

Capital Markets Day 2018 >

Stuttgart, 17 October 2018





Today's topics



Thomas Kusterer, CFO:

Financial discipline linked to an evolving corporate strategy and a challenging capital markets environment



Frank Mastiaux, CEO:

EnBW Strategic Roadmap: Status and a look ahead.



Lothar Rieth, Group Expert Sustainability:

Sustainability as an integral part of the strategy



Georgios Stamatelopoulos, Senior Vice President Generation:

Sustainable generation at EnBW

Thomas Kusterer, CFO

Financial discipline linked to an evolving corporate strategy and a challenging capital markets environment



Sustainable capital markets player with focus on debt capital markets



Permanent access to debt capital markets necessary

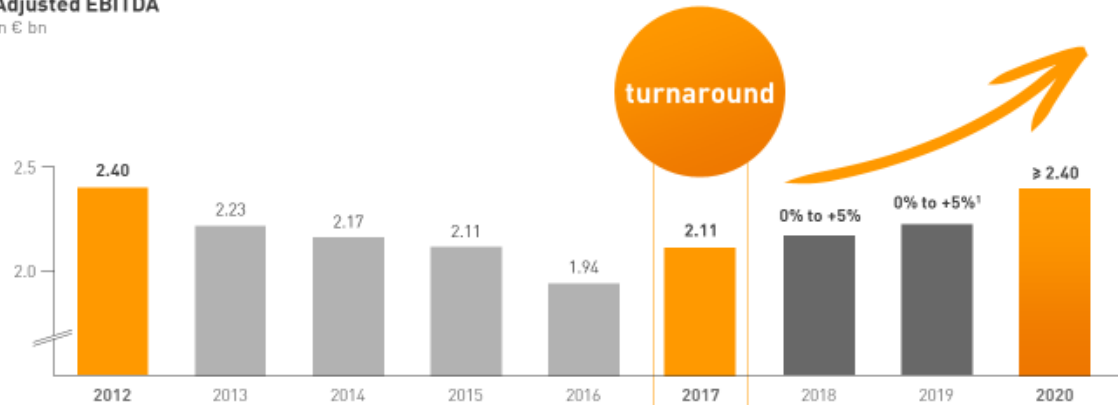
Permanent investor dialogue to underline capital markets positioning

High financial gearing



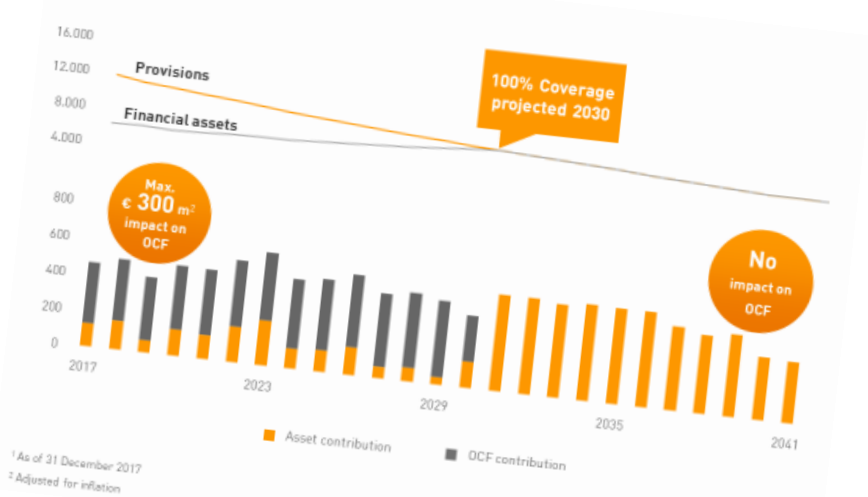
Strong creditworthiness is based on EnBW's conservative financial policy

Adjusted EBITDA
in € bn



- › Operating performance
- › Efficiency measures
- › Financial discipline

EnBW's CF-based model¹
in € m



Rating: a sound financial policy has allowed EnBW to maintain A category ratings against the negative sector trend

MOODY'S
INVESTORS SERVICE

A3 / stable
12 June 2018

- › Leadership position as a vertically integrated utility within Baden-Wuerttemberg
- › Around 50% of EBITDA from low risk regulated distribution and transmission activities and growing share of renewables under contracts, as EnBW continues to invest in line with its 2020 strategy
- › Difficult operating environment in Germany for conventional generation and increasingly challenging environment in retail markets
- › Certain execution risks relating to a large investment programme
- › Balanced financial policies and track record in implementing measures to shore up its financial profile
- › Strong shareholder support

STANDARD & POOR'S
RATINGS SERVICES
McGraw Hill Financial

A- / stable
24 July 2018

- › Solid regional competitive position and increasing foothold in national gas distribution
- › Considerable progress made in business repositioning strategy
- › Increased share of operating income from low-risk regulated activities and long-term contracted renewables
- › Still significant exposure to volatile and commodity-driven wholesale power prices
- › Well managed funding of nuclear waste-related liabilities, without major disruptions to its strategy or changes to the capital structure
- › Prudent financial policy underpinned by utilisation of nuclear tax refund for capex and deleveraging

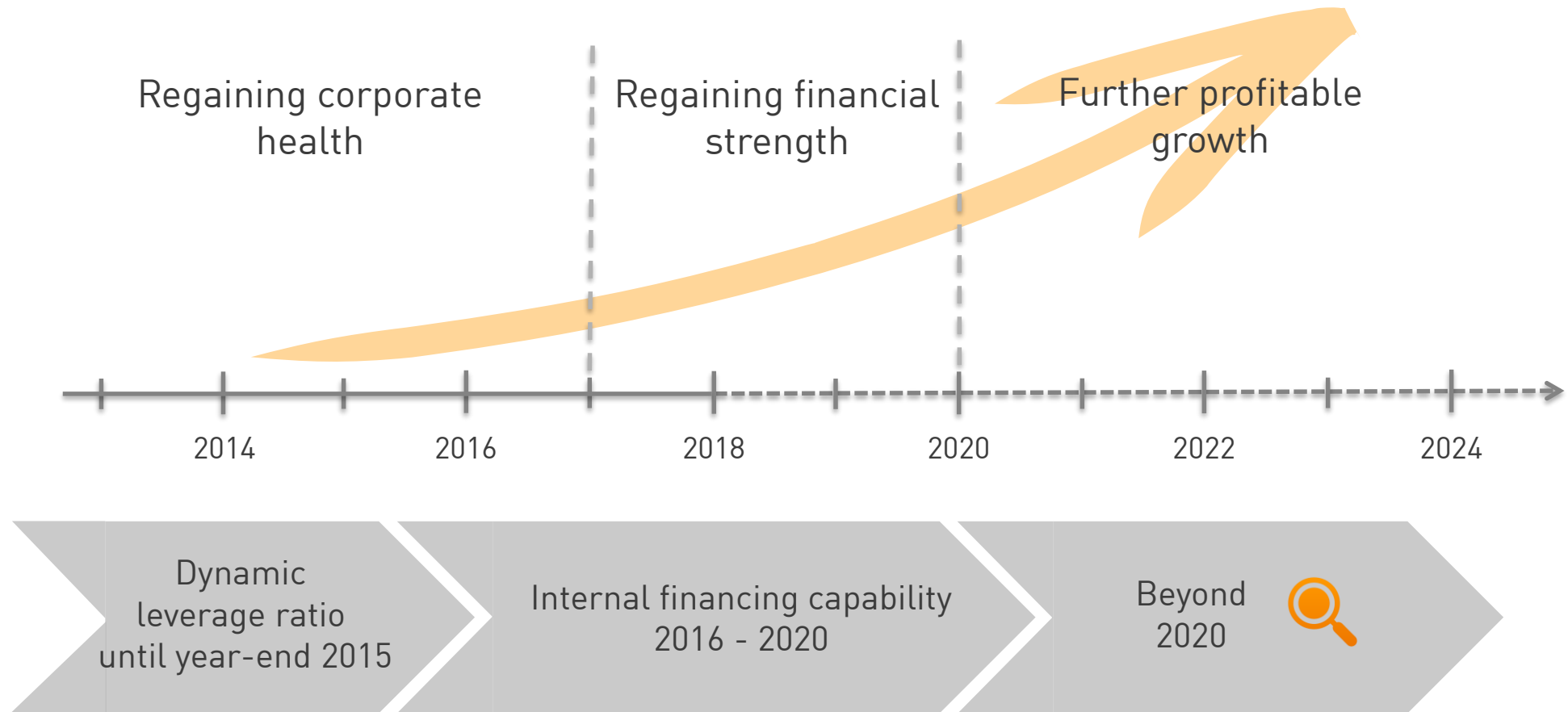
FitchRatings

A- / stable
28 September 2018

- › Continued evolution towards a more regulated and contracted business profile
- › High earnings visibility in grids and renewables partly offset by residual nuclear decommissioning risk; payment of EUR4.8 billion for transferring responsibility for nuclear waste storage has substantially reduced these risk
- › Average forecast credit metrics are generally stronger than peers, with some exceptions with respect to funds from operations (FFO) fixed charge cover
- › If the share of regulated EBITDA exceeds 50% on a sustained basis, Fitch may apply a one-notch uplift to the senior unsecured rating



Evolution of corporate strategy requires development of KPIs in order to manage financial discipline

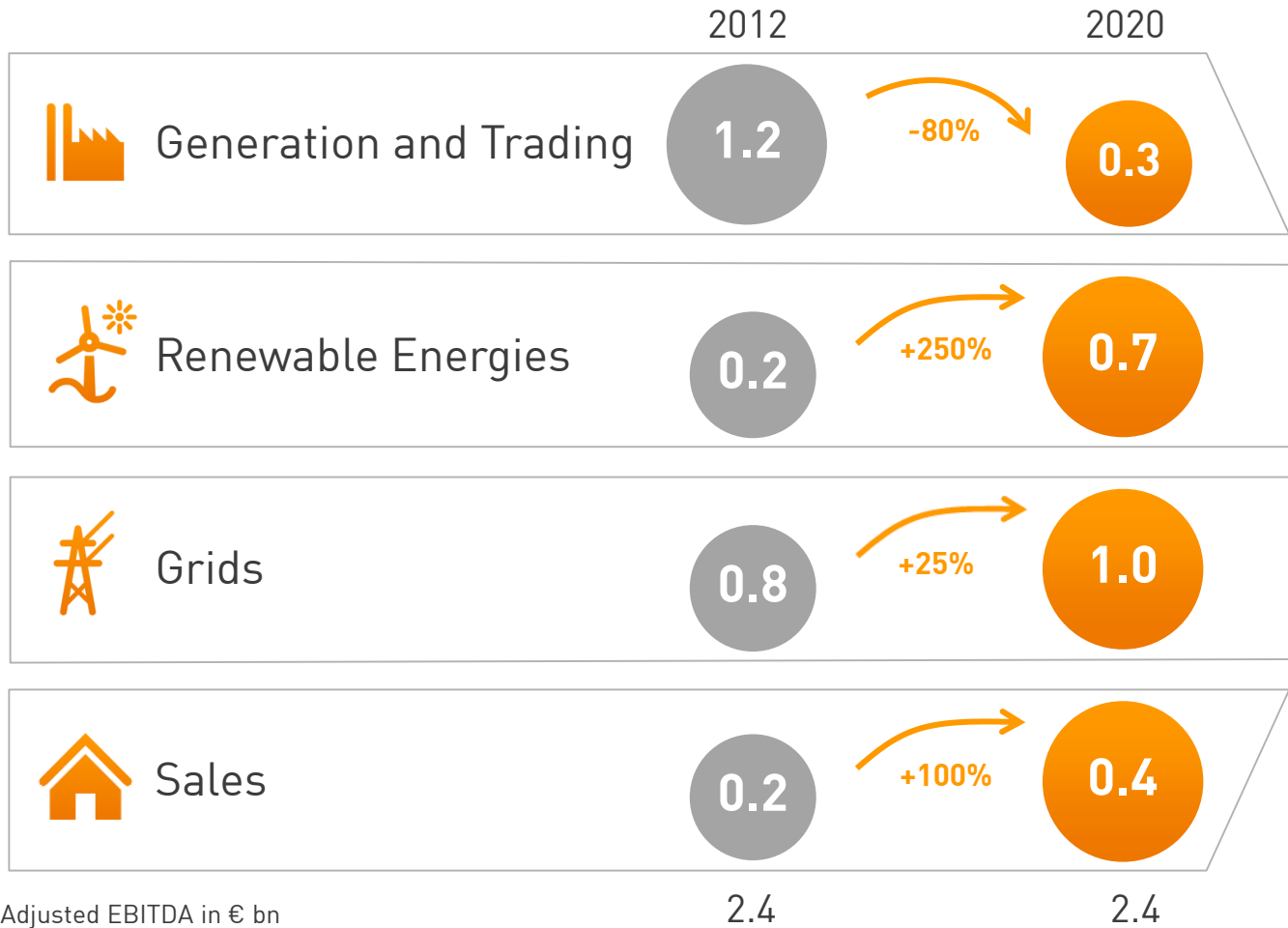




Strategy 2020 to manage the portfolio transformation necessary due to Energiewende

