Federal Ministry
for Economic Affairs
and Energy

Action Plan Bidding Zone

As Defined by Art. 15
Regulation (EU) 2019/943

Federal Republic of Germany

– English courtesy translation –

Summary

Regulation (EU) 2019/943 on the single European electricity market (EU Electricity Market Regulation) stipulates that at least 70% of the transmission capacity of critical network elements must be released for cross-border electricity trading by 1 January 2020 (Art. 16, Para. 8).

Pursuant to Art. 15, Para. 1 of the EU Electricity Market Regulation, EU member states with identified structural grid congestion can submit an action plan to reduce this congestion. This leads to a situation where the minimum capacity of 70% must be achieved via a linear trajectory by 31 December 2025 (Art. 15, Para. 2).

With its Action Plan Bidding Zone the Federal Republic of Germany is presenting a package of measures with a time schedule for the reduction of domestic structural network congestion.

Part I describes measures to reduce network congestion and to improve cross-border redispatch. These break down into national measures (chapters 2 and 3) together with regional initiatives for cross-border co-operation (Chapter 4). On the one hand the national measures are measures to increase electricity transmission capacity and to speed up network expansion; on the other hand the action plan presents measures for improving congestion management and for strengthening of cross-border trading.

Part II of the action plan presents the linear increase in trading capacity to 70% by the end of 2025, including the principles for calculating capacity start values.

Table of Contents

1 Introduction

Germany is the hub of international electricity trading. In the Single European Market electricity is exchanged not only nationally, but also across borders. Germany is in the middle of Europe and links the electricity markets in northern, southern, eastern and western Europe. A large share of the electricity trading between these markets flows through Germany. With the progressive liberalisation of European electricity trading, the transport requirement in the German electricity grid is also growing.

With the energy transition Germany is gradually converting its energy supply from fossil and nuclear energy sources to renewable energies. Due to the energy transition, too, the supra-regional transport requirement is increasing, because renewable electricity generation from wind and solar energy often takes place far away from where the energy is required. For a cost-efficient and secure energy transition it is crucial to open up as many cost-effective locations as possible in Europe for the generation of electricity from renewable energies and to connect the actors on both the production and the consumption side on a large scale. Thus in particular we are seeing the construction of additional wind energy plants in Germany – due to favourable wind conditions found there – for the most part in the north. This electricity must then be transported via the distribution networks and the transmission network to consumers in southern and western Germany and neighbouring countries. Compared to wind power, production of electricity from photovoltaic plants is distributed more evenly. However this electricity, too, creates a transport requirement, especially for transport within distribution networks and from the distribution networks to the transmission network.

The extent and volatility of the consignments make fundamental expansion and reorganisation of the electricity network at all network levels necessary. The installed capacity of renewable energies connected to the electricity grid in Germany has increased almost tenfold since 2000 from around 12 gigawatts in that year to 118 GW in 2018. The scenario framework for the current German Network Development Plan (NDP) 2019-2030 assumes that installed renewable production capacity will nearly double again to around 200 GW by 2030. This will further increase the transport requirement. New power lines are therefore needed at all network levels, even if the existing network is optimised and strengthened as far as possible.

Germany has begun to strengthen and expand its transmission grid massively. Legal approval has already been obtained for 65 projects involving approximately 7,700 kilometres of power line on land. Many more network kilometres will follow both offshore and from the current Network Development Plan.

In their network planning the German transmission system operators anticipate total investment of around EUR 75-85bn in expansion, reinforcement and optimisation of the transmission networks between now and 2030. The large investments are not only important for the energy transition. They are investments in the single European market for electricity and Europe as an economic location. They make gradual expansion of European electricity trading possible. In this connection Germany is aware of its special role in the single electricity market.

The stipulations of the new EU Electricity Market Regulation 2019/943 strengthen cross-border electricity trading. The Regulation stipulates that at least 70% of transmission capacity must be available for cross-border trading. In future domestic network congestion and loop flows may only be taken into account to a very limited extent when allocating capacity. Through market behaviour this leads to a major intensification of international electricity trading.

The new stipulations on electricity trading mean a much greater transport task for the German transmission grid. It is therefore to be expected that the European requirements will lead to a worsening of network congestion in Germany at least until the planned large high-voltage direct current transmission lines (HVDC lines) are commissioned. This is because there is currently less transmission capacity available at many borders than planned for the future. Potential for cross-border electricity trading is being significantly increased compared to the status quo.

Direct application of the new rules would present the network operations management with major challenges. The German transmission system operators would literally have to take many times today's congestion management measures overnight. The requirements in regard to network operations management and redispatch costs would increase sharply.

Member states which submit an action plan are given a transition period. In view of the major challenges for the network operations management, Art. 15 of the EU Electricity Market Regulation stipulates that member states which submit an action plan can be given a transition period. They do not have to achieve the target figure of 70% until 31 December 2025. Up to that point in time they must increase trading capacities gradually based on a rising linear trajectory. This gives them time to reduce internal network congestion by means of measures related to network expansion and network optimisation.

The prerequisite for the transition period is structural internal congestion. A transition period can only be granted to those member states whose electricity systems exhibit structural internal congestion and which submit an action plan for elimination of the congestion. Pursuant to Art. 14, Para. 7 of the EU Electricity Market Regulation structural congestion must be identified either by means of a study of the European Network of Transmission System Operators (ENTSO-E) or by the national transmission system operators in the form of a congestion report. If structural congestion is diagnosed with a congestion report, the national regulator must formally accept this report.

The four German transmission system operators have submitted a report on structural congestion in Germany to the Federal Network Agency. In their analysis of 4 July 2019 TenneT, Amprion, 50Hertz and TransnetBW show that immediate application of the minimum trading capacity of 70% from 1 January 2020 would lead to structural congestion in the German transmission grid. Many power lines would suffer congestion in more than 400 hours each year – thus in more than 5% of all the hours in a year. From this regularity the transmission system operators conclude that congestion would be within the meaning of the EU Electricity Market Regulation in structural terms.

The congestion would be spread throughout the whole German transmission grid and would not indicate a clear-cut method for division of a bidding zone. This distinguishes between the German electricity grid and the electricity grids of other countries, for example Sweden or Italy, whose network topologies allow clearer-cut bidding zone borders. In addition, the analyses of the German transmission system operators show that German congestion would be volatile over time and heavily dependent on the weather. The Federal Network Agency accepted the report of the transmission system operators on 28 November 2019 and thus formally paved the way for the present action plan.

Germany is presenting an action plan. The resulting transitional period allows Germany to gradually adapt its electricity system to growth in cross-border trading. The network and its operational management can be adapted to the new requirements at an appropriate pace.

In presenting its action plan Germany remains committed to the single German-Luxembourgish bidding zone. Within this bidding zone trading can be carried out irrespective of the network situation. A uniform energy exchange price applies throughout the zone. This electricity price results from the interaction of supply and demand in the market area as a whole. In the electricity mix the most cost-effective production technologies prevail throughout the bidding zone, regardless of location. The plants with the lowest deployment costs are used supra-regionally. This reduces electricity procurement costs.

The large market area of the single bidding zone makes it possible to exploit geographical balancing effects in production and consumption. The high level of liquidity in the electricity market reduces the power of major suppliers over market outcome and allows innovative actors to achieve market entry.

In a bidding zone it can be that more electricity is traded than the electricity network can transport. This is because trading fails to take the situation in the electricity networks into account. If trading exceeds the transport capacity of the networks, network congestion arises, which the network driver must resolve with

redispatch. Redispatch is the powering down and ramping up of power plants, storage facilities or consumption equipment before and after a congestion point. When the German transmission system operators or distribution system operators carry out redispatch, the plant operators concerned receive reimbursement of the costs incurred and lost profits. The German Energy Industry Act (EnWG) makes provision for cost-neutral reimbursement: plant operators cannot be left better or worse off than if they had not participated in redispatch.

A certain degree of redispatch within a bidding zone is efficient. It is normal that the transport capacity of the network within a bidding zone will not be sufficient in every conceivable market situation. An electricity network perfectly designed for the last kilowatt-hour and for unusual hours would be excessively costly. For this reason, a cap of 3% is already taken into account in network expansion planning. The single German bidding zone is expected to be retained, as the macroeconomic advantages of a single bidding zone outweigh its disadvantages.

This action plan contains concrete measures to reduce structural network congestion that is backed up by a time schedule. The time horizon for the measures is four years. The action plan thus complies with the stipulations of Art. 15, Para. 1 of the EU Electricity Market Regulation. Pursuant to Art. 14, Para. 7 the action plan can be national or multinational. Due to its central geographical location in Europe, Germany's electricity policy often has an impact on its electricity-consuming neighbours. Germany has therefore decided also to include cross-border measures in the action plan. National measures are described in chapters 2 and 3 of the present action plan. Regional initiatives and co-operation agreements are dealt with in Chapter 4.

On the one hand the national measures are subdivided into those aimed at increasing electricity transmission capacity. These include the extensive planned network expansion projects up to 2030 (Chapter 2.1). Germany is planning more kilometres of new power line than all the other member states. Measures to accelerate network expansion (Chapter 2.2) aim at simplifying and shortening approval procedures, improving incentives for network operators to expand power lines, forward-looking controlling to better monitor the progress of network expansion and identify obstacles at an early stage, and steps to increase acceptance of network expansion. Measures to optimise the existing network (Chapter 2.3) include in particular new technologies in network resources and network operations management, which are intended to increase the capacity utilisation of the networks and thus transport more electricity.

On the other hand the action plan describes measures for improved congestion management. They accompany the immediate network measures and thus allow the desired increase in cross-border trading until the network is strengthened. Chapter 3.1 focuses on various measures relating to redispatch, including for example improved redispatch processes for the transmission and distribution system operators and the integration of new domestic and foreign potential in order to make congestion management more effective and more cost-efficient overall. In this chapter the action plan also explains why Germany is asserting an exception under Art. 13, Para. 3 of the EU Electricity Market Regulation and is continuing with cost-based redispatch. Market-based measures for reduction of network congestion are dealt with in Chapter 3.2. These include stronger regional control of new-build of power generation facilities in order to counteract the growing distance between production and load. Also with the gradual phase-out of coal-fired power generation that Germany is pursuing for climate action reasons, care is being taken to ensure that this is carried out in the most grid-compatible manner possible.

Some measures require cross-border co-operation. Germany is therefore committed to bilateral and multilateral co-operation agreements with neighbouring countries. The regional processes foreseen by EU law need more time until they are implemented. Bilateral and multilateral co-operation agreements help to bridge this period and make progress in electricity trading, strengthen secure network operation and reduce network congestion.

The action plan also provides information on the linear path to the gradual opening of borders in the transitional period. Opening of 70% of the transmission capacity of interconnectors must be completed by the end of the transitional period, that is to say by 31 December 2025 at the latest. Until then linear growth paths

determine the minimum line capacity that transmission system operators must keep free for international trade. The start values for the growth paths differ between regions. They are based on the average allocated capacity in 2018 or the average allocated capacity in the period 2016-2018, whichever is higher. The principles of this complex start value calculation are described in Chapter 6.

