



Federal Ministry  
for Economic Affairs  
and Energy



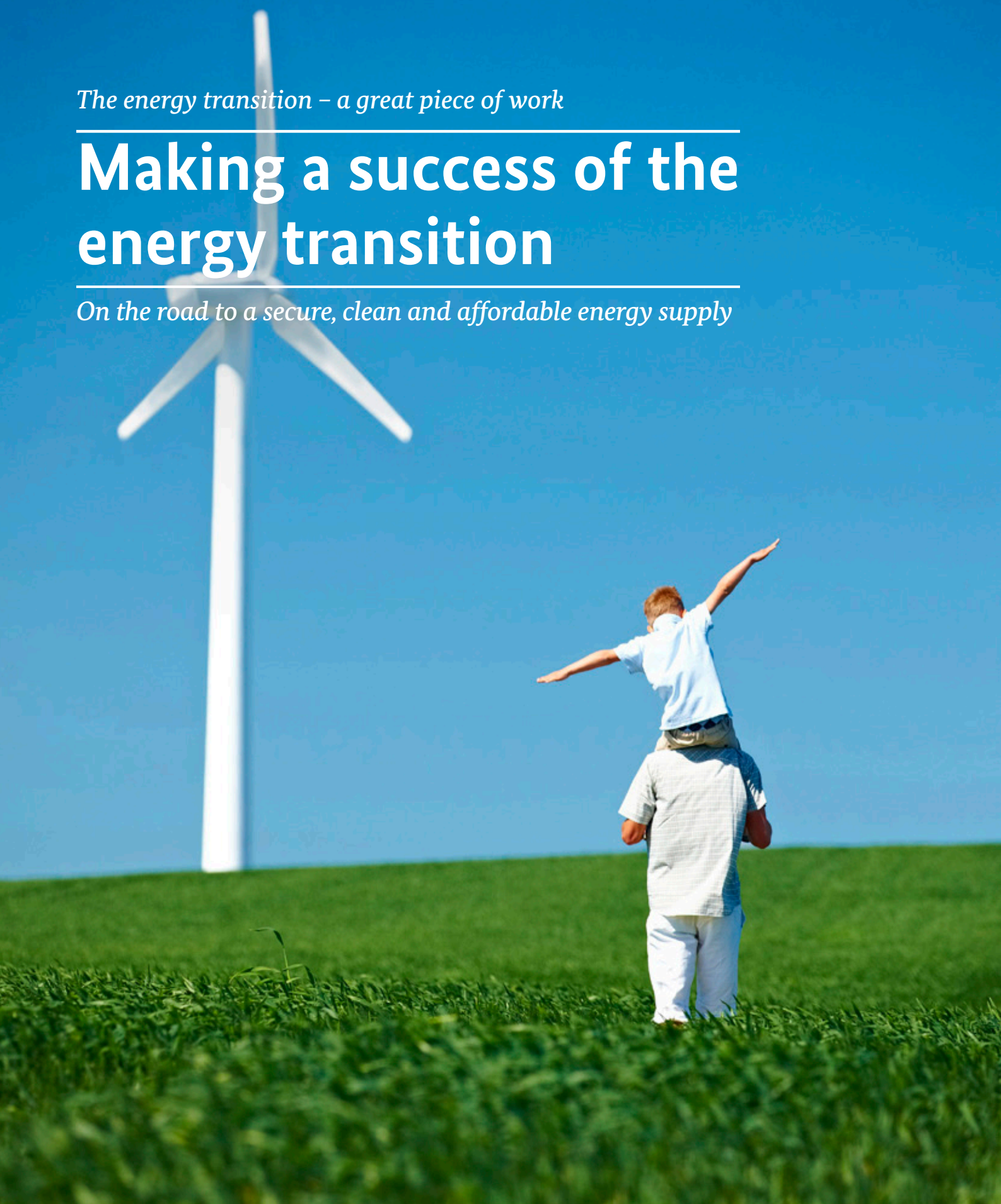
*The energy transition – a great piece of work*

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# Making a success of the energy transition

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*On the road to a secure, clean and affordable energy supply*



## Imprint

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






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# Foreword

The energy transition is Germany's avenue into a secure, environmentally friendly, and economically successful future. We have decided to fundamentally alter Germany's energy supply: away from nuclear energy and towards renewable energy. And we are aiming to use energy more and more efficiently in future. This should help Germany to make a significant contribution towards combating climate change.

At the same time, we want the energy transition because it offers a unique opportunity for business in Germany. It is to become a key driver of modernisation for tomorrow's industrial society, opening up new fields of business, stimulating innovation and creating growth and jobs. Finally, we want renewable energy and energy efficiency to make us less dependent on oil and gas imports.

If the energy transition is to deliver this ecological and economic success, the energy supply must remain secure and affordable. Only then will the general public continue to back the energy transition. And the energy transition can only be a long-term success if Germany remains a competitive centre of economic activity.

We have already been able to achieve a great deal. Renewable energies have become our leading source of electricity. At the same time, we are using energy more and more efficiently. Our economic output is rising but we are not consuming more energy.

New global markets have arisen in the wake of the expansion of renewable energy sources and efficient use of energy. German enterprises play a major role here. They are developing cutting-edge technologies and creating growth and jobs.

Nevertheless, the energy transition is challenging, and much remains to be done. We have a clear road map for this, the 10-Point Energy Agenda.

One major achievement has been to place funding for renewable energy on a viable footing. Wide-ranging packages of measures have also boosted energy efficiency and climate change mitigation, thereby passing further important milestones.

This publication is intended to give you an overview of where we stand in the energy transition and what the next key steps will be. We will only be successful if we tackle the energy transition as a task involving the whole of society. Together, we can master the challenges on the road to a clean, affordable and secure energy future.

Your  
Federal Ministry for Economic Affairs and Energy



# 1. Overall energy transition strategy



We won't manage to fundamentally restructure Germany's energy supply overnight. The energy transition is to be gradually rolled out up to 2050. It affects all levels of government, small and large companies, and the lives of the whole population. Such a task for entire generations will only succeed if we have a clear compass, a precise roadmap and good cooperation.

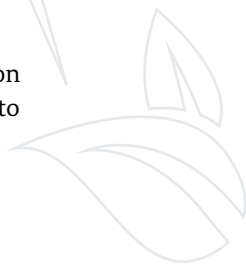
## A clear compass

The German government's **Energy Concept** is the compass for the energy transition. It sets clear goals for all the areas it covers - electricity, heat and transport. The focus is on two core objectives: Firstly, the energy supply should be increasingly based on renewable energy. Secondly, energy should be used more and more efficiently.

## 10-Point Energy Agenda

The Federal Ministry for Economic Affairs and Energy is responsible for choosing the right measures to attain the goals of the energy transition. To do this, the ministry is following a precise road map: the **10-point Energy Agenda** outlines the steps that need to be taken by this government and dovetails the various fields of action in terms of substance and timing. The overview shows what we have already achieved and what tasks still lie ahead of us.

The energy transition is a joint effort. So everyone involved in the energy transition is closely involved in the implementation. The Federal Government, the Länder and the municipalities, and also commerce and society. Ultimately, the energy transition will only succeed if everyone uses their strengths to make it happen.



The energy transition: key projects

	2014												2015												2016											
	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12				
Renewable Energy Sources Act	RES Act 2.0 ✓			Pilot auctions ✓						Pilot auctions and construction ✓						Report on effects ✓			RES Act 3.0 (auctions)																	
EU 2030/ETS	EU 2030 targets ✓						Development of governance 2030 ✓						Negotiation of new EU legal framework																							
	ETS reform (market stability reserve) ✓						ETS reform post-2020																													
Electricity market design	Expert report ✓			Green Paper ✓						White Paper ✓						Market Design Act (Energy Industry Act revision)																				
Regional cooperation (in EU)/internal market	More regional cooperation in the electricity sector ✓												Continuation of discussion on market coupling and energy security in Pentilateral Forum																							
	Concept to open up PV auction to installations in other MS																																			
Transmission grids	Scenario framework 2015 ✓						Network development plan 2015 (target year 2025)												Revision FRP Act																	
	Evaluation of Incentive Regulation Ordinance ✓						Draft of smart grids ordinance package ✓						Package of ordinances to modernise the distribution grids (Incentive Regulation Ordinance/grid fee system/smart grids)																							
	Draft of smart grids ordinance package ✓																																			
Efficiency strategy	Efficiency Action Plan ✓						Implementation of Energy Efficiency Action Plan incl. implementation of Energy Efficiency Directive																													
Buildings strategy	Drafting of Renovation Roadmap ✓						Drafting of Energy Efficiency Strategy for Buildings						Energy Saving Ordinance Process and Renewable Energies Heat Act																							
	Drafting of Renovation Roadmap ✓																																			
Gas supply strategy	Development of a gas supply strategy ✓						Implementation of strategy in coordination with international partners																													
Monitoring/Platforms	Progress Report ✓						Monitoring Report 2015						Monitoring Report 2016																							

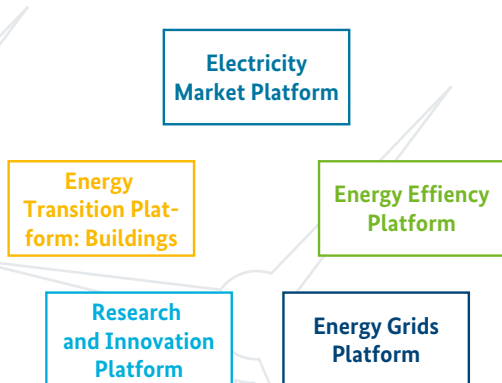
Successful cooperation

The Federal Ministry for Economic Affairs and Energy has set up five energy transition platforms for the dialogue with business, science, government and society. These develop and discuss overarching solutions and strategies for key fields of action in the energy transition.

