Business report

General conditions

External influences

The business performance of EnBW is greatly influenced by a wide range of external factors. These include, above all, the development of the wholesale market prices for electricity, the political/regulatory framework conditions and also the weather conditions. The price of electricity is not only dependent on demand but also on the development of the global fuel and CO_2 markets. In an environment characterised by a constantly growing share of generation accounted for by renewable energies, earnings are naturally influenced by the weather conditions. In addition to these factors, the energy sector is still experiencing a period of fundamental change due to the transition to increasingly carbon-neutral methods of energy generation. On the sales side of the business, there is very intensive competition with ever more newer players joining the market.

Macroeconomic trends

Economies

Economic growth accelerated in 2017 in almost all of the economies relevant to EnBW. The growth in economic output was based above all on buoyant levels of private consumption. However, there was also an increase in economic and political risks, such as populist and separatist movements and the abandonment of tried-and-tested international trade agreements.

The general conditions for the business activities of EnBW should remain favourable in 2018. Economic growth in Europe is expected to be at the same level as in the previous year. The slower rate of growth anticipated in Turkey and the Czech Republic will not have any significant effect on the business performance of EnBW.

Development of gross domestic product (GDP)

in %	2018	2017	2016[1]
World	3.9	3.7	3.2
Eurozone	2.2	2.4	1.8
Germany	2.3	2.2	1.9
Switzerland	2.0	1.0	1.4
Czech Republic	3.3	4.4	2.6
Turkey	3.5	7.5	3.2

1 The figures for the previous year have been restated.

Development of interest rates

The European Central Bank (ECB) continued its expansive monetary policy in 2017. In the middle of the year, suggestions of a possible reduction in the purchase of securities by the central bank led to a temporary rise in yields for government bonds, which declined again during the remainder of the year.

The discount rates, especially those for the pension and nuclear provisions of the company, also followed this trend. For the year as a whole, both the discount rates and also the present value of the pension and nuclear provisions remained almost stable.

The average of the consensus forecasts for the ECB main financing rate has remained unchanged at 0.0% since the middle of March 2016.

Development of the sector and competitive situation

The energy sector is still undergoing a period of fundamental change. The Energiewende has concentrated up to now on the generation of electricity using renewable energies, but the focus will expand in future to bring the themes of heating and electromobility more and more into play. This will result in fierce competition in all segments of the market.

Many new business models are being developed and new competitors are emerging on the market offering new products and services. In this challenging environment, traditional energy supply companies need to review their business models and orientate themselves to the new market conditions (p. 14 f. and 24).

International, national, regional and new competitors

Competitor segment	Companies	Characteristics
International competitors	EDF, Enel, Engie, E.ON, Uniper, Iberdrola, RWE, innogy, Vattenfall	> Broad-based, internationally oriented growth strategy > Growth especially in renewable energies, grids and sales/solutions
National competitors (DACH region)	ALPIQ, EVN, Verbund	> Stable national position, activities in selected foreign markets > Focus on market development, for example in renewable energies, grids, sales and/or solutions
Regional competitors	Badenova, EWE, MVV, SWM, Thüga	> Focus on regional markets > Main focus of the business activities mostly in area of grids and sales
New competitors	1&1, Capital Stage, Deutsche Telekom, Google, NEXT Kraftwerke, sonnen, Tesla, wpd	> Entry of new market participants increases competition and leads to a fragmentation of the value chain

Cross-segment framework conditions

Climate protection

The business activities of EnBW will be significantly influenced by international climate protection targets and the associated measures for their achievement. The 23rd UN Climate Change Conference was held in Bonn in November 2017. Its main aim was to push forward with the practical implementation of the Paris Climate Change Agreement. The achievement of Germany's climate protection targets for 2020 and maybe also those for 2030 is under threat. Therefore, further measures are now required – with political discussions focussing above all on the accelarated phasing out of coal-fired power generation.