PART I: MEASURES FOR REDUCTION OF NETWORK CONGESTION, GROWTH OF CROSS-BORDER ELECTRICITY TRADING AND STRENGTHENING OF THE SINGLE GERMAN BIDDING ZONE

2 Increase power transmission capacities

The combination of European electricity trading and the energy transition is creating a growing electricity transport requirement. In order to come to terms with this, Germany plans to noticeably increase the transmission capacity of its electricity grid by means of targeted measures. In particular these include expansion and reinforcement of the electricity networks (Chapter 2.1). Experience has shown that network expansion takes time. Germany is therefore taking various measures to speed up network expansion (Chapter 2.2). Besides construction of new power lines and reinforcement of existing power lines, optimisation of existing electricity networks is of great importance (Chapter 2.3). Finally, measures for improved economic incentives for transmission system operators for network expansion and reduction of the redispatch requirement are being addressed (Chapter 2.4).

2.1 Expand and strengthen electricity networks

The electricity network is the backbone of the power supply system. Thanks to the network, production and consumption of electricity can be balanced both regionally and over large distances. Without an efficient electricity network a large number of regional storage facilities would be required, which would involve heavy costs. By contrast an efficient electricity network provides cheap spatial flexibility in balancing supply and demand in the electricity market. This is particularly important in order to make European electricity trading possible and for optimal integration of fluctuating power production from renewable energies on the supply side and flexible loads on the demand side into the overall electricity supply.

The energy transition is causing a significant increase in the supra-regional transport requirement. This is because renewable power production from wind and solar energy does not take place – as was previously the case with conventional power production – close to where the energy is required, but instead far away. For an affordable and secure energy transition it is crucial to open up as many cost-effective locations as possible for the generation of electricity from renewable energies and to connect the actors on both the production and the consumption side on a large scale. Thus in particular we are seeing the construction of additional wind energy plants due to favourable wind conditions, for the most part in northern Germany. This electricity must then be transported over long distances through the transmission network to consumers in the south and west of Germany.

Network expansion is the most cost-effective option for integrating renewable energies into the electricity system and exploiting the welfare gains of the Single European Market. Studies show that an energy system with needs-based network expansion generates the lowest system costs (Fraunhofer ISI, Consentec, ifeu 2017). Investment in the electricity network is thus investment in the infrastructure of a modern and competitive European economy.

For the energy transition and the Single European Market Germany is planning and building electricity networks on a scale that is unique in Europe. Even just until 2025/2026 planned and in some cases already realised network expansion onshore and offshore involves approximately 10,600 kilometres of power line with investment of around EUR 40bn. To this can be added further measures for optimised operation of the transmission networks, for example eight phase shifters to be constructed by 2023. In addition there is a considerable expansion requirement in the German distribution networks.

Table 1: Legally enacted transmission network expansion onshore and offshore (as of June 2019)

Realised network expansion	Approximately 3,000 km
Approved network expansion	Approximately 4,000 km
Planned network expansion	Approximately 10,600 km by 2025/2026
Short-term network expansion and network optimisation measures	Ten phase-shifting transformers, nationwide overhead power line monitoring and high-temperature conductor by 2023
Investments	Around EUR 40bn to 2025/2026

2.1.1 Advance further with network expansion

Transmission network expansion in Germany has been legally enacted and continues apace. Based on the Power Network Expansion Act (EnLAG) and the Federal Requirement Plan Act (BBPlG), 65 onshore projects with approximately 7,700 kilometres of power line are currently being planned, approved and realised. To this can be added the offshore connecting power lines in the North Sea and Baltic totalling approximately 2,900 km. As of June 2019 onshore power transmission routes with a total length of 1,800 km have been approved and approximately 1,200 km have been realised. Of the offshore connections approximately 2,200 km have been approved and approximately 1,800 km realised. In net terms, therefore, over a third of the planned transmission lines have been approved and more than a quarter realised and commissioned.

Over the next few years substantial progress can be expected with network expansion. By the end of 2023 the approval procedures for 85% of the currently planned power lines onshore and for all previously planned offshore connecting power lines should have been completed. This represents 9,500 kilometres of power line. The long HVDC transmission lines from north Germany to south Germany should then be under construction. Besides this, by the end of 2023 3,200 kilometres of power line onshore and 2,500 km offshore will have gone into operation.

Germany ensures maximum transparency in the planning and advancement of network expansion, reinforcement and optimisation. The German federal government and the state governments have agreed concrete schedules and milestones with the transmission system operators for all network expansion projects (see appendix). On its website www.netzausbau.de the Federal Network Agency has bundled all the information on network expansion, including detailed information on type, location and progress with implementation for each individual line project.

2.1.2 Project network expansion planning forward to 2030

The key instrument for planning expansion of the electricity networks at transmission network level is the Network Development Plan. Every two years the transmission system operators draw up a Network Development Plan which must be examined and confirmed by the Federal Network Agency. For this purpose the likely energy-related developments of the next 10-15 years are initially presented in at least three scenarios (scenario framework). On this basis the network expansion requirement for the next few years is then determined.

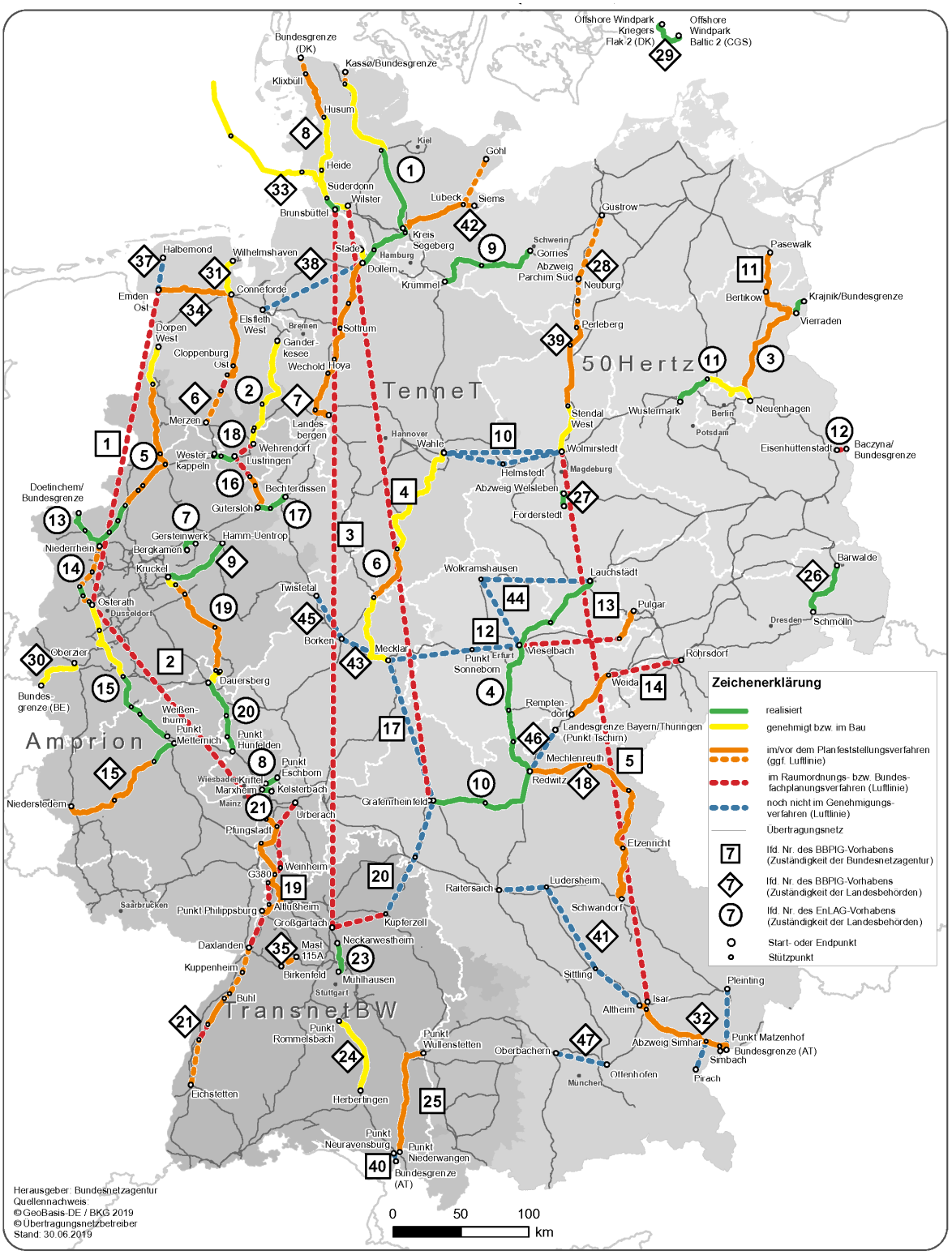
The already approved network expansion projects are laid down in the Power Network Expansion Act (EnLAG) and in the Federal Requirement Plan Act (BBPlG). These make provision for a total of 65 projects with approximately 7,700 kilometres of power line onshore that are either planned, approved or partially already realised. The BBPlG 2015 has just recently been amended. Against the backdrop of the great dynamism of the German energy transition on course for its ambitious climate action targets and in view of the progressive integration of the European electricity markets there is an additional expansion requirement over and above the approved level of network expansion. A contribution is also made by the increase in the offshore wind expansion cap from 15 GW to 20 GW.

There is an additional network expansion requirement between now and 2030. In the current Network Development Plan 2019-2030, in addition to the above 7,700 kilometres a further requirement of about 3,500 transmission route kilometres has been identified, including a new HVDC corridor. To this can be added a further 1,900 km to 2,900 km for connection to the network of offshore wind farms. For expansion and optimisation of the transmission networks to 2030 the transmission system operators anticipate total investment of around EUR 79-85bn in their draft Network Development Plan, of which around EUR 62bn for network expansion onshore and around EUR 18-24bn for connection to the network of offshore wind farms (👁 Table of Measures No. 1).

Germany's current energy policy targets to 2030 are taken into account in Network Development Plan 2019-2030. These include the target agreed in the coalition agreement between CDU, CSU and SPD to meet 65 per cent of electricity consumption from renewable energies in 2030 and to expand offshore wind power plants more quickly. The Network Development Plan also reflects the requirements of Climate Action Plan 2050, which states that by 2030 the German energy industry will emit 61-62 per cent less greenhouse gases than in 1990. This also takes the German coal phase-out into account. The European framework data from the current Ten-Year Network Development Plan (TYNDP) as well as the opening of cross-border trading capacities in accordance with the EU Electricity Market Regulation are also taken as a basis.

Network development planning is carried out with a large degree of public involvement and transparency. All information and documents relating to Network Development Plan 2019-2030 and past network development plans are published by the Federal Network Agency at www.netzausbau.de.