Monitoring the energy transition

Is the energy transition on track? Can we attain the objectives we have set ourselves? The Federal Government is regularly reviewing this in a fact-based **monitoring process**. This will enable it to detect incipient developments over the years and to take action where necessary. A body of independent energy experts supports the process.

The Federal Ministry for Economic Affairs and Energy's energy transition platforms



A CLICK AWAY

- **The Federal Ministry for Economic Affairs and Energy's "Energy" website:** The website of the Federal Ministry for Economic Affairs and Energy is the central information portal for everything relating to the energy transition. It offers up-to-date information, data and analyses, as well as reports and publications on all aspects of energy policy: [www.bmwi.de/EN/Topics/Energy/energy-transition.html](http://www.bmwi.de/EN/Topics/Energy/energy-transition.html)
- **The "Energiewende direkt" newsletter:** You can subscribe to the energy transition. The online newsletter "Energiewende direkt" provides information about current developments, background, and facts: [www.bmwi-energiewende.de/EWD/Navigation/EN/Home/home.html](http://www.bmwi-energiewende.de/EWD/Navigation/EN/Home/home.html)





## 2. Renewable energy: the mainstay of the energy supply



Germany's energy supply is becoming greener from year to year. Whereas in 2000 only around six percent of the electricity consumed was renewable, the share is roughly 28% today. And Germany is well on track to attain the planned share of 40-45% in 2025.

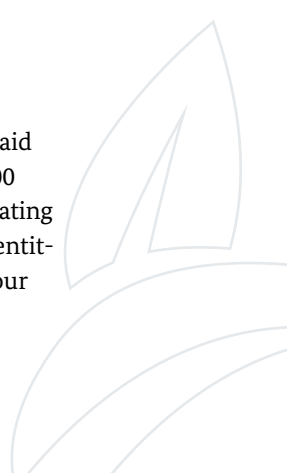
### Majority of Germans in favour of energy transition

Renewable energy has high approval ratings in the German population. According to the latest surveys,

the overwhelming majority of Germans believe that the expansion and use of renewable energy is "important" or "very important".

### Promotion of renewable energy

The **Renewable Energy Sources Act (EEG)** has laid the foundations for this. The act adopted in 2000 contained the following principle: anyone generating electricity from sun, wind, water or biomass is entitled to fixed remuneration for every kilowatt-hour





of electricity. And this is guaranteed for a period of 20 years. The costs of this are passed on to the electricity consumers via the “EEG surcharge”.

The funding from the EEG surcharge has transformed renewable energy from a niche product into one of the mainstays of our energy supply. Advances in technology have significantly cut the costs of generating electricity from renewable sources. However, the rapid expansion of renewables also caused the EEG surcharge to rise considerably up to 2014.

### Relaunching the energy transition

For this reason, the German government fundamentally reformed the Renewable Energy Sources Act. The new act entered into force on 1 August 2014. As a result, the expansion of renewables is continuing rapidly. But it is being better controlled, and is being implemented in a way that reduces the costs.

In order to slow down the rise in costs seen in recent years, the funding is being concentrated

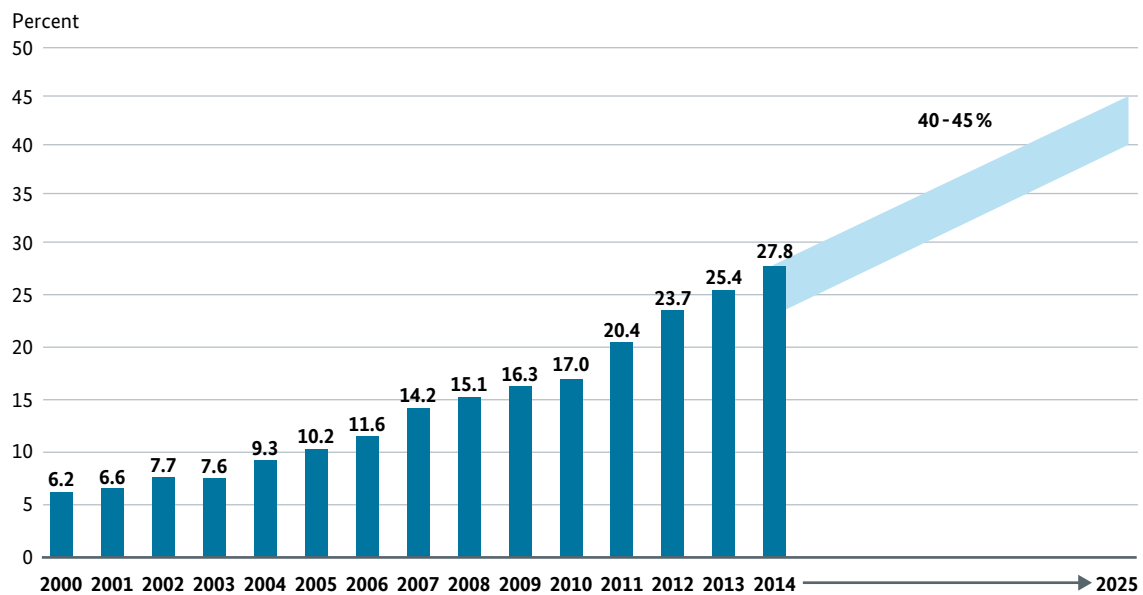
on wind and solar power, which are cheap energy sources. Their costs have now fallen so sharply that they can generate electricity at the same overall costs as new coal-fired or gas-fired power stations.

Specific deployment corridors now stipulate the extent to which renewable energy is to be expanded in the coming years. This makes it possible to plan their growth. And it makes it possible to align the process with the expansion of powerlines and the other components of the energy transition.

Another aim is to integrate electricity from renewable energy more into the market. In future, renewable energy sources must increasingly stand up to competition and the plant operators must market their electricity themselves. Also, in future the funding rates will not be stipulated by the government, but will be determined by auctions. This will enable the cheapest and most efficient producers to win. In a pilot project, this is currently being tested for ground-mounted PV installations.

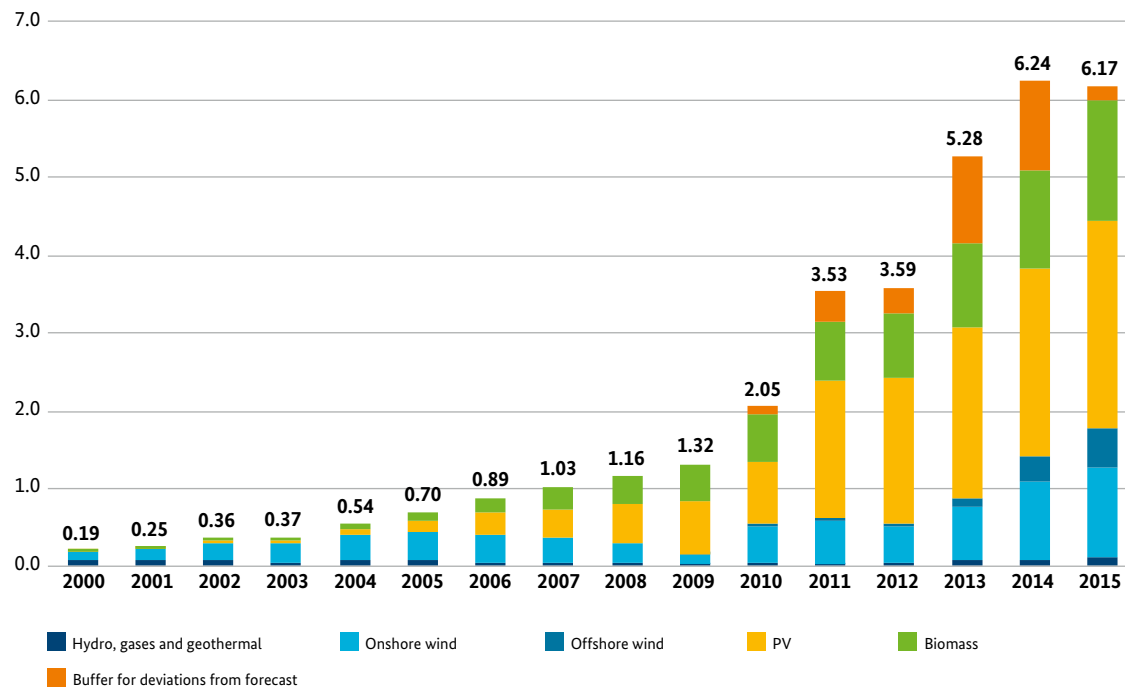
### Renewables growing fast

Share of gross electricity consumption covered by renewable energy



Source: Federal Ministry for Economic Affairs and Energy on basis of data from working group on renewable energy statistics

### EEG surcharge in eurocents per kilowatt-hour



Source: Federal Ministry for Economic Affairs and Energy

**The first fruits of the reform of the Renewable Energy Sources Act can now be seen. In 2015, the EEG surcharge has fallen for the first time since it was introduced. From 1 January 2015, it has stood at 6.17 cents per kilowatt-hour of electricity consumed.**