EnBW

2013





Accounting effects resulting from low-interest rate environment at high level

EnBW

2016



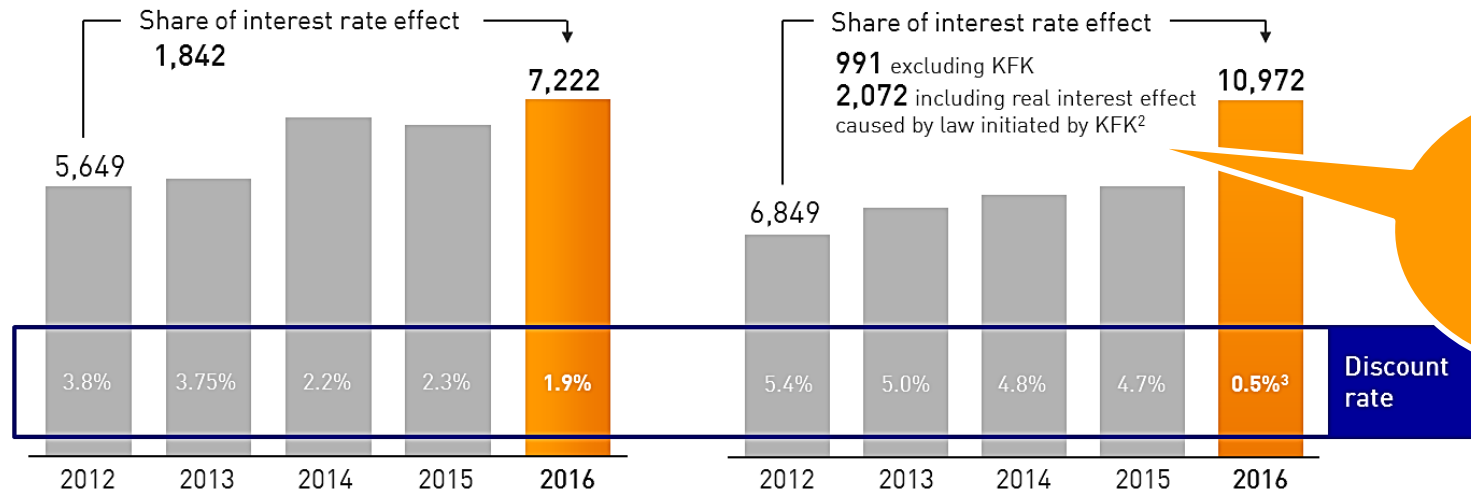
Increase of provisions resulting from continuing low interest rate level

EnBW

Interest rate

Pension provisions¹
in € million

Nuclear provisions
in million



KFK

¹ Before deduction of Contractual Trust Agreement (CTA)
² KFK: Commission to examine the financing of the phase-out of nuclear power
³ Average interest rate after implementation of law initiated by KFK



Further investments to implement 2020 Strategy limited to internal resources only



8.4 New financial framework for operating business

<< Agenda

Asset Liability Management Model
Timely coverage of pension and nuclear obligations

Operating business
Management of net financial debt

Active management of corresponding financial assets

Internal financing capability new key performance indicator

Impact on max. €

Limitation of cash relevant net investments to retained cash flow of an average € 1.3 bn p.a.

After cash

Further implementation of strategy can be executed by internal financial resources only

By managing the level of net financial debt EnBW maintains high level of financial discipline

... based on the earnings performance and ... internal financing capability

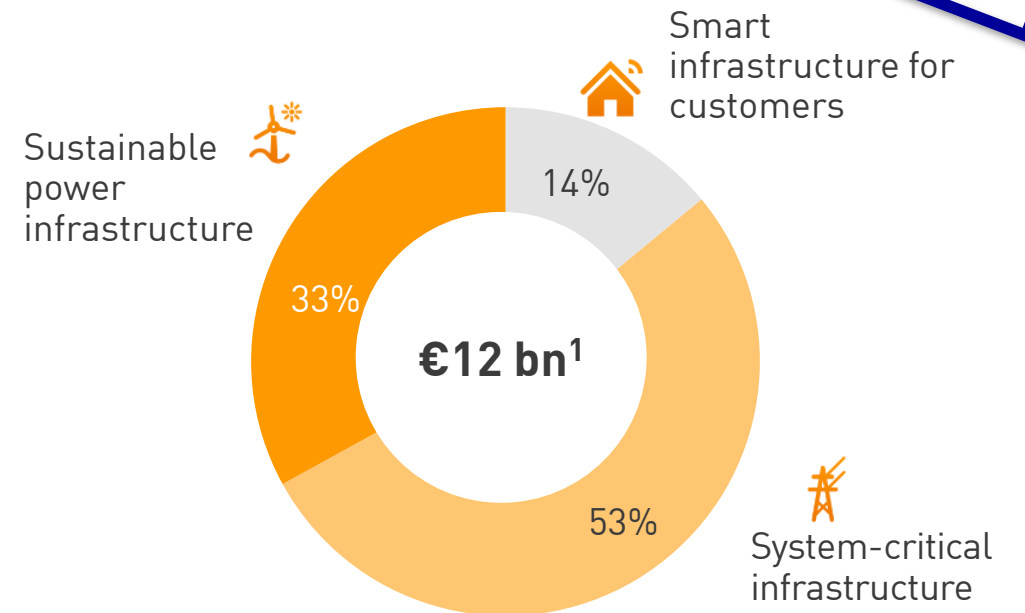
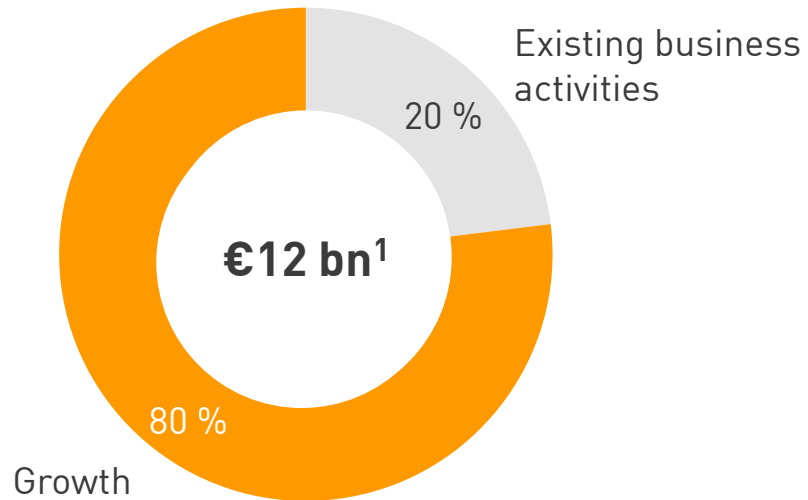



Stick to financial discipline in a phase of “growth”


EnBW

2020-2025

Allocation of investment spending 2021 - 2025



 2025 adjusted EBITDA for the Group > €3 bn

 a sustainable and innovative infrastructure partner

¹ Rounded figure



Further evolution in KPI mechanism will be required

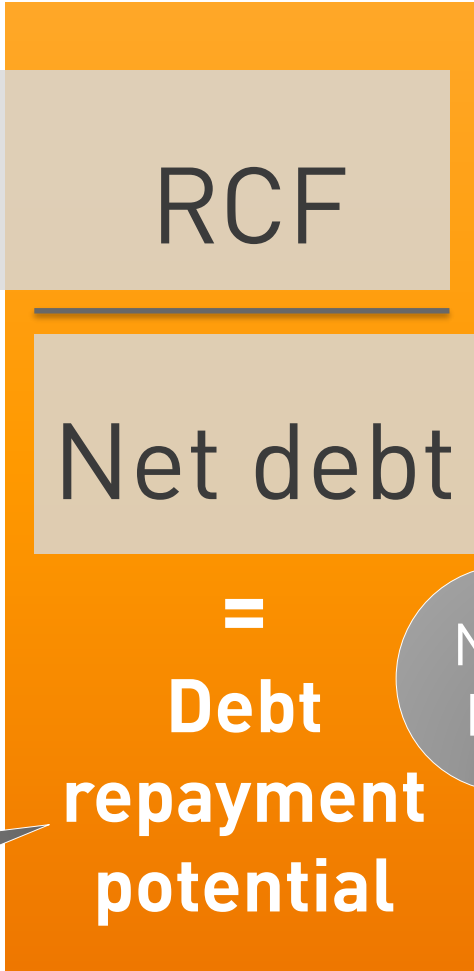
EnBW
After 2020

Internal financing capability:

$$\text{FFO} - \text{Dividends paid} = \text{RCF}$$

Economic debt:

$$\text{Net debt} = \text{Net financial debt} + \text{Net debt relating to pension and nuclear obligations}$$



New KPI

Of at least 16% until 2025 will support our A ratings



Evolution of corporate strategy and financial policy are closely linked

— EnBW

- KPI mechanisms are adopted accordingly to meet future challenges
- Creditworthiness plays a central role in defining strategy
- We deliver what we promise
- Strategy and finance are focused on sustainability
- This long-term approach makes EnBW a reliable partner for investors



EnBW maintains its A ratings

MOODY'S
INVESTORS SERVICE

Long-term rating: A3 Outlook: stable

STANDARD & POOR'S
RATINGS SERVICES
McGRAW HILL FINANCIAL

Long-term rating: A- Outlook: stable

FitchRatings

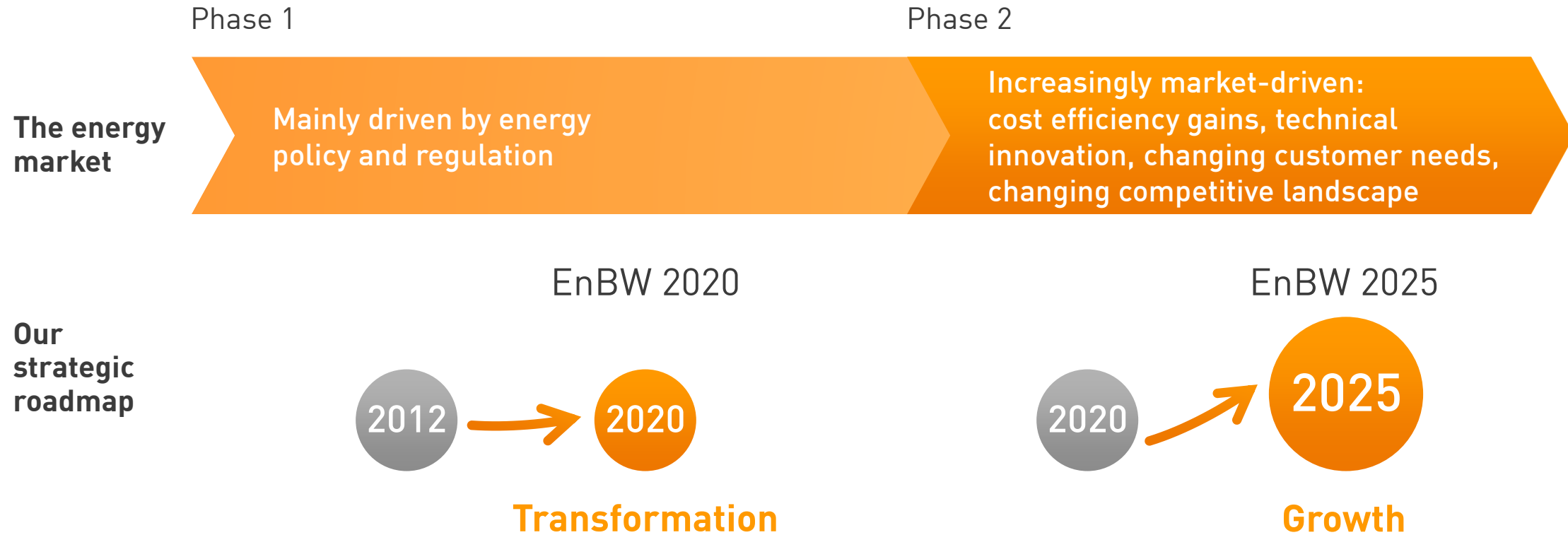
Long-term rating: A- Outlook: stable

Frank Mastiaux, CEO

EnBW Strategic Roadmap:
Status and a look ahead.



Our business environment and our strategic response





Group restructuring and renewal continues according to plan



Phase 1

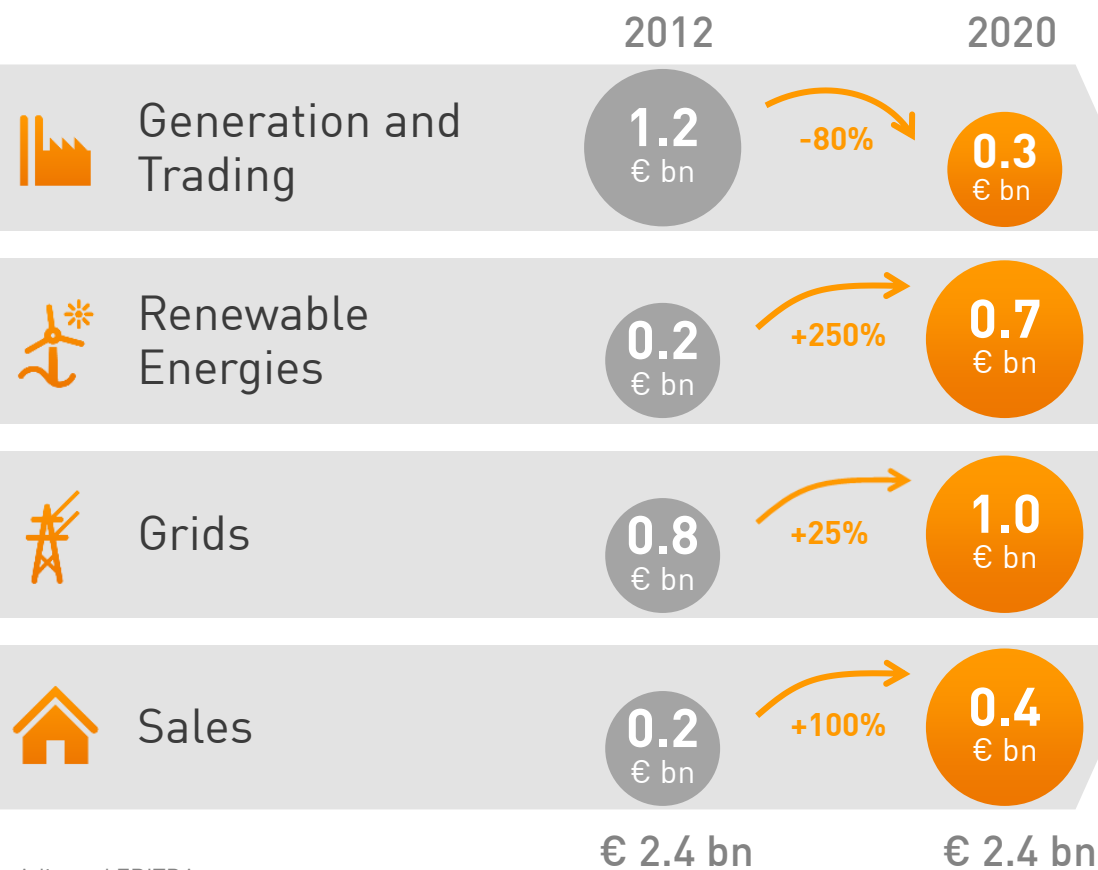
Mainly driven by energy policy and regulation