Figure 1: Status of projects from the Federal Requirement Plan Act (BBPlG) and the Power Network Expansion Act (EnLAG) after the second quarter of 2019



Source: Federal Network Agency, www.netzausbau.de (chart last updated: 30 June 2019)

2.2 Speed up network expansion

If the climate action targets are to be achieved it is important for network expansion to progress faster than previously. For this purpose the Federal Ministry for Economic Affairs and Energy had presented an amendment to the law which simplifies approval procedures and reduces unnecessary bureaucracy. The revised version of the Network Expansion Acceleration Act (NABEG) has been in force since May 2019. In

addition to simplifying approval procedures it is also important that network expansion projects are implemented as quickly as possible within the given legal framework. In order to establish constant results measurement and to support the optimisation of processes, the federal government and the states have introduced an effective controlling system for network expansion. Finally, the Federal Ministry for Economic Affairs and Energy is taking various measures to contribute to an increase in acceptance of network expansion among members of the population.

Germany is accelerating network expansion with a bundle of measures. Approval procedures are being shortened (Chapter 1.2.1), a forward-looking controlling system is being introduced (Chapter 1.2.2) and measures are being taken to increase public acceptance of network expansion (Chapter 1.2.3).

2.2.1 Shorten approval procedures

A new legal framework has entered into force which will accelerate network expansion by means of simpler and shorter approval procedures. The amended Network Expansion Acceleration Act (NABEG) of 17 May 2019 simplifies and accelerates the procedures for construction, reinforcement and optimisation of power lines in the high voltage grid to an even greater extent than before. This applies both to projects that cross federal state borders and to those that cross international borders. At the same time material environmental standards are not reduced. The public will also continue in future to be comprehensively involved at an early stage (👁 Table of Measures No. 2).

Approval of a new and more efficient power line in an existing power transmission route will be significantly shortened. The Federal Network Agency can now dispense with federal technical planning when building and modifying power lines in or directly adjacent to existing power transmission routes. The federal states, too, can more easily dispense with a regional planning procedure in such cases. Public and private interests are bundled and carefully examined in the planning approval procedure.

Replacement and addition of conductor ropes on existing transmission routes is possible without costly approval. The same applies to the use of innovative operations management concepts such as weather-dependent overhead power line operation. In this case the faster notification procedure can be used. The notification procedure is used to check whether the planned change has effects on humans and the environment that require a planning approval procedure. If this is not the case, a procedure with less extensive documentation and without additional participation steps is sufficient. The change in the power line can thus be implemented quickly.

It is now possible to start construction at an early stage if a positive decision can be expected from the planning approval authority. This allows the network operator to start preparatory construction work before the planning approval decision is available. In addition, subsequent increases in transport capacity that are foreseeable and necessary can now be implemented more easily than before. For this purpose empty conduits can be planned for from the outset. In this way foresight is used to make the electricity networks capable of meeting a greater transport requirement.

2.2.2 Introduce a forward-looking control system

A new forward-looking control system monitors and supports the progress of the network expansion projects on land. The key element of the control system is the time schedules agreed between the federal government, the states, the Federal Network Agency and the transmission system operators for each project, including all sections of the projects (see appendix). The time schedules are published at www.netzausbau.de. For six designated milestones they define who has to complete which task, setting a deadline to the nearest quarter. The time schedules are a strong pledge of commitment to the public and provide a reliable planning basis for all those involved in network expansion (👁 Table of Measures No. 3).

In the coming years considerable progress can be expected in expansion of the network. By the end of 2020 the federal technical planning for all major HVDC transmission lines should have been completed. Thus

the corridors in which the transmission lines are to be installed for projects with a scope of more than 2,500 km will have been firmly established. By the end of 2023 the approval procedures for 6,600 km of transmission lines will also have been completed. By the end of 2023 about 2,100 km of additional transmission lines will also be in operation, including important projects of common interest (PCI) such as NordLink, the Kassø (Denmark) to Dollern link and important north-south links such as between Wahle and Mecklar and between Diele and the Lower Rhine.

The control system ensures a constant exchange of ideas and information between all the relevant actors. This helps to ensure that network expansion projects can be implemented as quickly as possible. In the event of delays the federal government and the states will regularly assemble those responsible in order to make concrete progress with network expansion. In addition, best practices are identified so that good experiences from a network expansion project can also be used in other projects.

2.2.3 Increase acceptance of network expansion

Conversion and expansion of our future electricity network can only succeed if it is tackled in consultation with the population at large. The legislature has therefore provided for extensive opportunities for participation in the run-up to formal decisions in the approval procedures. And that is a good thing: expansion of the network infrastructure is a project that affects the whole of society. Every member of the population should be able to participate and all legitimate interests should be represented. This is the only way to ensure acceptance of the energy transition at local level, where it is being implemented (👁 Table of Measures No. 4).

Alternative technologies such as underground cables or certain mast types can make a significant contribution to the acceptance of electricity network expansion. The discussion about network expansion is therefore often concerned with the question of the best technology to reduce concern at local level as far as possible and reduce environmental interference. For example, use of underground cables for high voltage direct current transmission is much more expensive than an overhead power line. However, this can significantly increase local acceptance and make rapid network expansion possible at all.

The Public Electricity Network Dialogue initiative offers interested members of the public information and discussions on matters related to network expansion. The Public Electricity Network Dialogue is an initiative for open and transparent exchange between all parties involved in expansion of the electricity grid in Germany. It is funded by the Federal Ministry for Economic Affairs and Energy and is independent of the transmission system operators. It plays no role in planning and approval procedures and can therefore enter into dialogue with members of the public as a neutral actor. It offers a wide range of information and dialogue formats for members of the public at local level, both on the internet and in social media. On the basis of the positive experience and positive feedback on the work of the initiative, the Federal Ministry for Economic Affairs and Energy will continue and expand the project and thus ensure in the coming years that, in addition to the authorities and the network operators, a further contact person is available to answer questions from members of the public. Any member of the public can talk to the Public Electricity Network Dialogue initiative about network expansion.

Clear compensation rules for those affected are important for acceptance of network expansion. The compensation payable to farmers and foresters for registration of an easement in favour of a transmission line was increased in March 2019. Since then a facilitation supplement has also become payable if farmers and foresters reach an amicable agreement with the network operator within eight weeks. In addition, compensation is paid according to general rules for all damage occurring during network expansion. Farmers receive compensation for crop failures during the construction period and in the forestry sector compensation is paid for premature deforestation and loss of use.

2.3 Optimise the existing network

There is optimisation potential in the electricity network in the form of more efficient network capacity utilisation. Higher transport capacities can be achieved by means of consistent implementation of state-of-the-art technology. Model-based estimates of potential have shown that more active control of current flows by means of phase shifters in conjunction with weather-dependent overhead power line operation can significantly increase the transport capacity of the network. Besides keeping up with the current state of the art, technological advances and innovative operations management concepts offer further optimisation potential.

Measures to optimise the existing network should therefore – in addition to accelerating expansion of the network – help to increase existing transmission capacities. The German transmission system operators have already taken concrete optimisation measures into account in Network Development Plan (NDP) 2019. For example, a total of seven phase-shifting transformers will be in operation for active load flow management by 2023.

In order to achieve higher overall network utilisation, interaction of various optimisation measures is required. This includes the planned introduction of online assistance systems for recording network status in real time (Chapter 2.3.1). Another key element is expansion of weather-dependent overhead power line operation to include congested lines (Chapter 2.3.2). The use of phase-shifters enables active control of load flows in the meshed three-phase network and thus more uniform network utilisation (Chapter 2.3.3). For the future there is further potential for optimisation in the use of innovative operations management concepts, for which the transmission system operators propose pilot plants for testing (Chapter 2.3.4).

In the context of improved network capacity utilisation technical issues and licensing challenges arise. Here, procedural simplifications were recently created with the “Energy Transmission Network Expansion Acceleration Act” (NABEG 2.0). For example, for certain measures designed to optimise and strengthen the network, network operators can choose an unbureaucratic notification procedure instead of a more complex planning approval procedure.

2.3.1 Implementation of digitisation of power networks, status monitoring and assistance systems

Digitisation of the electricity networks is becoming the backbone of efficient and at the same time secure network operation. If the actual operating status is also known in the distribution networks, network and market-related measures can be implemented much more effectively. Furthermore, digitisation offers great potential for optimisation in the area of production and consumption forecasts, which contribute significantly to stable network operation.

Better network capacity utilisation requires exact knowledge of the network status in real time. In this manner the electricity network can continue to be operated securely even with better capacity utilisation. Due to the preventive operations management approach, operating asset-based condition assessment has not so far been necessary. As a rule the permissible stability limits have not been exceeded. If the actual condition is known, thermal equipment limits and dynamic stability limits can be better estimated in future. This means that previously unused preventive safety buffers can be used to increase capacity utilisation. The principle of (n-1) security, according to which the electricity supply network must be operated securely even in the event of unplanned failure of any network element, thus remains fully intact despite higher capacity utilisation.

Dynamic stability limits can be a limiting factor for higher network utilisation. Therefore introduction of suitable assistance systems (*dynamic security assessment*) is required as a support measure in the control centres of the network operators. Transmission network operators are currently working on corresponding modernisation of their control centres. For this purpose, the existing monitoring systems or those under

development are to be supplemented by online assistance systems that allow stability-related condition assessment in real time (👁 Table of Measures No. 5).

2.3.2 Introduction of weather-dependent overhead power line operation

The current carrying capacity of an overhead power line is limited in particular by the conductor rope temperature. The heat generated during transmission causes the conductor material to expand, which can result in an inadmissible sag in the conductor rope and a shortfall in critical safety distances to the ground. Without knowledge of the exact environmental conditions, overhead power line operation must therefore be based on defined standard conditions ("midsummer weather conditions").

Depending on the weather, transport capacity can be significantly increased over and above the standard conditions. If ambient conditions such as outside temperature and wind speed are measured precisely, higher current carrying capacity is possible depending on the situation. In high wind situations increased network congestion occurs due to high rates of north-south transits. The potential of weather-dependent overhead power line operation is therefore particularly high in these situations.

Even now German transmission system operators are already using overhead power line monitoring on selected transmission sections. In order to exploit the potential of weather-dependent overhead power line operation, the Federal Ministry for Economic Affairs and Energy and the transmission system operators are currently discussing to what extent it is technically and legally possible to apply overhead power line monitoring to congested line sections (👁 Table of Measures No. 6).

