Stuttgart, 20 September 2017

Frank Mastiaux, CEO
Thomas Kusterer, CFO
Today’s topics

- EnBW 2020: Current status of strategy execution
- Strategic focus for EnBW towards 2025
- Main commercial and technical drivers of success in the offshore wind business
Thomas Kusterer, CFO
Current status of strategy execution EnBW 2020
EnBW 2020 strategy remains the framework for our ongoing transforming

- **Generation and Trading**
  - 2012: €1.2 bn (−80%)
  - 2020: €0.3 bn

- **Renewable Energies**
  - 2012: €0.2 bn
  - 2020: €0.7 bn (+250%)

- **Grids**
  - 2012: €0.8 bn
  - 2020: €1.0 bn (+25%)

- **Sales**
  - 2012: €0.2 bn
  - 2020: €0.4 bn (+100%)

in Adjusted EBITDA

Capital Markets Day 2017
Nuclear fuel tax reimbursement a positive one-off effect, but no easing of efforts to deliver 2020 strategy

H1 2017

7 June Federal Constitutional Court ruling declared nuclear fuel tax unconstitutional, leading to tax refund

~€1.1bn refunded to EnBW in June (total paid by EnBW 2011-2016: €1.44bn)

H2 2017

Remaining ~€300m refunded in July

Additional ~€200m in interest also refunded

~€145m pro-rata payout to co-owner of GKN II
Nuclear waste storage: uncertainty eliminated

Nuclear waste disposal fund

- Law approved by Brussels on 16 June
- Contract signed on 26 June creates long-term legal certainty for all parties
- Operators remain responsible for decommissioning, dismantling and packaging radioactive waste

€4.8bn paid into fund

- Cash outflow 3 July 2017; no P&L impact; balance sheet contraction
- Financial assets of approx. €10bn covering long-term provisions allowed EnBW to pay full amount without refinancing
- Cash flow-based Asset Liability Management Model remains in place
Asset Liability Management Model: EnBW nuclear and pension provisions still covered after payment into fund

EnBW’s CF-based model in € m

100% Coverage projected 2029

Max. €300 million \(^1\) impact on OCF

\(^1\)adjusted for inflation
Solid credit quality based on prudent financial policies

**Asset Liability Management Model:**
Coverage of long-term pension and nuclear obligations

- Active management of related financial assets
- Impact on operating cash flow: max. €300m p.a. (inflation-adjusted)
- No more funding through operating cash flow once full coverage reached

**Operating business:**
Management of net investment to control net financial debt

- Internal financing capability as new key performance indicator
- Net investment limited to average €1.3bn p.a. retained cash flow
- Ongoing delivery of 2020 strategy secured entirely by internal financing capacity
Half-year 2017 key financials underpin 2020 strategy execution

Adjusted EBITDA in € m

<table>
<thead>
<tr>
<th></th>
<th>H1 2016</th>
<th>H1 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>968</td>
<td>1,073</td>
</tr>
<tr>
<td>Grids</td>
<td>138</td>
<td>181</td>
</tr>
<tr>
<td>Renewable Energies</td>
<td>524</td>
<td>611</td>
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<tr>
<td>Generation &amp; Trading</td>
<td>153</td>
<td>152</td>
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<tr>
<td>Other</td>
<td>4</td>
<td>27</td>
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</tbody>
</table>

Net debt in € m

<table>
<thead>
<tr>
<th></th>
<th>31.12.2016</th>
<th>30.06.2017</th>
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</thead>
<tbody>
<tr>
<td>Net debt</td>
<td>6,358</td>
<td>5,383</td>
</tr>
<tr>
<td>Net debt relating to pension and nuclear obligations</td>
<td>3,645</td>
<td>3,565</td>
</tr>
<tr>
<td>Net financial debt</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- First-time consolidation of VNG
- No nuclear fuel tax in 2017
- Positive effects related to other periods
- Nuclear fuel tax refund
- Provisions down due to higher discount factor
- Positive free cash flow
- 49.89% of EnBW Hohe See sold to Enbridge
First-time consolidation of VNG is a strong booster of the transformation of our business portfolio.

