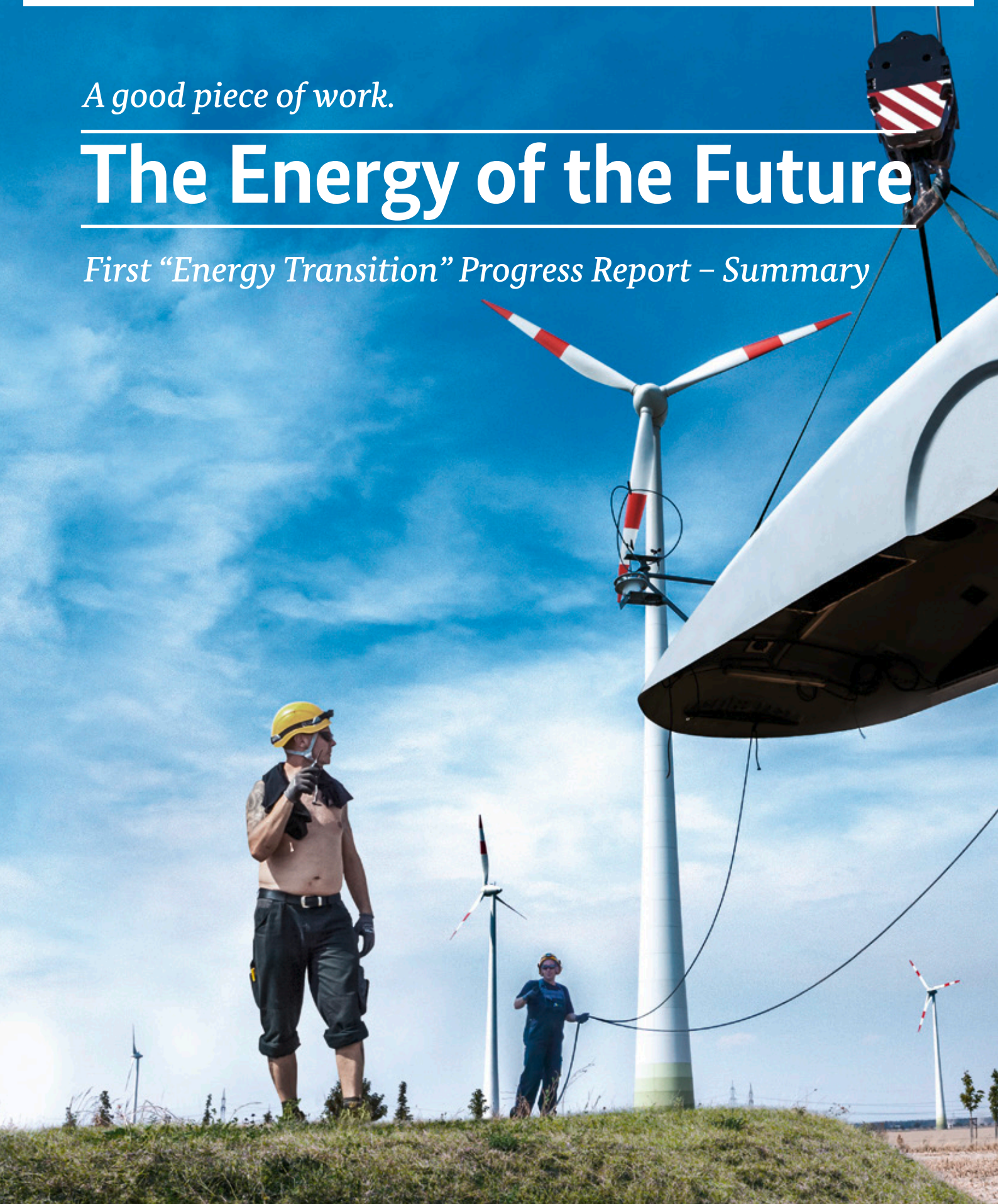
Federal Ministry  
for Economic Affairs  
and Energy

Energie **wende**  
Switch to the Future

*A good piece of work.*

# The Energy of the Future

*First “Energy Transition” Progress Report – Summary*



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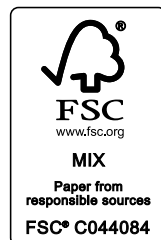
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# 1 Monitoring the energy transition

**The German government's blueprint for energy reform, commonly known as the Energy Concept, serves as the compass for steering the "energy transition" – the transformation of Germany's energy supply system to renewable energy sources.** It describes the road to a reliable, economical and environmentally compatible future for the energy supply system. Cost-effective solutions are crucial to ensuring that energy remains affordable for consumers. The motives for the energy transition are manifold: on the one hand, it aims to make it possible to phase out nuclear power. The last nuclear power plant in Germany is to shut down in 2022. The reform is also intended as an aid to achieving the country's climate change mitigation targets.

Emissions of greenhouse gases are to be reduced by at least 40 percent by 2020 and by at least 80 percent by 2050, compared to 1990. If properly managed, the energy transition can make a major contribution to modernising Germany as a centre of industry and thus boost growth and employment. Another aim is to reduce the country's dependence on oil and gas imports. Ensuring a reliable supply and keeping energy prices in check are key challenges for Germany's competitiveness as an industrial location. This in turn will be a decisive factor in determining how attractive possible imitators in other countries may find their own energy reforms. But the energy transition will only find public acceptance and emulators if it remains affordable and if

cost effectiveness and economic viability continue to be the guiding criteria.

**The energy transition is based on two pillars: renewable energy and energy efficiency.** The intention is for renewable energy sources to account for half of Germany’s energy supply by 2030. At the same time, energy is to be used even more efficiently. For the energy transition to succeed, much more importance needs to be attached to this “second pillar.” Because it is clear that the transformation of the entire energy supply system can progress in an economically, ecologically, socially and societally sustainable manner only on the basis of an ambitious efficiency strategy. Economically exploitable efficiency-boosting technologies are already available. In all sectors, energy consumption can be significantly reduced and thus energy costs effectively lowered using existing efficiency-enhancing technologies. In many cases, investing in efficiency pays off even today.

**The transformation of the energy supply system is going ahead essentially on the basis of the Federal Government’s Energy Concept as set out in September 2010 and the energy-policy resolutions adopted by Parliament in 2011.** The Government re-affirmed these resolutions in its second Monitoring Report on 8 April 2014. The basic direction of the transformation is outlined by some 20 quantitative targets for the coming years, but without giving these diverse targets a structure.

**A target architecture is put forward.** Section 2 introduces a new target architecture for the transformation of the energy supply system. It was developed by the Government on the basis of the recommendations of an expert committee following an analysis of the first two Monitoring Reports. The new target architecture prioritises and structures the objectives of the Energy Concept, paving the way for flexible and low-cost achievement of the goals. It makes it possible to optimise targets at the level of individual measures so as to attain the higher-level objectives.

**The “Energy of the Future” monitoring process essentially serves three functions: overview, evaluation and outlook.** The monitoring process thus continuously tracks the progress of the energy transition.

- 1. Overview:** the remit of the monitoring process is to provide a fact-based overview of the progress made in accomplishing the energy transition. For this purpose, the vast amount of statistical information available on the energy supply system needs to be consolidated into a manageable number of select key indicators and made accessible in an easy-to-understand format.
- 2. Evaluation:** the monitoring process continuously checks whether the targets of the Energy Concept are being met and how the measures implemented are taking effect. If it becomes apparent that targets are going to be missed, actions are proposed to achieve them.
- 3. Outlook:** the Progress Report drawn up as part of this monitoring process not only analyses for the first time where the energy transition currently stands but also outlines likely trends for the coming years. For this purpose, an academic consortium has been commissioned to make a forecast of future trends in the energy industry. On the basis of these and other inputs, the most probable scenarios are identified and recommendations for expedient action are proposed.