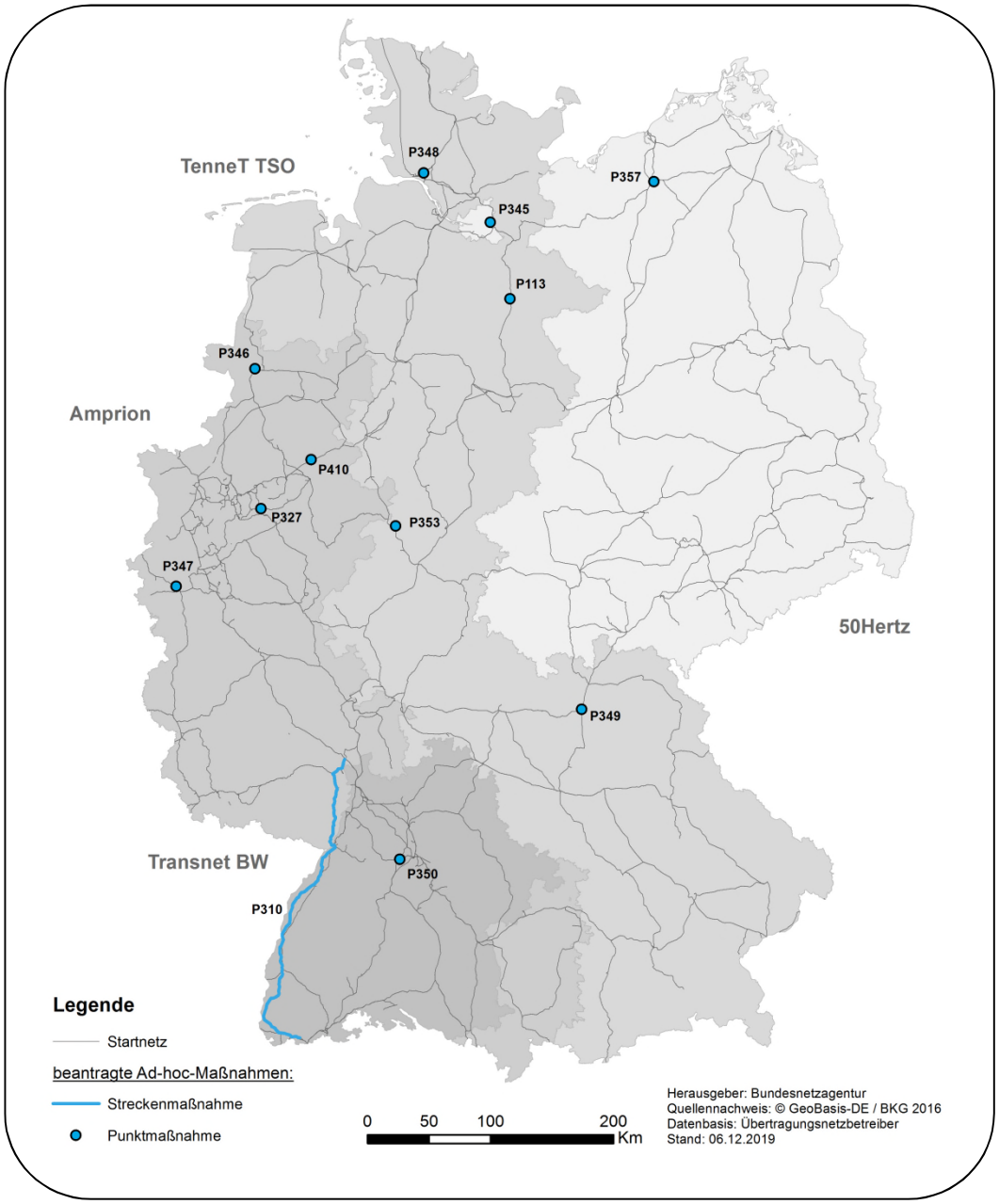
2.3.3 Control load flows with phase shifters

With phase shifters current flow can be actively controlled. Without the use of load flow-controlling elements, current flows along the path of least resistance according to physical laws. Depending on the respective load and production situation this results in individual power lines being subjected to very high loads and others being subjected to significantly lower loads. By using load flow-controlling elements such as phase-shifting transformers the current in the meshed network can be directed specifically to power lines with free capacities. In the long term phase shifters do not replace the transport task that must be fulfilled by network expansion.

The use of phase shifters makes more even utilisation of parallel power lines possible and thus better utilisation of existing transmission capacities. As part of Network Development Plan 2017 the Federal Network Agency has approved seven phase-shifting transformers within Germany as so-called ad hoc measures. The effect of these measures will be seen in particular in the transition phase between the phase-out of nuclear energy and commissioning of the central network expansion projects (2023-2025). Based on the current Network Development Plan 2019, by way of ad hoc measures the Federal Network Agency has confirmed three additional German domestic phase-shifting transformers looking to 2025. (👁 Table of Measures No. 7).

These phase-shifting transformers are used exclusively in Germany and are therefore not used to control loop flows. This distinguishes them from the phase-shifting transformers on the German-Polish and German-Czech borders (see Chapter 4.2). Rather, they serve to shift load flows on domestic lines so that they are better utilised and overloads are avoided.

Figure 2: Network Development Plan 2019-2030: Planned ad hoc measures within Germany confirmed by the Federal Network Agency



Source: Federal Network Agency (2019). The projects shown relate to phase-shifting transformers (exceptions P133 and P310).

2.3.4 Test reactive operations management

At present power lines are deliberately not utilised to full capacity during normal operation. As part of preventive operations management part of the transmission capacity is kept free as a preventive “safety reserve” so that the power supply network can be operated securely even in the event of an unplanned shutdown or failure of a network component.

The aim of reactive network operations management is to achieve higher network utilisation during normal operation. The responsible transmission system operator only intervenes in the event of a fault, that is to say immediately after failure of a network resource. Intervention must take place within seconds to just a few minutes after the fault has occurred in order to keep the short-term overload of the remaining equipment within the permissible range. Reactive operations management therefore requires precise knowledge of the network

status in real time and must be activated automatically on the basis of previously defined relief concepts. At the same time the effects on the subordinate networks must also be taken into account.

The concept of reactive operations management is expected to be and must first be tested in real network operation before it can be applied more widely. In the current Network Development Plan, NDP 2019-2030, the transmission system operators have applied for pilot plants for this purpose. After detailed examination the Federal Network Agency has confirmed these (👁 Table of Measures No. 8).

At the same time there is still a considerable need for research and development in the field of reactive network operations management over the next few years. On the one hand existing processes must be further optimised, and on the other hand new developments and challenges must be recognised at an early stage and solutions driven forward. For this reason we will see further intensification of research activities for optimisation of operating resources, increased utilisation of existing networks, integration of new operating resources into operations management and digitisation of electricity networks. Together with technology providers and the scientific community the transmission and distribution network operators have launched the “InnoSys 2030” joint research project, which runs until the end of 2022.

2.4 Increase economic incentives for network expansion

Germany is examining adjustments to the regulatory framework for network expansion in order to provide optimal support for expansion of the electricity networks. The German transmission system operators – and thus expansion of the network, too – are generally subject to regulation by the Federal Network Agency. It is important that the rules are designed in such a way as to promote a rapid increase in transport capacity in the transmission network. This concerns both completion of power line projects and measures for optimisation of the existing network. To this end the instruments for financing network expansion and dealing with the cost of congestion management will be reviewed in order to gauge the extent to which they support the objective of creating urgently needed transport capacity in the electricity network.

As early as March 2019 measures were taken at short notice to strengthen incentives for network expansion. The measures aim to improve the supervisory options of the Federal Network Agency in the implementation of investment measures. They regulate the refinancing of major expansion and restructuring investments made by transmission system operators. Among other things, imputation of operating costs in network expansion projects was adjusted. Furthermore, investment measures will in future only be approved for a single regulatory period. The aim of this rule is to create an incentive to bring applications for investments to a swift conclusion.

The extent to which further measures are required for financing of investments and for dealing with the cost of congestion management is currently being examined. Since May 2019 talks with stakeholders have been under way to discuss the advantages and disadvantages of different concepts for refinancing investments in the transmission network and for dealing with the cost of congestion management and to what extent they are suitable for speeding up investments in expansion projects and optimisation of the electricity network (👁 Table of Measures No. 9).

3 Make more cross-border trading possible

Germany is doing justice to its central geographical location in Europe and facilitates European cross-border electricity trading. In order to create the necessary prerequisites for this in the electricity network, on the one hand congestion management will be optimised (Chapter 3.1). In parallel with this network expansion is being driven forward and expansion of the production structure better co-ordinated with network expansion (Chapter 3.2).

3.1 Optimise congestion management

Management of network congestion by means of measures such as redispatch and countertrading is a key component in making cross-border trading in the single European electricity market possible. Network operators resolve network congestion with a great sense of responsibility for network security and system stability. Network interventions for redispatch and other forms of congestion management are challenging and result in costs for network customers.

Germany is creating transparency in redispatch. On a daily basis the four German transmission system operators publish all redispatch measures concerning adjustments to power plants connected to the German grid at www.netztransparenz.de.

In order to optimise congestion management Germany has already made adjustments to the legal framework and further measures to optimise costs and processes are under consideration. A wide range of measures are available to optimise congestion management. In addition to increasing the efficiency of redispatch measures (Chapter 3.1.1), these include continuation of the network reserve (Chapter 3.1.2), cross-border redispatch (Chapter 3.1.3) and retention of cost-based redispatch (Chapter 3.1.4). As far as the network operators are concerned strengthening of co-operation and improved co-ordination between transmission and distribution system operators offers potential (Chapter 3.1.5), as does an increase in network support provided by load management (Chapter 3.1.6).

3.1.1 Make more efficient use of redispatch

Efficient redispatch optimises network operation and eliminates network congestion at lower cost. The amendment to the Network Expansion Acceleration Act contains a provision stipulating that, as of 1 October 2021, the previous feed-in management – that is to say downward regulation of renewable energy and CHP plants – will be transferred to a uniform regime together with redispatch. In future redispatch will not only include regulations on how to intervene in the operation of conventional power plants in order to eliminate congestion, but also on renewable energy and CHP plants, so that targeted balancing of feed-in management by means of the start-up of defined production plants also becomes possible – in contrast to the usual exchange procurement customary in the past (👁 Table of Measures No. 10).

The new regulation will in future allow network operators to control those renewable energy and CHP plants that have a particularly good effect on network congestion. At present they first have to control those conventional plants that only slightly relieve network congestion. Uniform optimisation of all available potential reduces the number of plants that have to be controlled and powered up.

Efficient redispatch increases the potential for eliminating network congestion. Since the network operators require fewer plants overall in order to eliminate a certain network bottleneck and can deploy these in a more targeted manner, by reverse logic more network congestion can theoretically be eliminated with the same plant stock. Thus the potential to eliminate network congestion increases. Moreover, in future all plants from 100 kW upwards must participate in redispatch. As a result the network operators have more potential for

optimisation of redispatch. The German distribution network operators will make a considerable contribution here by reducing local congestion already in the distribution networks.

More efficient redispatch allows more cross-border trading. With optimised network operation the transmission and distribution system operators will be able to address any remaining network congestion more effectively in future. This will enable TSOs to implement cross-border trade and thus the stipulations of the EU Electricity Market Regulation.

Efficient redispatch increases system security. In future necessary adjustments to renewable energy and CHP plants will be made on the basis of network status forecasts and in return for energy balance adjustment instead of by means of short-term call-offs not compensated by the network operator. Firstly this increases system security because the capped quantities of electricity are procured by the network operators taking the network situation into account. Secondly it makes optimisation of redispatch across the different voltage levels possible because the distribution and transmission system operators identify the necessary measures in a joint process.