#### Renewable energy technologies: a successful export

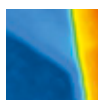
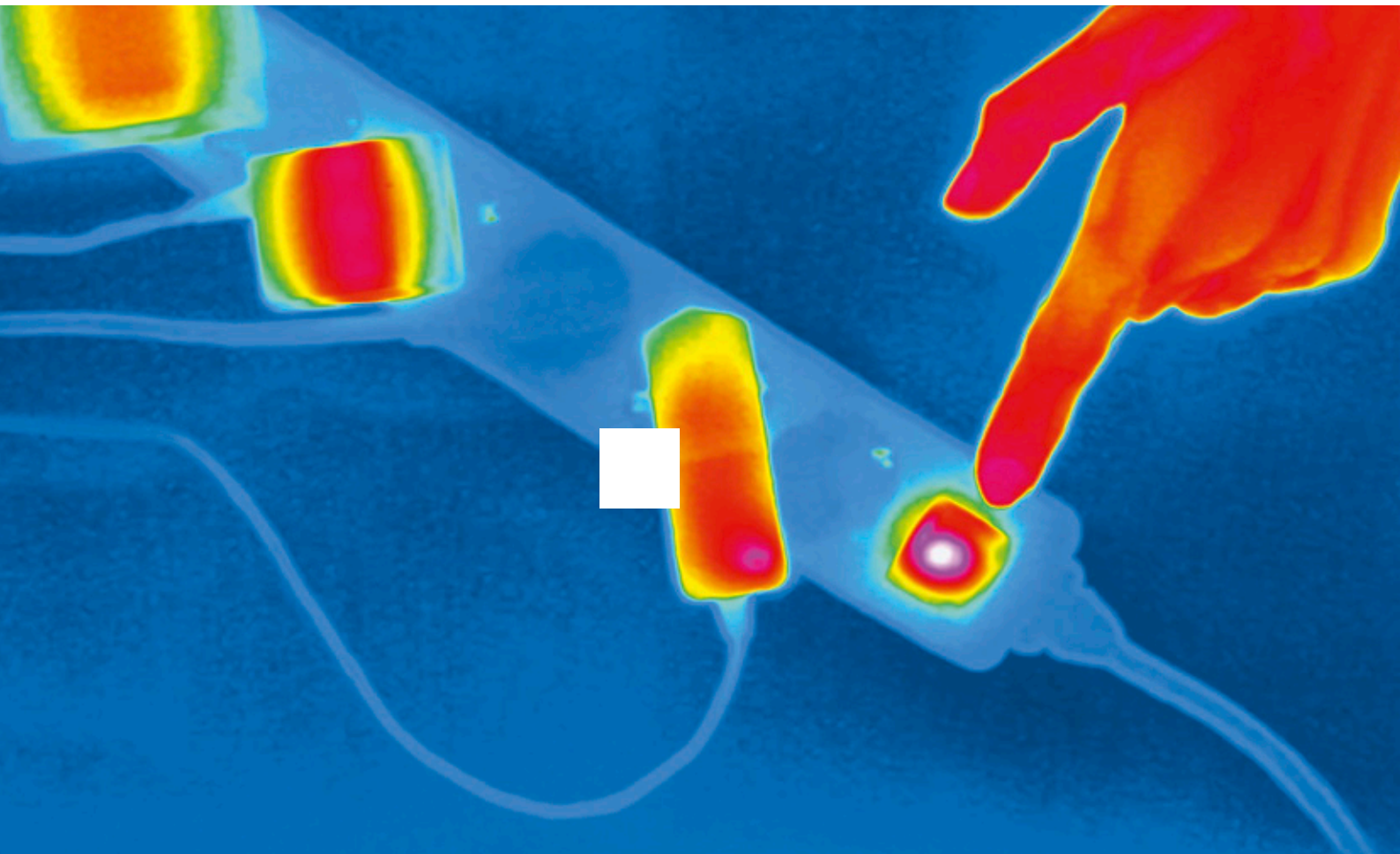
Renewable energy offers major export and growth opportunities for German companies. One example: German expertise was used to commission one of South Africa's first solar-thermal air-conditioning installations, utilising solar power to cool buildings. The outcome is 47 tonnes less carbon emissions and a successful business deal for the innovative manufacturer from Freiburg. This project in Johannesburg was backed by the Federal Ministry for Economic Affairs and Energy's Renewable Energy Export Initiative and by dena, the German Energy Agency. It also makes a contribution towards the German-South African energy partnership.



#### A CLICK AWAY

- Information portal on renewable energies:**  
 The Federal Ministry for Economic Affairs and Energy's information portal offers background and practical information about renewable energy and the funding available for operators of renewable energy installations and the interested public:  
[www.erneuerbare-energien.de](http://www.erneuerbare-energien.de)

### 3. Energy efficiency: making more from energy



Making efficient use of electricity, heat and fuel saves money, boosts energy security and combats climate change. For this reason, energy efficiency is the second pillar of the energy transition alongside the expansion of renewables.

Consumers can save cash by switching to efficient household appliances, switching off electricity-guzzlers, buying lower-consumption cars or investing in the improvement of the energy performance of their homes. But energy efficiency is also crucial for business in Germany: companies which use less resources and produce lower emissions gain key cost advantages in international competition. At the same time, there are major opportunities for providers of innovative solutions and products. “Energy efficiency made in Germany” is demand worldwide.

Germany has set itself ambitious targets in terms of saving energy and boosting energy efficiency. Total primary energy consumption is to drop by 20% by 2020 (compared to 2008). We have already achieved

a great deal. Germany’s energy consumption is at its lowest level since the country reunified in 1990. But much remains to be done.

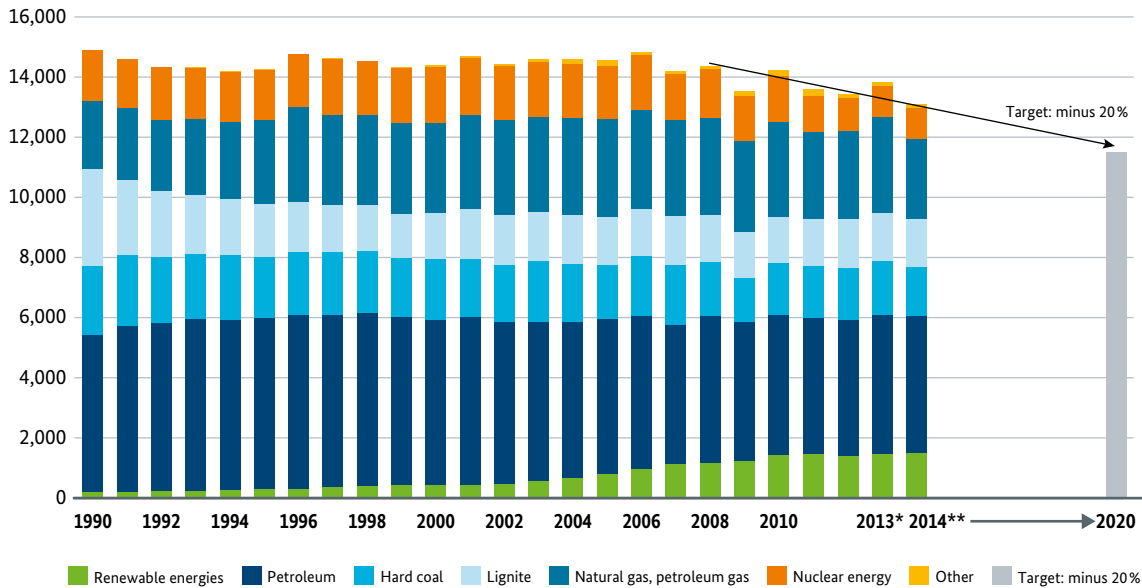
#### The Action Plan sets out the future direction

The German government is therefore helping private households, companies and municipalities to make even more efficient use of energy in future. A wide range of information, advice and support services are available – and they are being used intensively.

In order to boost these efforts, the government has presented a comprehensive programme of work: the **National Action Plan on Energy Efficiency (NAPE)**. It covers many new and improved measures to make more efficient use of energy.



**Development of primary energy consumption by energy source**  
Non-adjusted figures in petajoule (PJ)



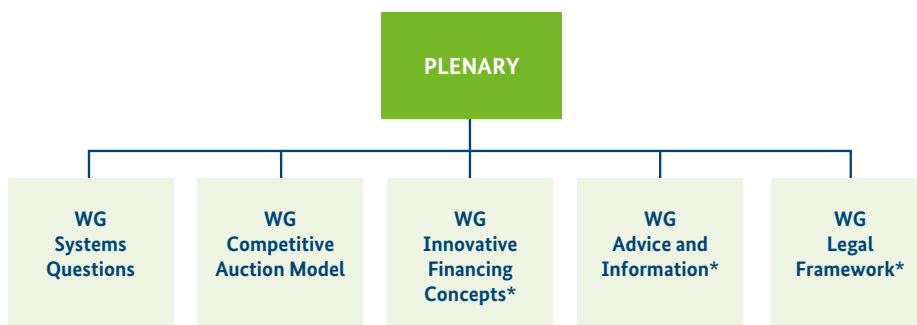
\* Provisional \*\* First estimate  
Source: AG Energiebilanzen

**Energy efficiency: a profitable model**

Companies which invest in their energy efficiency generally earn a higher yield than they would from investing on the capital market. However, various impediments mean that investments are not undertaken in practice even though they would be profitable. For example, some companies hesitate when the necessary capital has already been earmarked for other purposes. Many investors are scared of providing credit for efficiency projects because such projects are often very fragmented and it is difficult to assess the risks. Innovative financing concepts are being developed to overcome such barriers. One goal is to transform the future efficiency gains into present liquidity. Also, the aim is to provide energy consumers with more advice and to show them how

energy efficiency pays off – not just for businesses, but also and particularly for private households.