The achievement of Germany's climate protection targets up to 2050 will affect all levels of the value added chain for electricity and gas in which EnBW is active. Starting with the transition from generation using fossil fuels to renewable energies such as wind and sun, the implementation of the climate protection targets will involve the expansion of the grid infrastructure as well as customer-oriented areas of activity, such as energy efficiency, e-mobility or energy services, for all customer segments from household customers through to the housing industry, industrial customers and local authorities.

EnBW published a Declaration on Climate Policy together with the development and environmental organisation Germanwatch, Foundation 2°, B.A.U.M and more than 50 companies (www.enbw.com/klimaschutz). It demands that climate protection together with concrete measures in this area are made a central task of the future German government.

In addition, Thomas Kusterer, EnBW Chief Financial Officer, is a member of the Task Force on Climate-related Financial Disclosures (TCFD) and committed to the development of climate-related risk reporting. The TCFD published recommendations for effective climate reporting in summer 2017. It emphasises that, by implementing the recommendations, companies can demonstrate how they handle climate-related opportunities and risks. In addition, the TCFD standard requires companies to explain how robust their business models are on the way towards creating a low-carbon economy. Presenting the robustness of our business model with respect to climate protection (p. 15) and an index of the TCFD recommendations (p. 115) represents the first steps towards its implementation in this report.

The strategy being followed by EnBW of concentrating investment on renewable energies, expanding the grids and developing new and increasingly digitalised business models supports the achievement of the targets set at the Climate Change Conference, while the strategy itself is being promoted by the international efforts for climate protection.

Energiewende 2.0

At the beginning of the Energiewende, the main focus was placed on the expansion of energy generation using renewable sources. Since the Paris Climate Change Agreement in 2015, it has become clear that transforming the energy industry will not be sufficient on its own for the achievement of the greenhouse gas targets. Rather, all other sectors need to be included in order to achieve the climate target of limiting the increase in global temperature to well below two degrees Celsius.

The residual budget that is still available for greenhouse gas emissions for Germany in 2050 of 250 million t CO_2 (80% target) or 62 million t CO_2 (95% target) will be required to a significant extent for remaining process-related emissions in industry and agriculture. Therefore, private households, industry, trade and commerce, as well as transport and the energy industry, need to make a greater contribution to the reduction of greenhouse gases and be almost fully decarbonised by 2050. This will require a complete transformation of the energy system because fossil fuels will by and large need to be completely replaced.

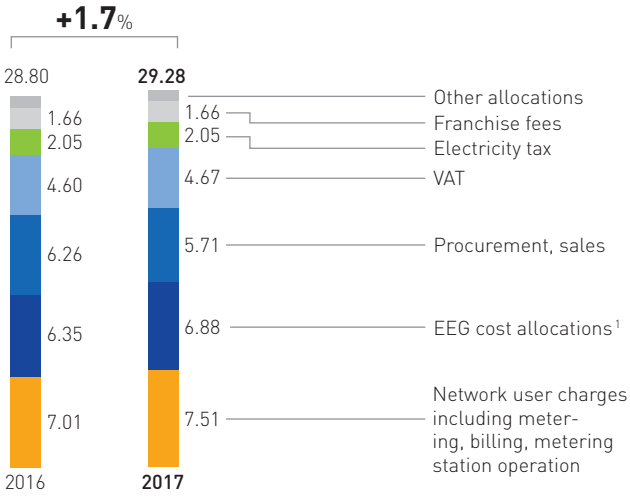
Sector coupling – the networking of the three sectors of electricity, heating and transport – is associated with an increase in the levels of complexity. Balancing the generation of electricity from renewable energies that cannot be directly controlled and the demand for energy is an important aspect of the Energiewende. The necessary flexibility will, to a certain extent, mean controlling demand, such as the charging of e-vehicles at times beneficial to the system and the short-term

or seasonal storage of energy. This movement towards a holistic approach across all sectors, the stronger links to sustainable infrastructure themes as a result and the development of numerous cross-sector business models will act as an important basis for the strategy of EnBW in the post 2020 period (p. 26 f.). We are already developing one growth field through the provision of a charging infrastructure for electric vehicles.