Efficient redispatch has been approved and becomes effective from 2021. In April 2019 the amendment to the Network Expansion Acceleration Act (NABEG) was enacted. The rules on efficient redispatch contained therein will enter into force on 1 October 2021. Between now and then the Federal Network Agency and the sector will prepare for implementation, in particular co-operation between the network operators and the necessary data exchange as well as the associated IT systems.

3.1.2 Continue with the network reserve as a transitional tool

The network reserve ensures redispatch potential on a transitional basis. The network reserve contains power plants that can be used by the transmission system operators to maintain (n-1) network security whenever alternative redispatch potential has been exhausted. This means that the network reserve is designed for those particularly critical situations in which the redispatch potential from power plants in the German electricity market, power plants from the German-Austrian redispatch co-operation agreement and also power plants from cross-border redispatch with other neighbouring countries is not sufficient to safely cope with the transport task in the transmission network.

The network reserve is compatible with the rules applicable to the competitive electricity market. It only includes power plants which have left the market based on an independent entrepreneurial decision but whose decommissioning has been prohibited by the transmission system operators. The basis for this is that the transmission system operators have identified the power plants as systemically relevant and the Federal Network Agency has confirmed this accordingly This in turn is carried out on the basis of an annual needs analysis of the transmission system operators and a power plant-specific system relevance test. Network reserve power plants do not affect the wholesale electricity price because they are not allowed to participate in the electricity market. Return to the electricity market after removal from the network reserve is similarly prohibited, unless the power plants are prematurely decommissioned. In return for participation in the network reserve plant operators' costs are reimbursed. The network reserve currently includes natural gas-fired power plants (3.0 GW), bituminous coal-fired power plants (2.3 GW) and oil-fired plants (1.6 GW).

Reliable cross-border co-operation in redispatch could replace the network reserve. Current forecasts show that the requirement for the network reserve will continue to exist over the next few years. However, the requirement could be significantly reduced if, in the relevant situations, potential abroad could be securely exploited. Binding rules for cross-border redispatch are provided by the "Capacity Allocation and Congestion Management" (CACM) guideline and the EU Electricity Market Regulation. Full implementation will take a few years yet (see Chapter 3.1.3). Until then the network reserve will continue to be used as a transitional tool (👁 Table of Measures No. 11).

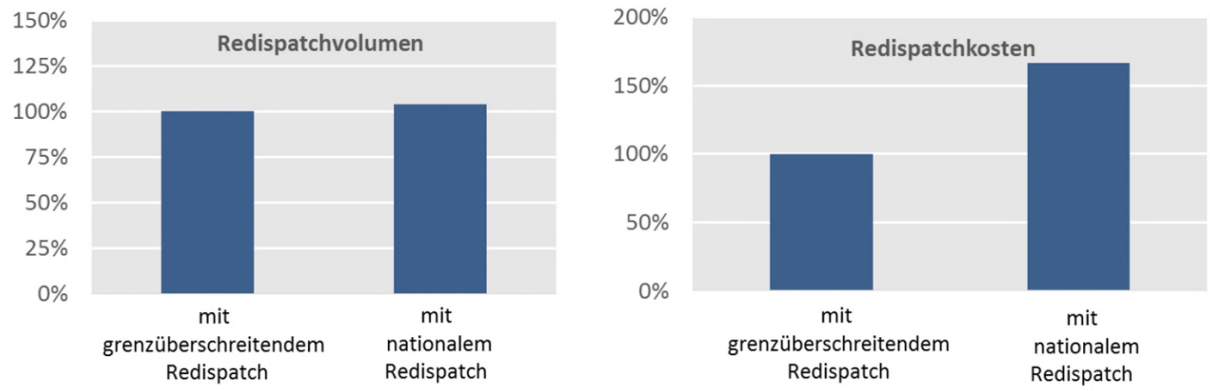
3.1.3 Make cross-border redispatch possible

Foreign plants are indispensable for congestion management in the long term. In order to avoid overloads on interconnectors it is essential that foreign plants also participate in redispatch. However, internal congestion in the German grid can also be solved more efficiently in some cases than with domestic plants with the help of power plants or consumers in neighbouring countries who can flexibly adapt their feed-in or feed-out on the instructions of the network operators. This is because the location of a plant in the network is critical for its influence on the network bottleneck needing to be remedied (so-called load flow sensitivity). Foreign power plants can have a heavy impact on certain power lines.

In certain load situations individual network congestion can only be remedied with the help of foreign plants. This applies, for example, to congestion on some cross-border lines or lines close to borders. Without transnational redispatch, electricity trading capacity at borders would have to be reduced in such situations in order to ensure secure operation of electricity networks. This would indeed be in line with the European stipulations of the EU Electricity Market Regulation (Art. 16, Para. 3). However, it is fully in the interests of the Single European Market to be able to expand electricity trading by means of cross-border redispatch.

Redispatch optimised for cross-border trading reduces redispatch volume and makes cheaper redispatch possible. Plants abroad can in some cases resolve network congestion more efficiently than domestic installations. A recent study by Consentec and r2b examined how redispatch volumes and costs develop when cross border-optimised redispatch is used to solve network congestion instead of purely national measures. The study shows that costs can fall by more than 50% as a result (see Figure 3). The study results were calculated by way of example for German network congestion. However, comparable effects of cross-border redispatch can also be expected for other EU member states.

Figure 3: Effect of cross border-optimised redispatch on redispatch volume and cost of redispatch



Source: Consentec GmbH and r2b Energy Consulting GmbH (2019)

The work being done on cross-border optimisation of redispatch is still in its infancy. So far there have only been individual, bilateral and multilateral co-operation agreements for redispatch, and still no pan-European system in which redispatch is optimised across borders. Based on the CACM guideline the European transmission system operators are currently developing a method for cross-border optimisation of redispatch as well as rules for allocation of costs (👁 Table of Measures No. 12).

Co-ordinated security analyses are to be carried out in the framework of regional co-operation ventures. With the new EU Electricity Market Regulation, Regional Co-ordination Centres (RCCs) will be introduced in future. The latter replace the regional security co-ordinators (RSCs) and are to carry out pan-European optimisation of redispatch measures within the framework of a co-ordinated security analysis. In

addition, they are to propose concrete implementation options to the transmission system operators, from which the transmission system operators may then only deviate within narrow limits.

Implementation of co-ordinated regional redispatch will take some time yet. First the methods for cross-border optimisation of redispatch must be approved and implemented. According to the provisions of the new EU Electricity Market Regulation, the RSCs, too, will not become operational until the middle of 2022. In addition, the transmission system operators and regulators of the member states still have very different interpretations of the rules in the CACM guideline and in the EU Electricity Market Regulation. A common basic understanding is necessary here in order to implement the specifications promptly and to ensure genuine added value from the security analysis.

In the meantime Germany wants to build on existing bilateral solutions. The German transmission system operators have so far co-operated with their neighbours in cross-border redispatch on the basis of bilateral agreements. These are to be extended and – as far as possible – further deepened (cf. Chapter 4.1).

3.1.4 Retain cost-based redispatch

The new EU Electricity Market Regulation makes provision for market-based redispatch as a rule. In Germany non-market-based – but instead cost-based – redispatch is currently the norm. Upon request by the network operators all power generation facilities and storage facilities above a certain size must participate in redispatch. Where this occurs they must adjust their production or their electricity procurement for the purpose of eliminating the bottleneck and in return receive a legally regulated amount of compensation which leaves them in an economically neutral position. The provisions of the new EU Electricity Market Regulation provide for various exceptions where cost-based redispatch is permitted. This is the case if either market-based procurement does not make sufficient potential available or there is a lack of sufficient competition or network congestion is so easily foreseeable that it leads to strategic congestion-worsening behaviour on the part of market participants.

In an expert appraisal the Federal Ministry for Economic Affairs and Energy had an investigation carried out to determine whether market-based redispatch makes sense in Germany. Neon, Consentec et al. (2019) consider various market-based procurement concepts and their effects on the total cost of power supply, the scope of redispatch and its costs as well as CO_2 emissions. It also examines whether the concepts are compatible with the design of the German electricity market and the single German bidding zone.

In the event that Germany were to switch to market-based redispatch, the experts would expect considerable distortions in the electricity market and a massive increase in network congestion. The advantage that new potential such as storage facilities and flexible consumers could be more easily integrated into redispatch would be more than offset by the expected disadvantages. The coexistence of zonal electricity trading and a necessarily regional or local marketplace for the elimination of network congestion would lead to economically rational market players optimising their interests between the two markets. To the extent that network congestion would be foreseeable, market players would try to generate higher revenues from the local marketplace by saving their flexibility for the latter and not making it available for zonal electricity trading or already pricing it in there. This would be economically rational and could not be objected to under competition law. This optimisation strategy is referred to in the literature as increase-decrease (Inc-Dec) behaviour and is a direct consequence of market-based redispatch. Thus all the current concepts that are discussed using the terms redispatch market, local flexibility market and smart markets would lead to massive problems.

According to the experts Inc-Dec behaviour would lead to more network congestion being caused by the decentralised deployment decisions of production plants, storage facilities and flexible loads due to the market outcome. As a result, network operators would have to carry out more redispatch. The costs incurred by network customers would rise. In empirical model calculations experts have determined that – even under very conservative assumptions – conversion to redispatch markets in the German transmission grid would lead to a tripling of redispatch quantities and costs. In addition, due to the local value of electricity there

would be numerous suppliers with dominant positions. This means that, above and beyond Inc-Dec behaviour, there is a high risk of expensive exercising of market power.

The results of the report were discussed with European stakeholders in various meetings, some of which were public. The final report is available in German and English and is publicly accessible on the homepage of the Federal Ministry for Economic Affairs and Energy (BMWi).[1]

Based on the expert appraisal cost-based redispatch is being retained. The appraisal shows that two of the exceptions provided for in Art. 13, Para. 3 of the EU Electricity Market Regulation are present: considerable strategic and therefore congestion-worsening behaviour is to be expected and there is insufficient competition. Germany is taking advantage of these exceptions. The legal framework for redispatch, which was recently reformed with the amendment to the Network Expansion Acceleration Act (see Chapter 3.1.1), is therefore being retained (👁 Table of Measures No. 13).

3.1.5 Strengthen co-operation between transmission and distribution system operators

Improved co-operation between transmission and distribution system operators reduces the redispatch requirement. A forward-looking network security analysis based, among other things, on the data of the plant operators for electricity generation shows, firstly, the expected network congestion in their own network area and the measures required to eliminate them. Secondly, it shows whether flexibility potential in a network can be exploited by other network operators without creating new congestion. By means of a co-ordination process between network operators the scope and number of measures to be taken can then be reduced. If, for example, several network operators at different voltage levels require additional feed-in at the same time, the network operators do not act independently, but rather in a co-ordinated manner. Joint working groups made up of transmission system operators and distribution system operators are already working on further concept development (👁 Table of Measures No. 14).