Another important measure is the “STEP up” call for bids in the field of electricity efficiency (the title is derived from the German for “utilise electricity efficiency potential”). In this competition for funding, companies and energy utilities from various sectors are called on to propose specific measures to save electricity. Smaller ideas, including from private households, can be packaged into group projects. The special feature is this: the funding will go to those measures offering the highest electricity savings per euro of support. This will identify and implement the most worthwhile energy conservation opportunities.



\*Joint Working Group with the energy transition’s Buildings Platform

**Energy Efficiency Platform**

In the energy transition’s Energy Efficiency Platform, the Federal Ministry for Economic Affairs and Energy brings representatives of the federal government, the Länder, commerce and consumer associations together to discuss tailor-made ideas and solutions for higher energy efficiency.

### Information box: Further key measures to improve energy efficiency

- **Energy Efficiency Networks Initiative:** The Federal Ministry for Economic Affairs and Energy and the Federal Environment Ministry have launched the Energy Efficiency Networks Initiative together with leading business associations. The aim is to set up some 500 energy efficiency networks by 2020. With the aid of experienced energy consultants, the 8-15 companies contained in each network are to define and implement efficiency targets together.
- **Top-runner strategy for energy-efficient products:** The top-runner strategy has been set up at European level to boost the energy efficiency of fridges, ovens, televisions and many more appliances. Firstly, it sets out clear minimum requirements for low energy consumption. Secondly, it uses colour-based efficiency scales to show how much energy a product consumes. In the national top-runner strategy, the German government is bringing together various measures to boost and develop product-related energy efficiency, involving equipment manufacturers, retailers and consumers, and is thus supporting the European measures.
- **Higher energy efficiency in transport:** The German government is ensuring that the transport sector is also helping to save energy and to combat climate change. The measures here aim to improve the policy environment for alternative propulsion, to promote alternative fuels, and to shift more freight from the roads to the waterways.
- **Higher energy efficiency in buildings:** Buildings offer a great deal of potential to save energy. Chapter 4 shows the specific measures being taken by the German government here.



### A CLICK AWAY

- **Energy advice for private households:** Save energy – live better. The consumer advice centres offer expert and independent energy advice, funded partly by the Federal Ministry for Economic Affairs and Energy: [www.verbraucherzentrale-energieberatung.de](http://www.verbraucherzentrale-energieberatung.de).
- **Website providing information for private households:** The Energy Efficiency Initiative's website provides information about energy conservation, online tools and appliance databases: [www.stromeffizienz.de](http://www.stromeffizienz.de).
- **Energy consulting for SMEs:** The funding programme "Energy Advice for SMEs" funds up to 80% of the costs of energy advice for small and medium-sized enterprises. Companies investing in higher energy efficiency can obtain funding and low-interest loans: [www.bafa.de](http://www.bafa.de).
- **SME Initiative for Energy Reforms and Climate Change Mitigation:** This initiative supports small and medium-sized enterprises in their efforts to identify and utilise energy conservation opportunities. The focus is on providing companies with specific assistance in the form of dialogue, information and training: [www.mittelstand-energiewende.de](http://www.mittelstand-energiewende.de).
- **Grant programme for highly efficient horizontal technologies:** SMEs can obtain grants of up to 30% if they invest in energy-saving technology, e.g. highly efficient electric motors, pumps, ventilators, compressed air systems and air-conditioning: [www.bafa.de](http://www.bafa.de).
- **Funding for energy management systems:** Energy management systems reveal the actual energy situation in a company. They help to cut energy consumption and energy costs. The Federal Ministry for Economic Affairs and Energy offers assistance to companies introducing such systems: [www.bafa.de](http://www.bafa.de).
- **Funding for energy-efficient, climate-smart production processes:** Industrial companies which make their manufacturing processes more energy-efficient and climate-smart receive assistance of up to 20% of the investment costs: [www.ptka.kit.edu](http://www.ptka.kit.edu).



## 4. Fostering the energy transition in the buildings sector



The building sector plays a key role to play in the implementation of the energy transition. It accounts for almost 40% of Germany's energy consumption. The government is therefore aiming to make Germany's building stock virtually climate-neutral by 2050. To achieve this, we will have to cut primary energy consumption (oil and gas) by 80%. This requires higher energy efficiency and greater use of renewable energy.

### Boosting energy efficiency in buildings

New buildings are to be designed to use as little energy as possible. They will have to comply with the minimum requirements of the Energy Saving Ordinance. But many existing buildings also need to become more energy-efficient. Drafty windows and non-insulated roofs and outside walls mean that older buildings in particular consume a lot of



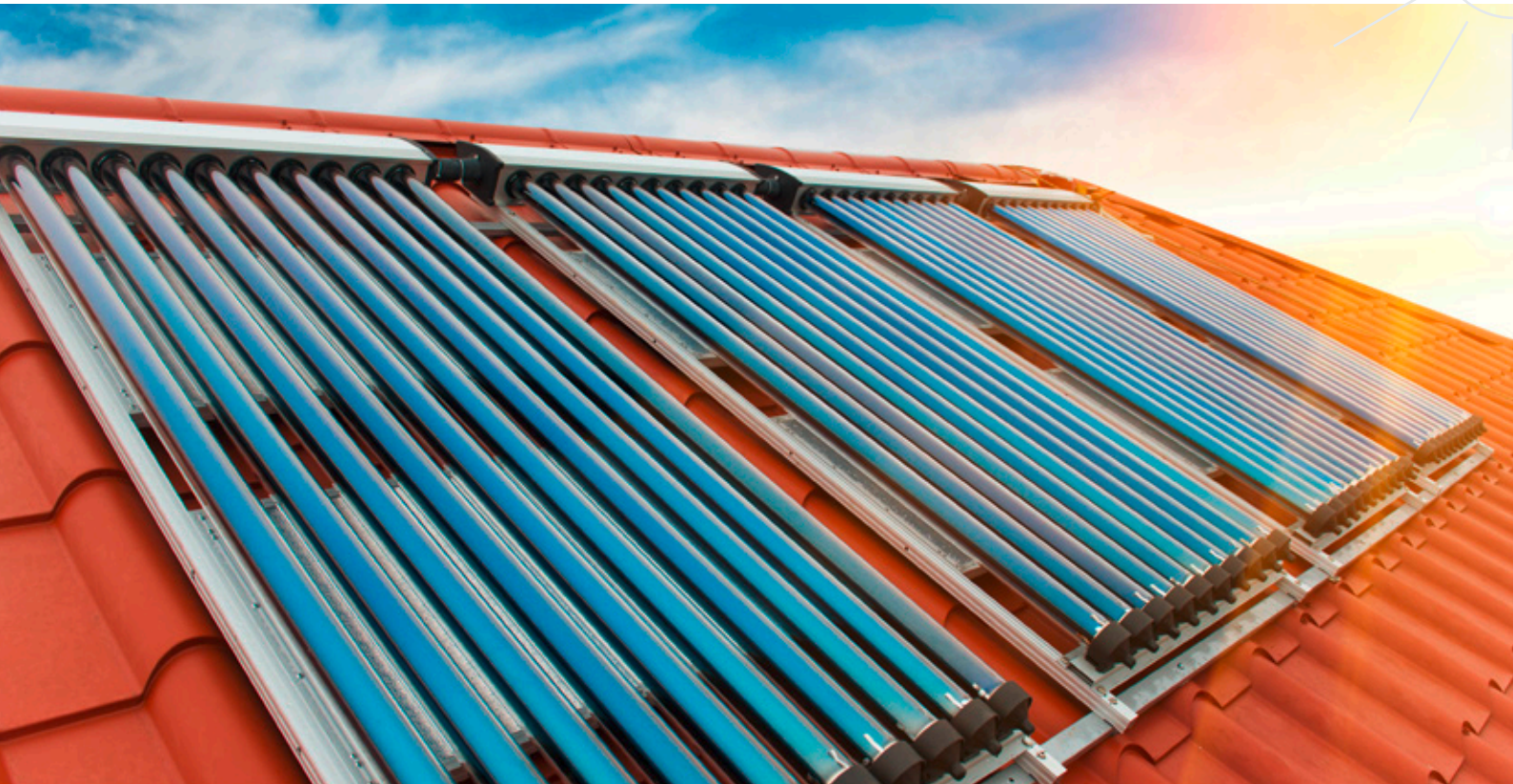
energy. Insulating the building’s outer shell, replacing old heating units and renovating windows cuts heating costs and improves comfort.

Anyone wishing to modernise his or her home’s energy performance should start by utilising the “on-the-spot advice”. An energy consultant analyses the building and produces a tailored energy rehabilitation concept. The government covers up to 60% of the consultancy costs – up to a maximum of 800 euros for one-family and two-family houses, and up to 1,100 euros for multi-family houses. A further grant is available if the energy consultant’s report is discussed in meetings of apartment owners or advisory boards.

When investment decisions are taken, the tried-and-trusted **KfW funding programmes on energy-efficient building and modernisation** can be used. Grants and low-interest loans from the KfW have helped more than 3.9 million dwellings to be refurbished or built in an energy-efficient way since 2006. The Federal Government is providing 2 billion euros for this each year. It should be noted that the standards to be met under the KfW programmes are far higher than the minimum requirements imposed by the Energy Saving Ordinance. The principle is as follows: the greater the energy efficiency achieved, the higher the financial assistance provided.