- EnBW is number 2 in gas transportation and number 3 in gas supply.
- VNG a perfect fit with EnBW 2020 strategy.
- Approximately 50% of VNG’s future earnings are regulated.
- First-time consolidation adds €41m to EnBW’s adjusted EBITDA in H1 2017.
- Expected full-year adjusted EBITDA contribution 2018: ~€140–150m.
We will deliver earnings turnaround in 2017

Adj. EBITDA
2016
in € m
250

Sales

Grids

Renewable Energies

Generation and Trading

Group

Forecast 2017
in %

+15 to +25

-5 to +5

+5 to +15

-10 to -20

0 to +5

1,004

295

337

1,939
Portfolio transition shows substantial progress, in line with EnBW’s 2020 strategy.

Adjusted EBITDA\(^1\):

- **2012**: 2.4 € bn
- **2017\(^2\)**: 1.9 – 2.0 € bn
- **2020**: 2.4 € bn

Share of low-risk earnings:

- **2012**: 48% Sales, 33% Grids, 10% Renewable Energies, 10% Generation & Trading
- **2017\(^2\)**: ~15% Sales, ~52% Grids, ~15% Renewable Energies, ~15% Generation & Trading
- **2020**: 40% Sales, 30% Grids, 15% Renewable Energies, 15% Generation & Trading

\(^1\) Divergence from 100% possible due to rounding effects
\(^2\) Forecast

Capital Markets Day 2017
2017-2019 investment program kept flexible with focus on growth in low-risk businesses

Investment/Divestment volume 2012–2020¹
in € m

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Investment</th>
<th>Total Divestment</th>
<th>Net Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>8.6</td>
<td>3.7</td>
<td>4.9</td>
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<tr>
<td>2013</td>
<td>5.5</td>
<td>1.4</td>
<td>4.1</td>
</tr>
<tr>
<td>2014</td>
<td>14.1</td>
<td>5.1</td>
<td>9.0</td>
</tr>
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Investment volume 2017–2019

- Low-risk earnings: 38% (80%)
- Growth investments: 42% (77%)

Low-risk earnings
- Generation & Trading/Sales: 17%
- Grids: 3%
- Renewable energies, mainly offshore: 38%
- Others: 32%

¹ As of 30.06.2017; 2012 as reference year
Efficiency targets already to be met by 2019

- Unprofitable power plants incorporated in German power plants network reserve
- 2016: exit from unprofitable B2B commodity business
- 2017–2020: ~€100m p.a. from 6.3% management and workforce pay cut
- ~€150m p.a. contribution from functional units, including holdings such as VNG
Progress toward 2020 targets supports solid ratings

One-notch downgrade by Moody’s in May 2017 – S&P and Fitch ratings confirmed; all agencies with stable outlook

Long-term rating: Baa1
Outlook: stable

Long-term rating: A-
Outlook: stable

Long-term rating: A-
Outlook: stable

Agencies expect continuation of financial discipline
Concrete measures underpin delivery of 2020 strategy targets

- Efficiency programs
- No nuclear fuel tax from 2017
- Earnings contribution from VNG
- Growth in onshore wind
- Growth in offshore wind: Hohe See/Albatros
- Increasing sales earnings:
  - Exit from B2B Commodity Business
  - Decentralized energy solutions

**2017**

- Adjusted EBITDA
  - Sales: 15%
  - Grids: 30%
  - Renewable Energies: 40%
  - Generation & Trading: 15%

**2020**

- Sales: 15%
- Grids: 30%
- Renewable Energies: 40%
- Generation & Trading: 15%

2.4 € bn
Frank Mastiaux, CEO
Strategic focus for EnBW towards 2025
Key elements of the energy business are shifting (again) – change becomes the norm

Phase 1

Mainly driven by energy policies 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)
- Digitization and network energy solutions (e.g. smart grids)
- Customer needs: individualization and transaction simplicity
We have extended our strategic thinking towards 2025

