Conclusion

This Offshore Grid Development Plan 2014 (O-GDP) is already the second of its kind to be presented for public consultation by the four German transmission system operators 50Hertz, Amprion, TenneT and TransnetBW. The Offshore Grid Development Plan describes the expansion measures required to the offshore grid over the next ten and twenty years. Together with the Power Grid Development Plan, the Offshore Grid Development Plan shows how power generation in Germany can successfully be restructured and renewable energy be integrated.

The grid development planning process promotes transparency and an open dialogue with the public. The general public was invited to take part in the public consultation process for the first draft of the O-GDP 2014. The statements received during this process have changed the O-GDP.

The contents of these statements mostly focussed on the topics of decentralised power generation, the timescale for implementing measures, the consideration of progress made during the scheduling of measures concerning offshore wind farms, technical concepts regarding the security of supply and the minimisation of damage to the offshore grid and selected grid connection points.

The transmission system operators are happy to welcome all contributions made within the scope of the public consultation regarding the first draft of the O-GDP. This ensures that all stakeholders interested in the O-GDP are taken into consideration and that the Offshore Grid Development Plan is the result of a process of mutual recognition and development.

Process and methodology
By presenting the assumptions regarding the generation and consumption structure, the calculation method used and the resulting requirements for grid expansion on a public stage, the whole process of grid development planning is made very transparent. Thus, with regard to assumed energy generation capacity and the consumption situation in the future, the scenario framework, as approved by the Federal Network Agency on 30 August 2013, is used as a starting point for creating both the Power Grid Development Plan and the Offshore Grid Development Plan (in accordance with Section 12b and Section 17b of the German Energy Management Act).

The Offshore Grid Development Plan draws together the development of the overland transmission network, the spatial planning at sea and the basic technical conditions to create a basis for sustainable planning, including detailed information on the properties, time scheduling, execution times and costs of the measures necessary for the next ten and twenty years respectively. Here, particular attention is paid to the timing of the offshore grid expansion measures based on objective criteria. This includes the classification of the North Sea and the Baltic Sea into distance zones, the generation potential of wind farm clusters, as individually mentioned in the Federal Offshore Plan or in respective regional planning, the planned

commissioning of the grid connection points stipulated in the Power Grid Development Plan as well as progress updates on the realisation of the offshore wind farms that are to be connected. The Offshore Grid Development Plan therefore plays a key role as a tool for coordinating the efficient and sustainable development of offshore wind energy.

The Offshore Grid Development Plan investigates the demand on the grid connection system and determines the start and end points of grid connection systems, taking into account the expected geographic distribution of the offshore wind farms and the network connection capacities available at the grid connection points in the transmission network. Specific line corridors are determined within the scope of federal sectoral planning by the Federal Maritime and Hydrographic Agency (*Bundesamt für Seeschifffahrt und Hydrographie*) for the exclusive economic zone and by the Federal Network Agency in cooperation with the respective German states for German coastal waters.

The coordination of the onshore grid expansion, the development of offshore wind farms, the Federal Offshore Plan and the planning of coastal states is an iterative process. The results of the Offshore Grid Development Plan will have repercussions for the offshore wind energy industry and the plans that have been used, which will in turn lead to adjustments being made in subsequent Offshore Grid Development Plans. The Offshore Grid Development Plan is therefore not conclusive, but, just like the Power Grid Development Plan, will continue to be regularly revised in order to meet changing conditions.

Results

The length of offshore grid expansion required is calculated at 1,055 km in Scenario A 2024, 1,525 km in Scenario B 2024 and up to 2,555 km in Scenario C 2024. The total transmission capacity of these extensions to the offshore grid would be sufficient for an additional 2.95 GW in Scenario A 2024, 4.35 GW in Scenario B 2024 and for 7.4 GW in Scenario C 2024. The investment costs for the network measures are calculated in the Offshore Grid Development Plan on the basis of specific cost estimations and are of a provisional nature. Depending on the scenario, the total volume of investments over the next ten years totals between 17 and 23 billion euro. This already accounts for investments of approximately thirteen billion euro in the expansion of the starting grid offshore.

The Offshore Grid Development Plan describes measures that have been made available for public consultation and are based on the scenario framework approved by the Federal Network Agency on 30 August 2013; these measures fulfil all the requirements imposed by the German legislative and regulatory authorities. Three scenarios have been created for the target year 2024. One scenario has also been projected for the year 2034 so as to gauge long-term development over a period of twenty years. Due to the scope of three different scenarios, the grid expansion measures investigated cover a wide range of possible future developments.

As long as progress in implementing the turnaround in German energy policy continues along the same path that has already been started, i.e. phasing-out nuclear

power and the dynamic expansion of renewable energy sources for electricity supply, the measures from the Offshore Grid Development Plan 2013, which were approved in early 2014, are still just as essential as before. A comparison with the resultant networks of the Offshore Grid Development Plans for 2013 and 2014 shows that, even when the target values are reduced in the scenario framework, the need for expansion measures in the long-term is not diminished in any way, but simply stretched out over a longer period of time. The amendments to the Renewable Energy Act that are currently being discussed do not mean a fundamental reversal in policy, but rather a simple extension of the time given to develop individual generation methods, such as wind power. This means that certain network development measures will also be postponed slightly, without necessarily becoming obsolete. The transmission system operators are merely building the energy network that is required in order to facilitate the turnaround in energy policy efficiently and securely on the part of the energy grid.

This second draft also clears up inconsistencies that appeared in the first drafts of the GDP and the O-GDP. Certain grid connection points were assigned different capacities for generation of offshore wind power. The cause for this was already described in detail in the first drafts of the GDP and the O-GDP. Grid connection points in the Halbemond area, Cloppenburg East, Wilhelmshaven 2, Elsfeth West and the Unterweser region were particularly affected by this issue.

The successful expansion of offshore wind power is dependent upon understanding and widespread acceptance both in politics and in society as well as integrating the development of offshore wind farms, the offshore power grid and the onshore transmission network. The frameworks for legal planning and regulation as well as extensive social and political support at all levels are going to play a decisive role in implementing this ambitious investment programme. This requires both extensive information and a cooperative and binding collaboration with all stakeholders. The grid development planning process aims to contribute to this by promoting transparency and an open dialogue.