Expansion of renewable energies

Exit from nuclear power

Decline in economic importance of conventional power generation

Expansion of electricity/gas grids



in Adjusted EBITDA



Development of energy industry and energy policy environment in line with strategic assumptions

Energy business environment

- › Current CO₂ price development leads to rising electricity prices on wholesale market, opportunity for renewable energies, hard coal still under pressure
- › Competitive environment undergoing change

Energy policy environment

- › Commitment to renewables: Target raised from 55% to about 65% in 2030
- › Special tenders for renewables from 2019 onwards with modified auction design
- › Acceleration of electricity grid expansion plans
- › Growth in e-vehicles and charging infrastructure

Commission for Growth, Structural Change and Employment

- › Four chairpersons, 28 voting members from associations, trade unions, affected regions, academia and industry
- › Commission to help regions affected by structural change, boost investment and set phase-out date for coal-fired electricity generation
- › Ambitious timetable



Implementation of EnBW 2020 strategy (I)



Decarbonisation:

9 power plant blocks in reserve/
Retrofit at Gaisburg (coal to gas)

Nuclear energy:

Fourth and last decom-
missioning permit Obrigheim/
Future approvals planned with
1-2 steps

Shareholding in VNG:

Completion of the sale of VNG
Norge



Offshore wind:

Hohe See and Albatros under
construction (610 MW)/ Trail-
blazing award for He Dreiht (900
MW)/Taiwan and US market entry

Onshore wind:

~500 MW in operation/First steps
towards internationalisation with
11 MW in Sweden

Photovoltaic:

Increasingly significant with
planned expansion to 200 MW by
2020 and 600-800 MW by 2025



Implementation of strategy EnBW 2020 (II)



E-mobility:

Leading position in DC based charging

Distributed energy:

Entry into PV and home storage market with acquisition of senec

Performance and efficiency:

Realignment of process and system landscape

Customer-facing business:

Stabilisation of the B2C contract portfolio

Growth:

Central growth focus on grids, with €7 billion investment up to 2020

Broadband:

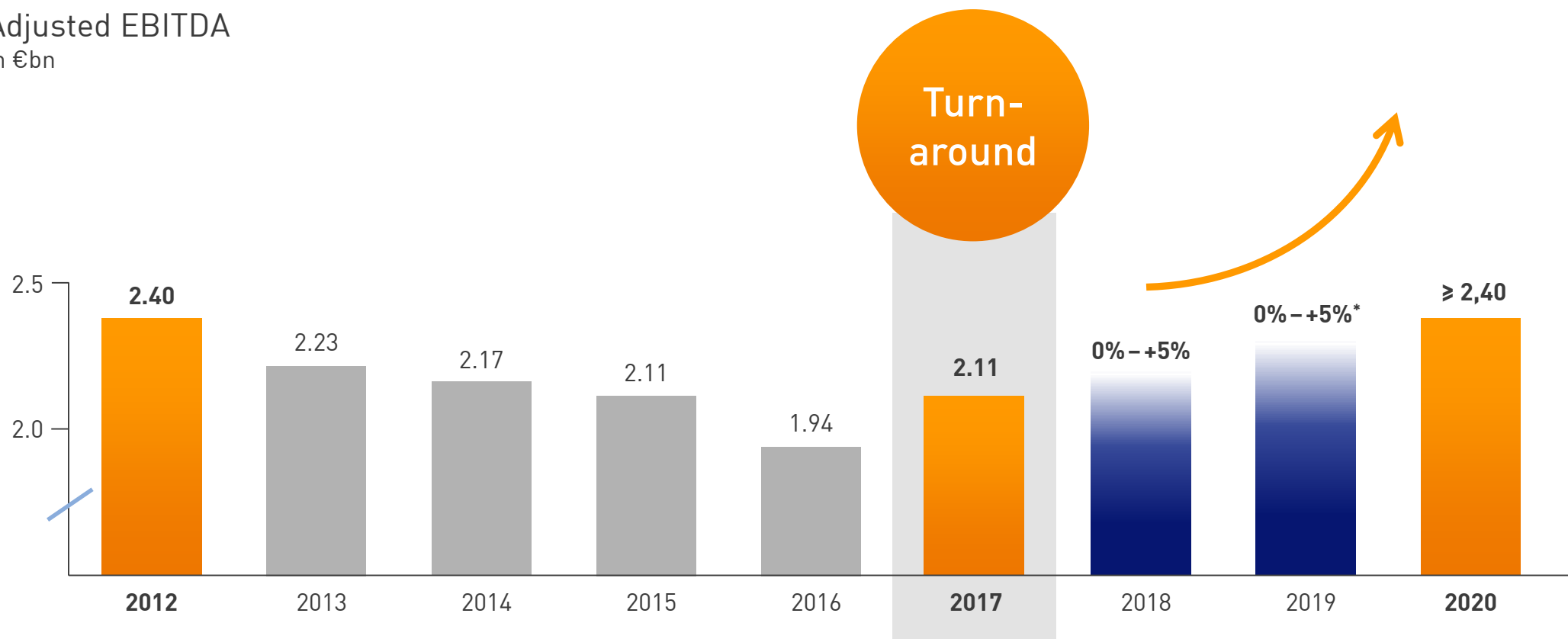
Continued 15% growth rate/
7 new regional municipalities added in 2018





Heading towards target achievement in 2020: financial turnaround in 2017

Adjusted EBITDA
in €bn





Forecast 2018: further increase in earnings targeted



	Group	Sales	Grids	Renewable Energies	Generation and Trading
Adj. EBITDA 2017 in €m	2,113	330	1,046	332	377
Forecast 2018 in %	0 to +5	-5 to -15	+5 to +15	+10 to +20	0 to -10



A look ahead: strategic development towards 2025



Phase 1

Mainly driven by energy policy and regulation

Expansion of renewable energies

Exit from nuclear power

Decline in economic importance of conventional power generation

Expansion of electricity/gas grids

Phase 2

Increasingly market-driven: cost efficiency gains, technical innovation, changing customer needs, changing competitive landscape

Increased competitiveness and market integration of renewable energies

Technical innovations driving new business models (e.g. e-mobility)

Digitalisation and network energy solutions (e.g. smart grids)

Customer needs: individualisation and transaction simplicity



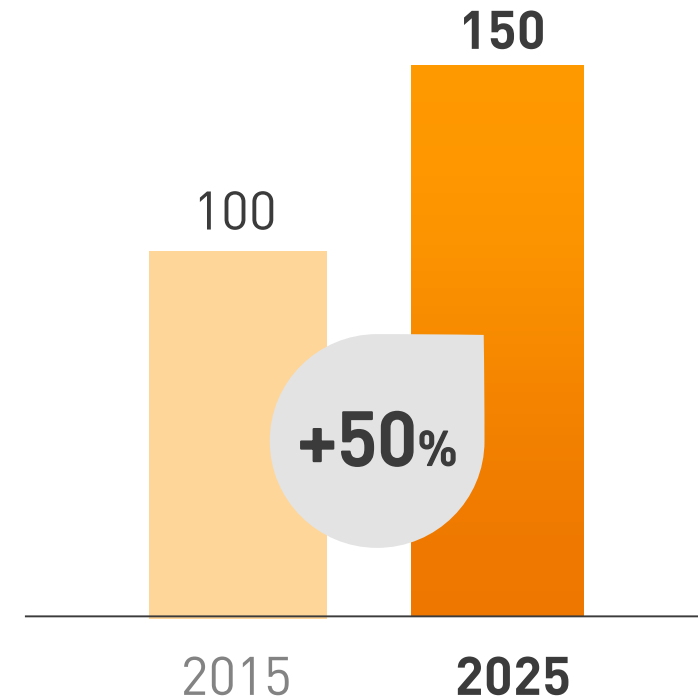
Reminder: Core competence meets future market for critical infrastructure



EnBW core competence

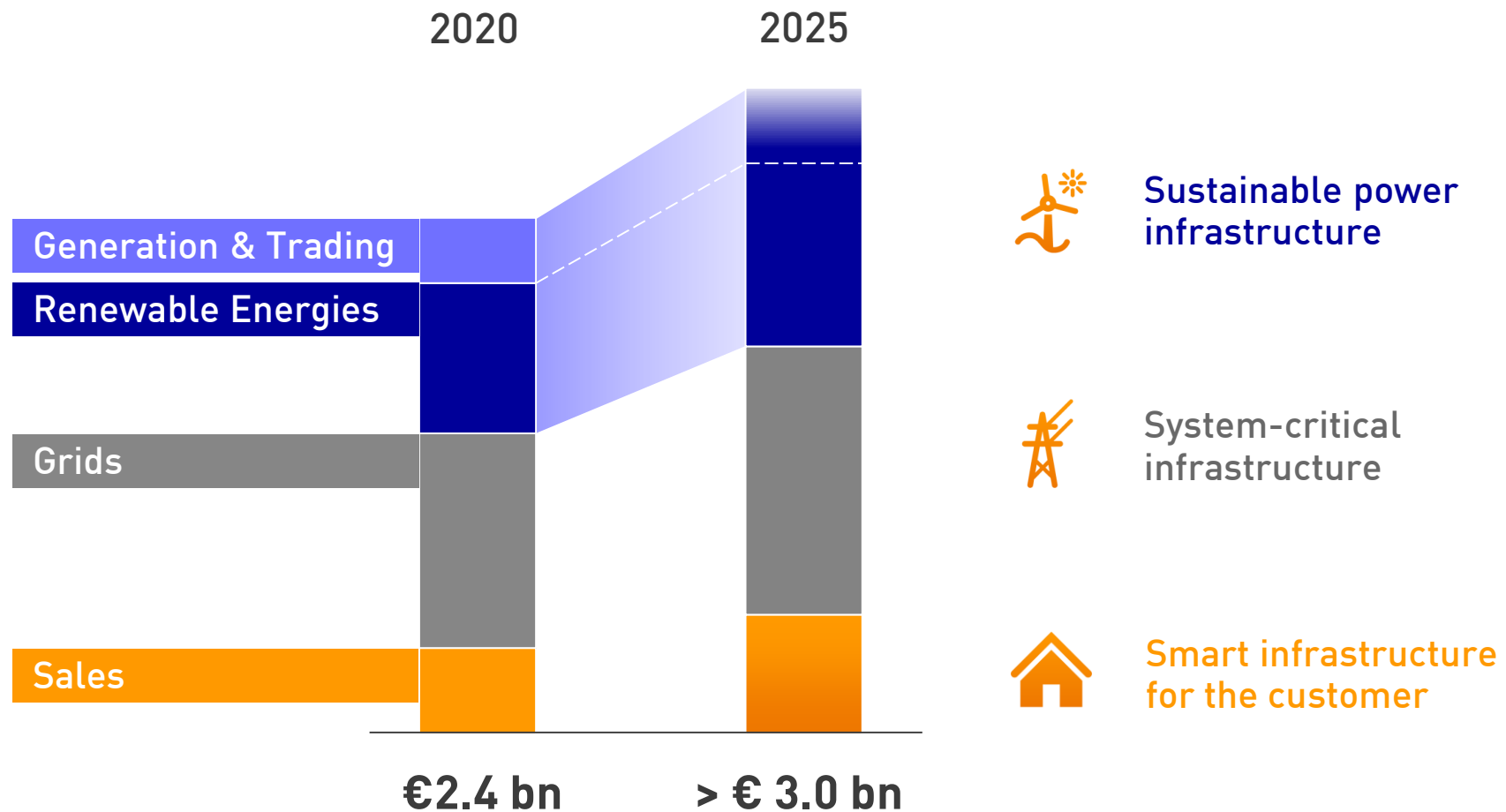


German infrastructure market*
in €bn



* Source: Macquarie/Oxford Economics, own calculations

Reminder: Implementation of EnBW 2020 towards 2025: balanced portfolio with three strategic areas



Adjusted EBITDA



Strategic implementation of EnBW 2025 (I)



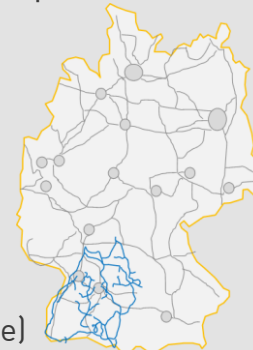
E-mobility

- > Leading position in DC based charging
- > Half of the planned 1000 quick charging stations acquired
- > EnBW mobility+ App first in line with 120k downloads and 19k charging options
- > Success through partnerships



Broadband

- > 15 percent growth rate
- > 7 new local municipalities added in 2018
- > 11,000 km high-speed network with 43k customers
- > Expansion of infrastructure via GasLINE (VNG)
- > Next steps: expansion of 5G mobile network



GasLINE (grey)
and NetCom (blue)

Security infrastructure

- > Piloted security solutions for public spaces
- > AI solutions for hazard detection
- > Smart barrier access protection
- > Flood detection sensors
- > EnBW full crisis service:
 - > Goal: Leading IT security total solution provider
 - > Rapidly increasing order volume