Reasons for extension

1. Medium-term planning reaching end of long-term strategic period (2020)
2. Major changes in business environment
3. Capitalizing on lessons learned from strategy EnBW 2020

Methodology and approach

1. Timely anticipation of market/environment and regulatory changes
2. Best possible fit between market potential and EnBW capabilities
3. Long-term competitiveness and future viability as key benchmark for each business and for EnBW as a whole
4. Development of new growth areas – also for further diversification
5. Ongoing organizational renewal across EnBW (structure, processes, leadership, performance)
Our assessment of future trends pinpoints six key developments

1. Decarbonization continues to be a main driver of political and regulatory action
2. Renewable energies and grids will remain pillars of growth in the markets we serve
3. New competitors and technological developments will impact the value chain
4. Energy and infrastructure issues will converge
5. Demand for intelligent, safe and reliable infrastructure will grow significantly
6. Customer expectations will demand greater individualization and be harder to predict
**Strategic conclusions we have drawn for our business towards 2025**

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<tr>
<td><strong>1</strong></td>
<td>Renewable energies, grids and customer-facing businesses will remain EnBW’s key future growth areas</td>
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<tr>
<td><strong>2</strong></td>
<td>We are developing new growth areas in the field of (critical) infrastructure, including beyond energy</td>
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<tr>
<td><strong>3</strong></td>
<td>We attach great importance to a balanced and diversified business portfolio</td>
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<tr>
<td><strong>4</strong></td>
<td>A key goal of EnBW will remain continuous improvement and performance drive</td>
</tr>
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<td><strong>5</strong></td>
<td>We consider the ability to change and adapt quickly to be a key basic competitive success factor</td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>We are preparing EnBW for growth in absolute numbers post-2020</td>
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The German infrastructure market will grow strongly, with opportunities in our existing business portfolio and in areas beyond energy.

1. Enhanced emphasis on infrastructure aspects in our existing businesses.

2. New growth areas beyond energy infrastructure, closely linked to EnBW’s existing core competencies.

German infrastructure market in € bn

- 100 in 2015
- 150 in 2025 (+50%)
Infrastructure pilots beyond energy already underway

<table>
<thead>
<tr>
<th>Pilot segment</th>
<th>Business case</th>
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<tbody>
<tr>
<td>Broadband/telco</td>
<td>Expand <strong>NetCom’s telco and broadband activities</strong> into <strong>major earnings pillar</strong> for EnBW Group</td>
</tr>
<tr>
<td>E-mobility/charging infrastructure</td>
<td>Launch and build <strong>substantial e-mobility activities focused on grid and charging infrastructure</strong>, plus (digital) services</td>
</tr>
<tr>
<td>Urban precinct development</td>
<td>Pool existing activities and products and build integrated, extended <strong>portfolio going beyond energy</strong></td>
</tr>
<tr>
<td>Security infrastructure</td>
<td>Devise business models for <strong>enhanced public security</strong> based on digital solutions and components (e.g. video surveillance)</td>
</tr>
<tr>
<td>Waterway locks</td>
<td>Support <strong>lock enlargement on rivers</strong> (Neckar, others?) for larger scale vessels</td>
</tr>
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...
Example: Huge business opportunities in urban infrastructure development

- Intelligent street lighting
- Public security infrastructure
- Integrated development of residential areas
- Smart customer solutions
- Broadband expansion
- Sustainable mobility
- Environmental sensors
- Traffic and parking management
We have defined specific growth targets until 2025, with a clear set of priorities.