**The Progress Report is based on energy statistics.** Unless otherwise stated, it takes data up to 30 September 2014 into account. The data is freely available on the Internet pages of the Federal Ministry for Economic Affairs and Energy and the Federal Network Agency dedicated to the “Energy of the future” monitoring process.

**The monitoring process is being accompanied by leading academics.** An independent commission consisting of four reputable energy experts advises the Government. The commission comprises Prof. Andreas Löschel (Chair), Prof. Georg Erdmann, Prof. Frithjof Staiß and Dr. Hans-Joachim Ziesing.

## 2 Objectives of the Energy Concept

**With the energy transition the German government proposes to embark on the path towards a reliable, economical and environmentally-compatible energy supply system of the future.** The Government's Energy Concept and Parliament's resolutions are the compass by which this process is steered.

**The triangle of energy-policy objectives remains the guideline for energy policy.** By implementing the energy transition the Federal Government aims to reconcile affordability, reliability and environmental compatibility and to ensure Germany's economic competitiveness in the long term.

**The Energy Concept juxtaposes over 20 quantitative targets.** These exhibit different levels of detail and are situated at different levels. The goals range from political commitments (e.g. phase-out of nuclear power by 2022), via targets

for the energy supply system as a whole (e.g. reduction of primary energy consumption) to specific targets for different sectors.

**The Progress Report prioritises the goals.** On the basis of the recommendations of the expert committee, the Government formulates a target architecture. This architecture addresses potential conflicts between goals and creates a dependable basis for planning. At the same time it makes allowance for the different importance of the various goals.

**The target architecture distinguishes various target and steering levels.** It clarifies how the numerous specific targets interact and differentiates between the various target levels. The aforementioned guiding criteria for optimising the targets at the level of the individual measures open up possibilities for flexible and cost-effective solutions for achieving the higher-level objectives.

**The political objectives shape the context.** Climate change mitigation, the phase-out of nuclear power, ensuring a reliable supply and competitiveness establish the political framework for the transformation of the energy supply system.

**The core objectives are the key strategies to be pursued for advancing the energy transition.** As outlined in the Government’s Energy Concept, the core objectives consist of extending and expanding the use of renewable energy sources and reducing primary energy consumption and, conversely, improving energy efficiency.

**The steering goals add concrete form and detail to the core objectives for the various fields of action.** These comprise the areas of electricity, heat and transport. These steering goals are to be attained by various means.

**To achieve the higher-level objectives, paths are to be chosen that lead to cost-effective solutions and an optimally integrated system.** These are the guiding criteria for optimising the various goals. Cost-effective solutions are a prerequisite to keeping energy affordable for consumers. The Government will continue to bear this in mind.

## 2.1 Political objectives

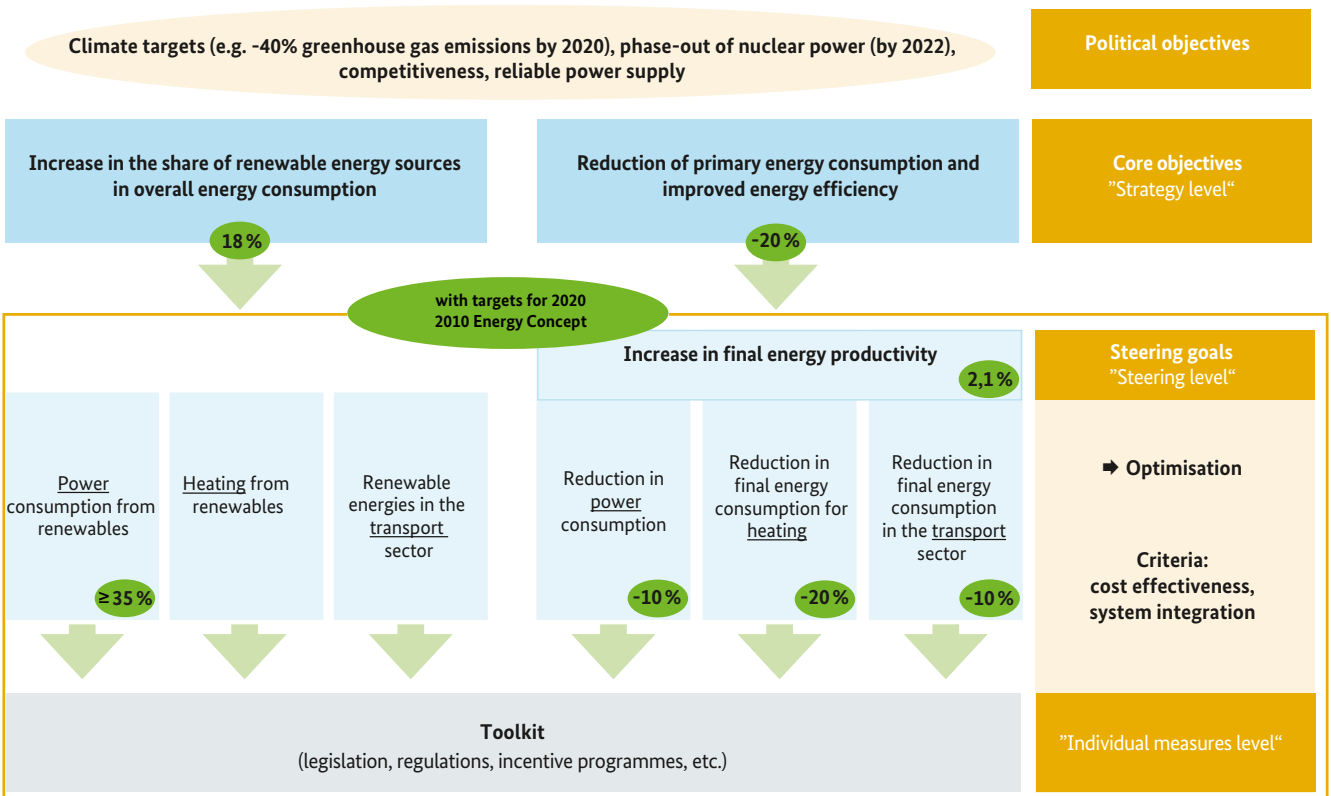
**The political objectives set the goalposts** for all efforts to put the energy reforms into practice.

### Climate change mitigation

**Ambitious climate change mitigation targets remain a key driver behind the transformation of the energy supply system.** Germany has committed to achieving ambitious greenhouse gas reduction targets in the national, European and international context. The international greenhouse gas reduction target set by the Kyoto Protocol is 21 percent by 2012 compared to 1990. Germany has over-fulfilled this target with about minus 24 percent on average over the years 2008 to 2012.

**The European greenhouse gas reduction target goes beyond 2012. It is 20 percent for 2020 and at least 40 percent for 2030 across the EU compared to 1990 levels.** Within this context Germany has set itself a national target of at least 40 percent reduction by 2020 and 80 to 95 percent by 2050 compared with the 1990 level. The German government remains committed to these national targets.

Figure : Structuring of the targets of the Energy Concept



**The European emissions trading scheme is the key instrument for combating climate change in Europe.** It is also an integral component in the transition to green energy in Germany. The intended reform is designed to improve the functioning of the European emissions trading system.

### Phase-out of nuclear power

**Germany is phasing out nuclear power.** In the wake of the Fukushima disaster, the decision was taken to phase out the use of nuclear power in a number of stages. The eight oldest nuclear power plants have been taken off line (including those plants that were not in active service at that time). The nine remaining nuclear plants will be shut down step by step by 2022.