A common data path makes co-ordination possible. Information on usable potential and planned call-offs must be exchanged in a transparent manner between the network operators involved. In this way each network operator can also take into account the restrictions affecting other network operators. After the co-ordination process the previously agreed measures are called off. In order to reduce complexity and increase process efficiency, a common data path with clearly defined interfaces is developed. For both network operators and operations managers a “single point of contact” ensures transmission and availability of all relevant information, such as planning data, for the exploitation of flexibility.

The network operators develop innovative approaches. A distribution network operator co-operation venture developed the so-called “Flex-Router Concept”. These approaches are gradually developed and finalised in corresponding sector implementation projects.

3.1.6 Organise network-supporting load management with flexible consumers

Network-supporting load management can help to avoid congestion in the distribution networks. While distribution network operators have an instrument at their disposal for controlling production plants in the form of integration of renewables and CHP plants upwards of 100 kW into congestion management (cf. Chapter 3.1.1), they have no comparable tool on the consumption side.

[1] www.bmwi.de/Redaktion/DE/Dossier/strommarkt-der-zukunft.html#id912106

Germany will therefore continue to develop the legal framework in respect of flexible consumption equipment. As part of the project entitled “Digitisation of the Energy Transition – Barometer and Key Subject Areas” (Ernst & Young 2018) commissioned by the Federal Ministry for Economic Affairs and Energy, a concept was developed for network-supporting load management in the distribution networks. The Federal Ministry for Economic Affairs and Energy has drawn up a list of discussion points for further development of the legal framework. On this basis a broad, open-ended stakeholder process is currently taking place to determine whether and how the expert recommendations should be implemented. The aim is to enable distribution network operators to manage flexible loads within a clearly defined framework (e.g. during electric vehicle charging processes) in a way that supports the network, where otherwise unreasonable costs for network expansion would arise due to rare peak loads.

The core of the concept will be to divide the network connection capacity of flexible consumption devices such as electric vehicles and heat pumps into two parts in future. By default the network connection capacity then contains a part that is unconditionally and unrestrictedly available to the consumer and a second part that is conditional on network-compatible use. The network operator could then limit or postpone consumption if the simultaneous utilisations push the distribution network to its capacity limits. This avoids high investments for merely short-term peak loads and increases the potential of flexible consumption devices for the distribution network (👁 Table of Measures No. 15).

3.2 Coordinate network expansion and production structure

The German electricity system in 2030 will feature a low-emission production structure and a solidly developed electricity grid. The share of electricity from renewable energy plants will be significantly higher than today. For the efficiency of the overall system it is important that expansion of renewable energies and expansion of electricity networks is more closely synchronised. Production and transport must be increasingly co-ordinated. Only in this way can the transport task in the German transmission grid be fulfilled in the medium and long term.

In the German electricity market there are already spatial control instruments in place to synchronise grid expansion and electricity production, and further measures are planned. With the network expansion area the Renewable Energy Sources Act (EEG) already provides an instrument for the synchronisation of network expansion and electricity generation from onshore wind energy. In the case of offshore wind energy the land development plan is the central instrument for spatial management of additional capacity construction in the North Sea and the Baltic. In addition the offshore expansion targets will in future be linked to progress with network expansion (Chapter 3.1.1). While gradually phasing out coal-fired power generation the federal government is taking care that the order in which power plants are shut down is supportive of the grid (Chapter 3.2.2).

3.2.1 Synchronise expansion of renewable energies with network expansion

The Network Development Plan takes into account expansion and distribution of renewable energies now and in future. Future distribution of renewable energies across Germany is estimated on the basis of historical developments and regionally-focused estimates of potential. This is decisive for expansion of onshore wind energy in particular, as the latter has a major influence on transport requirements in the transmission grid and, alongside European electricity trading, is a driver of the necessary grid expansion.

Better distribution of renewable energies across Germany can reduce the transport requirement in the transmission grid. The cost-effective locations with good wind conditions are mostly located in northern Germany. For this reason expansion of wind energy plants is concentrated on the northern federal states. Historically, however, the transmission networks have not been designed to transport high wind power production volumes to the consumption centres in southern Germany.

If more wind energy plants are installed in southern Germany and fewer in northern Germany, the transport and network expansion requirement will decrease. Although the energy yield at less windy locations in southern Germany is significantly lower than in the windy regions of northern Germany, nationwide expansion of wind energy cannot be avoided if the expansion targets are to be achieved.

The 20 GW expansion target for offshore wind energy by 2030 will therefore be linked to conditions in order to achieve better synchronisation between expansion of offshore wind energy plants and network expansion progress. On the one hand the network capacities required for call-off, transmission and distribution of electricity must be created in good time. On the other hand binding agreements must be reached with the coastal countries and the transmission system operators in regard to completion of offshore linking routes (👁 Table of Measures No. 16).

In addition, expansion of offshore wind energy is already being controlled by means of spatial planning. New-build of offshore wind turbines and their grid connections in the North Sea and Baltic is controlled spatially and temporally by the Federal Maritime and Hydrographic Agency as the regional planning and licensing authority by means of the land development plan. This ensures effective synchronisation with network expansion.

Furthermore, the so-called network expansion area contributes to better dovetailing of expansion of onshore wind energy plants with the electricity networks. It limits expansion of wind energy in the regions north of the network congestion until network expansion no longer requires it. For example, wind energy plants on land in the network expansion area which, pursuant to a decision by the Federal Network Agency, comprises the federal states of Mecklenburg-Western Pomerania, Schleswig-Holstein, Bremen, Hamburg and the northern part of Lower Saxony, can only be awarded a contract up to an annual upper limit currently of 902 MW. The Federal Network Agency is evaluating the instrument and may redesign the network expansion area (👁 Table of Measures No. 17).

3.2.2 Gradually reduce and phase out coal-fired power generation

Germany will phase out coal-fired electricity generation by 2038 at the latest. The “Growth, Structural Change and Employment” Commission issued recommendations for action in January 2019. Accordingly, the output of bituminous coal- and lignite-fired power plants is to be reduced from just over 40 GW today to 30 GW in 2022, 17 GW in 2030 and 0 GW in 2038. Within the framework of the Climate Cabinet the federal government has decided to reduce coal-fired power plant capacity to 17 GW by 2030 and to phase it out by 2038. Legal implementation is currently being worked out.

Decommissioning of coal-fired power plants is causing far-reaching changes in the electricity supply system. This is also affecting network operation and load flows within the German and European network. For this reason, the Federal Ministry of Economic Affairs and Energy, when implementing the Commission’s proposals, attached great importance from the outset to taking appropriate account of network aspects (👁 Table of Measures No. 18).

The following measures are currently under political discussion within the legislative process. Discussions in the Federal Government and with the European Commission may still result in changes: The network aspects of the coal phase-out are being analysed by the transmission system operators. On behalf of the Federal Ministry for Economic Affairs and Energy the transmission system operators are currently working in consultation with the Federal Network Agency to examine the consequences of coal phase-out for the grid and which aspects need to be taken into account.

- **Transmission system operators are investigating whether coal-fired power plants are temporarily required for secure network operation.** There are bituminous coal plants that are necessary for maintaining system stability and that cannot therefore be decommissioned. For this reason all bituminous coal-fired plants for which a ban on coal combustion is to take effect by means

of the awarding of a contract are to be subjected to a system relevance test by the operators of the transmission network.

- **Grid-relevant bituminous coal-fired power plants are to be excluded in the first tender.** Which bituminous coal-fired power plants are to be shut down and when is to be determined with the help of a tender. The first tender is expected to be held as early as 2020. The aim is to exclude all bituminous coal-fired plants necessary for secure operation of the grid from participation in the tender process.
- **In later tenders, too, grid-relevant bituminous coal-fired power plants are only to be considered on a subordinate basis.** In the tenders after 2020 a grid factor is to be taken into account as a result of which grid-relevant bituminous coal-fired power plants will be downgraded in the award ranking. This contributes to a situation in which bituminous coal-fired power plants that are less relevant for grid operation are more likely to be awarded a contract.
- **Grid-relevant bituminous coal plants will be kept available for secure grid operation.** Grid-relevant bituminous coal plants which are nevertheless awarded a contract are to continue to be available for secure grid operation. Although they are being phased out of the electricity market in order to achieve a significant reduction in emissions, they must continue to be available to transmission system operators for network operation until alternative measures have been taken.
- **Transmission system operators are to prepare a long-term network analysis.** This will examine the effects of the statutory reduction of bituminous coal- and lignite-based electricity generation on the management of network congestion, on frequency maintenance, on voltage maintenance and on ensuring possible restoration of supply. In so doing they also take into account planned measures and alternatives for continued operation of the bituminous coal plants.
- **Transmission system operators will carry out an audit as part of the regulatory decommissioning order.** This will be based on an accompanying network analysis and is intended establish whether individual bituminous coal plants are necessary for the management of network congestion, for frequency maintenance, for voltage maintenance and for ensuring possible restoration of supply. If the hard coal plant is required, the Federal Network Agency can suspend the statutory reduction following approval by the BMWi.
- **The transmission system operators are drawing up alternative measures for future network operation without coal-fired power plants.** In order to ensure that coal-fired power plants will no longer be necessary for secure network operation in future, the transmission system operators are to develop alternative measures in co-operation with the Federal Network Agency. This can include, for example, point measures in the network, such as the installation of capacitor banks or generators in phase shifter operation or cross border-optimised redispatch.

4 Cooperate across borders in regional initiatives

Many measures that have a positive effect on network congestion are to be implemented in co-operation with neighbouring countries. Unlike other measures Germany cannot approve and implement such measures alone, as it needs co-operation partners.

In co-operation with its European neighbours Germany has already taken a number of measures to address network congestion in recent years. For example the German transmission system operators have reached agreements on remedial actions such as redispatch or countertrading with many transmission system operators in neighbouring countries and the regulatory authorities. In addition, phase-shifting transformers have been installed at some borders in co-operation with neighbouring countries in order to control load flows and thus avoid network congestion.

The specified regional processes for co-ordinated and optimised use of remedial actions are being driven forward. The EU Guideline on Capacity Allocation and Congestion Management, the EU Guideline on Transmission Network Operation and EU Electricity Market Regulation 2019/943 provide a framework for cross-border redispatch (cf. Chapter 3.1.3). However, implementing this is likely to take some time, as many complex issues such as technical implementation, technical reliability and cost-sharing need to be addressed. In the meantime bilateral and multilateral co-operation can help to bridge this period in a sensible way.

Germany is therefore interested in further co-operation agreements. Existing co-operation agreements are to be continued and deepened and new co-operation agreements are to be started until holistic regional cross-border optimisation of remedial actions has been achieved. Discussion processes with individual neighbouring countries are already under way in respect of this issue. Germany is open to further initiatives and approaches from partners interested in co-operation in this area.