Strategic implementation of EnBW 2025 (II)



Corporate early stage

- > AI for better road conditions
- > Real-time monitoring of road condition via sensors
- > AI algorithms analyse the road surface image by image
- > Optimisation of road maintenance via web GIS
- > Market size (EU): €400 m

other examples



Corporate late stage

- > From hardware to data and services
- > E-mobility, traffic management and safety in the smart city
- > Sales target 2018: €8 m
- > 23 employees/11 countries/230 customers

other examples



New ventures

- > Delivers real-time parking data to simplify parking management
- > Ideal for applications in cities, stadiums, airports, schools and more
- > Less search time, less emissions, increased efficiency
- > Realised already over 40 projects in over 15 countries

other examples





Summary



- › EnBW on plan to meet 2020 strategic targets
- › New phase of energy market development has already started
- › First steps towards EnBW 2025 strategy taken successfully



Questions & Answers



**Lothar Rieth,
Group Expert Sustainability**

Sustainability as an integral part
of the strategy

Sustainability as an integral
part of the corporate strategy >





Conversion of EnBW into a sustainable and innovative infrastructure partner



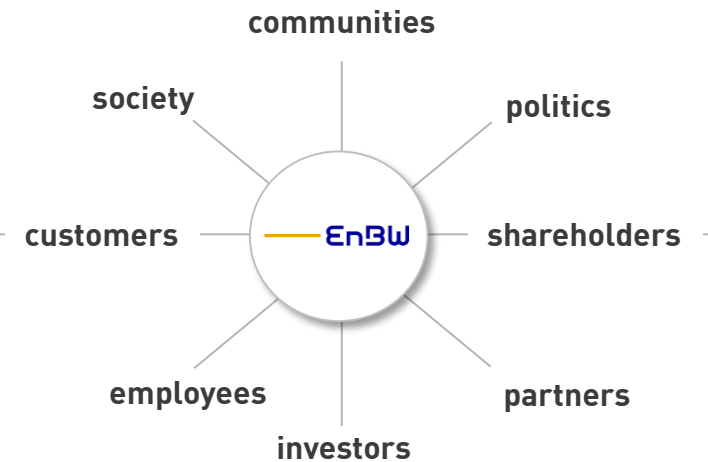
Strategy 2025 - Vision

"We are **makers and designers** of tomorrow's **infrastructure world** - **sustainable, innovative and reliable**"

Our understanding of sustainability

- Creation of **economic as well as ecological and social added value** for **our customers, shareholders, employees, partners and society** as a whole - **today and in the future.**
- "We associate **sustainable management** with the claim to **conduct all our business activities responsibly**"

Stakeholder focus





1

Integrating sustainability at EnBW

2

Selected sustainability issues - Group and core business

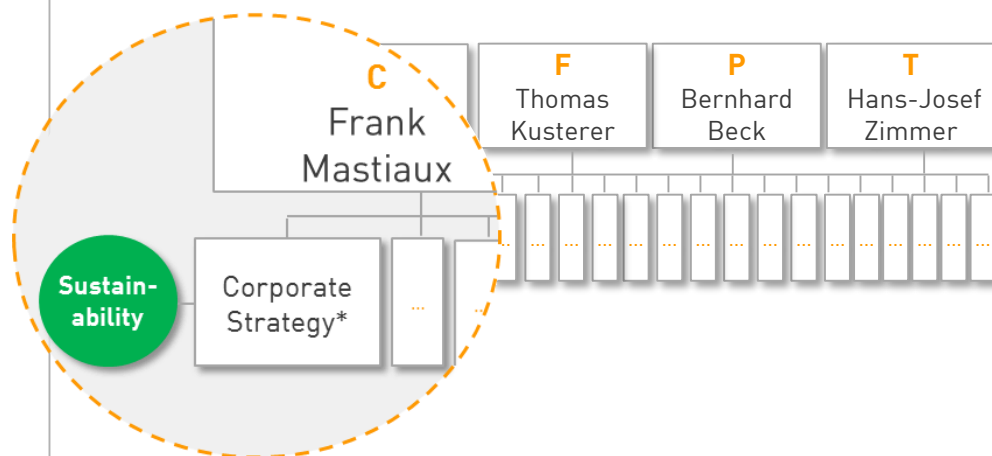
3

Reporting



Organisational and strategic anchoring of sustainability at EnBW

Organisation



Responsibilities Team Sustainability:

- Impulse generator for sustainability at EnBW
- Contact and driving force for sustainability issues
- Internal sparring partner for sustainability issues (lightning rod, devil's advocate and lucky charm)

*Corporate Development, Strategy & Energy Economics

Strategic Approach



Sustainability Concept

- Starting Point: Integral part of corporate strategy
- Vision: EnBW transforms into sustainable infrastructure partner
- Ambition level: Embedding sustainability in core business operations
- Logic of action: Stakeholder-based dialogue (internally / externally)

Sustainability Action Plan

- Operationalization of sustainability concept
- Determination of material areas of activity
- Identification of TOP activities including KPIs and target-setting
- Establishment of monitoring process



EnBW's performance management system includes non-financial key performance indicators and targets



Financial indicators and targets



Non-financial key performance indicators and targets

1. Customers and society goal dimension	2016	2017	Trend	2020
> Reputation Index	50.0	52.1	↗	55.4
> EnBW/Yello Customer Satisfaction Index	132/ 150	143/ 161	↗	>136/ >159
> SAIDI (electricity) in min./year	16	19	↘	<25

2. Employees goal dimension	2016	2017	Trend	2020
> Employee Commitment Index (ECI)	59	60	↗	65
> LTIF (occupational safety)	3.9	3.0	↘	<previous year

3. Environment goal dimension	2016	2017	Trend	2020
> Installed output of RE in GW	3.1	3.4	↗	5.0
> Share of generation capacity (by RE in %)	23.1	25.9	↗	>40
> CO ₂ intensity in g/kWh	577	556	↘	-15% to -20%

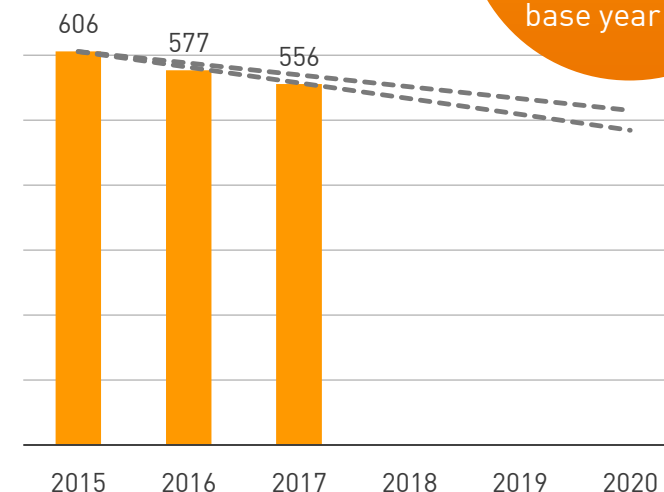


TOP KPI CO₂ intensity: EnBW is committed to Energy Transition (“Energiewende”)

- › **EnBW’s long-term strategy is in line with the Paris Agreement** and the goals of the EU and the German government
- › EnBW has introduced a **TOP KPI** in 2013, **covering expansion of RE**, and in 2016 a **TOP KPI, focusing on CO₂ intensity***
- › Long-term forecasts includes **scenarios with ambitious climate protection targets** (see TCFD recommendations)
- › **TOP KPI CO₂ intensity** reflects the great importance of **climate protection as an economic and ecological goal of EnBW**
- › EnBW strives for greatest possible **CO₂-free power generation** – with grid expansion, **we support climate-friendly energy supply**
- › EnBW strongly advocates **a price floor for CO₂** of 25 EUR/t in 2020 and 30 EUR/t in 2025

CO₂ intensity EnBW
in g/kWh

■ EnBW Group
■ Target corridor until 2020



Goal EnBW:
Reduction of
CO₂ intensity by
-15% to -20%
compared to the
base year 2015

*The calculation basis for the key performance indicator CO₂ intensity is the amount of CO₂ emissions from own generation of electricity for the Group, as well as the quantity of electricity generated by the Group without the contribution made by the nuclear power plants. By excluding the electricity generated by nuclear power plants, the performance indicator will not be influenced by the phasing out of nuclear energy in the coming years.



1

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Sustainability in the core business – Sustainable power infrastructure

Examples



**Hohe See and
Albatros under
construction**



**~ 500 MW in
operation**



**Steady expansion
until 2025**

Relevance of sustainability

Economic aspects

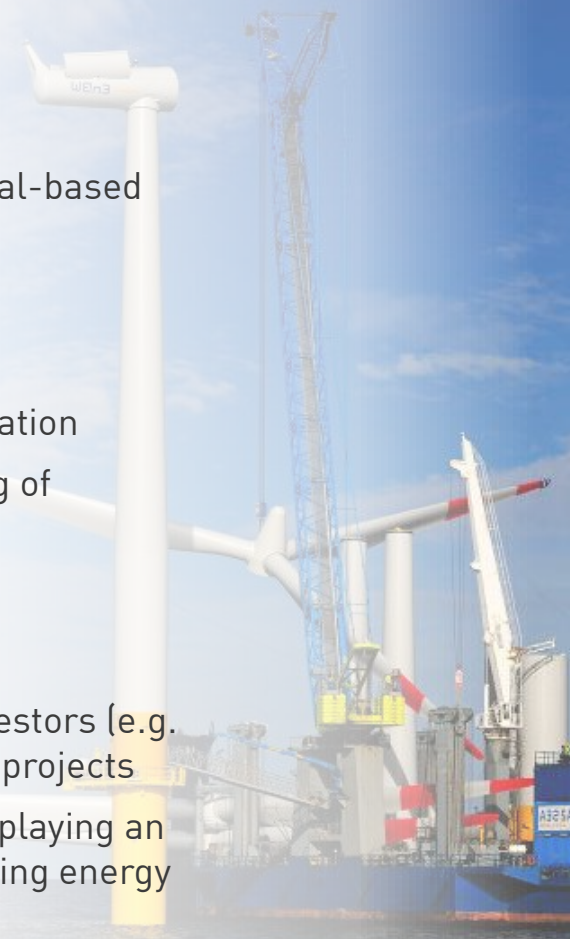
- › Investment in sustainable business models
- › Active shaping of decarbonisation in relation to coal-based conventional generation

Environmental aspects

- › Further expansion of low-carbon electricity generation
- › Positive contribution to climate protection – saving of CO₂ emissions

Social aspects

- › Principle of partnership – chance for potential investors (e.g. local authorities, private citizens) to participate in projects
- › Citizen turn from consumer to prosumer, thereby playing an active role in shaping the “Energiewende”, producing energy and consuming it (bi-directional flow of energy)





Sustainability in the core business – System-critical infrastructure

Examples



**“Ultranet” and
“SuedLink” (trans-
mission grid)**



**Development of the
distribution grid
(Smart Grid)**



**Provision of grid-
related services
for customers**

Relevance of sustainability

Economic aspects

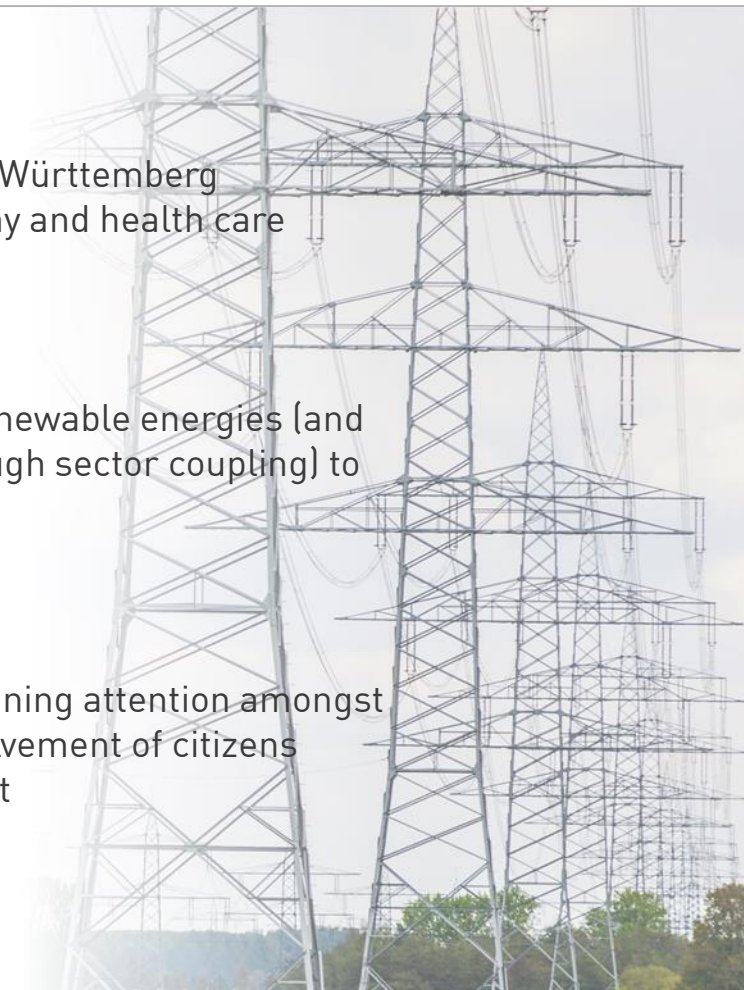
- › Maintaining supply reliability in Baden-Württemberg – reliable energy supply for the economy and health care

Environmental aspects

- › Grid business enables integration of renewable energies (and E-mobility), that contributes (also through sector coupling) to the success of the energy turnaround

Social aspects

- › Expansion of (transmission) grids is gaining attention amongst general public – early stakeholder involvement of citizens provides transparency and creates trust





Sustainability in the core business – Smart infrastructure for the customer

Examples



E-mobility: Charging stations, EnBW mobility app etc.