**The CO<sub>2</sub> Building Renovation Programme:  
KfW programmes for energy-efficient construction and retrofitting**

KfW programmes for energy-efficient construction and retrofitting			
For residential buildings		For municipal and social service buildings	For commercial buildings
<b>“Energy-efficient refurbishment”</b>	<b>“Energy-efficient construction”</b>	<b>“IKK/IKU – energy-efficient construction and retrofitting” (from 1 October 2015)</b>	<b>“KfW Energy Efficiency Programme – Energy-efficient Construction and Retrofitting”</b>
<p><b>What is being funded?</b> Individual retrofitting measures (heating, windows, insulation) or comprehensive refurbishment to meet KfW Efficiency House standards.</p> <p>In addition, grants are provided for independent energy-related advice on planning and construction.</p> <p><b>How does funding work?</b> Either: low-interest loan with additional grant towards repayment, or: grant towards investment costs (only for owners of single-family and two-family houses, owners of apartments and associations of owners of apartments)</p> <p><b>Further information?</b> KfW-Infocenter: infocenter@kfw.de</p>	<p><b>What is being funded?</b> New energy-efficient residential buildings which meet the standard of KfW Efficiency House 70, 55 or 40.</p> <p><b>How does funding work?</b> Low-interest loan; additional grant towards repayment provided if KfW Efficiency House 55 or 40 is built</p> <p><b>Further information?</b> KfW-Infocenter: infocenter@kfw.de</p>	<p><b>What is being funded?</b> 1) Individual retrofitting measures (heating, windows, insulation) or comprehensive refurbishment to meet KfW Efficiency House standards. 2) New energy-efficient buildings which meet the standard of KfW Efficiency House 70 or 55.</p> <p><b>How does funding work?</b> Retrofitting: low-interest loan with additional grant towards repayment New buildings: low-interest loan; additional grant towards repayment provided if KfW Efficiency House 55 is built</p> <p><b>Further information?</b> KfW-Infocenter: infocenter@kfw.de</p>	<p><b>What is being funded?</b> 1) Individual retrofitting measures (heating, windows, insulation) or comprehensive refurbishment to meet KfW Efficiency House standards. 2) New energy-efficient commercial buildings which meet the standard of KfW Efficiency House 70 or 55.</p> <p><b>How does funding work?</b> Retrofitting: low-interest loan with additional grant towards repayment New buildings: low-interest loan; additional grant towards repayment provided if KfW Efficiency House 55 is built</p> <p><b>Further information?</b> KfW-Infocenter: infocenter@kfw.de</p>
<b>Principle: The more energy-efficient the building, the higher the assistance</b>			

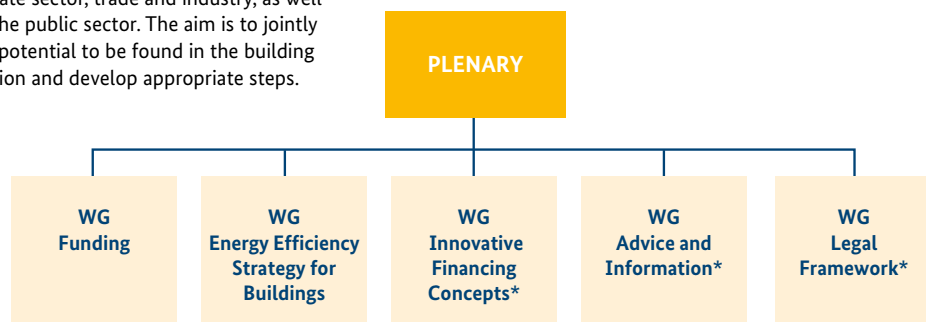


The new **Energy Efficiency Incentive Programme** complements and strengthens the existing funding mechanisms. The additional new measures will provide an important stimulus for funding and will foster innovation in the field of energy efficiency in buildings. One aspect will be for example investment grants to facilitate the market launch of highly-efficient fuel-cell heating.

It is important that all sides profit from higher energy efficiency. Tenants just as much as landlords, private households just as much as companies. The **Energy Efficiency Strategy for Buildings**, which is currently being developed, bundles and embraces numerous individual measures and takes broader aspects into account, such as societal issues and questions of commercial viability and funding.

**The energy transition's Buildings Platform**

The energy transition's Buildings Platform involves the key stakeholders in the real estate sector, trade and industry, as well as the consumer side and the public sector. The aim is to jointly leverage the wide-ranging potential to be found in the building sector in the energy transition and develop appropriate steps.



\*Joint Working Group with Energy Efficiency Platform



## Switching to renewable energy

Renewable energy is to be increasingly used not just to generate electricity, but also heat. The Renewable Energy Sources Heat Act therefore stipulates that new buildings should gain some of their heat from renewable energy sources. If owners of existing buildings switch their heating systems to renewable energy, e.g. solar-thermal installations, pellet heating or efficient heat pumps, they are eligible for

financial assistance from the **Market Incentive Programme (MAP)**, which was received in April 2015 and now offers even better support. Companies which generate the heat they need from renewable energy, or municipalities which build local heating networks to distribute heat generated from renewable energy, can also receive grants towards this from the MAP.



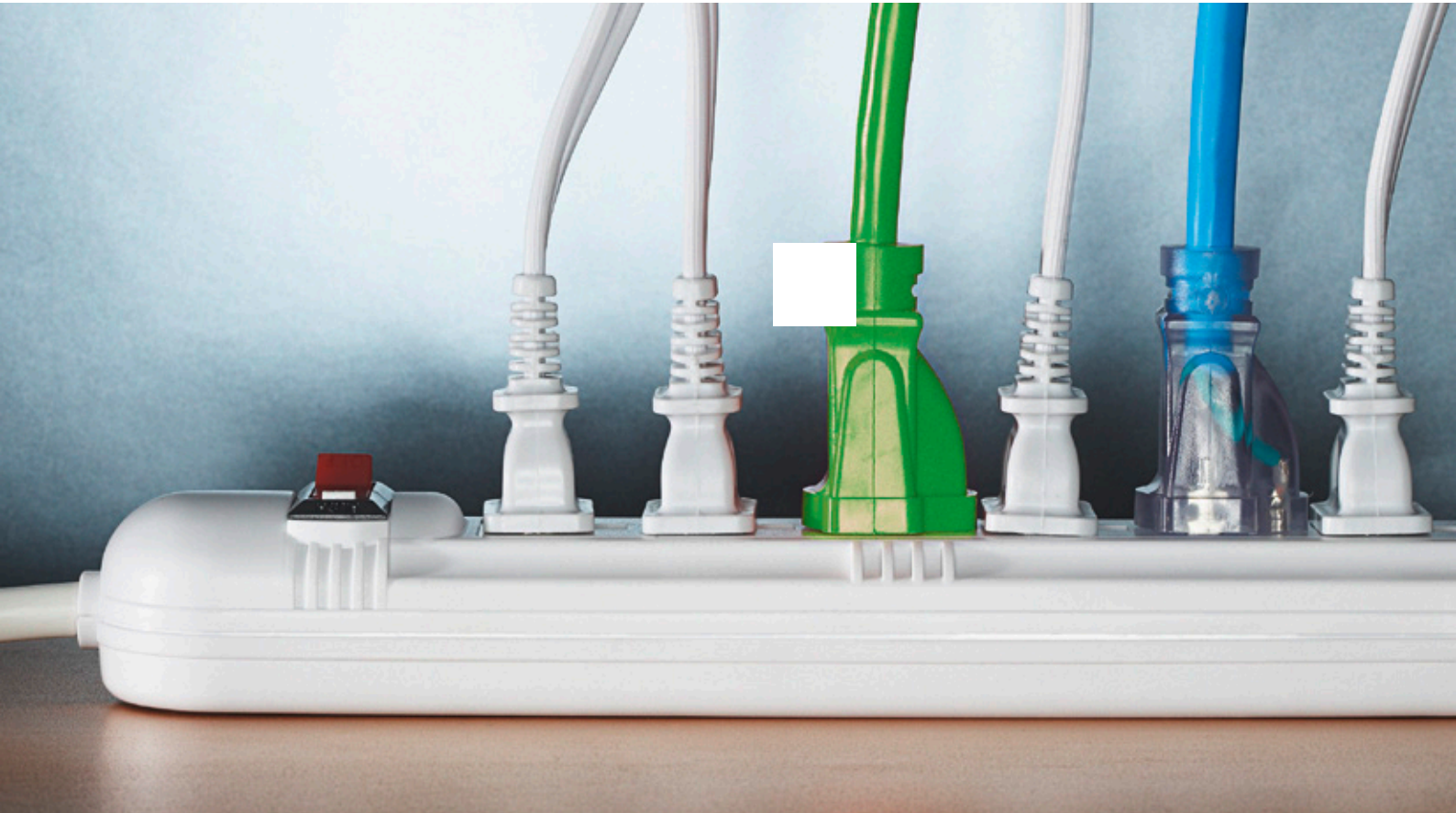
### A CLICK AWAY

- **“On-the-spot advice” for residential buildings:** you can find expert, independent energy consultants for this across the country at [www.energie-effizienz-experten.de](http://www.energie-effizienz-experten.de). Further information is available here: [www.bafa.de](http://www.bafa.de).
- **KfW programmes for energy-efficient construction and retrofitting:** Whether for private citizens, companies or municipalities, for existing or for new buildings: the KfW product-finder will take just a few clicks to guide you to the appropriate assistance: [www.kfw.de](http://www.kfw.de).
- **Market Incentive Programme (MAP):** More detailed information about MAP can be found here: [www.bmwi.de/go/marktanreizprogramm](http://www.bmwi.de/go/marktanreizprogramm) and [www.bafa.de](http://www.bafa.de).
- **Modernisation wizard:** What retrofitting would help your home to save how much energy? What costs are incurred, and which measures are eligible for government funding? The Federal Ministry for Economic Affairs and Energy’s modernisation wizard answers the key questions: [www.sanierungskonfigurator.de](http://www.sanierungskonfigurator.de)
- **Multimedia Infotainment “Energetische Gebäudesanierung”:** Start your own personal energy transition! The Federal Ministry for Economic Affairs and Energy’s multimedia report shows you how: <http://info.bmwi.de/energieeffiziente-gebauedesanierung>
- **Online flyers (in German):**