### Competitiveness

**Economically sensible transformation of the energy supply system is a major factor in sustaining public acceptance and making the country more competitive.** The energy transition also demands financial participation by private consumers and businesses, especially as regards the cost of energy. However, it also provides opportunities for an economically efficient and affordable energy supply going forward and can potentially stimulate innovation, growth and employment. High-efficiency power plants, leading-edge technology in wind power, IT-based steering of a complex energy supply system, smart grids and smart meters, modern transmission technologies and storage – all these are technologies and capabilities that are in demand world-wide for modern energy supply systems. New business models, for instance for load management and energy efficiency, also derive from these. With its energy transition, Germany is on the way to becoming the first large industrial nation to achieve the transition to a highly efficient renewable energy supply system. In this context it is essential that a reliable energy supply is ensured at all times and that energy prices remain affordable. This is important to prevent the transition from putting energy-intensive industries faced with international competition at a disadvantage and placing an unreasonable burden on private households. Thus the Government found it appropriate as a first step to amend the Renewable Energy Sources Act (EEG) to curtail dynamic increases in the renewable energy surcharge. In a nutshell, the transformation of the energy supply system calls for certainty for business planning and investment and for cost effectiveness in implementing the energy reforms. Ensuring a reliable energy supply and keeping energy prices in check are key challenges for Germany's competitiveness as a centre of industry.

### Reliable energy supply

**A safe and reliable supply of energy at all times is indispensable for a modern industrial society.** The conversion of the energy supply system to renewable energy sources brings new challenges. These include, for example, the fluctuating generation of electricity from wind and solar power. But the transformation of the energy supply also harbours opportunities. For instance, efficiency-enhancing measures in buildings, small businesses and private households can reduce dependence on energy imports. Cross-border cooperation in the power sector of the European internal market as a whole requires less generating capacity to be kept on call than if every country were to pursue a strictly national approach. Properly exploited, these new potentials can open up new business areas and market opportunities and reduce cost.

## 2.2 Core objectives

**Renewable energy and energy efficiency are the two pillars of the energy transition.** This is also in line with the decisions of the European Council and the heads of state and government on the European energy and climate package for 2030.

**These two core objectives are broken down into steering goals in the various sectors.** In the case of the renewable energy objective, these are the proportion of renewable energy in the transport sector, heating and electricity consumption. In the context of the energy efficiency objective, they are the reduction of electricity consumption, the reduction of final energy consumption for heating in buildings, the reduction of final energy consumption in the transport sector and – derived from these goals – an increase in final energy productivity overall.

**These steering goals are what matter most.** They are optimised at the level of the specific targets and measures. This creates potential for a flexible and cost-effective implementation that achieves the higher-level objectives. Cost effectiveness and system integration are the guiding aims for optimisation at the level of the individual measures. These two criteria are intended to ensure that energy prices remain affordable and that the various fields of action optimally intermesh.



## 3 Renewable energy sources



### Where do we stand?

Germany's efforts to increase the use of renewable energy sources in the electric power sector are well on track. The proportion of the renewables in gross electricity consumption has risen by 1.7 percentage points over the previous year to 25.3 percent.

In 2013 the share of the renewable energy sources in gross final energy consumption was 12.0 percent. This breaks down over the various sectors as follows:

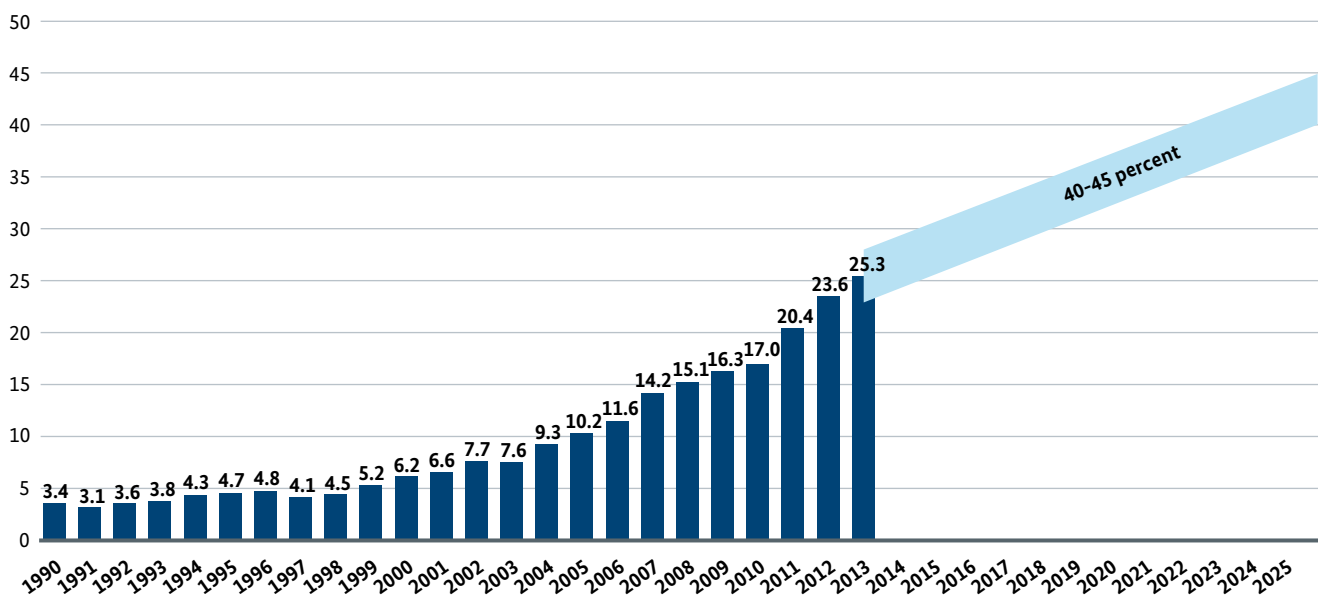
- **electricity:** the renewables have just become Germany's most important source of electric power for the first time. From the start of 2014 until August, total gross

power generation from renewable energy amounted to 109 TWh.

- **heating:** the proportion of renewable energy sources in the total heat consumption dropped slightly in 2013 to 9.1 percent. In absolute figures, however, consumption of heat from renewable source increased to 134.4 TWh in 2013.
- **transport:** the proportion of renewable energy in the transport sector in 2013 was 5.5 percent.

**The total cost of subsidies under the renewable energy incentive scheme drops for the first time.** For the first time since the Renewable Energy Sources Act (EEG) was

**Figure: Development of the share of renewable energy sources in gross electric power consumption in percent**



Source: Federal Ministry for Economic Affairs and Energy based on data from the Working Group on Renewable Energy Statistics

introduced in 2000, the amount to be re-allocated via the surcharge levied on electricity prices is to drop compared to the previous year. For 2015 it will be 21.8 billion euros. In 2013, the EEG surcharge brought in 20.4 billion euros and in 2014 23.6 billion euros.

**Accordingly, the renewable energy surcharge itself is to be reduced for the first time.** In 2015 the EEG surcharge will be 6.17 ct/kWh. Previously the surcharge had been 5.28 ct/kWh in 2013 and 6.24 ct/kWh in 2014. The 2014 amendment to the Renewable Energy Sources Act has helped to break the upward trend for 2015.

## Where do we go from here?

**The reform of the Renewable Energy Sources Act (EEG) in 2014 has made it fit for the future.** The fundamentally overhauled Act (EEG 2014) came into force on 1 August 2014.