Urban infrastructure and public security



Development of intelligent products, e.g. SMIGHT

Relevance of sustainability

Economic aspects

- › Contributes to the success of the mobility shift
- › Contributes to economic attractiveness of industrial zones and industrial estates

Environmental aspects

- › Green electricity supply (reducing and avoiding emissions)
- › Reduction of emissions (particulate matter) in cities/municipalities

Social aspects

- › Cities/municipalities will become more attractive
- › Cities and municipalities become more livable and safety





Selected group-wide sustainability highlights focusing on the most relevant resource – our employees

„Mobility & Staff“

- > **Project „New Mobility“** (mobility solutions for employees)
- > **Targets:**
 - Enabling flexible solutions
 - Creating enthusiasm for sustainable mobility
 - Contributing to climate protection and reduction of traffic
- > **Employee offerings:**
 - BMW I3 - Leasing
 - Bike - Leasing
 - Jobticket

„Diversity & Staff“

- > **Motto:** “Diversity generates added value”
- > **Diverse workforce**, different criteria – gender, age, disability, sexual identity ...
- > **Goal:** Respond to needs of market, accelerate speed of innovation, be an attractive employer
- > **Events (2018):**
 - Initiative “Chefsache”
 - “Actively managing diversity – opportunities/challenges”(11.2018)
- > **Upcoming Chief Personnel Officer** (in 2019): Colette Rückert-Hennen

„Transformation & Staff“

- Selected Events across EnBW:**
- > **Strategy Dialogue Workshops** (2017/2018)
 - > **“Next level” – Workshops** (2018)
 - > **“Leadership Forum”** (October 2018)
 - > Regular employee meetings **“EnBW Aktuell” – e.g. Focus digitization“** (April 2018)



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Evolutionary development of EnBW's annual corporate reporting – being a driving force in international initiatives



Integrated Annual Report



GRI - Reporting



INTEGRATED REPORTING <IR>

IIRC
International Integrated Reporting Council

2011

TCFD

TCFD
Task Force on Climate-related Financial Disclosures

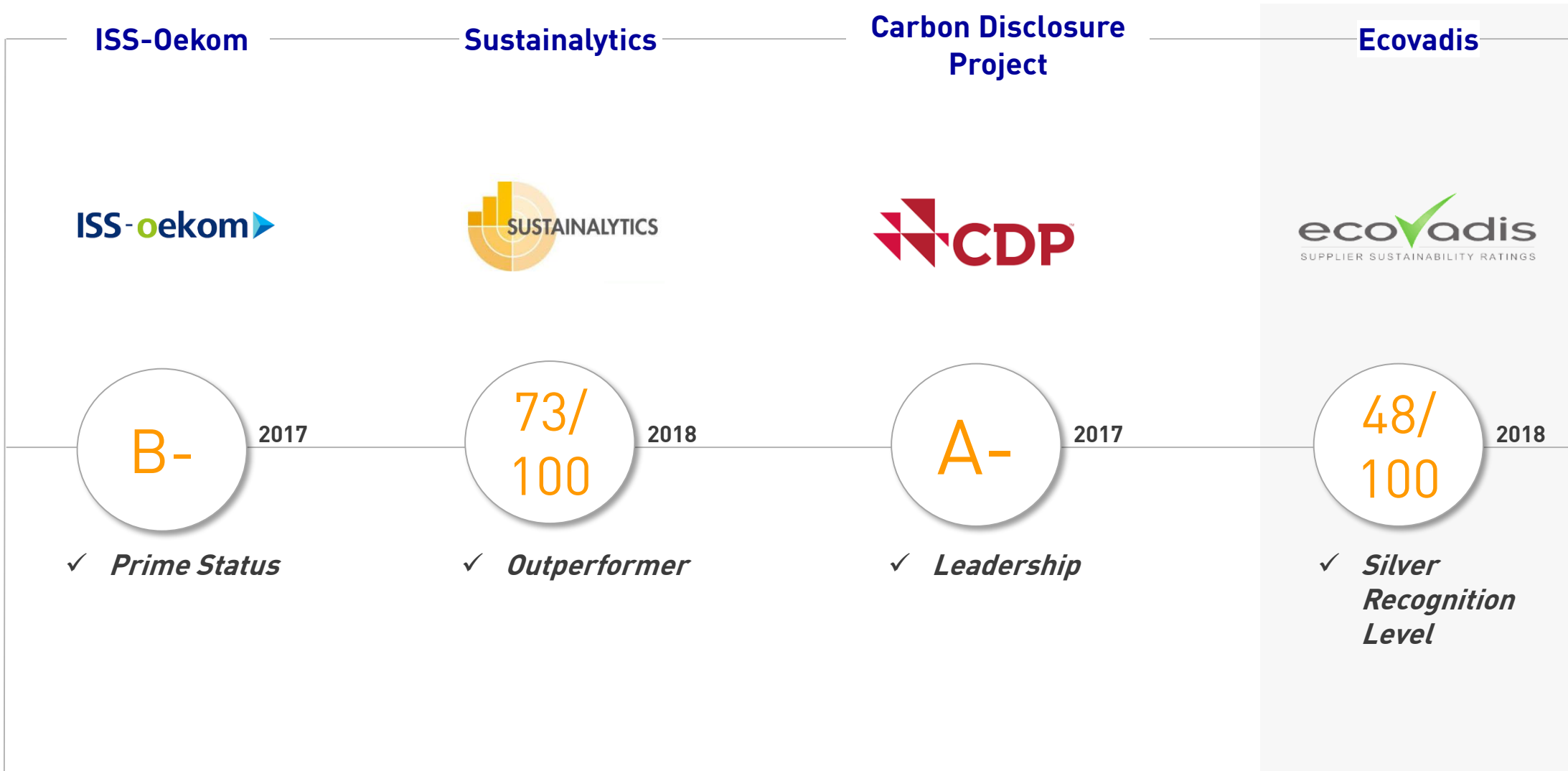
2015

TEG
EU Technical Expert Group on Sustainable Finance

2018



Regular external evaluation by sustainability rating agencies – far above average score





Sustainable finance – towards a new paradigm? EnBW has published Green Financing Framework



Why Sustainable Finance?

- > **Financing of green investments** in line with EnBW corporate strategy 2020/2025
- > Underlines **credibility of EnBW's ESG approach** and commitment to climate protection
- > **Expanding investor base**, meeting expectations of investors with particular sustainability requirements
- > **“Green Bonds are the future”**, very often heard these days

Publication of EnBW's Green Financing Framework

- > **The net proceeds** of future green financing instruments **will be used to finance or refinance Eligible Green Projects**
- > **Under the Green Financing Framework EnBW is able to issue Green Bonds**
- > EnBW's framework is **inspired by, and intends to follow the Green Bond Principles**

Possible asset categories

The Green Financing Framework lists **eligible asset categories**:

- > **Renewable energy projects**
- > **Energy efficiency projects**
- > **Clean transportation projects**

Contribution
to TOP KPIs
& SDGs





Contribution of EnBW to Sustainable Development Goals (SDGs)



Relevant SDGs for EnBW



EnBW Strategy 2020/2025 ✓

EnBW Sustainability Concept ✓

Selected business activities



- > Construction/operation of **renewable energies**
- > Development of **smart grids**
- > ...



- > Expansion of **E-mobility**
- > Further expansion of **broadband networks**
- > ...

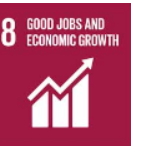


- > **Smart city solutions** for cities/municipalities
- > **Research and development, innovation campus**
- > ...



- > Sustainable **operational mobility**
- > **New risk maps including** climate protection
- > ...

Further SDGs:



Looking ahead – possible next sustainability actions

**Social urban
infrastructure**

**Sustainable
operational
mobility**

**Sustainable
Finance**

**“EnBW
cafeteria of
tomorrow -
sustainable,
creative and
healthy”**



Georgios Stamatelopoulos,
Senior Vice President Generation
Sustainable generation at EnBW



- **Overview EnBW's Generation Portfolio**
- **Challenges linked with the conventional generation**
- **Challenges linked with the renewables generation**
- **Dominating Trends: Decarbonisation, Digitalisation, Security (of Supply)**
- **Way forward for a sustainable generation business**



Overview over EnBW's Generation Portfolio

Renewable and conventional generation



Power generation [gross values]:



Hard coal

- › Installed output: 3,848 MW
- › 5 sites



Gas/Oil

- › Installed output: 1,282 MW
- › 5 sites



Pump storage/ storage plants

- › Installed output: 133 MW
- › 2 sites



Thermal waste treatment

- › Capacity: 480,000 t/a (≈30% of waste in Ba-Wü) in one site



Operational participations

- › Installed output: 2,237 MW
- › GKM, Lippendorf, Schluchseewerke, VIW



Offshore

- › Installed output: 336.3 MW
- › 2 wind farms



Onshore

- › Installed output: 492 MW
- › 47 wind farms



Hydropower

- › Installed output: 377 MW
- › 61 run-of-river power plants



Photovoltaics

- › Installed output: 77 MWp
- › 21 solar farms



Biomass

- › Installed output: 0.75 MW
- › 3 sites

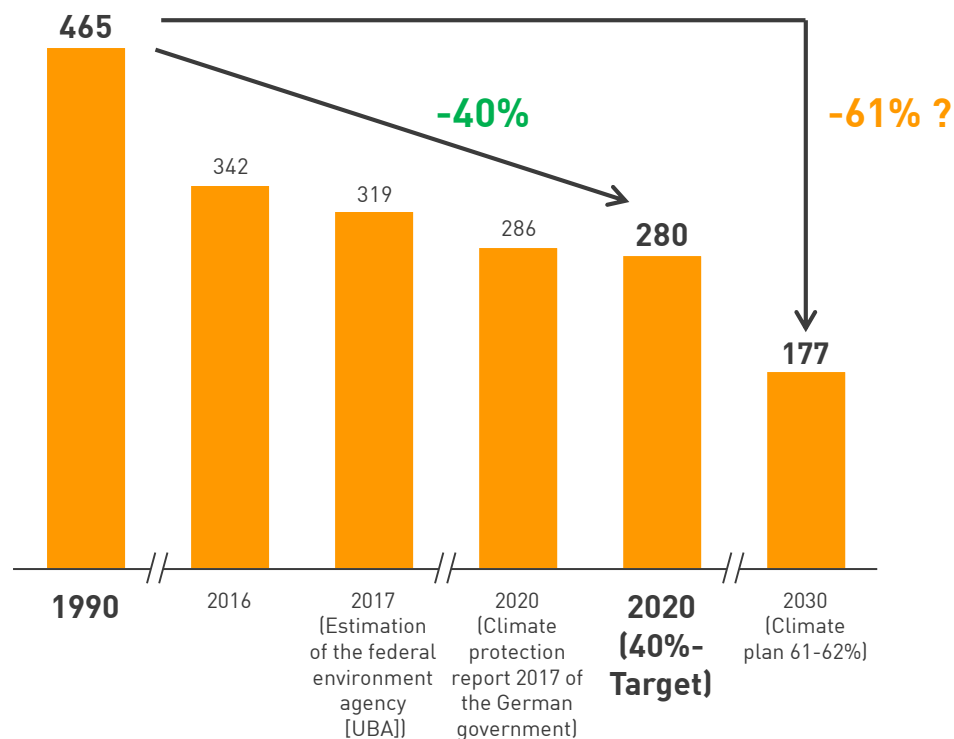


Challenges linked with the conventional generation

Climate protection goals for the energy sector

Greenhouse gas emissions for the energy industry

[in m t CO₂ equivalent]



- > Two main reasons for target achievement in the energy sector:
 - > **Decommissioning of hard coal power plants** (approx. 11 GW)¹
 - > **Development of renewable energy** (currently 36% of electricity generation)²
- > Further decommissioning of coal-fired power plants would be an additional contribution in anticipation of a more ambitious reduction for 2030 (61-62% target reduction in the energy sector vs. 55% in total for Germany).