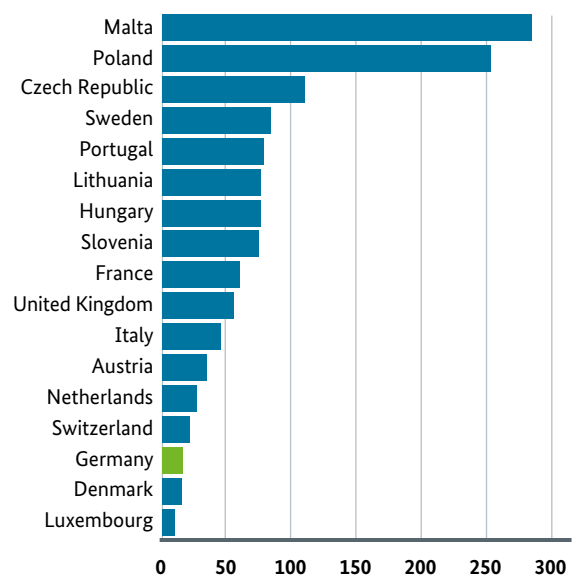
## 5. An electricity market for Germany's energy transition



A new phase of the energy transition has begun. Renewables have become the dominant source of electricity. The focus is no longer on funding their technologies. Rather, it is on creating an electricity system which can cope with growing shares of weather-dependent electricity generation from wind and solar power, whilst remaining secure and low-cost.

When there's no wind or sun, flexible gas-fired and coal-fired power plants need to cover the residual demand. There are also other ways to respond to the weather-related fluctuations in feed-in. For example, flexible industrial companies can consume particularly large amounts of electricity at times when a lot is available at low prices. Well-developed electricity grids offset fluctuations between regions and across borders. Storage can also make a contribution in the long term towards balancing power generation and demand.

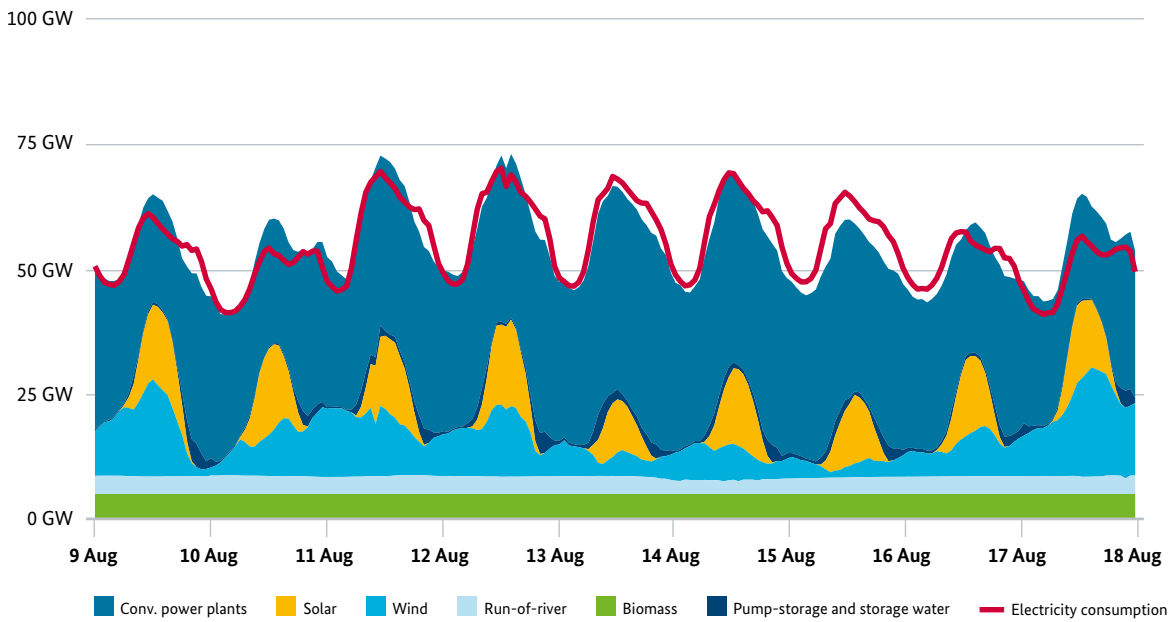
Unscheduled outages in 2013 (minutes/year)



Source: Council of European Energy Regulators

**Germany is an international leader in terms of the quality of its electricity grids and its security of supply. The German government is putting the policies in place to ensure that this will remain the case.**

**Electricity generation and consumption from 9 - 17 August 2014**

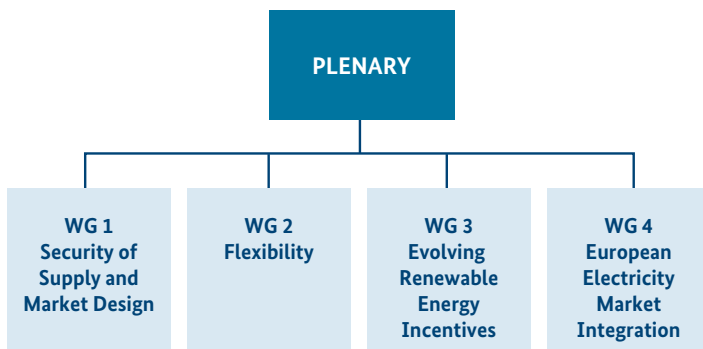


Source: Agora Energiewende

**Wanted: the electricity market of the future**

The big challenge now is to organise the wholesale electricity market so that the electricity supply will remain secure and reliable in future. One key feature of this “electricity market of the future” is flexibility. This is because the electricity market needs to respond as flexibly as possible to fluctuating wind and solar electricity generation. At the same time, it needs to create competition between the various ways to offset these fluctuations. This will ensure that the overall costs remain low.

The ministry issued a Green Paper flagging a number of measures to make the electricity market fit to cope with the energy transition, and opened it up to consultation. A broad-based dialogue took place with associations, the Länder, scientists, private citizens and Germany’s neighbouring countries. The outcome of this dialogue has been collated in a White Paper. It brings together specific proposals for the future design of the electricity market and forms the basis for the implementation in law.



**Electricity Market Platform**

How should the electricity market be organised in future? This question is being discussed intensively in the Electricity Market Platform. The Federal Ministry for Economic Affairs and Energy has brought together high-level representatives from commerce, government and society.



## 6. Go-ahead for grid expansion



Our future electricity generation system will be highly decentralised. There are already some 1.5 million PV and 23,000 wind turbines. But a distributed, decentralised approach should not be misunderstood as implying self-sufficiency. Several thousand kilometres of powerlines need to be upgraded or newly built so that the whole of Germany can continue to enjoy a reliable and secure supply of low-cost electricity.

This is necessary because the energy transition is radically restructuring the map of our energy generation. For many decades, nuclear power plants and large gas-fired and coal-fired power plants in southern and western Germany have supplied the conurbations in the area with electricity. Step by step, however, the nuclear power plants are being taken off the grid up to 2022. Renewable energy in the area cannot offset this on its own. For this reason, large amounts of wind energy need to be

transported from the windy north to the south and west of Germany. At other times, solar power needs to be shipped from the south to the north. However, the existing overland powerlines are not designed to cope with this. They are reaching their limits.