Activities in Turkey

EnBW has been actively involved in the expansion of electricity generation in Turkey, above all through investment in wind power plants, as part of its joint venture with its Turkish partner Borusan since 2009. In 2017, the joint venture was the second most successful company in the auctions for wind projects with bids accepted for around 400 MW. It was thus able to increase its existing generation portfolio from around 750 MW to around 1,150 MW. In the past few years, the economic and political conditions in Turkey have deteriorated noticeably. EnBW continues to closely monitor these developments. In our opinion, there is currently no immediate danger to the employees working in Turkey or to the security of the investments made jointly with our Turkish partner.

Average electricity price for a 3-person household (annual consumption of 3,500 kWh)
in ct/kWh



1 Use of the German Compensation Mechanism Ordinance (AusglMechV) applies since 2010.

Source: BDEW
As of January 2018

Sales segment

Electricity and gas prices for retail and industrial customers

According to an analysis of electricity prices by the German Association of Energy and Water Industries (BDEW) published in January 2018, the average monthly electricity bill for a household with an annual consumption of 3,500 kWh in 2017 came to €85.42 compared to €83.99 in the previous year. Taxes and levies account for more than half of this amount. EnBW was able to keep the price for the basic supply of electricity stable in 2017 as lower wholesale market prices compensated for the increase in levies. In the case of industrial customers receiving a medium-voltage supply, the average electricity price including electricity taxes increased according to calculations made by the BDEW by 9.9%, from 15.55 ct/kWh in the previous year to 17.09 ct/kWh in 2017.

According to calculations by the German Federal Statistical Office in 2017, natural gas prices for private households had fallen by 3.0% compared to the previous year; the price of natural gas for industrial customers had risen by 3.8%.

Structural changes

In the area of **energy services**, there will be new applications for electricity in the areas of electromobility and urban infrastructure and in other business fields. In the long term there may even be an increase in demand as fossil fuels are replaced by electricity – such as through the use of heat pumps – and due to the politically desired expansion of electromobility. More than 20% of new buildings are now equipped with heat pumps. An expanding range of vehicles with electric drives and the increase in state funding in 2016 has led to a significant rise in newly registered e-vehicles: Growth of 133% was recorded in the first half of 2017 alone compared to the previous year. The expansion of the public charging infrastructure is also accelerating: Around 10,700 publicly accessible charging points were available in Germany by the middle of 2017 – which represented an increase of over 4,000 charging points in comparison to the previous year. EnBW made an important contribution in 2017 with the expansion of the charging infrastructure at around 120 motorway service stations together with Autobahn Tank & Rast GmbH. EnBW believes that the "transport transition" (Verkehrswende) – a further component of the Energiewende – is an important prerequisite for achieving the German climate protection targets. For this reason, electromobility is a strategically relevant area of activity.

The increasing digitalisation of the energy supply system is also acting as the basis for the development of innovative business models. The digitalisation law that came into force in 2016 includes an obligation for the installation of **smart meters** in progressive stages. Large consumers with annual consumption of more than 10,000 kWh will receive digital smart meters from 2017. Smart meters will then become obligatory for private households with an annual consumption of 6,000 kWh or more from 2020. The certification of the devices by the Federal Office for Information Security (BSI) has been delayed – the roll-out will begin as soon as the first certified devices are available on the market.

The act to promote **tenant electricity** came into force on 25 July 2017. Tenant electricity describes electricity that is generated in solar power plants on the roof of a residential building and supplied to end consumers – especially tenants – in the same building or in residential buildings and ancillary facilities in the immediate vicinity without transmission via the grid. The electricity that is not used by the tenants is fed into the grid for general supply and reimbursed accordingly. Funding could only be provided up to now for electricity from PV power plants that was fed into the grid for the general supply of electricity. The new regulations should also allow tenants to enjoy the benefits of decentralised, renewable generation. EnBW believes that the improved general conditions offer opportunities for developing innovative business models and is already offering an innovative product called EnBW solar+ that optimally combines a photovoltaic power plant and a storage system.