Energy sector will successfully implement its reduction targets by 2020

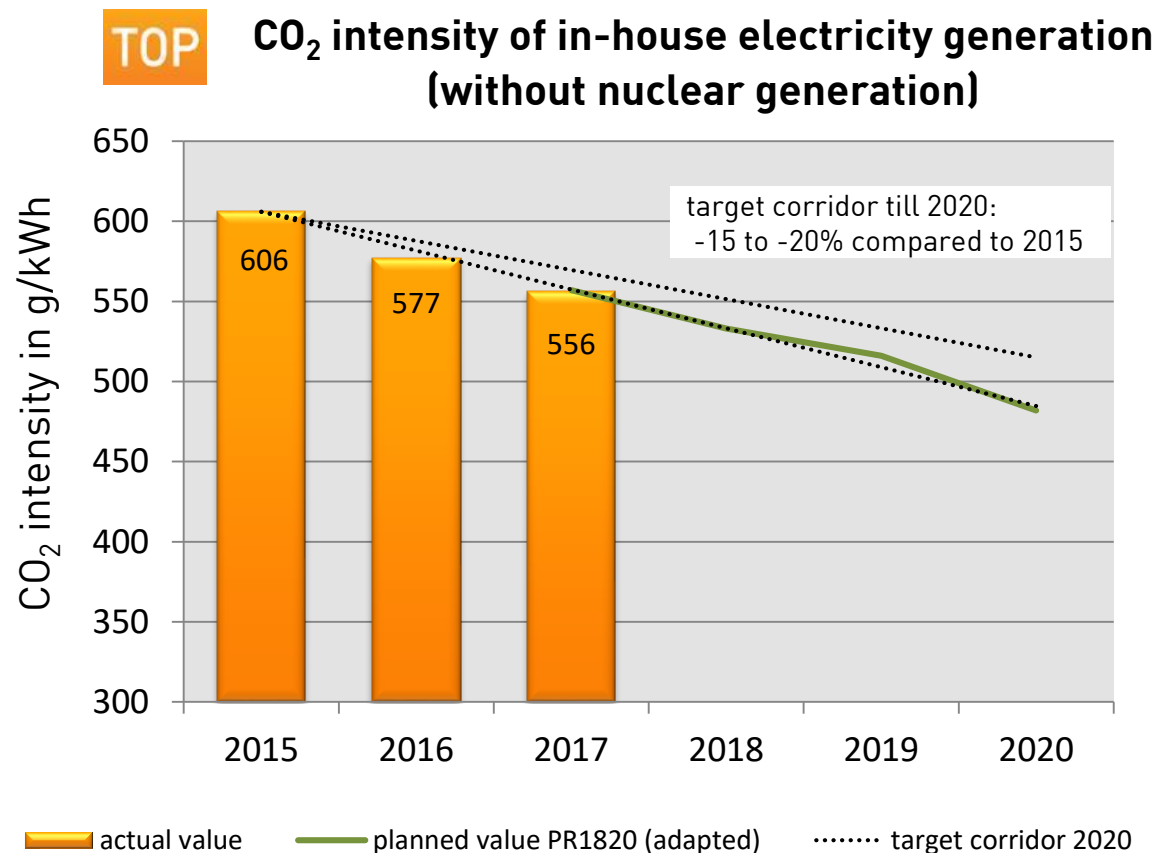
Source:

¹BNNetzA – Power plant shutdown declarations

²ZSW und BDEW to the share of renewable energies in electricity consumption in 2017



Challenges linked with the conventional generation EnBW's contribution to the climate protection goals



Explanations

- > The **CO₂ intensity** of the in-house generation **decreases** despite the compensation of the decommissioning of KKP2 and higher redispatch assignments for the conventional generation.
- > The decline is due to the **consistent development of renewable energies** and due to the larger share of electricity generation by **more efficient fossil-fueled power plants**, like in particular through the operation of RDK 8 in Karlsruhe.

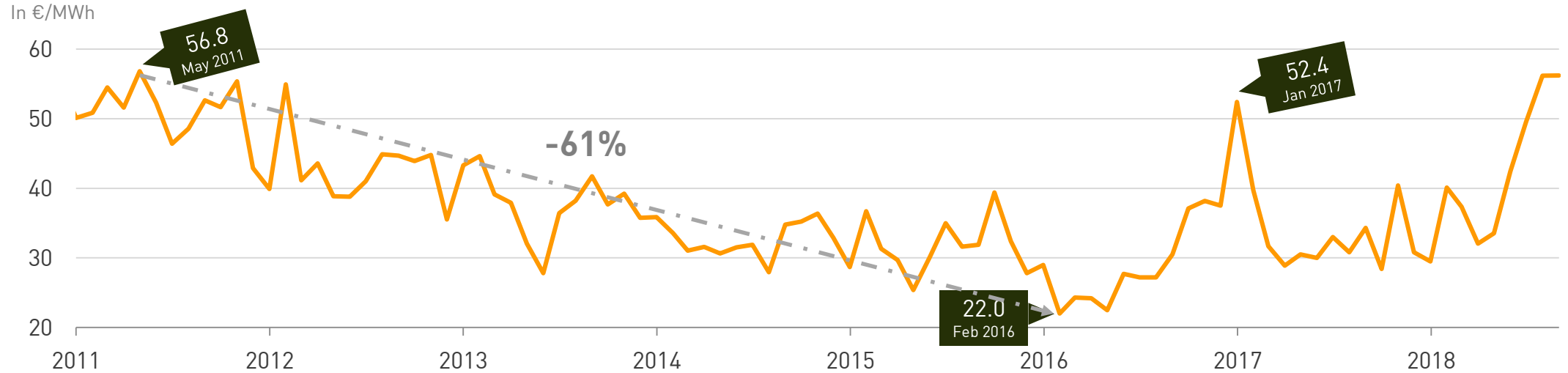


The reduction target of -15 to -20%, which was set for the base year 2015, will be reached in 2020

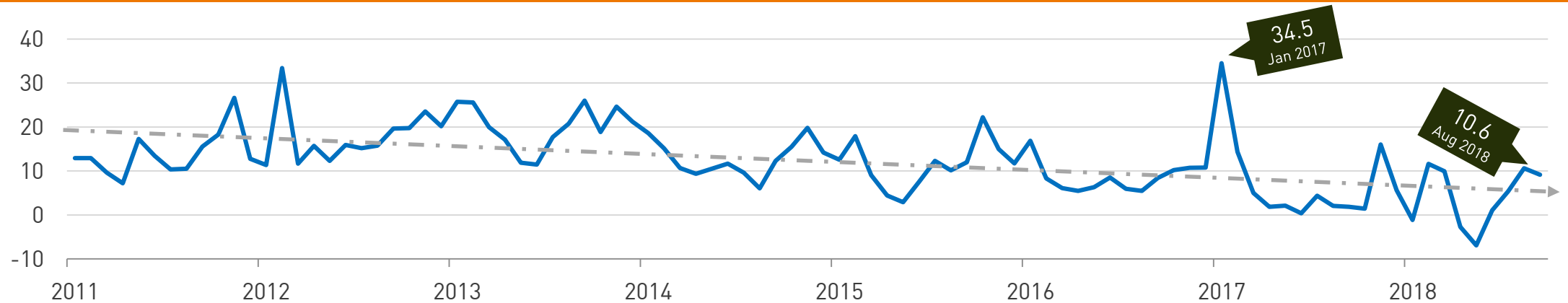


Challenges linked with the conventional generation Development of wholesale prices in Germany

Development of wholesale prices for electricity since 2011



Development of the Clean Dark Spread (Peak) since 2011



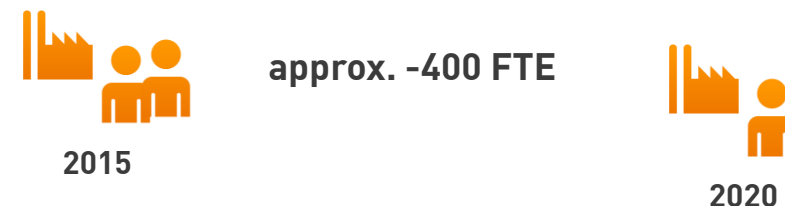


Challenges linked with the conventional generation

Economic efficiency and decommissioning of older plants

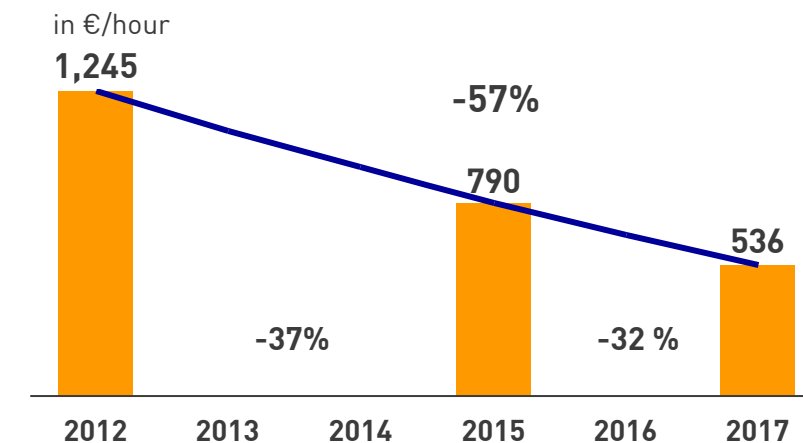
> Reduction of employees

Employee capacity reduction in the power plant field of EnBW



> Optimisation of availability and maintenance

- Cost reduction for one hour power plant availability
- Safety and environmental aspects are mandatory elements and excluded from the cost reduction.
- Condition monitoring and risk modelling allow a better estimation of downtime costs and the efficiency of maintenance measures.



> Decommissioning + Divestment of non-economic units

Transfer of 9 units to the Reserve Capacity + Divestment of two coal-fired power plants

HLB 5 (HC, 125 MW, Apr 2014)

HLB 6 (HC, 125 MW, Apr 2014)

WAL 1 (HC, 96 MW, Jul 2013)

WAL 2 (HC, 148 MW, Jul 2013)

ALT HKW 1 (HC, 433 MW, Mar 2017)

RDK 4S (GAS, 353 MW, Dec 2016)

MAR GT II (Fuel oil, 77 MW, Jul 2013)

MAR GT III (Fuel oil, 85 MW, Jul 2013)

MAR DT III (Fuel oil, 262 MW, Jul 2013)

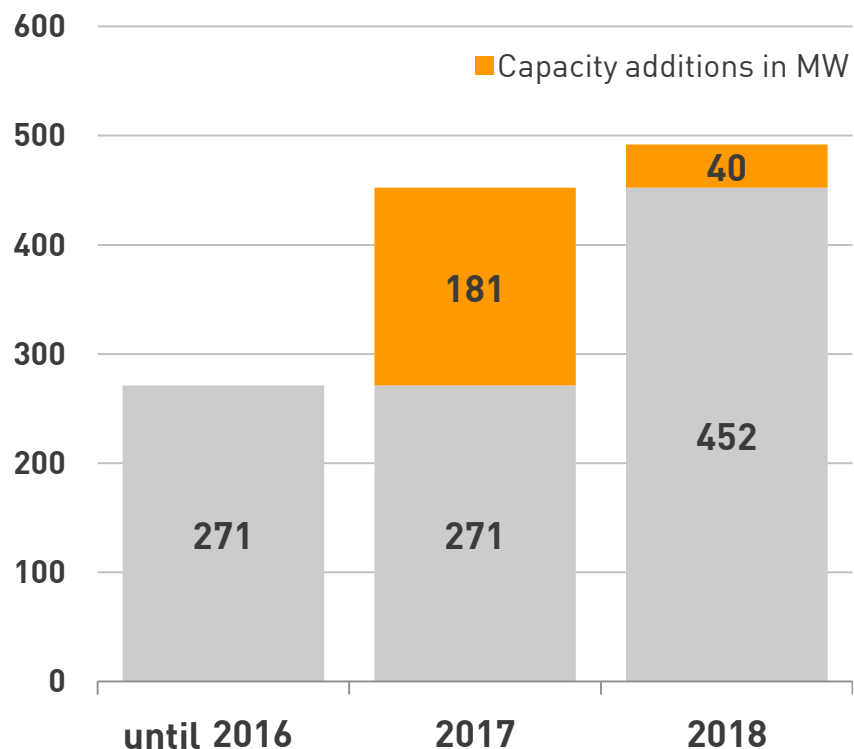
BEX (HC, 721 MW, Jan 2015)

BUS (Lignite, 159 MW, Jan 2014)

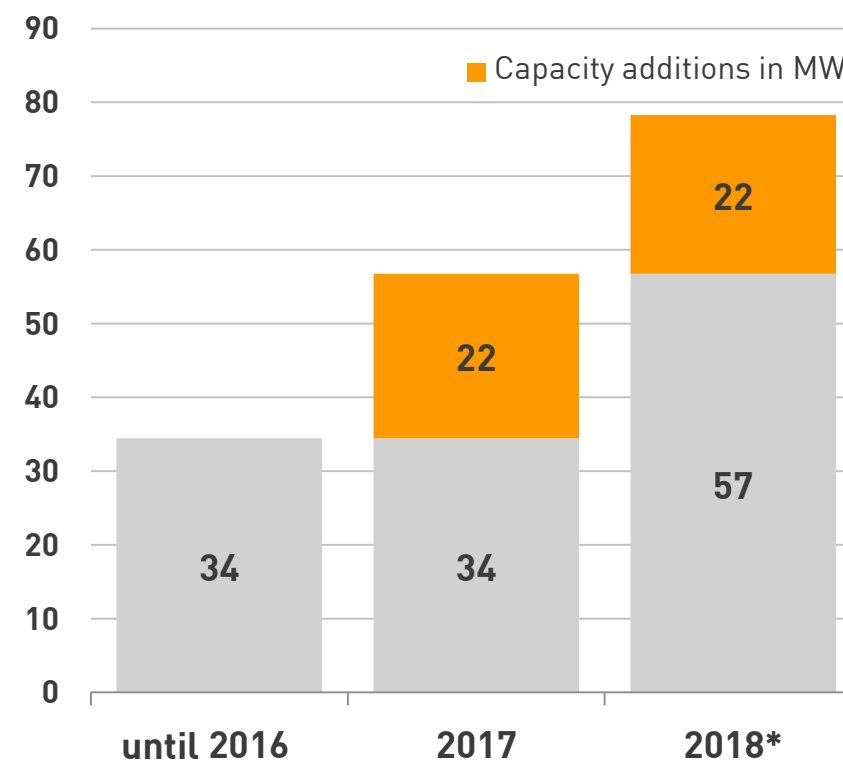


Challenges linked with the renewables generation EnBW's installed wind onshore and PV capacity