**Development of earnings**

In € bn

2020

- **Sustainable power infrastructure**
  - Expansion of onshore and offshore wind to > 3,500 MW by 2025
  - Selective international business activities
  - CO2-reduced generation (e.g. midstream gas, fuel switch)

2025

- **System-critical infrastructure**
  - Expansion of the distribution and electricity transmission grid
  - Expansion of network-related services
  - New areas of system-critical infrastructure (e.g. public security)

- **Intelligent infrastructure for the customer**
  - Cost reduction and digitization of B2C sales as well as transformation to customer infrastructure business
  - New infrastructure-related business areas beyond energy (e.g. mobility infrastructure)
Resulting investment priorities 2021–2025:
80% targeting growth, 90% targeting regulated businesses

Allocation of investment spending

Focus on future growth:
80% of total investment targets strategic growth areas

High proportion of (quasi) regulated business: approx. 90% of investment in grids and renewable energies
Strategic long-term plan: growth and significant improvement in our financial situation by 2025

- Significant increase in operating result (adjusted EBITDA) to > €3bn (approx. +30% compared to 2020 target)
- Increased retained cash flow, stronger balance sheet and higher quality earnings
- €10bn total (gross) investment over the period 2021–2025, approx. 80% targeting growth
- Adequate and stable dividend yield
- Substantial increase in the value of EnBW by 2025
Clear-cut goals for EnBW in 2025

- EnBW transformed into a sustainable and innovative infrastructure company
- Balanced portfolio with three key areas and high proportion of stable and regulated businesses: power, infrastructure, customers
- New growth areas beyond energy closely linked to EnBW’s core competencies
- Significant improvement in our financial situation
- Evolution of EnBW into a modern, high-performance organization
Stefan Kansy, New Projects Offshore

Main commercial and technical drivers of success in the offshore wind business
Topics

- Portfolio and status update
- How does the world’s first zero-subsidy bid work?
- EnBW’s path to its current market position
- The future of offshore wind – EnBW’s next steps
Offshore wind portfolio and project pipeline

- Installed capacity 2015: 336 MW
- Under construction: 609 MW
- Secured pipeline: 900 MW

- EnBW He Dreiht: ~900 MW
  - 71+16 = 87 x Siemens SWT 7.0-154 on monopile foundations
  - Commissioning planned for 2019
  - Shareholders: EnBW (~50.1%) & Enbridge Inc. (~49.9%)

- EnBW Hohe See: 497 MW
- EnBW Albatros: 112 MW
  - 71+16 = 87 x Siemens SWT 7.0-154 on monopile foundations
  - Commissioning planned for 2019
  - Shareholders: EnBW (~50.1%) & Enbridge Inc. (~49.9%)

- EnBW Baltic 1: 48.3 MW
  - 21 x Siemens SWT 2.3-93
  - Commissioned in 2011
  - Shareholders: EnBW (~50.1%) & 19 municipal utilities (~49.9%)

- EnBW Baltic 2: 298 MW
  - 80 x Siemens SWT 3.6-120
  - Commissioned in 2015
  - Shareholders: EnBW (~50.1%) & Macquarie, PGGM and ÄvWL (~49.9%)
Update on the EnBW Hohe See and Albatros offshore wind farms

Design
- Partner on board
- Design ready and certified
- ALB\(^1\): new OTM\(^2\)

Fabrication
- HS\(^3\): all lots started
- ALB: directly after HS

Installation
- Key equipment secured
- FOU\(^4\), IAG\(^5\), OSS\(^6\): 2018
- WTG\(^7\)/feed-in: 2019

\(^1\) ALB = Albatros
\(^2\) OTM = Offshore transformer module
\(^3\) HS = Hohe See
\(^4\) FOU = Foundations
\(^5\) IAG = Internal array grid
\(^6\) OSS = Offshore substation
\(^7\) WTG = Wind turbine generators
Update on the EnBW Hohe See and Albatros offshore wind farms

Offshore Substation (Hoboken, Belgium)

Internal array grid (Lochem, The Netherlands)
Update on the EnBW Hohe See and Albatros offshore wind farms

1st coated monopile (Rotterdam, The Netherlands)

Transition piece (Hoboken, Belgium)
How does the world’s first zero-subsidy bid work?