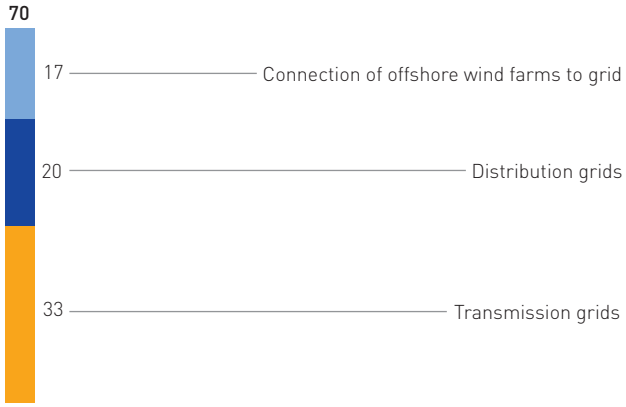
The German Federal Ministry for Economic Affairs and Energy (BMWi) published the **"Funding strategy for energy efficiency and heating from renewable energies"** in May 2017. The strategy describes measures for the further development of energy efficiency funding in the new legislative period and contains recommendations for action to define the climate protection plan in concrete terms in relation to energy efficiency and heating from renewable energies. The aim is over the next few years to combine, for example, energy efficiency and renewable energy funding programmes and align them towards specific target groups. In addition, the funding of heat generation that is exclusively based on fossil fuels is due to be phased out from 2020. EnBW believes that the pending "heating transition" (Wärmewende) offers opportunities for the provision of energy-efficient and low-carbon heating solutions.

Grids segment

The success of the Energiewende is closely linked to the **expansion of the transmission and distribution grids**. The connection of renewable energies will require further construction measures at all levels of the electricity grid. Furthermore, the electricity grid also needs to be equipped for the expected escalation in the number of electric cars. The distribution grid operators at EnBW are preparing to face these challenges.

The **Network Development Plan Electricity (NDP Electricity)** up to 2030 anticipates further demand for new power lines for the German transmission grid. The Federal Network Agency (BNetzA) has examined and approved 16 new projects for inclusion in the Federal Requirements Plan. According to assessments made by the transmission system operators (TSO), further expansion of the grid will be necessary even after 2030, which could also comprise pure high-voltage direct current transmission lines (HVDC lines). Our transmission system operator TransnetBW is involved in these grid development plans through the SuedLink and ULTRANET projects.

Investment for the expansion of the German electricity grid up to 2030
in € billion



Source: Own estimates based on latest Network Development Plan Electricity from TSO and the BMWi 2014 Distribution Grids Study.

The final version of **Network Development Plan Gas (NDP Gas)** 2016 to 2026 from 16 October 2017 comprises an investment volume of €3.9 billion to expand the transmission gas pipelines by 823 km and increase compressor capacity by 429 MW. This does not include expansion measures with a volume of around €500 million linked to the Nord Stream 2 pipeline that has not yet been approved. If approval for Nord Stream 2 is received, the gas transmission grid operators want to include these measures again in an addendum to the final NDP Gas. There are no measures for the grid area operated by ONTRAS in the NDP Gas. As part of the work to strengthen the German and European gas supply, ONTRAS is participating in the European Gas Pipeline Link (EUGAL) as a project shareholder. A further revision was necessary to create the conditions for the future development of the power plant sites in Altbach and Heilbronn am Neckar as possible locations for gas-fired grid reserve power plants. Both of these planned power plants are located in the grid area covered by our gas transmission grid operator terranets bw.