Wind Onshore



PV



*... including plants under construction

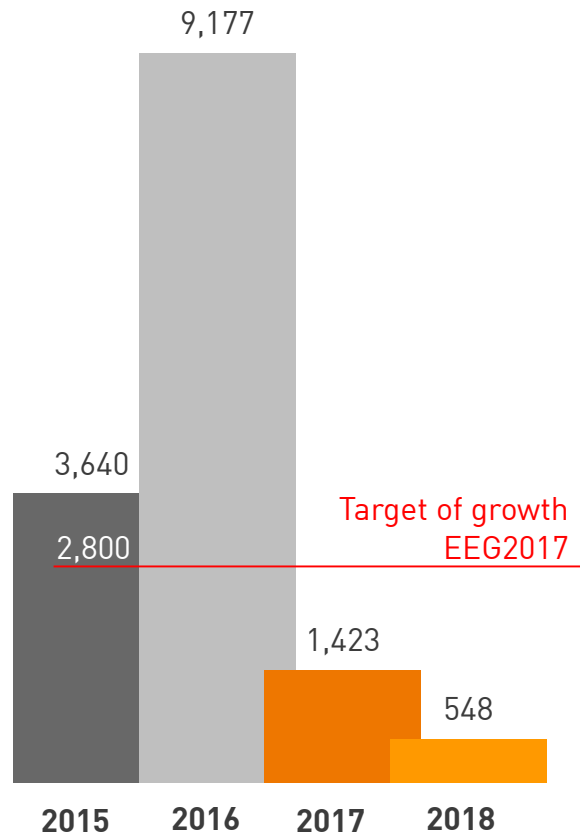


The installed wind onshore and PV capacity have almost doubled since 2016

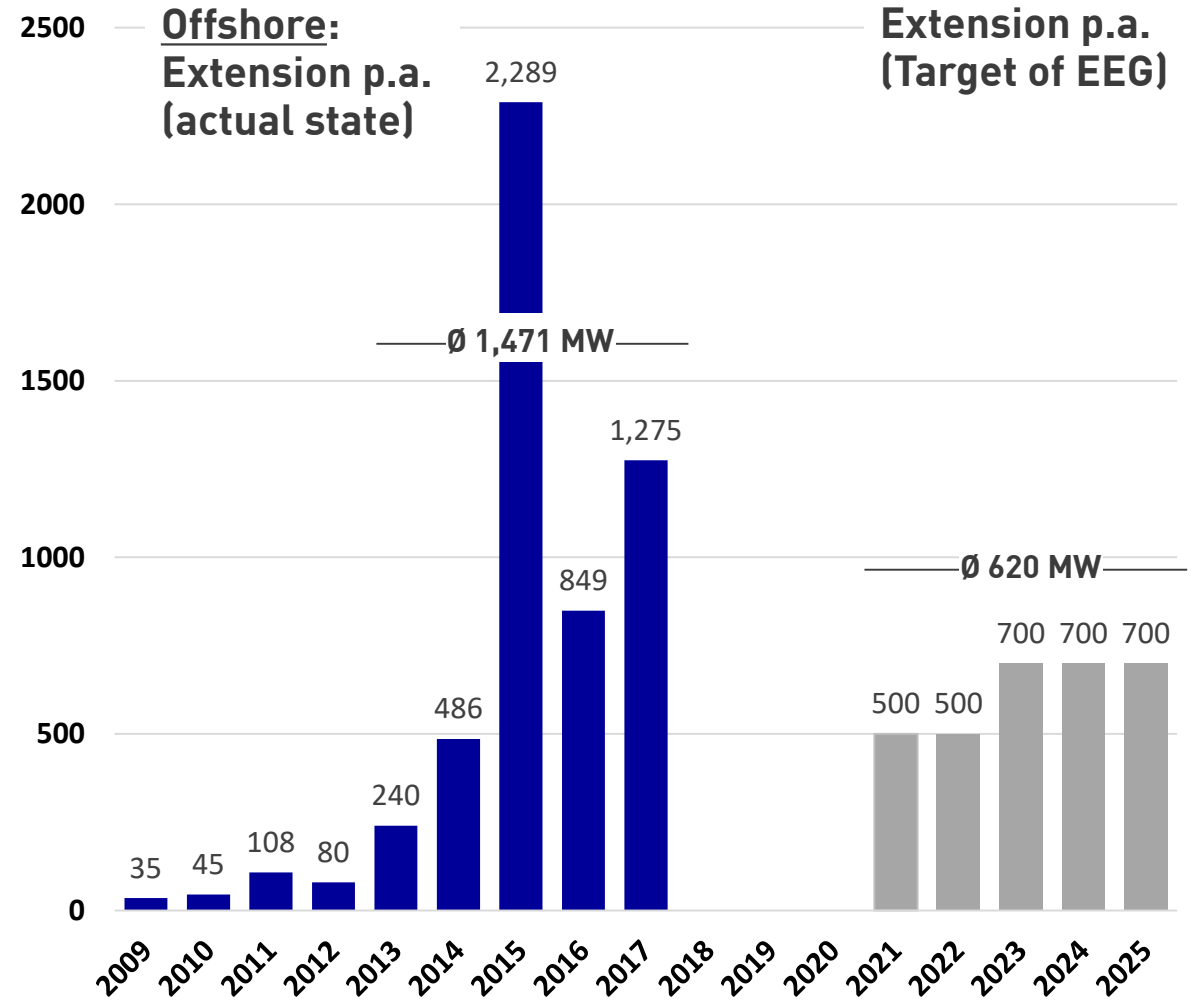


Challenges linked with the renewables generation Outlook: Wind on- and offshore in Germany

**Onshore: New "BImSchG" permits
(full year)**



Source: Bundesnetzagentur 08 2018

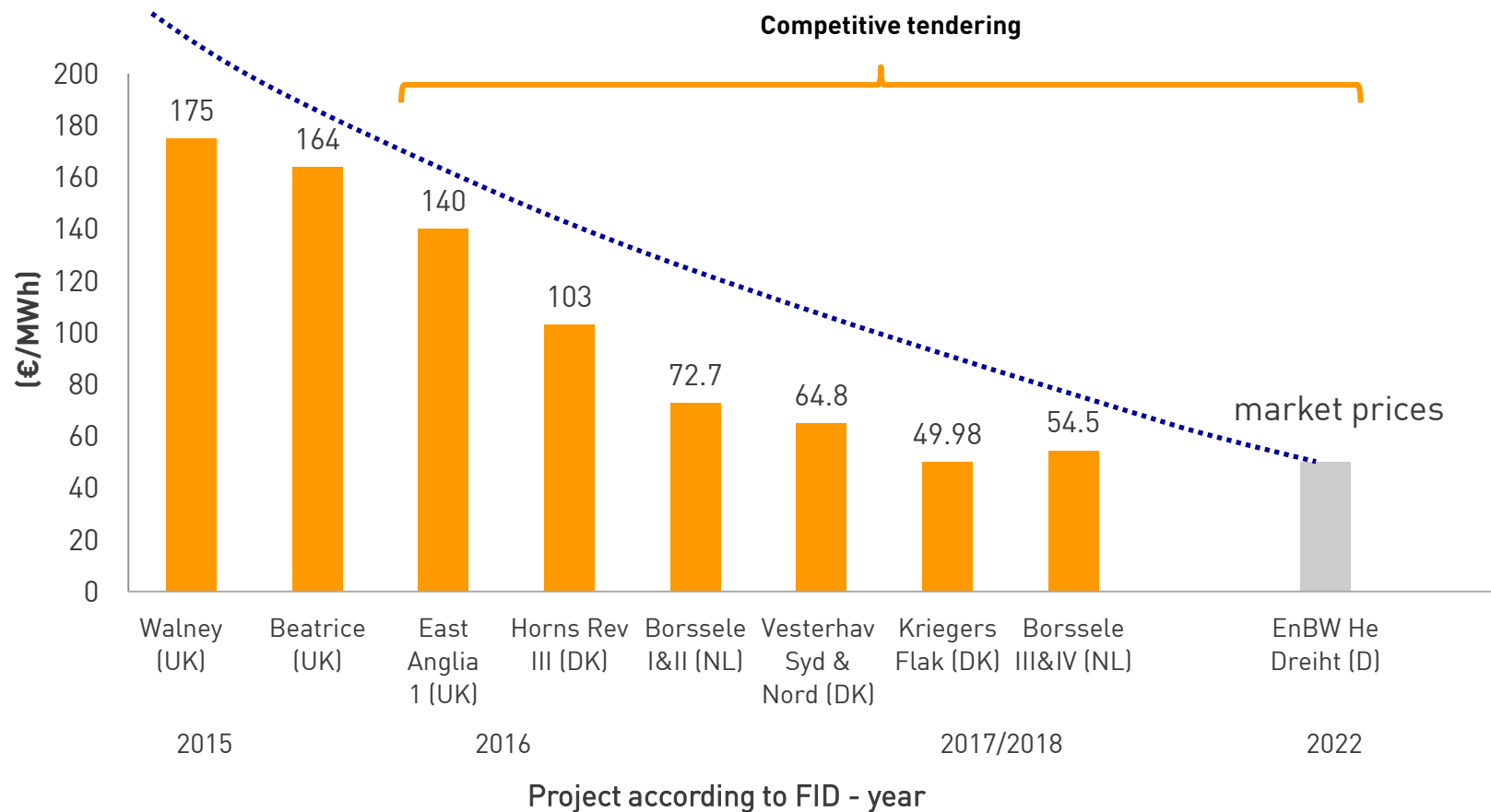


Source: Umwelt-Bundesamt/AGEE 03 2018, EEG



Challenges linked with the renewables generation

Renewables meet the market, e.g. Wind Offshore



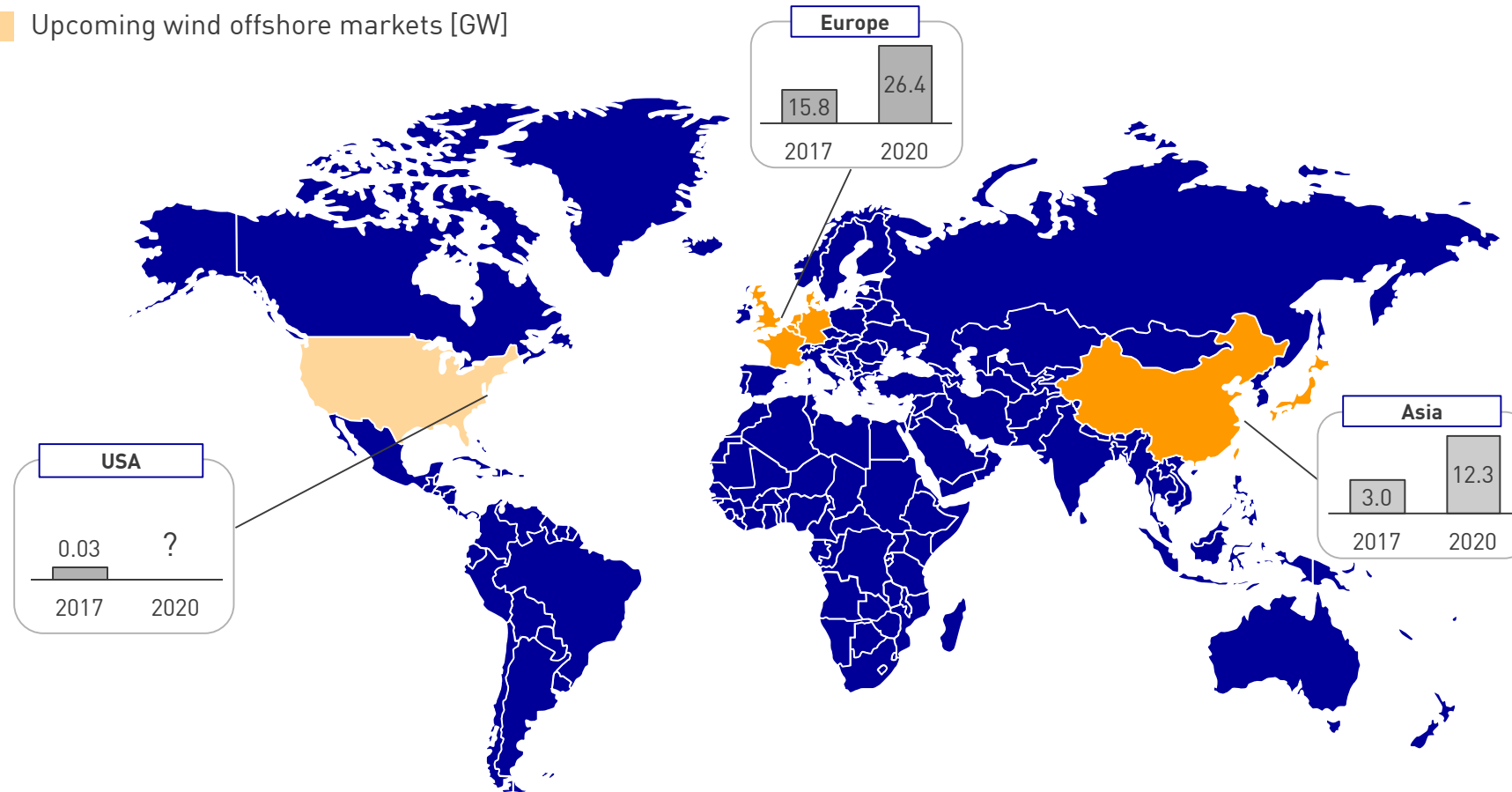
Note: Without taking into account regulatory differences; Bids in national currencies converted to €



Challenges linked with the renewables generation

New markets beyond Germany

- Current wind offshore markets [GW]
- Upcoming wind offshore markets [GW]