The reform is characterised by four cardinal elements:

- 1. The corridor for expansion established in the Act makes it possible to steer the future development of the renewables more precisely.** This creates certainty for planning in the conventional energy supply system and for the future development of the electricity market. The corridor will enable the renewable energy sources to achieve a share of 40 to 45 percent in overall electric power generation by 2025.
- 2. The cost of further expansion is to be mitigated by Germany giving priority to low-cost wind and solar technologies.** This will slow down the dynamic rise in cost

observed in past years and curtail over-funding. However, because of the long-term guarantees given for feed-in tariffs, the higher subsidies from the past will continue to impact on the surcharge in future, too.

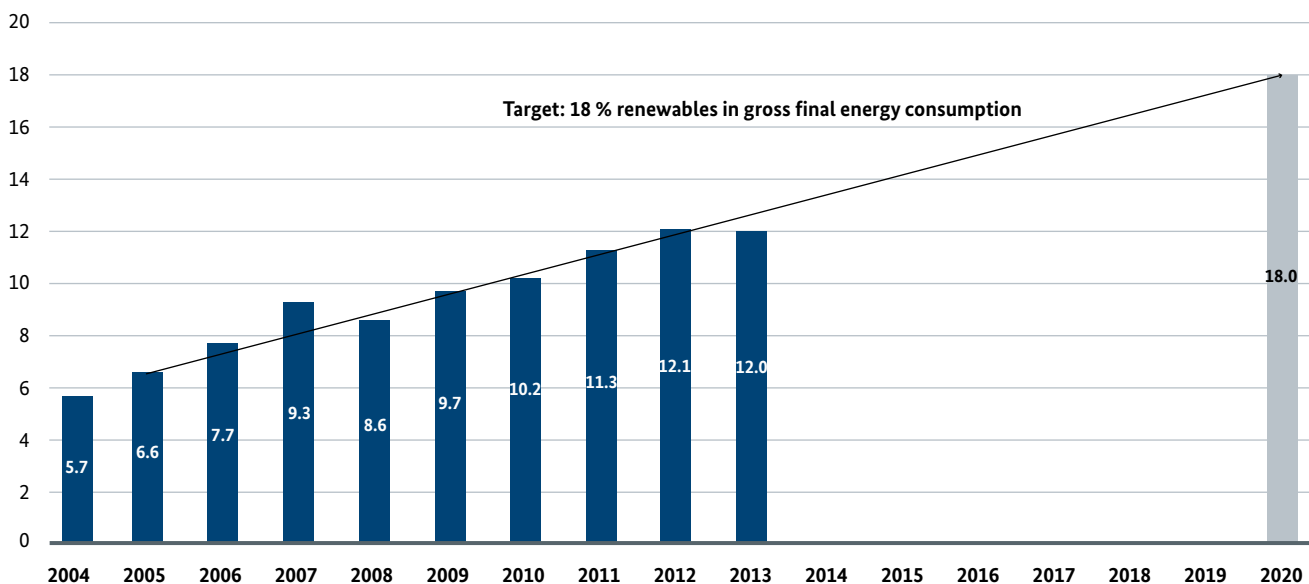
- 3. Renewable energy forms are to be better integrated into the electricity market.** The operators of large installations will in future be responsible for forecasting demand and marketing their electricity (mandatory direct marketing).
- 4. Partial extension of the renewable energy surcharge to electricity produced and consumed in-house will spread the cost of subsidies over more shoulders.** At the same time, changes to the special compensation arrangements for businesses will ensure that electricity-intensive industries will continue to be able to produce on competitiveness terms in future, too. This is important for keeping industrial value creation and jobs in Germany.

**In future the amount of assisted funding is to be determined via competitive tendering.** Assistance rates will then no longer be set in an administrative procedure but in competition. The Government expects that this approach will enable it to tap potentials for reducing the cost of further extending the use of renewable energies.

**A pilot call for tenders for photovoltaic installations on open spaces is currently in preparation.** The associated regulation is expected to come into force around the turn of the year 2014/2015.

**These points are intended to be implemented in practice in the course of 2016 with the next amendment to the Renewable Energy Sources Act.**

**Figure: Development of the share of renewable energy sources in gross final energy consumption in percent**



## 4 Energy consumption and energy efficiency

### Where do we stand?

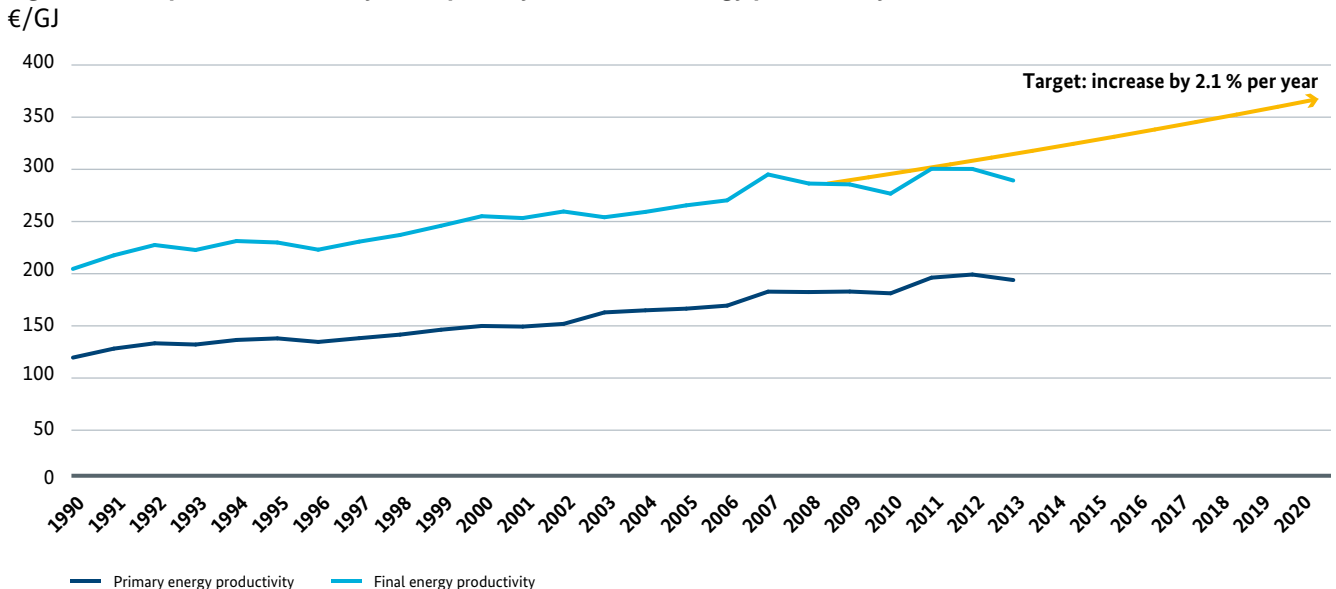
**Germany has achieved a lot in terms of energy efficiency.** A separation of energy consumption from economic growth is already apparent today.

**However, primary energy consumption increased in 2013 year on year.** The low temperatures in 2013 were the main reason for primary energy consumption rising by 2.8 percent compared to the 2012 figure. Adjusted for temperature and inventory effects, primary energy consumption in 2013 was around 1.9 percent up on the previous year's level. Compared to the reference year for the reduction target, 2008, primary energy consumption has dropped by 3.8 percent.

**In 2014, primary energy consumption has been declining compared to 2013.** According to an initial estimate by the Working Group on Energy Balances based on the first nine months, primary energy consumption in Germany will drop by 5 percent in 2014. Adjusted for the effects of the extremely mild winter, primary energy consumption in 2014 will be 2 percent down year on year.

**A significant proportion of final energy consumption in Germany is accounted for by buildings.** The harsh and long winter in 2013 pushed heating demand up in 2013 to 3,484 PJ, 0.8 percent above the figure for the reference year 2008.