Good experience in cross-border co-operation on network issues has already been gained. Network operators are already co-operating with their neighbours, for example in cross-border redispatch and countertrading and in the operation of so-called phase-shifting transformers at selected borders. Cross-border redispatch and countertrading also make it possible to tap potential for relieving congestion in neighbouring countries. This contributes towards cost reduction and increases efficiency (Chapter 4.1). Phase-shifting transformers are technical devices that control current flows in the network and can improve the evenness of loading. These systems have been in use at German external borders for the past few years and have been operated in co-ordination with the neighbouring transmission system operator (Chapter 4.2).

4.1 Carry out redispatch and countertrading across borders

Cross-border exchange of remedial actions such as redispatch and countertrading and their joint optimisation has great advantages for all parties involved. As described in Chapter 3.1.3, this can reduce redispatch volume and in particular redispatch costs. It also safeguards European electricity trading because some network congestion can only be solved with cross-border remedial actions.

Cross-border optimisation of remedial actions is complex. It requires a high level of co-ordination between transmission system operators, joint planning and closely co-ordinated request processes. Another challenge is to ensure a high level of transparency for all participants. Each transmission system operator must be informed of the potential in his network area and must share this information with the other transmission system operators in the region. It is also important for remedial actions to be available reliably and in sufficient quantity for them to be securely scheduled. Not least, allocation of costs is a challenging question. There are differences of opinion between the regulatory authorities on this issue. For a sustainable long-term pro-

European solution it is important that the cost-sharing rules provide an incentive for all member states to expand the internal network sufficiently for cross-border electricity flows to be transported. At the time it is of importance to secure the exchange of information on reliable redispatch potential, to implement necessary internal measures and to react to grid congestion in due time.

Implementation of the regional methods provided for in EU law is therefore being driven forward with urgency. First, transmission system operators and regulators must agree on common regional methods. These must then be put into practice.

Germany is bridging the interim gap with bilateral and multilateral agreements on the exchange of redispatch, countertrading and topological measures. Germany has concluded a large number of such agreements in recent years and has had very good experiences with the agreements. They improve co-ordination by means of joint security analyses, increase the available potential of redispatch and countertrading measures for all participants, make it possible for congestion to be removed more efficiently and allow measures to be better co-ordinated with neighbours. Table 2 provides an overview of existing agreements for cross-border redispatch. The agreements regulate both the call-off processes and the cost-sharing rules (👁 Table of Measures No. 19).

Table 2: Agreements between Germany and its neighbours in respect of cross-border redispatch, countertrading and joint security analyses

Co-operation partner	Co-operating TSOs	Type of agreement	Status
AUT	APG, TenneT	Bilateral agreement on redispatch	Concluded
CHE	Swissgrid, Amprion, TransnetBW	Bilateral agreements on redispatch	Concluded
FRA	RTE, Amprion, TransnetBW	Trilateral agreement on redispatch	Concluded
NDL	TenneT NL – TenneT DE	Bilateral agreement on redispatch	Concluded
NDL	TenneT NL – Amprion	Bilateral agreement on redispatch	Concluded
POL	50Hertz – PSE	Bilateral agreement on redispatch	Concluded
CZE	50Hertz – ČEPS	Bilateral agreement on redispatch	Concluded
DNK	TenneT – Energinet	Bilateral agreement on countertrading	Concluded

Coreso	50Hertz, Eirgrid (IRL), Elia (BEL), National Grid ESO (GBR), REE (ESP), REN (PRT), RTE (FRA), SONI (GBR), TERNA (ITA)	Multilateral agreement on co-ordinated security analysis and call-off of topological measures	Concluded
TSC Initiative	50Hertz, Amprion, APG (AUT), ČEPS (CZE), ELES (SVN), Energinet (DNK), HOPS (HRV), MAVIR (HUN), PSE (POL), SEPS (SVK), Swissgrid (CHE), TenneT DE,TenneT NL, Transelectrica (ROU), TransnetBW	Multilateral agreement on co-ordinated security analysis and call-off of redispatch	Concluded

In addition to the existing agreements negotiations are being held on a common redispatch process with Switzerland and France. This is expected to allow redispatch measures between the three countries to be co-ordinated even better. The agreement is expected to have come into effect for the winter of 2019/2020. The agreements are currently under legal review.

Germany is interested in further co-operation partners. As shown in the summary in Table 2, agreements on redispatch and countertrading have not yet been concluded for all of Germany's external borders. Initial talks on trilateral redispatch co-operation with Belgian transmission system operator ELIA and Dutch transmission system operator TenneT-NL are currently taking place. Co-operation of this type would have the advantage that redispatch measures between the three states could be co-ordinated in future and redispatch potential could be exchanged across borders. Germany is open to further co-operation partners.

The existing co-operation can be deepened further. The agreements concluded still differ greatly from one another at present. While individual agreements allow full integration into the existing planning processes of the transmission system operators and allow far-reaching exchange of redispatch potential, other co-operation agreements do not yet make provision for this. It would be useful to identify best practice from existing bilateral agreements. This could take the form of a model agreement to facilitate the conclusion of new agreements or the extension of existing agreements.

The transmission system operators have developed principles which, on the basis of their previous experience, have proved to be important for the implementation of cross-border redispatch. They could serve as a basis for best practice and could also be incorporated into the development of the regional methods provided for in EU law.

- Transmission system operators (TSOs) are to inform each other and/or the regional co-ordination centres (RCCs) in a timely manner of the available redispatch potential for the target period.
- The responsibilities of the participating TSOs and RCCs must be clearly defined in all procedural steps.
- Where remedial actions are required, indicative prices should be exchanged in order also to allow optimisation from a cost efficiency point of view.
- The agreed remedial actions should be reliable.
- There should be clearly defined joint documentation of the agreed remedial actions to facilitate monitoring and cost-sharing.

- Cost-sharing must be in accordance with the agreed operational processes and principles and developed jointly with the national regulatory authorities.

4.2 Control cross-border network flows better with phase-shifting transformers

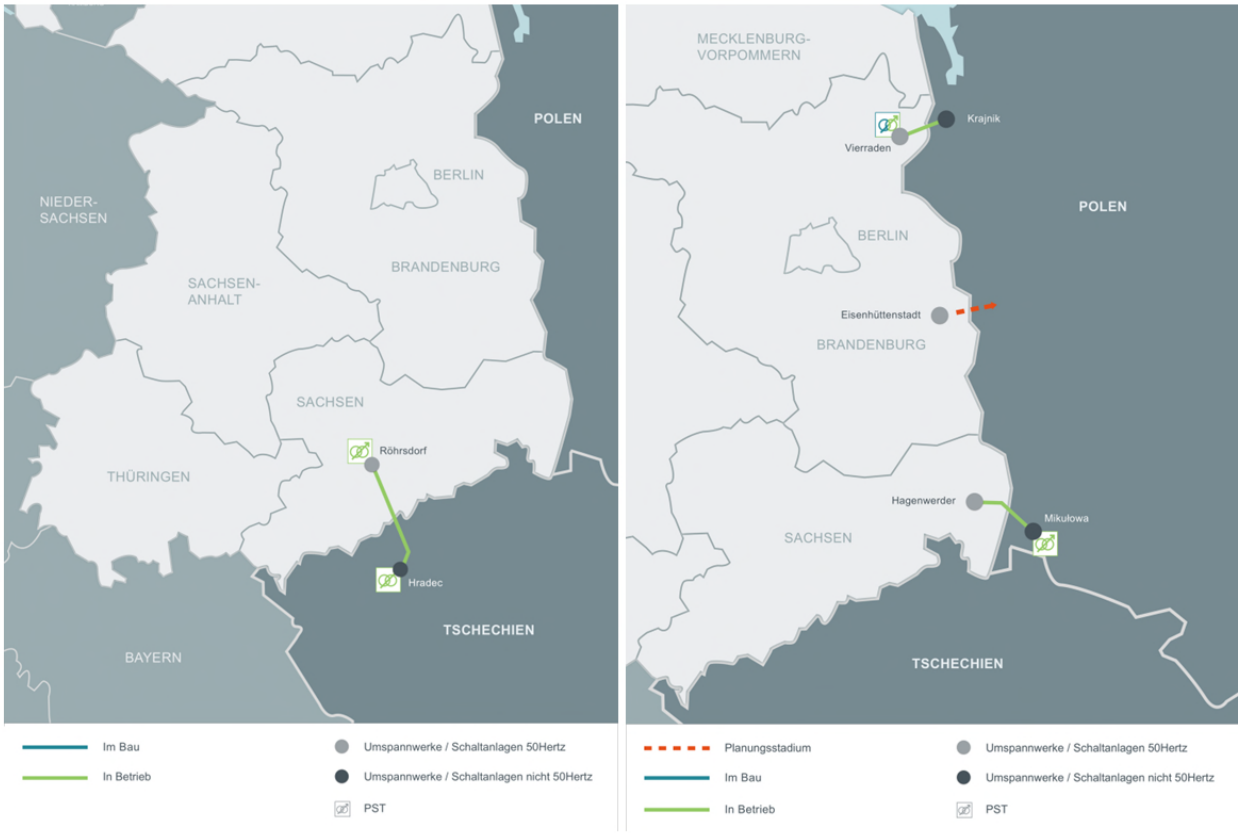
Cross-border current flows can lead to network congestion which must be remedied by redispatch and other remedial actions. Current flows are distributed over the network on the basis of electrical resistance. This can lead to individual power lines being overloaded while other lines are not yet fully utilised. Management of cross-border current flows requires co-ordination with the neighbouring countries concerned.

In order to better manage cross-border load flows, transmission system operators 50Hertz, PSE and ČEPS have installed phase-shifting transformers (PSTs) at the borders. Phase-shifting transformers function like “adjustable impedances”. They control the load flow across the network by adjusting the phase angle of the voltage between the ends of a power line and in addition by changing the resistance of the line. The change in resistance causes the load flows in the network to be redistributed. This avoids overloads on individual power lines and allows less heavily loaded lines to be used to greater capacity.

The phase shifting transformers at the German-Czech and German-Polish borders were installed between 2016 and 2018 and are operated in a co-ordinated manner by the transmission system operators of the three countries. On the German-Polish border the first four PSTs at the Polish substation in Mikułowa were commissioned as early as June 2016. In August 2018 the first two PSTs were commissioned at the German substation in Vierraden. These are to be supplemented by two further PSTs with the commissioning of the planned Uckermark line. These complete the installation of PSTs in the Vierraden substation. On the German-Czech border four PSTs were put into operation in January 2017 in Hradec in the Czech Republic. These were supplemented by two PSTs at the Röhrsdorf substation in Saxony, which went into operation in January 2018. Following conversion of the substation in Röhrsdorf, these PSTs will also be upgraded to allow them to control current flows through the other power lines in the southern area of the 50Hertz control zone.

The positive experience of recent years shows that loop flows have been significantly reduced by the phase-shifting transformers and their co-ordinated operation. This reduces network overload on the cross-border power lines and thus makes cross-border network operation more secure. In addition to this more cross-border electricity trading is made possible (👁 Table of Measures No. 20).