The German government passed a law on the modernisation of grid fees **(Netzentgeltmodernisierungsgesetz, NEMoG)** on 30 June 2017. NEMoG envisages the stepwise harmonisation of the transmission grid fees from 2019 until 1 January 2023. Furthermore, the remuneration for decentralised feed-ins (so-called avoided grid fees) will be

adjusted: The payments for all controllable power plants will be frozen at the grid fees for 2016 and adjusted for the costs of connecting up the offshore wind farms and of the underground cables for the transmission grids. In the case of non-controllable power plants (wind and photovoltaic power plants), the avoided grid fees will be phased out from 2018 in three stages up to 1 January 2020. It can be assumed that cost components for the Energiewende across Germany will be additionally contained within the network user charges for TransnetBW, as the network user charges are currently lower than at other German TSOs. The earnings for our EnBW power plants from the decentralised feed-in remuneration will reduce in accordance with the legal agreements.

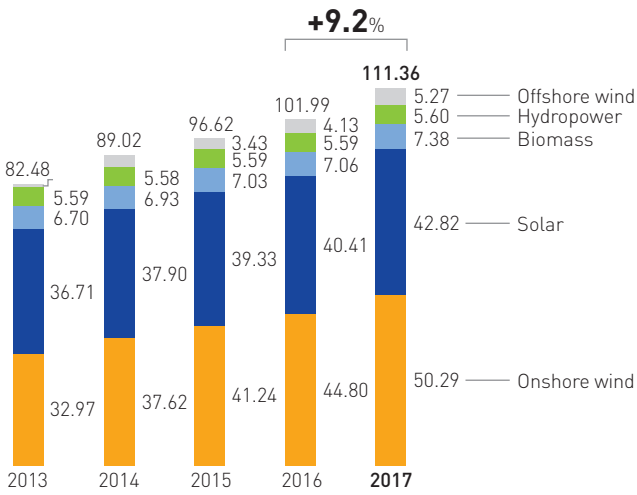
The natural gas market in Germany has been split into the two balancing zones NetConnect Germany (NCG) and GASPOOL – both of which supply L-gas and H-gas – since October 2011. The Bundesrat agreed on the **reform to the Gas Grid Access Directive** (GasNZV) on 7 July 2017. In particular, the reform requires the merging of the two German market areas by 1 April 2022. This is seen as an important step for future European developments that could also include a cross-border market area with German participation. This would prevent any discrimination within Germany caused by the integration of only one of the two German market areas. We view the merging of the two German market areas as a necessary intermediate step in the further development of the national gas market, as well as for cross-border integration, such as with the Benelux countries. In particular, we anticipate that this will result in an improvement to the liquidity situation on the forward market.

As part of the cost assessments for the third incentive regulation period, the electricity grid operators submitted their **network user charge applications** using the data for base year 2016 by 30 June 2017. The corresponding network user charge notices for the third regulatory period for electricity (2019 to 2023) are only expected during the course of 2018. The gas grid operators had already submitted their network user charge applications for the third regulatory period for gas (2018 to 2022) in 2016, using the 2015 financial year as a basis. The cost assessments are very relevant for our grid operators because the results have a significant effect on their earnings situation.

Renewable Energies segment

Renewable energies in Germany experienced significant growth in 2017 both in terms of their capacity and also the volume of electricity generated. According to the Fraunhofer ISE, the proportion of total German electricity generation accounted for by renewable energies increased to 38.4% (2016: 33.6%). Generation from photovoltaics increased by around 1%. Generation from wind power increased by around 32% in comparison to 2016, which had experienced relatively poor wind conditions. The area of onshore wind power experienced especially strong growth in 2017 with the addition of more than 5 GW of capacity.

Installed net output for electricity generation from renewable energies in Germany
in GW/year



Source: AGEE, BMWi, Bundesnetzagentur
As of 02/01/2018

For **onshore wind power plants**, there is a transitional period for the completion of already approved projects with fixed funding up to the end of 2018. Three rounds of auctions were held in 2017 for later projects. The existing privileges for community energy cooperatives (BEG) meant that nearly all of the bids accepted were for projects from these types of cooperative. EnBW did not have any of its bids accepted in Germany in 2017. The rate of expansion is set to decrease in 2018 and 2019 because BEG enjoy greater freedom for the implementation of the projects. The first two rounds of auctions without privileges for BEG will be held in 2018, which means that all of the projects can bid under the same conditions in these auctions. It is anticipated that BEG will once again enjoy the same privileges in the two subsequent rounds of auctions.