**Figure: Development of economy-wide primary versus final energy productivity**



Source: Working Group on Energy Balances

### Where do we go from here?

Without further measures, the target of reducing primary energy consumption by 20 percent by 2020 compared to 2008 would be missed. On the basis of the actual improvement achieved from 2008 to 2013, a reduction in the primary energy consumption by about 7.2 to 10.1 versus the reference year 2008 can be expected by 2020. This would mean missing the target by 9.9 to 12.8 percentage points.

The National Action Plan on Energy Efficiency makes a major participation toward achieving the target set for 2020. With the National Action Plan on Energy Efficiency (NAPE), the German government has refined and complemented the instruments and actions previously available for improving energy efficiency. The measures embodied in the NAPE are expected to save 390 to 460 PJ in all by 2020 (without actions in the transport sector). This will be a major step toward achieving the target set – but further action is still needed in various areas.

The NAPE has short-, medium- and long-term impacts. It includes both priority measures that are to be implemented immediately and also a broader package of measures that are to be given concrete shape in the course of the present parliamentary term. In addition, the NAPE

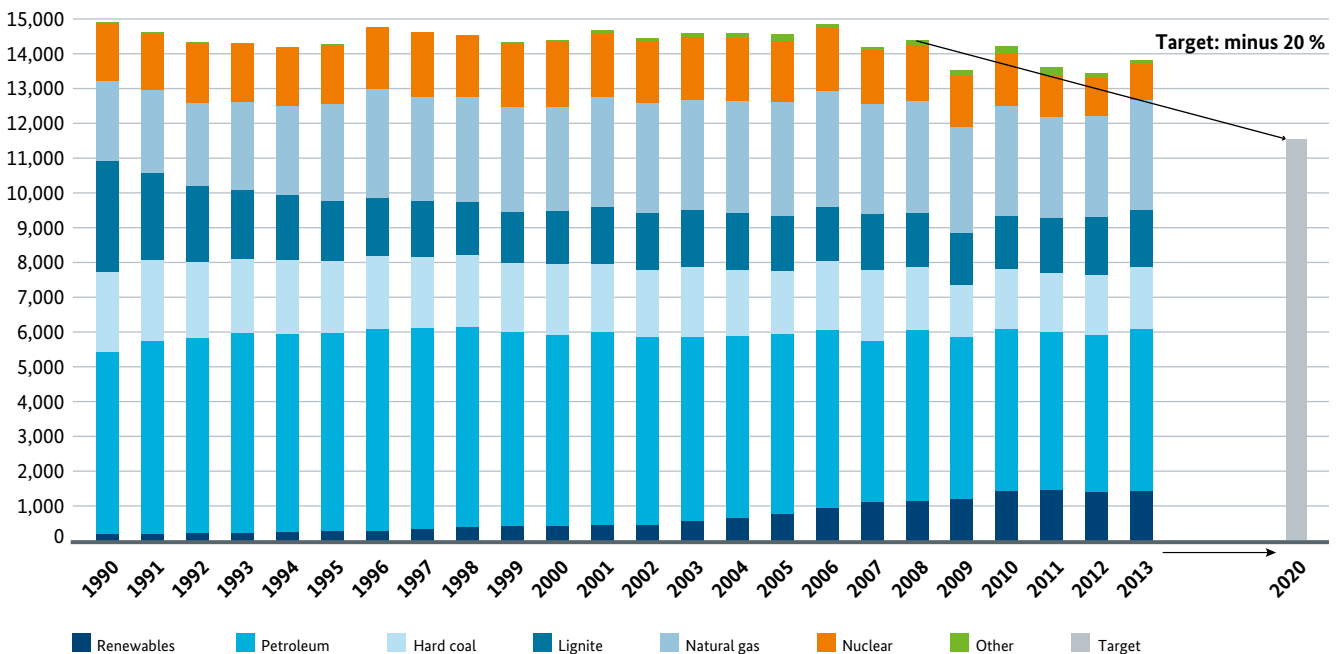
identifies long-term projects to be worked on during the remainder of the parliamentary term to ensure the ongoing refinement of the toolkit.

#### The priority measures of the NAPE include

- introducing competitive tendering for energy efficiency;
- increasing the amount of subsidised funding available for building refurbishment and introducing Federal- and State-funded tax incentives for efficiency-improving building renovations. To expedite this process, the Federal Government will be holding talks with the Länder (States) in the near future with the aim of reaching a final decision by the end of February 2015 at the latest;
- setting up energy efficiency networks together with industry and business.

The second mainstay of the NAPE is the ongoing work projects scheduled for the current parliament, including elaboration of an energy-efficiency strategy for buildings (ESG) which, alongside individual refurbishment roadmaps, also takes the functions of the buildings and the concerns of their residents into consideration.

Figure: Development of primary energy consumption by energy sources in Petajoules (PJ)



Source : Groupe de travail Bilans énergétiques

# 5 Transport

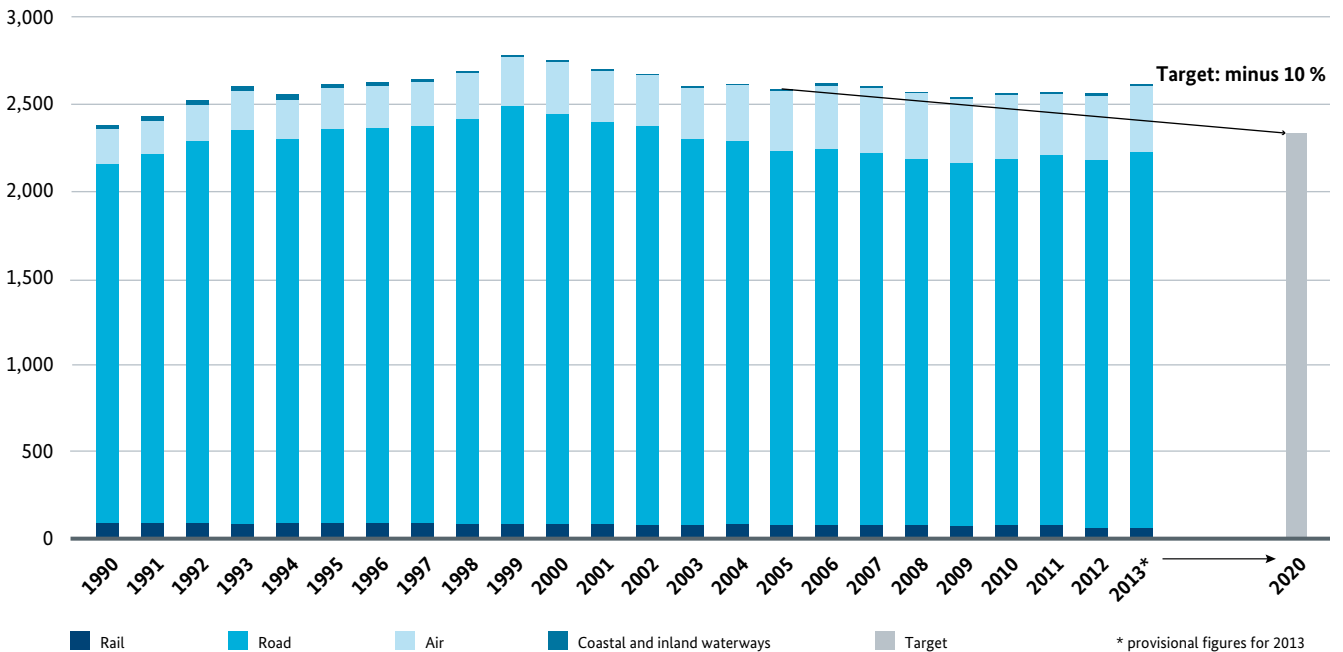


## Where do we stand?

At 2,612 PJ, final energy consumption in the transport sector in 2013 was around one percent higher than in the reference year 2005. At the same time, the passenger and freight kilometres travelled have increased by around 5 and 11 percent, respectively, since 2005. One reason for the widening gap between kilometres travelled and final energy

consumption is improving energy efficiency in the transport sector. In relation to the number of kilometres travelled in the passenger and freight sectors, specific energy consumption in the transport sector declined by just on 8 percent between 2005 and 2013 (on average 2.7 percent per year since 1990).