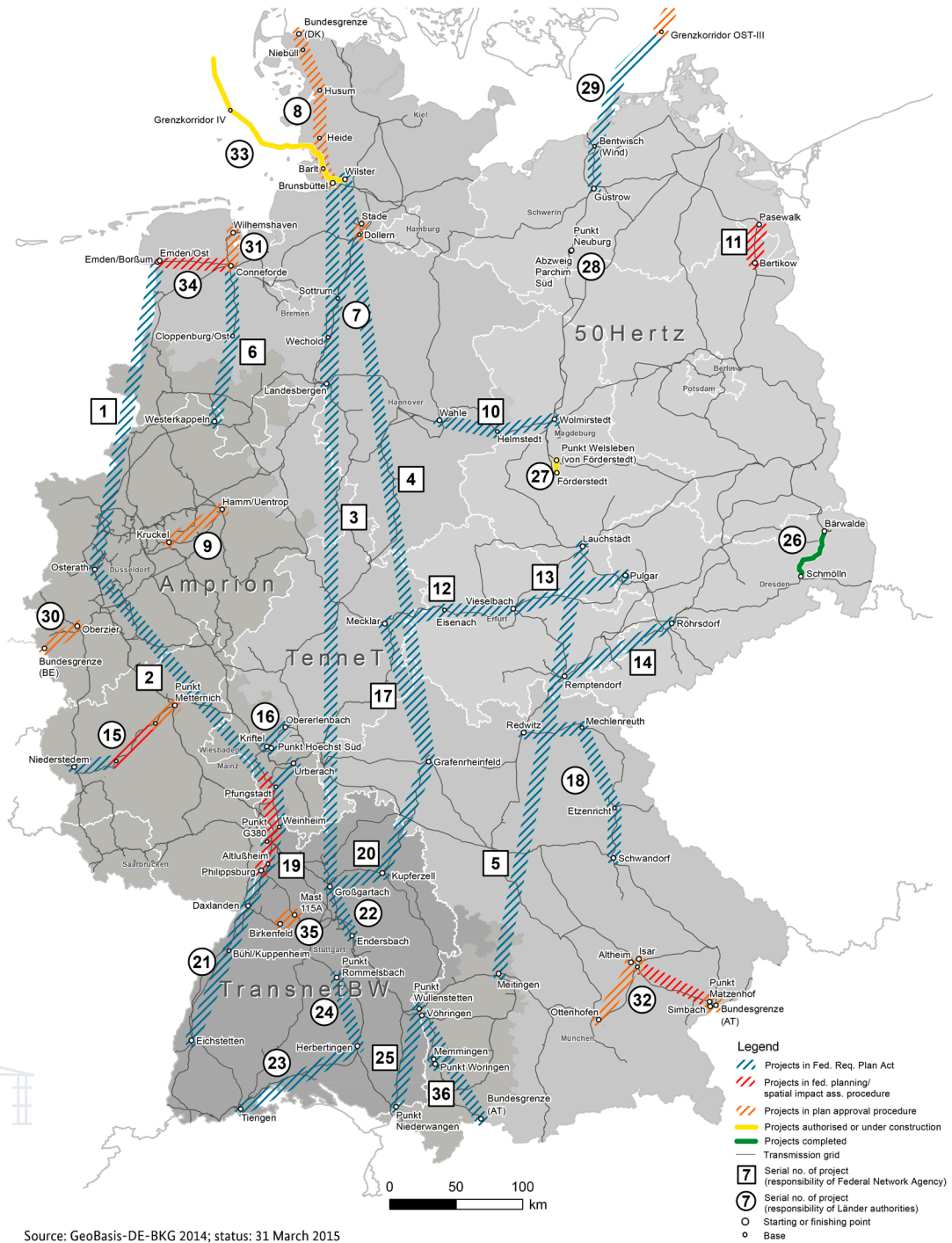
The German government has therefore paved the way for the transmission system operators to be able to expand their grids more quickly, with better coordination, and transparently. The system works like this: The four major transmission system operators jointly present the “**Electricity Grid Development Plan**”. This shows what new “electricity highways” will be needed in the next few years. To ensure that the wind energy facilities in the North Sea and the Baltic can be coordinated and rapidly connected to the powerlines, the grid operators also draft an **Offshore Grid Development Plan**. The Federal Network Agency examines both plans objectively and neutrally, and confirms them – possibly with changes.





Once the Grid Development Plan has been adopted, it usually becomes a basis for the **Federal Requirements Plan**. The latter entered into force for the

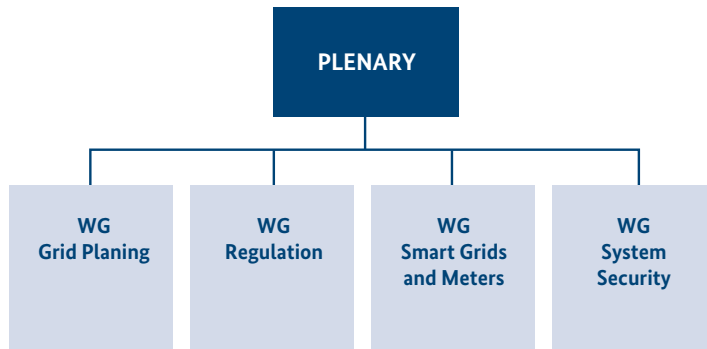
first time in July 2013. It stipulates in law what grid expansion projects are urgently needed for the energy transition (cf. diagram). Furthermore, the act



Source: GeoBasis-DE-BKG 2014; status: 31 March 2015

**Germany's future ultra-high voltage grid**

New, modernised powerlines are needed to transport electricity from the north to the centres of consumption in the west and the south. The Federal Requirements Plan Act has stipulated the starting and end points of the new routes.



### The Energy Grids Platform

Everyone around one table: In the plenary sessions and the four working groups of the Energy Grids Platform, grid operators, federal and Länder institutions and associations discuss ways to expand and modernise the grids.

speeds up the subsequent planning and authorisation procedures needed for the construction of the powerlines.

### Approving border-crossing grids

In the case of inter-regional expansion projects in particular, many of the planning and approval procedures used to be long-drawn-out. This was because the transmission system operators had to submit separate planning applications in each of the Länder. This has been changed: in the case of new “electricity highways” which run through several Länder or which link Germany with its neighbours,

the Federal Network Agency is now responsible for authorising the entire project.

### Upgrading the distribution grids for the energy transition

Not only the electricity highways need to be made fit for the energy transition: the same applies to the **distribution grids**. In the past, their main job was to “distribute” electricity to all households and companies. This has changed as renewables have expanded. Today, they also provide the grid connections for the many wind and solar installations. This means that the lines now need to transport electricity in



### In a dialogue with the general public

The energy transition is a joint project. It will only succeed if it enjoys the support of the public. It is therefore important for the ordinary citizens to be informed about planned new grids at an early stage and for their wishes and concerns to be taken into account. The rules on the grid expansion already mean that the public can play an active part in all phases of the expansion planning process. Also, since January 2015, the Federal Ministry for Economic Affairs and Energy has been supporting the initiative for a public dialogue on grids. It is reaching out with citizens' offices and offers of dialogue in those regions where there is a particularly large number of unresolved questions on grid expansion.



### Research for the energy transition: Superconductors

The energy transition cannot succeed without new technologies. Take superconductors, for example: they transmit electricity virtually without any losses, and are more efficient than traditional copper cables. The “AmpaCity” research project in Essen aims to find out whether superconductors can be a worthwhile alternative to traditional high voltage power lines. The German government is funding this and other promising research projects for the energy transition in its Sixth Energy Research Programme.

both directions – and they also need to balance the intermittent feed-in of renewables and the fluctuating electricity consumption of the companies and households. For this reason, the distribution grids not only need to be expanded and modernised. In many cases, they will also need to become “smarter”.

### Smart grids

**Smart grids** use modern IT to coordinate the electricity grids, electricity generation and electricity consumption. **Smart meters** not only measure electricity consumption, but also record the time of

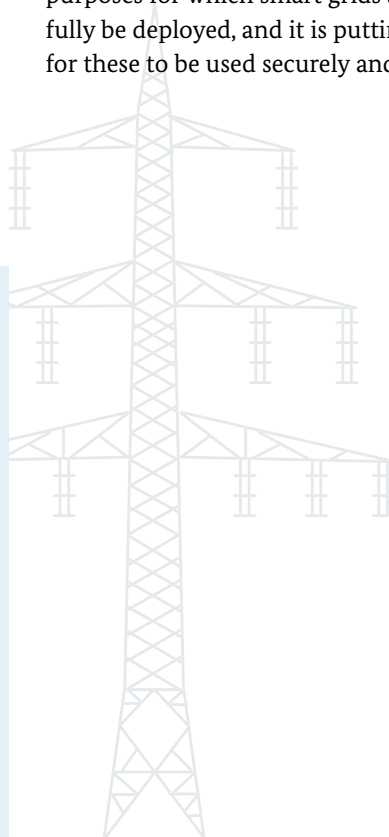
consumption. This puts the technology in place for major consumers to use electricity at times when availability is high and the price is low.

In the light of this, the German government is providing a framework in which the approx. 800 distribution system operators can invest in good time in new, modern grids. The government is analysing the purposes for which smart grids and meters can usefully be deployed, and it is putting policies in place for these to be used securely and economically.



#### A CLICK AWAY

- **Public dialogue on the electricity grid:** The online citizens’ office of the public dialogue on the electricity grid provides the public with quick and personal answers to all questions relating to the expansion of the power grid. The website also shows the local services offered by the initiative to promote the dialogue on the electricity grid: [www.buergerdialog-stromnetz.de](http://www.buergerdialog-stromnetz.de).
- **Netzausbau.de:** The Federal Network Agency’s website provides a comprehensive overview of the expansion of the power grid. It also shows the progress being made on individual projects: [www.netzausbau.de](http://www.netzausbau.de).





## 7. Energy research: innovations for the energy transition



Energy research paves the way for tomorrow's energy transition. From energy conversion to transport, distribution and storage, and the use of the energy in companies and households: we need new technical solutions throughout our energy system if we are to master the energy transition successfully.

Energy research is therefore a strategic element of energy policy. The German government is helping companies and research establishments to research and develop innovative energy technologies. To ensure that the best and most competitive technologies win through, the funding is provided on a technology-neutral basis as far as possible. In this way, alternative solutions can be developed which ultimately the market can then decide whether to adopt or not.

### The Sixth Energy Research Programme forms the basis

The Federal Government has anchored the basic features and priorities of its energy research funding in the **Sixth Energy Research Programme**. In addition to energy efficiency and renewable energy, the funding also focuses on new grid technologies and energy storage.

In total, the Federal Government spends roughly 820 million euros a year on supporting all phases of research and development of new energy technologies, from basic research to project applications. The annual **Report of the Federal Government on Energy Research** presents the assisted measures and indicates the structural and substantive changes in the Federal Government's energy research.