For **offshore wind power plants**, the target of 15 GW of installed output by 2030 has been defined. There will also be a period of transition to competitive auctions for offshore wind power plants: All wind farms that are placed into operation by 2020 will receive funding in accordance with the EEG 2014. The first of a total of two transitional auctions for wind turbines to be connected to the grid between 2021 and 2024 was held in April 2017. Three projects that did not require any state funding were accepted, including the He Dreiht project from EnBW. The central auction process will apply to new projects from 2025. EnBW will realise its EnBW Hohe See and EnBW Albatros projects as planned by 2019 and participate in the tender procedures with its subsequent projects (p. 90).

A central auction model is also being used for **photovoltaic power plants** with an installed output of more than 750 kWp. The prices in the accepted bids for the participating projects fell during the course of the three rounds of auctions in 2017, from an initial 6.6 ct/kWh to 4.9 ct/kWh. The development of photovoltaic output in Germany is also dependent on the growth of smaller power plants, whose profitability is in-

creasingly characterised by own consumption models. A continuous fall in the cost of battery storage systems in combination with lower feed-in remuneration already makes these models an attractive option today.

Generation and Trading segment

Electricity wholesale market

Following a low in 2016 and lateral movement in the first half of 2017, prices on the wholesale market for electricity rose significantly during the remainder of the year. While the market prices for the 2018 delivery year stood at €30/MWh on average in the first half of the year, prices already increased in the third quarter to €33/MWh and in the fourth quarter to €37/MWh. The increased prices on the electricity market were due primarily to higher prices for hard coal and emission certificates. As a result, the pressure on generation from coal power plants remains high, especially in Germany. The trend for electricity generated at large power plants to be driven out of the market by the increasing level of generation from renewable energies is continuing.

The front year E base load prices in 2018 will remain highly dependent on the development of prices for fuel and CO_2 allowances. In the medium term, the price level will be increasingly influenced by changes in energy and environmental policies at home and abroad.

Development of prices for electricity (E EPEX), E base load product

in €/MWh	Average 2017	Average 2016
Spot	34.19	28.98
Rolling front year price	32.38	26.58

Gas market

Long-term gas import contracts form a primary basis of Germany's gas supply. The wholesale markets, such as the TTF and the trading point of the E NetConnect Germany (NCG) market area, are other important sources of natural gas. Prices track the oil price trends with a time lag. In addition, prices on the European wholesale market have developed more autonomously because the increased supply of Liquefied Natural Gas (LNG) from the USA and Australia has meant that gas and oil prices have become less and less tightly linked to one another. The border price index for natural gas published monthly by the German Federal Office of Economics and Export Control (BAFA) stood at €16.34/MWh in August 2017, which was 7.2% below the December 2016 figure (€17.60/MWh) and 15.5% above the figure for the same month in the previous year (€14.15/MWh). As a result of the oversupply on the gas markets, we do not anticipate that prices will recover further in the short term.

Development of prices for natural gas on the TTF (Dutch wholesale market)

in €/MWh	Average 2017	Average 2016
Spot	17.29	14.02
Rolling front year price	16.98	15.40