**Figure: Development of final energy consumption in the transport sector in Petajoules (PJ)**



Source: Working Group on Energy Balances

## Where do we go from here?

**In the transport sector significant improvements in energy efficiency are noticeable even today.** According to the Traffic Interconnection Forecast for 2030, it should be possible to reduce final energy consumption in the transport sector by just on 11 percent versus 2005 by 2030. More extensive measures would be needed to achieve any further reduction in the final energy consumption.

The National Action Plan on Energy Efficiency and the Action Programme for Climate Change Mitigation 2020 provide for concrete measures that are to become effective even before 2020. What is more, the mobility and fuels strategy (MKS) adopted by the Cabinet in June 2013 is to be continued as an important instrument for implementing the energy transition in the transport sector as part of the national sustainability strategy.

Altogether, numerous further measures are to be taken in the transport sector to help reduce final energy consumption and CO<sub>2</sub> emissions by 2020. These include

- measures in the freight sector, such as extending motorway tolls for heavy goods vehicles to other highways;
- measures to make passenger transportation more climate-friendly, such as improving local public transport services and encouraging use of bicycles and walking;
- wider use of electric propulsion systems in motor vehicles;
- over-arching measures in the transport sector;
- measures in aviation and
- supporting measures in international maritime transport.

# 6 Greenhouse gas emissions

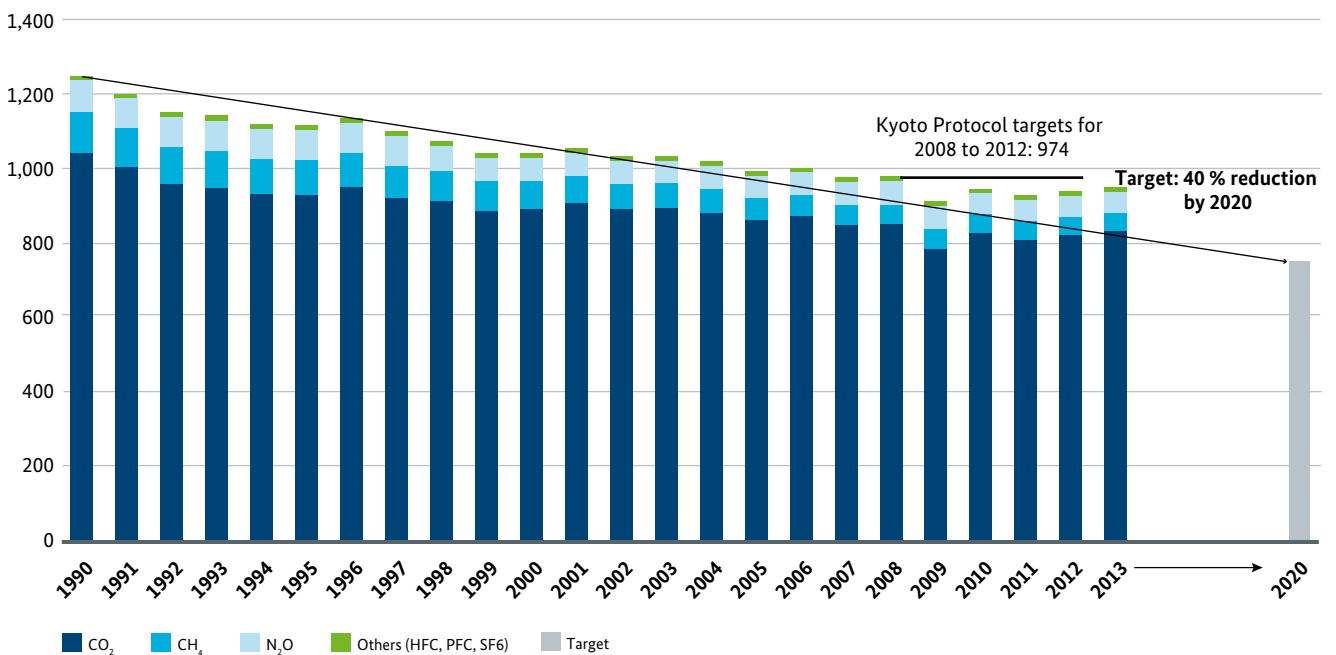


## Where do we stand?

Germany is pursuing ambitious climate change mitigation targets. At the national level, Germany is striving to reduce emissions of climate-changing greenhouse gases by at least 40 percent by 2020 and by 80 to 95 percent by 2050, each compared to the reference year 1990. Thus, Germany's national targets go beyond international and European

deliverables. Resolute combating of climate change is one of the key drivers behind the transformation of the German energy supply system initiated as part of the Government's blueprint for a new energy policy and powering the innovations and technological progress it has triggered.

**Figure : Greenhouse gas emissions in Germany**  
Mn tons CO<sub>2</sub> equivalent



Source: Federal Environment Agency

**Initial successes can already be observed.** As part of its international obligations under the Kyoto Protocol, Germany has reduced its greenhouse gas emissions by more than the Kyoto target for the first commitment period (21 percent). On average over the years 2008 to 2012, Germany has achieved reductions totalling about 24 percent versus the reference year 1990.

**However, emissions have been rising again recently.** Calculations for 2013 indicate a slight increase in emissions. This is due mainly to more electricity being generated from hard coal, higher net electricity exports, and weather factors.

### Where do we go from here?

**Current projections estimate that the measures decided on and implemented to date will make it possible to reduce greenhouse gases by about 33 to 34 percent by 2020, with an uncertainty of +/- 1 percent.** This leaves a corridor of 5 to 8 percentage points for the gap to be filled. This means that significant extra efforts in all sectors and by all players will be needed to meet the 40-percent target.

For this reason the Government has adopted an Action Programme for Climate Change Mitigation 2020 defining further measures for achieving the target set for 2020.

**The Government anticipates that the measures embodied in the Action Programme for Climate Change Mitigation 2020 will make it possible to achieve a further reduction in gas emissions by 62 to 78 mn tonnes by 2020, enabling the goal of a cut-back of at least 40 percent to be met.** The Government will closely monitor the implementation of the Action Programme for Climate Change Mitigation 2020 in an ongoing process up to 2020. In this context the Federal Ministry for the Environment will draw up an annual climate report.



## 7 The electricity market and expansion of the grid



### Where do we stand?

**The electricity market is going through a phase of transition.** Fluctuating generation from wind and solar and assimilation into the larger European context are bringing new challenges and demanding a more sophisticated electricity market. The renewable energies will take on more responsibility within the energy supply system, use of nuclear power will come to an end in Germany in 2022, and the European electric power markets are converging.

**The task of the electricity market remains unchanged.**

That is to balance generation and consumption at all times, despite an increasing share of wind and solar power. To do this, it needs to fulfil two functions: firstly to ensure that adequate capacities are available (reserve function) and secondly to make sure that these capacities are deployed at the right time and on the necessary scale (operations manage-

ment function). The future design of the market and the regulatory framework for the electricity sector must be tailored to making the energy supply reliable, cost-effective and environmentally compatible. Against this backdrop, different actions are needed for each of the two functions of the electricity market.

**In Germany, the quality of the grids is still very high, and the energy supply system is among the most reliable anywhere in the world.** Investment by the transmission grid operators in the extra-high voltage grid nearly doubled in 2012 and 2013 compared to previous years, and planning for 2014 envisages a further rise.