## Priorities set by the Federal Ministry for Economic Affairs and Energy in energy research

### Energy conversion

- Wind
- Photovoltaics
- Deep geothermal
- Solar thermal power plants
- Hydropower and marine energy
- Power-plant technology and CCS
- Fuel cells and hydrogen technologies

### Energy distribution and storage

- Electricity grids
- Energy storage

### Efficient energy use

- Energy-optimised buildings and neighbourhoods – decentralised and solar energy supply
- Energy efficiency in industry, commerce, trade and services
- Key energy-related elements of electric mobility

### Overarching energy research

- Systems integration of renewable energy
- Energy system analysis



## In dialogue: energy research and innovation

In order to transfer the findings of energy research straight across to the stakeholders in the energy transition, the Federal Ministry for Economic Affairs and Energy has set up the **research networks entitled “Electricity grids”, “Energy systems analysis” and “Energy in buildings and neighbourhoods”**. By providing an interface between research, application and policy-making, the networks also foster the discussion of practical research promotion strategies and the coordination of new measures.

The new **Research and Innovation Platform** focuses on the strategic exchange of information between the Federal Government, commerce and science on the implementation and development of the energy research and funding programmes. The aim is also to develop fresh stimuli to boost the coordinated and accelerated use of innovative energy technologies.




### A CLICK AWAY

- **Information hotline on federal support for research and innovation:** Is my research project eligible for financial support? Where can I apply? Answers to these and many more questions relating to research funding can be obtained by research establishments, higher education institutions and businesses from the Research and Innovation Funding Advisory Service. You can contact the funding advice hotline at 0800 2623 009 (free of charge) or by email to [beratung@foerderinfo.bund.de](mailto:beratung@foerderinfo.bund.de). The service also offers a comprehensive and up-to-date information service online: [www.foerderinfo.bund.de](http://www.foerderinfo.bund.de).
- **Federal report on energy research:** The annual Report of the Federal Government on Energy Research is available as a download: [www.bmwi.de](http://www.bmwi.de).





## 8. European and international energy policy: tackling the energy transition together with our partners



The European energy markets are growing closer and closer together. This brings about major advantages for electricity and gas consumers: greater choice, lower prices and better energy security. An internal market makes it possible to draw on the advantages offered by the different locations of the various EU Member States. And the larger the common market, the better the possibilities are to offset fluctuations in the feed-in of electricity from the wind and the sun. The same applies to gas: the better networked Europe is, the more secure the supply will be.

### Cooperation creates security

However, a single market will only work if the energy can flow to where it is needed uninterrupted by borders. And there is currently still a lack of free

capacity in the existing grids in many places. The cross-border electricity and gas grids need to be further expanded and modernised. Access for liquefied natural gas to import terminals (LNG terminals) must also be improved further.

### The energy transition will only succeed on a European basis

The more that Europe's energy markets grow together, the more important it will be to have common political targets and rules. Together with our European partners, we need to put the right policies in place so that we can make further progress along the road towards a sustainable energy supply. Germany's energy transition needs an ambitious European energy and climate policy, and a reliable policy environment.



The German government is therefore glad that the European Council has agreed on ambitious **climate and energy targets** for the coming decade. At least 40% less greenhouse gases are to be emitted in Europe in 2030 than was the case in 1990. At least 27% of energy consumed at that time is to derive from renewable sources. And EU-wide energy consumption is to fall by at least 27%.

### Attaining the climate targets together

The European Council has also called for reforms to **European emissions trading**. Emissions trading is the key European instrument to combat climate change. However, given the current high surpluses of certificates and very low carbon prices, it does not provide sufficient incentives to invest in low-emission technologies. The German government is therefore calling for a rapid and lasting reform of emissions trading.

At the same time, it is important that the ambitious climate change mitigation requirements do not result in disadvantages for those companies which need a lot of energy and face international competition. For this reason, the Member States have agreed that the existing preferences granted to these companies should continue.

### Successful international energy policy

Germany will remain reliant on oil, coal and gas from abroad for the foreseeable future. Germany's international energy policy therefore aims to safeguard the reliability and affordability of these energy imports in the long term.

At the same time, Germany wants to encourage others to embark on an energy transition. An enhanced international dialogue can help to improve the understanding of the energy transition, to alleviate concerns and to utilise synergies for a common, forward-looking energy policy.

Against this background, the German government has established numerous successful **energy dialogues and partnerships** – e.g. with Tunisia, Morocco, Algeria, Russia, Norway and Turkey, and also with major consumers like India, China, Brazil

and South Africa. The German government is also working in **multilateral energy organisations and dialogue forums**, such as the G7, G20, International Energy Agency (IEA), the International Renewable Energy Agency (IRENA) and the Renewable Energy Policy Network (REN 21) to achieve competition-based, open and transparent markets and a sustainable energy and climate policy. During the **German G7 Presidency in 2015**, Germany is particularly working to improve sustainable energy security around the world.

### Support for the global energy transition

More and more countries are trying to improve energy efficiency and are turning to renewable energies. German suppliers have special expertise here, and offer innovative solutions. Germany's international energy policy therefore also aims to support the export activities of German manufacturers and service providers, thereby also fostering a sustainable, secure and affordable supply of energy in the partner countries.



#### A CLICK AWAY

- **Export initiatives of the Federal Ministry for Economic Affairs and Energy:** The Renewable Energy and Energy Efficiency Export Initiatives offer a lot of support to German firms starting out on markets abroad. Small and medium-sized firms particularly benefit from a comprehensive information service on selected markets, from fact-finding missions abroad, matchmaking in the target country and from support with marketing abroad. The websites of the two initiatives provide interested companies with a good overview of the broad range of services and with a lot of valuable information.

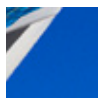
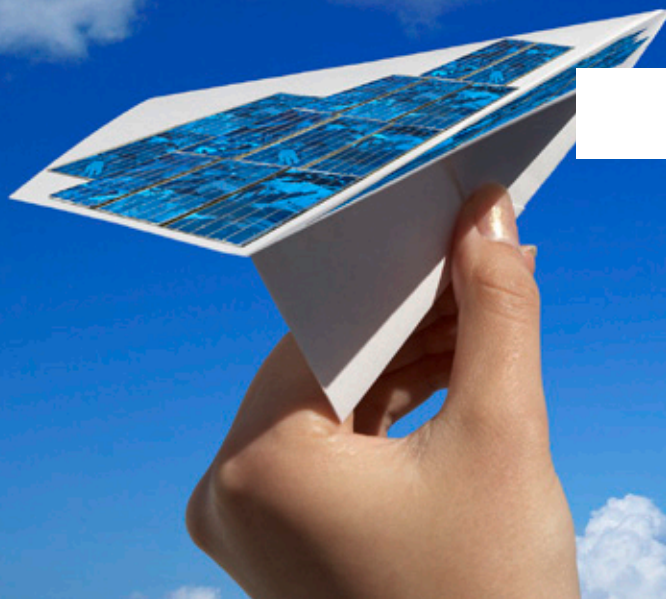


[www.export-erneuerbare.de](http://www.export-erneuerbare.de)



[www.energieeffizienz-germany.info](http://www.energieeffizienz-germany.info)

## 9. Outlook



The energy transition is one of the most important projects for Germany's future. It can demonstrate that a highly industrialised country can switch to a sustainable energy supply without losing competitiveness in a globalised world. More than that: a successful energy transition will combine environmental sustainability and climate change mitigation with a high level of industrialisation, high-tech innovation, higher prosperity and more jobs.

We have already done a great piece of work – but much remains to be done. The 10-Point Energy Agenda shows us the next key steps in the energy transition.

Renewable energies have become a central pillar of our energy supply. They must not be permanently sheltered in a separate system, but must increasingly survive in the face of competition on the electricity market. In future, the level of funding is to be determined by means of a competitive auction between the plant operators. As a first step, we are now testing this for ground-mounted PV installations.

To make sure that the cheap electricity generated from renewable energy can reach the consumers, we all – Federal Government, Länder, municipalities, and individuals – need to work together to expand the electricity grids. We have established the basis for this. We now need to ensure that the grids can be rapidly expanded, with broad public acceptance.

We need a new electricity market design which fits the energy transition. We need to ensure that there is an optimal interplay between the power plant fleet and the renewables, and that security of supply continues to be ensured in future. To this end, the Federal Ministry for Economic Affairs and Energy has developed a viable policy framework together with all the stakeholders.

As a second pillar of the energy transition, energy efficiency needs to be further improved. The Energy Efficiency Strategy for Buildings will shift the focus more to the real estate sector, with its massive potential for energy conservation and renewable energy.

The energy transition does not stop at Germany's borders. We are working together with our European and international partners to ensure that the European internal market in electricity becomes a reality, and we are developing viable international solutions for a sustainable energy policy.

We will not be able to do that on our own. We need more than just backing from government, commerce and science: above all we need the support of the public. As consumers, investors and electricity generators, they are the real backbone of the energy transition. Together, we can make the energy transition into an economic and environmental success story.

**You can subscribe to the energy transition:**

Renewable energy and energy efficiency, tomorrow's electricity market and grid expansion, key legislation and forward-looking energy research: you can find background information, facts, trends and contentious standpoints relating to the energy transition in the newsletter "Energiewende direkt", which is published fortnightly in English and German by the Federal Ministry for Economic Affairs and Energy: [www.bmwi-energiewende.de](http://www.bmwi-energiewende.de)

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