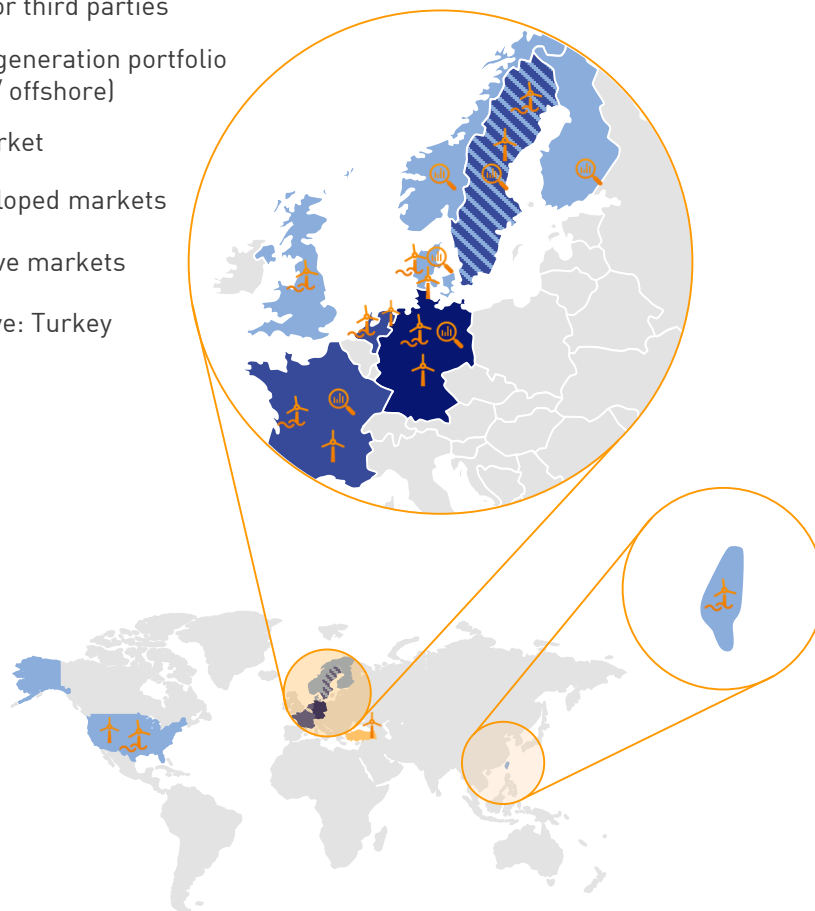


Challenges linked with the renewables generation

New markets beyond Germany

EnBW business segments and markets in 2025

-  services for third parties
-  In-house generation portfolio (onshore / offshore)
-  Home market
-  New developed markets
-  Perspective markets
-  informative: Turkey



Rational

- > **Engagement in new markets** in neighboring European countries and entering selective global markets stabilizes **the growth path** and achieves diversification of **the regulatory risk**
 - Focus on **offshore project development** in Europe (depending on the market development and attractiveness of tenders) and in global markets, such as **North America** and **Asia** (especially **USA** and **Taiwan**)
 - **Onshore**: Entering selective foreign markets (in 2018: market entry France + Sweden), ideally for the entire value chain
- > **Expansion of the service business** (in-house portfolio, services for third parties), thus **adding more assets in O&M** and fulfilling the increasing importance of plant operation, maintenance, marketing and repowering / dismantling in the target markets



Dominating Trends

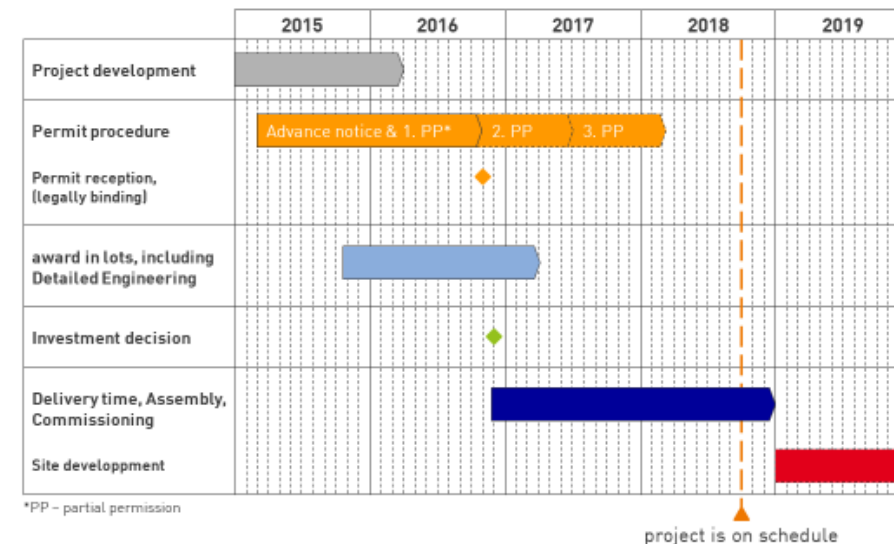
Decarbonisation

Objectives and key data

- › Improving efficiency by reducing maintenance and personnel costs as well as increasing the efficiency of electricity and heat generation
- › Improvement of climate protection and emissions
- › 5 hot water boilers (210 MWth)
- › Pressure-free heat storage (300 MWth)
- › 3 gas engines (30 MWe/30 MWth)

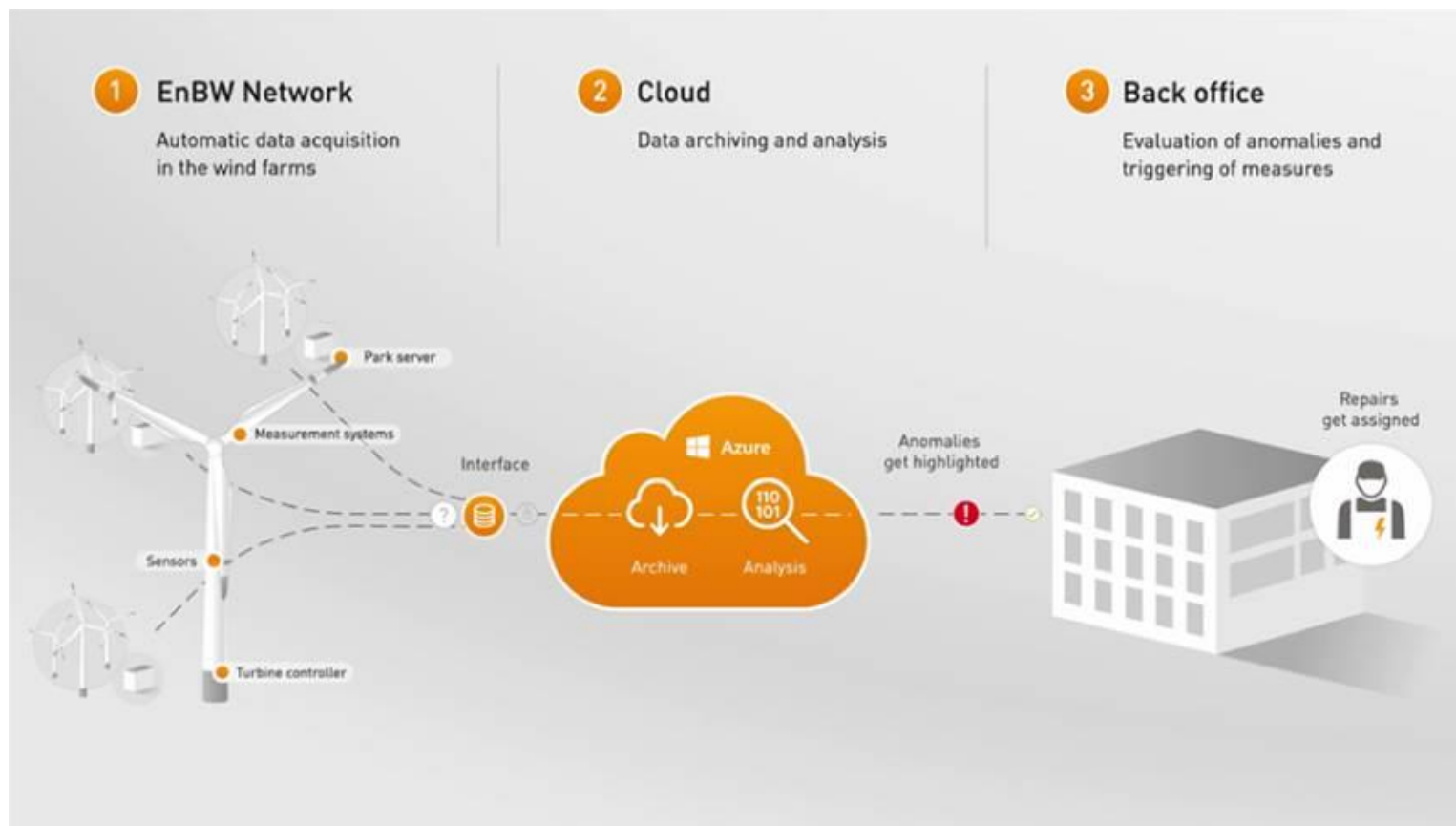
Current project status and outlook

- › Start of construction in January 2017 with pile foundation
- › Foundations / floor panels for the main building as well as walls / ceiling for the gas engine building are completed
- › Main assembly activities started in November 2017
- › Commissioning since end of May 2018
- › Overall plant optimization in November 2018
- › Commercial Commissioning December 2018





Dominating Trends Digitalisation



Initiatives for cost reduction:

- > Condition monitoring for the identification of emerging failures
- > Predictive Maintenance for estimation of future maintenance costs and planning of resources and budget
- > Savings through in-house operation (Baltic 1 since 2016) and optimisation of offshore wind farms



Dominating Trends

Security of supply – cold spell in Jan/ Feb 2017

Temperature forecast of -9°K compared to long-time average:

-> France, Italy and Belgium are announcing possible supply shortages.

Low water and ice formation in the rivers:

-> Restrictions in the generation of hydropower.

-> Coal shortages at power plant locations in southwest Germany due to shipping restrictions.

Non-availability of nuclear power plants:

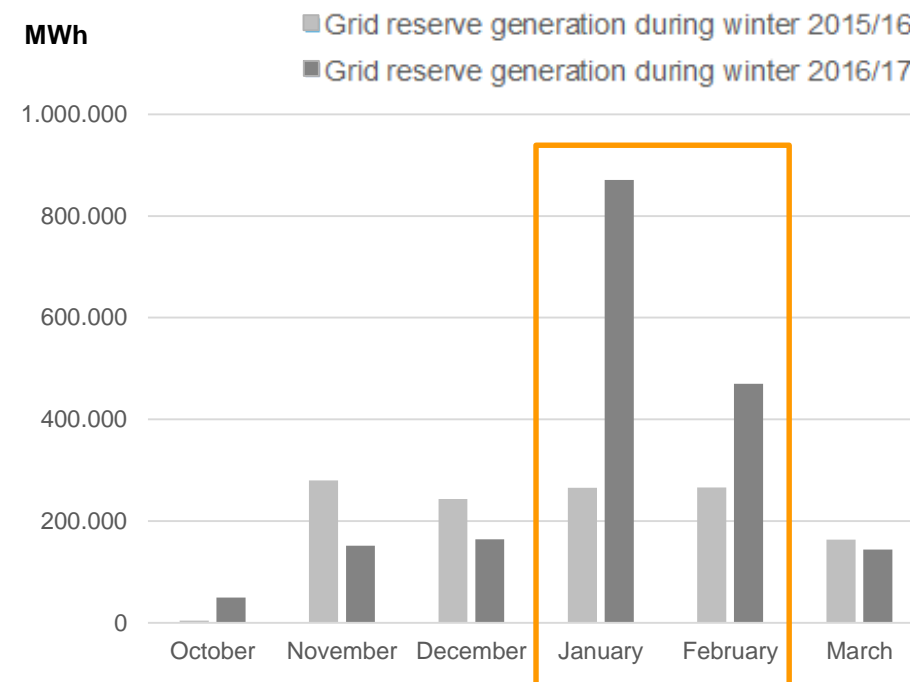
-> Refuelling in connection with nuclear fuel taxation in southern Germany

-> Unavailability in France due to audit by “Autorité de Sûreté Nucléaire (ASN)” and planned downtime.

Very low feed-in of renewable energy to the grid:

-> Wind energy between 3 GW - 4 GW (<10% of the installed output of 50 GW).

-> Maximum solar feed below 10 GW (<25% of the installed output of 41 GW)



EnBW contributed significantly in securing grid stability by operating its power plants. In peak, every available rotating machine was in operation.



Dominating Trends

Security of supply – An example from a realistic future

Tuesday, 30.3.2027



Weather forecasts for today and for tomorrow are confirmed ... 15 m/s wind speed.



Wind farm runs with the capacity of 900 MW



Forward market prices and trading volumes of the electricity exchange are advantageous



Trading sells 900 MW in the period from 6 - 8 pm on the forward market for the day after



He Dreiht
900 MW

Wednesday, 31.3.2027



Weather forecast from the previous day not met (sudden weather change) ... only 5 m/s wind speed



Wind farm runs at 5:45 pm with the capacity of 450 MW



Shortfall of the sold trading quantity



Options:

- Trading buys missing quantity on the on the energy stock exchange for 1000 €/ MWh
- Trading calls for two gas turbine from its own portfolio to start up.
- Checking option not to deliver: Height of penalty?



The availability of in-house adjustable generation is favorable and advantageous



Dominating Trends

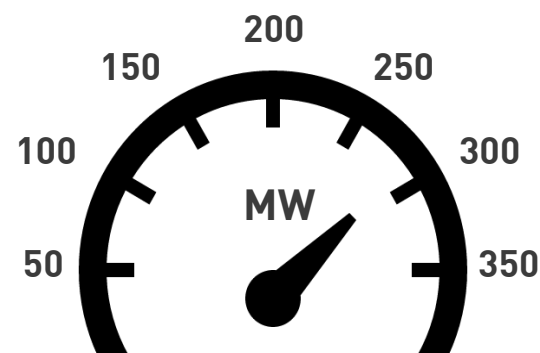
Security of supply: What can be adjustable generation?

CONVENTIONAL

Gas



Coal



ADJUSTABLE GENERATION

STORAGE TECHNOLOGY



Pumped-storage



Battery storage



Biomass/ Biogas



Bioenergy



Green gases (H₂, CH₄)

RENEWABLES



Way forward for a sustainable generation business



Keep restructuring the conventional generation

- > Cost consolidation
- > Fuel switch to gas, or biomass
- > Flexibility of operation
- > Flexibility of response

Realise the project pipeline in Renewables

Optimisation of Renewables operation

- > Cost reduction, especially in Wind Offshore
- > Scale effects
- > Participate at all stages of the value chain

Establish load adjustable generation:

- > Seek opportunities for gas turbines installation
- > Using batteries for primary regulation
- > Use of biogas, or other green gases in generation





Questions & Answers





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