## Where do we go from here?

**Deployment of the available capacities needs to be optimised.** This involves especially improving on accounting grid management, extending and enlarging the grid, and evolving the control energy market. These are considered to be "by-the-way measures", i.e. they are expedient and important to the transforming electricity market anyway.

**Keeping adequate capacities in reserve calls for a decision on basic principle.** There are two fundamentally different approaches available for shaping the long-term development of the electricity market: do we want an optimised electricity market (electricity market 2.0) with a credible legal framework in which investors can trust and on which the electricity consumers decide under their own responsibility via their market demand how much capacity needs to be kept available – or do we want to introduce a second market dedicated specifically to maintaining reserve capacities (capacity market) alongside the existing electricity market? These two approaches are discussed in detail in the Green Paper "An Electricity Market for Germany's Energy Transition."

**The Green Paper launches the stakeholder consultation on the future design of the electricity market.** With its Green Paper "An Electricity Market for Germany's Energy Transition" the Federal Ministry for Economic Affairs and Energy facilitates a structured debate and makes it possible to arrive at an informed political decision on the future design of the electricity market. Consultation based on the Green Paper will be followed by a White Paper specifying concrete measures. The White Paper will likewise be presented for public consultation. The necessary legislation will follow.

**A decision on the further development of combined heat and power generation will be taken in the near future.**

Combined generation of electric power and heat (cogeneration) can save fuel and cut CO<sub>2</sub> emissions. The Economic Affairs Ministry is currently evaluating a study tabled in October 2014 analysing the potential and benefits of combined heat and power generation and assessing the present Cogeneration Act and the comments and opinions on it received to date. Correlations with the current ongoing debate about the electricity market make it necessary to discuss and decide in the spring of 2015 on the future development of combined heat and power generation in the context of the fundamental decisions to be taken concerning the electricity market. The Amendment to the Cogeneration Act implementing those decisions can then be passed immediately and need not wait for the legislative package on the electricity market itself.

**Faster enlargement and expansion of the grid is vital to the success of the energy transition.**

The Government has therefore established important terms of reference for accelerating the expansion of the grid. Grid development plans, the Power Grid Expansion Act (Energieleitungsbaugesetz – EnLAG), the Grid Expansion Acceleration Act for the transmission grid (Netzausbaubeschleunigungsgesetz Übertragungsnetz – NABEG) and the Federal Requirement Plan Act (Bundesbedarfsplangesetz – BBPlG) lay the foundations for the coordinated, accelerated and transparent expansion of the power grids. The convergence of the European internal market for electricity is continuing and is even being pushed forward by the installation of further cross-border interconnectors.

**The German government is also intent on accelerating the modernisation of the distribution networks.**

## 8 Energy supply in the European context



**The European markets for energy are meant to converge further.** Because a common European energy market creates advantages for all energy consumers. To tap these potentials, the German government advocates clear rules for power trading and regional cooperation in ensuring a reliable energy supply. In addition, the cross-border grid infrastructure is to be expanded and modernised Europe-wide.

**In October 2014 the European Council agreed on a climate and energy package for 2030.** A mutual understanding on the future framework for climate and energy policy is essential for the transformation of the energy supply system in Europe and for creating certainty for potential investors. The climate and energy package comprises a mandatory target of at least 40 percent for reducing greenhouse gases within the EU. Other binding targets adopted at the EU level are at least a 27 percent share of renewable energies in energy consumption and an indicative EU energy efficiency target of likewise at least 27 percent. This package sets a key milestone for the transformation of the energy supply system not only in Germany but also in Europe.

**The European emissions trading system needs to be quickly and sustainably reformed.** The emissions trading system should be overhauled to enable it to fulfil its incentive function as a key European instrument for combating climate change. The German government supports the EU Commission's proposal to introduce a market stability reserve. However, this should already be introduced in 2017 and the 900 million emission certificates from "backloading" should be included in it. At the same time, effective regulations should be put in place to pre-empt carbon leakage after 2020, too, so as to avoid direct and indirect CO<sub>2</sub> costs imposing excessive burdens on the industrial sectors affected and so leading to carbon leakage.

**With its energy transition, Germany is setting a good example.** Only if as many countries as possible make their own energy supply systems more sustainable can global climate change mitigation function effectively. With this in mind, the German government is actively engaging in international cooperation and encouraging the climate-friendly transformation of the energy supply systems in developing countries.

## 9 Energy prices and the cost of energy

**The cost of energy has been rising in recent years.** Increasing prices on the international energy markets have been a major cause of this. They have significantly driven this cost trend in recent years. In 2013 the tendency toward rising commodity prices moderated somewhat. Coal prices have been drifting downward since 2008. The price for CO<sub>2</sub> certificates remains low.

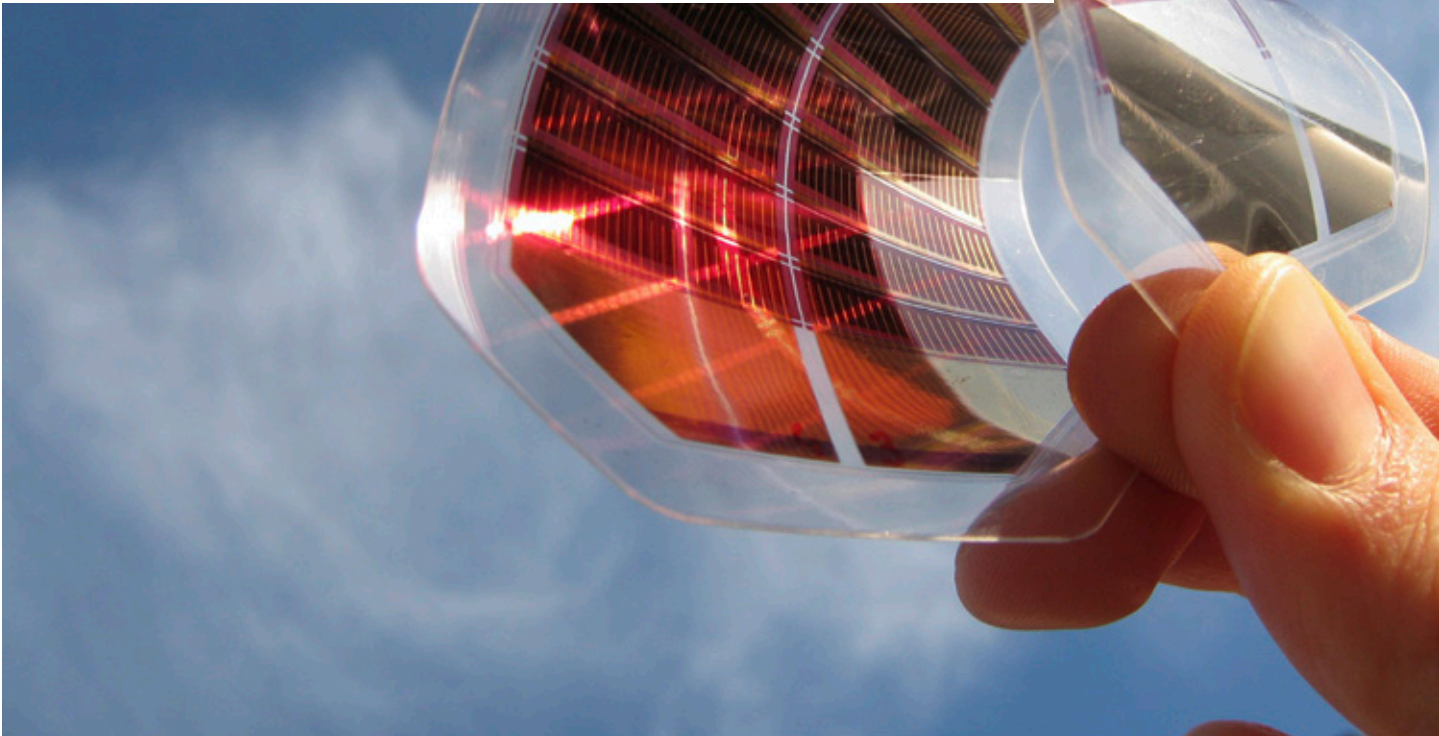
**The trend toward declining prices in power exchange trading continues.** This has been due especially to booming generation from renewable energy sources at the same time as high available conventional power plants capacities. On average over the year, the power exchange price was 39 EUR/MWh in 2013 (1-year future contracts). That is a 20 percent decline compared to 2012.