Technical aspects
› Size: 63 km²
› Water depth: 39-40 m
› Distance to shore: 85 km
› Wind speed: ø 10.1 m/s
› Years of operation: 25 (EEG 2017)

Current state of project development
› Approval granted since 2007
› Principal surveying of seafloor and subsoil in 2011

Capacity
› 119 approved sites for wind turbines
› Maximum of 900 MW generation capacity

Timeline
› Auction on 3 April 2017
› FID until mid-2023
› Grid connection: Borwin 5 (NOR-7-1) in accordance with Offshore Network Development Plan (O-NEP 2025)
› Commissioning and start of operation in 2025

1 Grid connection capacity of 900 MW
2 A new survey of the seafloor and subsoil is partly necessary due to the planned use of larger wind turbines.
Remuneration for offshore wind in Europe: strong trend of declining remuneration since 2015

Projects in order of FID

<table>
<thead>
<tr>
<th>Year</th>
<th>Project</th>
<th>€/MWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>Walney (UK)</td>
<td>175</td>
</tr>
<tr>
<td></td>
<td>Beatrice (UK)</td>
<td>164</td>
</tr>
<tr>
<td></td>
<td>East Anglia 1 (UK)</td>
<td>140</td>
</tr>
<tr>
<td>2016</td>
<td>Horns Ray III (DK)</td>
<td>103</td>
</tr>
<tr>
<td></td>
<td>Borssele I&amp;II (DK)</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>Vesterbay Syd &amp; Nord (DK)</td>
<td>65</td>
</tr>
<tr>
<td>2017</td>
<td>Kriegers Flak (DK)</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Borssele III&amp;IV (NL)</td>
<td>55</td>
</tr>
</tbody>
</table>

Note: Without consideration of differences in regulatory frameworks; bids in other currencies converted to EUR.
Two rounds of offshore wind auctions in 2017/2018 – overview of the competitive situation

Competition within cluster

- **NOR-1-1** (2024) - 900 Projects, ~800
- **NOR-3-3** (2023) - 900 Projects, ~1,900
- **NOR-4-2** (in operation) - 387 Projects, ~200
- **NOR-5-2** (2025) - 900 Projects, ~800
- **NOR-7-1** (2025) - 900 Projects, 1,800
- **OST-B-1[2]** (2021/2) - 750 Projects, Baltic Sea

Competition across all clusters

- Qualified projects ~7,200
- Grid connection capacity 4,700
- First tender 1,550
- Second tender 1,550

**Competition on two levels**

- Demand for grid connection capacity significantly exceeded auctioned capacity in the first round in 2017 (oversubscribed by 4.6 times)
- Available grid connection capacity within the specific clusters limits capacity to be awarded

- **Competition has to be overcome at two levels**
- **Participation in second round of auctions in 2018 only if grid connection capacity within cluster still available**
The German Federal Network Agency published its acceptance of the following bids on 13 April 2017 in accordance with § 15 WindSeeG in conjunction with § 35 section 1 EEG 2017:

- Date of auction: 03/04/2017
- Accepted volume: 1,490 MW (of max. 1,550 MW)
- Lowest bid accepted: 0.00 ct./kWh
- Highest bid accepted: 6.00 ct./kWh
- Average bid price: 0.44 ct./kWh

<table>
<thead>
<tr>
<th>Accepted Bids</th>
<th>Capacity</th>
<th>Bid</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnBW He Dreih GmbH</td>
<td>900 MW</td>
<td>0.00 ct./kWh</td>
<td>North Sea Cluster 7</td>
</tr>
<tr>
<td>Dong Energy Borkum Riffgrund West II GmbH (Dong)</td>
<td>240 MW</td>
<td>0.00 ct./kWh</td>
<td>North Sea Cluster 1</td>
</tr>
<tr>
<td>Northern Energy OWP West GmbH (Dong)</td>
<td>240 MW</td>
<td>0.00 ct./kWh</td>
<td>North Sea Cluster 1</td>
</tr>
<tr>
<td>Gode Wind 03 GmbH (Dong)</td>
<td>110 MW</td>
<td>6.00 ct./kWh</td>
<td>North Sea Cluster 3</td>
</tr>
</tbody>
</table>
EnBW He Dreih combines cost and efficiency benefits in a unique way:

1. **Project development, realisation and operation by a company** with profound experience and existing portfolio
2. **Size**: 900 MW – by far the largest single project in the auction
3. **Synergies**: EnBW He Dreih is located in the direct vicinity of EnBW Hohe See (71 turbines, 497 MW) and Albatros (16 turbines, 112 MW)
   → considerable synergies during operation
4. **Time of commissioning**: Due to the later connection of BorWin5 to the grid (2025), EnBW He Dreih will:
   a. benefit from cost degression, innovation and technological progress within the offshore industry in the coming years
   b. fully operate in a more favourable market environment (e.g. phasing out of nuclear power in Germany completed)
Success factor #1: experienced project developer
Example: project portfolio

- Installed capacity 2015: 336 MW
- Under construction: 609 MW

EnBW Hohe See: 497 MW
EnBW Albatros: 112 MW
- 71+16 = 87 x Siemens SWT 7.0-154 on monopile foundations
- Commissioning planned for 2019
- Shareholders: EnBW (~50.1%) & Enbridge Inc. (~49.9%)

EnBW Baltic 1: 68.3 MW
- 21 x Siemens SWT 2.3-93
- Commissioned in 2011
- Shareholders: EnBW (~50.1%) & 19 municipal utilities (~49.9%)

EnBW Baltic 2: 288 MW
- 80 x Siemens SWT 3.6-120
- Commissioned in 2015
- Shareholders: EnBW (~50.1%) & Macquarie, PGGM and ÄvWL (~49.9%)

EnBW He Dreiht: ~900 MW

Kriegers Flak (DK): 2016 tender
Success factor #1: experienced project developer
Example: project team

EnBW approach
› Project office in Hamburg has grown continuously since 2009
› All areas of expertise in project development covered by in-house resources
› Selective in-sourcing of external expertise

Team

Areas of in-house expertise
- Project management
- Wind turbine technology
- Foundations and substation steel construction
- Substation technology
- Inter array cabling
- Offshore installation management and maritime logistics
- Marine biology and environmental management
- Geology and subsoil analysis
- Health and safety
- Quality assurance
- Contract and claim management
- Certification
- Consenting and external grid
- Commercial
- Finance
- Plus: interface & risk management, time scheduling, insurance, document management…
Success factor #2: size of wind farm
Comparison of project sizes

Overview of the qualified projects according to size¹

› EnBW He Dreih was by far the largest project in the auction

› Economies of scale: fixed planning, construction and operation costs distributed over a larger installed generation capacity (e.g. project development, design, certification, costs for offshore substation)

› Construction costs (CapEx) in figures:
  Fixed costs of MEUR 100 per offshore wind farm distributed across a:
  – 400 MW capacity offshore wind farm: EUR 250 K per MW
  – 900 MW capacity offshore wind farm: EUR 110 K per MW (-56%)

¹ Several smaller Baltic Sea offshore wind farms were omitted for illustrative purposes.
Success factor #3: synergies in operation
Example: EnBW cluster in the North Sea

Joint offshore logistics for three wind farms with a capacity of more than 1,500 MW

- EnBW cluster consisting of the Hohe See (497 MW), Albatros (116 MW) and He Dreih (900 MW) wind farms
- The small distance of just 7 nm between the wind farms makes a joint logistical concept possible comprising several vessels and a helicopter; operating from a central harbour base and dispatch centre
Success factor #4: time of commissioning in 2025
Example: schedule for connection to the grid in accordance with O-NEP

Auction scheme and Offshore Network Development Plan (O-NEP) define the time schedule for the realisation of the accepted projects

> Time schedules for the offshore wind farms under EEG 2017 are governed by the target dates for offshore grid connections in the Offshore Network Development Plan. System NOR-7-1 [relevant for EnBW He Dreiht] is due to be commissioned in 2025 and is one of the last grid connection systems for the transition phase of EEG 2017.