Oil market

The oil market in 2017 was primarily supported by the joint production cuts agreed by OPEC, but not including Libya and Nigeria, as well as by some non-OPEC countries such as Russia. Due to the more limited supply from these countries, global stocks fell steadily in 2017 but still continued to be above the target five-year average. The very dynamic growth in oil production in the USA, combined with a sometimes poor level of compliance by individual OPEC countries and the threat that the agreement to limit production would expire at the end of June 2017 meant that oil prices were consistently under pressure from March to June. The extension to the production cuts initially up to the end of March 2018 and then until the end of 2018 ultimately ended the fear of a return to oversupply. As a result, oil prices recovered by September to the levels seen at the start of the year, before the impact of the hurricanes Harvey and Nate as well as – from the middle of October – a series of geopolitical risks led to a further increase in prices to more than US$60/bbl. These risks included the conflict between the Iraqi central government and the Kurds in northern Iraq, new tensions between Saudi Arabia and Iran, the internal power struggle in Saudi Arabia, the potential reintroduction of US sanctions against Iran and the threat of Venezuela going bankrupt. We thus anticipate that the sharp increase in oil production outside of OPEC will mean that any price rises to anything significantly over US$70/bbl will be prevented, as long as there are no further production shortfall or geopolitical crises.

Development of prices on the oil markets

in US$/bbl	Average 2017	Average 2016
Crude oil (Brent), front month (daily quotes)	54.75	45.13
Crude oil (Brent), rolling front year price (daily quotes)	54.87	49.35

Coal market

In the first half of 2017, the prices of API #2 quality coal for delivery in the 2018 calendar year (API #2 Cal 18) fluctuated on the E forward market in a range between US$60/t and US$70/t. In the second half of the year, prices rose continuously to a value above US$85/t. The main reason for this were the severe restrictions on Chinese coal production due to comprehensive safety checks in the country's coal mines. Coal imports into China rose as a result to more than 27 million t in September 2017, which was the highest monthly volume since December 2014. The demand for coal was higher than in the previous year in many other, primarily Asian

countries, which resulted in global coal imports increasing by more than 20 million t in 2017 compared to 2016. In addition, higher freight costs and oil prices led to a rise in prices for deliveries to Europe. We thus anticipate that coal prices on the spot market in 2018 will level off at a price of over US$80/t if the high demand for coal in Asia continues.

Development of prices on the coal markets

in US$/t	Average 2017	Average 2016
Coal – API #2 rolling front year price	73.70	53.63
Coal – API #2 spot market price	84.52	60.05

CO_2 allowances

Under the European emissions trading system, proof must be provided of CO_2 allowances for CO_2 emissions from power plants. In the first half of 2017, the price of EU allowances (EUA) fluctuated between €4.30/tCO_2 and almost €6/tCO_2. In the second half of the year, the prices for emission allowances rose to around €8/tCO_2. The total supply of EUA certificates was slightly above the anticipated emissions in 2017. However, the hedging demand was higher due to the increase in clean dark spread during the course of the year. In addition, the ongoing negotiations on the reform of the EU Emissions Trading System (ETS) have provided some impetus for prices to rise. A general increase in EUA prices is expected in 2018.

Development of prices for emission allowances/daily quotes

in €/t CO_2	Average 2017	Average 2016
EUA, rolling front year price	5.77	5.34
CER, rolling front year price	0.23	0.38

Nuclear power

The Act for the Reorganisation of Responsibility in Nuclear Waste Management came into force in the middle of June 2017. It establishes new rules for the roles and financial responsibilities of the German government and operators. According to the new law, operators are responsible for the decommissioning and dismantling of their nuclear power plants, as well as for the conditioning and packaging of the radioactive waste. The obligations remain with the companies. The transport, intermediate storage and final storage of the waste will be the responsibility of the German government in future. A fund under public law took over these obligations from the operators on 3 July 2017. The payment of a risk premium of around 35% releases the operators from any subsequent liability for the areas of responsibility transferred to the German government. The law is accompanied by a public law contract between the government and the operators that not only clarifies the rules established in the law in more detail but also stipulates the further course of action to be taken regarding the repatriation of reprocessing waste from France and Great Britain. The operators are obligated in the contract to prepare applications for the storage of this waste at selected intermediate storage sites. The transport of the waste will only be carried out when the intermediate storage sites for highly radioactive waste have been transferred to the German government; this will not be the case before 1 January 2019.

On 7 June 2017, the Federal Constitutional Court declared the law for the nuclear fuel rod tax unconstitutional; EnBW has received a tax refund as a result (p. 56 ff.).