**Politics does not decide the price of electricity – but it is important for price components introduced by the government, such as the renewable energy surcharge, not to drive power prices further upward in the years to come.** In 2013 the average price of electricity for private households rose by 3.6 ct/kWh (just on 14 percent). The renewable energy surcharge will drop slightly for the first time in 2015. That marks a break in the dynamic cost rise of recent years. This should help to stabilise the price of electricity to consumers.

**The German government continues to monitor the trend in energy prices and expenditure carefully.** The cost to private households of running a car is on average still higher than spending on electricity and gas (including heating). Nonetheless spending on electricity rose in 2013, whereas the cost of running a car and spending on gas declined. According to calculations for a typical four-person household, total annual expenditure on energy (electricity, gas, petrol) in 2013 was around 4,070 euros. In 2014, this figure increased by around 86 euros over the previous year. The increase in total spending on energy was accompanied by a rise in average net incomes. The proportion of incomes spent on energy remained stable.

**To avoid businesses moving abroad, special attention needs to be paid to energy price components introduced by the government.** The average price of electricity for industrial customers in Germany is above the EU average and way above the price of power in the USA. These price differences are partially compensated for electricity-intensive companies, especially those exposed to international competition, both within the terms of reference of the Renewable Energy Sources Act and also in emissions trading.

## 10 Energy research and innovation



**The German government is systematically gearing research to its transformation goals for the energy supply system.** With its 6th Energy Research Programme, the German government is helping businesses and research institutions to explore and develop new technologies for tomorrow's energy supply system. The 6th Energy Research Programme provides 3.5 billion euros in assistance to promote research and development between 2011 and 2014. The government is working on evolving the Energy Research Programme still further.

**Energy efficiency and renewable energy forms are priority areas for funding.** Furthermore, new, cross-thematic and system-orientated research approaches are being pursued to tap further potential for innovation processes. Alongside the already ongoing research initiatives "Energy Storage" and "Future Electricity Grids," a new initiative on the topic of "Solar Construction/Energy-Efficient City" is currently in preparation. The Second Federal Report on Energy Research provides a summary of the Federal Government's activities.

**European cooperation in energy research is gaining importance.** In 2014 the new European Framework Programme for Research and Innovation, "Horizon 2020", was launched at EU level.

**Industry-focused energy research keeps German industry competitive.** The German government has launched an ongoing dialog with industry on the detailed priorities for

research. The aim is to focus the allocation of the available funds on industry so as to enhance the competitiveness of German industry through strategic energy research. Providing public funding for research and development will help German companies to retain their leading position on the energy technology markets of the future. The goal is to make leading-edge technologies more cost-effective and so to pave the way for faster penetration of these markets.

**The background conditions are also being improved.** Favourable terms of reference for innovation and technical progress are essential to rapid incorporation of promising research results into new, market-viable energy technologies. For instance, a number of incentive schemes set up by KfW (the government-owned development bank) provide funding for investment in innovative and highly effective energy-efficiency-enhancing measures such as energy-saving refurbishment of buildings. Regular revision of the regulatory requirements also helps to phase obsolete technologies out of the market. The Renewable Energy Sources Act (EEG) has already triggered dynamic growth in all sectors, prompting market players to invest in renewable energy production and technologies. Improved integration of renewable energies into the market, as was at the focus of the 2014 Amendment of the EEG, is a prerequisite for the development of further innovative technologies. The Renewable Energies Heat Act and the Market Incentive Program are promoting the more widespread use of renewable energy sources in the heating sector.

# 11 Macro-economic impact of the energy transition



**Investment in the context of the transformation of the energy supply system remains high.** In 2013, investment in renewable energy and in improving energy efficiency was again in the two-digit billions. Around 16 billion euros were invested in renewable energy. Investment in efficiency-boosting measures will result in less consumption and lower cost in the medium and long term.

**Renewable energy and energy efficiency are helping to save on fossil primary energy sources.** In 2013 Germany imported fossil energy sources to the tune of 92 billion euros. At the same time, around 9 billion euros in fuel costs were avoided thanks to renewable energy sources alone. These savings trigger macro-economic stimuli elsewhere. The transition of the energy supply system towards a more sustainable and lower-risk energy supply is also associated with significant qualitative benefits, such as much lower greenhouse gas emissions.

**The energy transition is promoting the development and export of innovative energy technologies from Germany.** Ever since the 1990s, Germany has been one of the biggest exporters of technology and equipment for use in exploiting renewable energy sources. The value of exports just recently totalled around 10 billion euros. Germany's exports of efficiency-boosting technologies stand at a comparable level.

**The energy transition is strengthening the growth of the German economy and is making itself felt on the labour market.** In 2013 increasing exploitation of renewable energies offered opportunities for employment for around 370,000 people (gross figures). About 261,000 jobs can be traced back to the Renewable Energy Sources Act.

## 12 Public acceptance of the energy transition



**In principle, the energy transition enjoys a high level of approval among the German public.** This is evident from recent opinion polls that recorded approval ratings of between 56 and 92 percent. Differences in the scale of that approval – other than those rooted in the survey methodology – can be traced to the different operationalisation of the term “energy transition” and of its public acceptance.

**Public acceptance of the energy transition should remain high.** The German government has taken various actions to sustain the popularity of its energy transition. These focus on providing timely information and involving the affected public in the planning of specific projects. In the context of planning the expansion of the power grid, for instance, every step, from identifying scenarios via approval of the grid development plan to the actual routing of the power lines, is carried out in a transparent manner and with public consultation. Furthermore, the grid expansion projects are accompanied by diverse opportunities for informal dialog at all stages of planning.

**Efforts to curb the pace of cost increases also help to uphold broad popular approval for the energy transition.**

**Using research to keep the energy transition socially compatible.** The transformation of the energy supply system can succeed only if the needs and expectations of the public at large, also as regards participation and fairness, are appropriately addressed and more attention is paid to the exigencies of a market economy. Research also focuses on public acceptance and involvement and on long-term options for the evolution of the energy supply system.

**Cooperation with the Länder and players from the business world and society is being improved.** The successful transformation of the energy supply system will be possible only through effective coordination and cooperation with the federal states (Länder) and stakeholders from business, academia and civil society. The electricity system of the future will in some respects be more decentralised. But decentralism must not be confused with autarchy. Autarchy would drastically increase the cost and does not fit in with a European internal energy market. The bodies already in place for consultation between the Federal and Länder levels enable constructive cooperation. They are supplemented by various platforms set up by the Federal Government (Electricity Market, Grids, Energy Efficiency, Buildings, Research & Innovation, Energy Transition Research Forum), in which all players are actively involved and concrete proposals for ongoing projects are elaborated.

**Close cooperation and communication with our European neighbours and international partners is essential.** This will make it possible to take advantage of synergy effects to shape a common, forward-looking energy policy at the international level and to allay reservations.