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<th></th>
<th>2021</th>
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<tbody>
<tr>
<td>Baltic Sea OST –B-1/2</td>
<td>Construction</td>
<td>Grid connection</td>
<td>Construction</td>
<td>Grid connection</td>
<td>Construction</td>
<td>Grid connection</td>
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<tr>
<td>North Sea NOR-3-3</td>
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<td>Construction</td>
<td>Grid connection</td>
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<td>Grid connection</td>
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<tr>
<td>North Sea NOR-1-1</td>
<td>Grid connection</td>
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<tr>
<td>North Sea NOR-5-2</td>
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<tr>
<td>North Sea NOR-7-1</td>
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Success factor #4: time of commissioning in 2025
Example: time schedule & selection of technology

Due to the later connection to the grid via NOR-7-1, the technology for EnBW He Dreihit only needs to be chosen in early 2022.

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Auction
Project development
Choice of technology
Construction phase
Commissioning Borwin5 [NOR-7-1]

Around 5 years between acceptance of the bid and selection of technology incl. contracts and financing.
Success factor #4: time of commissioning in 2025
Example: technology and innovation

Turbine manufacturers are already developing the next generation of wind turbines

- Current turbine technology in the 8 – 10 MW range with rotor diameters of 154 to 180 metres will be deployed in 2018/2019
- Manufacturers have already announced availability of new generations of turbines in a few years, significantly improving costs and efficiency
More powerful turbines with larger rotors have three positive effects:

1. Energy yield = function of rotor surface
   - Effect of larger rotor diameters is significant because rotor surface increases by the power of 2 with the diameter

2. Larger turbines mean that fewer turbines are required to obtain same overall wind farm capacity
   - Fewer turbines mean faster installation and thus reduced exposure to weather risks
   - This results in lower specific installation costs

3. Maintenance costs mainly driven by the number of sites rather than the capacity of each turbine
   - Fewer sites mean lower O&M costs

The area covered by a 200 m rotor (31416 m²) is equivalent to more than four football pitches and almost three times as large as the area covered by a 120 m rotor (11310 m²)
1. **Drivers for lowering LCoE:**
   a) Total size of wind farm (fixed cost degression)
   b) Technological developments/innovation (turbine capacity)
   c) O&M synergies with surrounding wind farms

2. **Drivers for increasing merchant power prices:**
   a) Price increase for CO₂ and fossil fuels
   b) Phase-out/reduction of power generation capacities

   ➔ The combination is decisive
EnBW’s path to its current market position

Organizational aspects – Transform existing DNA as an asset operator to a best-in-class project team for offshore wind

- Benefit from decades of experience in developing, building & operating complex and large-scale power generation assets
- Utilise the organisation’s broad range of expertise by setting up multidisciplinary teams. Turn division of labour into a gain rather than a pain.
- Change your image of projects and allow the projects to change the organization

Expertise and excellence
Approach and skills

- Start small and simple, transfer lessons learned and then increase size and complexity
- Cover all project phases from early development until operation
- Know the product you are buying and have a rock-solid understanding of the risks involved
The future of offshore wind/EnBW’s next steps

**Future of offshore wind**

- **Mature markets (NL, F, D):** increased competition, more zero-subsidy bids/market integration
- **Young markets (Taiwan, USA, Korea):** establishment of regulatory frameworks; more countries entering market due to zero-subsidy bids
- **Technological developments:** larger turbines; floating structures allow offshore wind in vicinity of large populations and also in deeper waters (i.e. West Coast of USA)
- **Consolidation of supply chain (OEMs)**

**Next steps**

- **Completion of EnBW Hohe See and Albatros by end of 2019**
- **Further development of EnBW He Dreih**
- **Participation in selected European auctions. Monitoring global developments**
- **Only competitiveness brings opportunities – being the best in class**
The future of offshore wind – EnBW’s next steps

1. The Hohe See and Albatros offshore projects are making a major contribution to achieving the targets in our EnBW 2025 strategy.

2. High competitiveness enables the successful acquisition of new offshore wind projects, while excellence and experience ensure they are delivered on budget.

3. Offshore wind will be a significant pillar of our strategy even after 2020. Therefore, we will selectively participate in European auctions and monitor global developments.
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