Figure 4: Phase-shifting transformers on the German-Polish and German-Czech borders



Source: 50Hertz

PART II: LINEAR INCREASE IN TRADING CAPACITIES TO 70%

5 Calculation of start values and trajectory

The action plan makes 70% minimum trading capacity possible by 2026. Art. 15, Para. 2 of the EU Electricity Market Regulation stipulates that the 70% target in the European electricity market will be achieved by 31 December 2025 if a member state submits an action plan. This target is reached along linear trajectories. The starting point of a given linear trajectory is the so-called start value. On this basis the minimum trading capacity is increased each year. However, in the course of the transmission system operators' capacity calculations, much higher values can be made available to the market, depending on the specific network situation. The German electricity grid is closely connected to that of its neighbours. There are several linear trajectories adequately mapping this. The minimum trading capacities apply from 1 January 2020.

Compliance with the linear trajectories is important. The introduction of pan-European minimum trading capacities is a cornerstone of the "Clean Energy for all Europeans" legislative package. It guarantees non-discriminatory cross-border trading and strengthens the single European electricity market. For this reason the federal government has a great interest in ensuring that the linear trajectories are adhered to – even if this results in additional load on the German electricity grid. Exceptions can only be made if operational reliability is jeopardised.

The Federal Network Agency monitors compliance with the linear trajectories by the transmission system operators. It has developed a two-stage monitoring process for this purpose. The transmission system operators inform the Federal Network Agency immediately if the minimum trading capacities are not met. In addition, each year the Federal Network Agency receives a detailed report by the transmission system operators on capacity developments in accordance with Article 15(4) of the EU Electricity Market Regulation. Market participants, too, are notified by the transmission system operators where suspensions of minimum trading capacities are needed (👁 Table of Measures No. 21).

The Federal Ministry for Economic Affairs and Energy, the Federal Network Agency and the transmission system operators are working in close co-operation, also with the neighbouring countries and the European Commission. The complex questions of start value calculation have been intensively discussed among all participants. Technical issues are decided by the Federal Network Agency. The federal government's action plan sets out basic methods for determining the linear trajectory. Technical issues are decided by the Federal Network Agency. The transmission system operators apply the methods for calculating the start values.

The transmission system operators calculate start values for the linear trajectories. The start values form the starting points for the linear trajectories. The allocated capacity figures of the last three years or the allocated capacity figure of the last year, whichever is higher, is used for this purpose. A start value can be calculated for each so-called "critical network element". This refers to power lines or other network elements (transformers) that play a decisive role in European electricity trading. They are therefore taken into account in the calculation of cross-border capacity. Critical network elements are interconnectors between two countries on the one hand and sensitive power lines in terms of international electricity trading on the other.

The start value calculation is based on several basic principles. According to the EU Electricity Market Regulation the start values are based on the *allocated* capacities, that is to say the capacities actually used in trading. As there are no continuous values for the 2019 full year when this action plan is made available, the calculated values are based on the years 2016 to 2018.

The start value calculation is based on the capacity calculation region. The European network is broken down into several capacity calculation regions. Each region has defined its own methods according to which the transmission system operators involved uniformly calculate the available capacities. Germany is integrated into three different regions with its neighbouring countries and administers corresponding bidding zone borders:

- Hansa: with Denmark and Sweden
- Central western Europe: with Belgium, France, Luxembourg, the Netherlands and Austria
- Eastern neighbours: with Poland and the Czech Republic.

In 2021 the eastern borders and central western Europe are to be assimilated into the larger central Europe region.

The methodology used in central western Europe and central Europe provides for a flow-based calculation method that is particularly good at mapping the physical legalities of electricity flow. This also means that in principle each individual critical network element has its own capacity and is thus included in the creation of a start value. The methodology in the Hansa region, on the other hand, provides for calculation by border. This procedure ensures consistency between the initial value calculation as a basis for the minimum trading capacities and the capacity calculations in the transmission system operators' network operation.

Existing minimum trading capacities are retained. In the central western Europe region a minimum trading capacity of 20% has applied since as long ago as 2018. Market participants and neighbouring countries can rely on the fact that these trading capacities will definitely be retained. In cases where the linear trajectories showed lower values, 20% trading capacity should nevertheless be considered as the lower limit. This also applies to new critical network elements in central western Europe.

Manageability of the linear trajectories must continue to be guaranteed. Germany has a particularly large number of neighbouring countries and a correspondingly large number of critical network elements. Monitoring of the multitude of linear trajectories is complicated and time-consuming. An average of all calculated initial values should therefore apply at least for the region of central western Europe. This value is also to be retained in the future central European capacity calculation region (CORE). This sustainably increases the transparency and traceability of the values.

Important influencing factors on minimum trading capacity in the EU are taken into account. A good network is essential for security of supply in Europe. The EU therefore trades large quantities of electricity with non-member countries such as Switzerland, Norway and the Balkan countries. Taking this trading into account when calculating the initial values ensures that the linear trajectories portray a realistic scenario.

New interconnectors are given minimum capacities in the year following their entry into service. Several interconnectors to Germany's neighbouring countries are currently under construction and these will become operational before 2026. They start their linear trajectory with a minimum trading capacity of zero, because historical capacity figures cannot initially be used for these connections.

All relevant information for the start value calculation and calculation of the linear growth trajectory is made transparent by the German regulatory authority and the German transmission system operators. At www.bnetza.de/marketcoupling the Federal Network Agency describes the principles of the start value calculation. The concrete values are published by the transmission system operators at www.netztransparenz.de and www.jao.eu.

6 Consultation on the action plan

Art. 14 of Regulation (EU) 2019/943 (EU Electricity Market Regulation) prescribes a consultation process on the action plan pursuant to Art. 15. The consultation is an important step towards justifying and discussing the decision in favour of an action plan and the measures described therein with the member states and other stakeholders in Europe and towards allowing existing opinions on it to be taken into account. Thus the public consultation on the action plan increases the transparency of the underlying decisions and announced measures. The federal government welcomes the close exchange on energy policy issues with the other member states, the European institutions and other relevant interest groups.

In order to allow for a broad-based consultation process two workshops in Brussels on 10 December 2019 were offered and an opportunity was given for written comments on the draft version of the action plan. The member states and the European Commission participated in a workshop in the morning, while other stakeholders took part in a workshop in the afternoon. The Federal Ministry for Economics and Energy (BMWi) had already held its own workshop on 30 September 2019 on the methodology and calculation of the starting values for cross-border trading capacities and the linear trajectory pursuant to Art. 15, Para. 2 EU Electricity Market Regulation. All three workshop formats received great interest and were well attended.

In addition to the verbal comments made in the consultation workshops, the BMWi received several written opinions on the draft version of the action plan. The BMWi has carefully evaluated all the opinions and comments. The results of the consultation process have been incorporated into the final version of the action plan.

The participants in the workshops and the written consultation showed lively interest in Germany's Action Plan Bidding Zone. Many welcomed the workshops as a valuable proposition for a transparent and direct exchange. Several comments welcomed the measures described in the action plan and the overall objective of maintaining a single German bidding zone. Many participants also stressed the important role of good co-operation between member states, national regulatory authorities and network operators, for example in cross-border redispatch.

In the course of the consultation there was praise for the transparency of Germany's energy policy, but at the same time a wish was expressed to publish further information on the proposed measures. Information on the individual network expansion projects, their location, their impact on transmission capacity and the time schedule for their implementation were of particular interest. This was justified by some participants with potential effects on available cross-border trading capacities and network expansion in Germany's neighbouring countries. Some participants also expressed interest in the locations and costs and energy-related benefits of domestic phase shifters as a measure to better control electricity flows over the German power lines. Some contributions also called for publication of the concrete start values. Questions were also asked about how to optimize redispatch, for example how to improve cross-border redispatch and how to tap new redispatch potential such as flexible loads.

Many participants in the consultation process were interested to know whether and how implementation of the measures taken should be monitored. On the one hand this concerned the concrete network expansion projects, while on the other hand great interest was expressed in Germany's concept for monitoring compliance with the stipulations in respect of the linear trajectory for minimum trading capacities.

The participants particularly welcomed the fact that the Federal Network Agency will continuously and closely monitor whether the transmission system operators always follow the linear path. The indication that the Federal Network Agency has established a procedure with the transmission system operators for immediate notification and transfer of information met with a positive response. In addition, the regulatory authority has appropriate competence for supervision of the transmission system operators, including sanctions. Some participants suggested that monitoring should be better reflected in the action plan.

Several questions were asked regarding determination of the linear trajectory to the 70% target. The participants welcomed the BMWi's statement that, in accordance with Art. 15 of the EU Electricity Market Regulation, it regards the linear trajectory as a minimum requirement for trading capacity. This minimum requirement must be complied with in all cases, also and in particular irrespective of concrete progress in measures such as network expansion.

It was welcomed that, beyond the requirements of the EU Electricity Market Regulation, the minimum trading capacity of 20% will be maintained in the central western Europe region. Questions were also asked about the impact of the measures described in the action plan on capacity allocation and trading. It was clarified that capacity allocation will continue to be based on the established mechanisms for capacity calculation in the respective regions. In essence this means that trading capacities above the linear trajectory are also put on the market if the respective regional capacity calculation mechanism determines this to be optimal.

7 Summary of measures

2	**Increase power transmission capacities**	
	2.1 Expand and strengthen electricity networks	
1.	Network expansion planning to 2030	The Network Development Plan (NDP) 2019-2030 identifies the network expansion requirement to be met by 2030. On the basis of the NDP the amendment to the Federal Requirement Plan Act (BBPlG) is intended to enshrine the network expansion requirement in law in 2020 and thus adapt it to the current challenges. The Federal Network Agency publishes all information on the Network Development Plan at www.netzausbau.de.
	2.2 Speed up network expansion	
2.	Shorten approval procedures	The Energy Transmission Network Expansion Acceleration Act (NABEG 2.0) has created procedural simplifications based on which the current official administrative proceedings can be accelerated.
3.	Introduce a forward-looking controlling system	The Federal Ministry for Economic Affairs and Energy will consistently implement and further develop the forward-looking controlling of grid expansion established in 2019 together with the Federal Network Agency (BNetzA), the federal states and the transmission system operators. The time schedules agreed by the participants and approved at the meeting of energy ministers in May 2019 will apply (see appendix). The time schedules have been published at www.netzausbau.de.
4.	Increase acceptance of network expansion	The Federal Ministry for Economic Affairs and Energy will pursue and expand the Public Electricity Network Dialogue initiative, thus ensuring that in the coming years, too, members of the public will have an additional competent local contact in addition to the licensing authorities and project sponsors. The project is expected to be significantly expanded from 2020. The Federal Ministry for Economic Affairs and Energy is currently examining whether and under what conditions it is possible to include further power line projects as an underground cable pilot project. In the case of projects which have not yet progressed as far in the planning stage, cabling is to be given greater consideration as far as technically possible.

	2.3 Optimise the existing network	
5.	Digitisation of power networks, status monitoring and implementation of assistance systems	Systematic implementation of online assistance systems for evaluation of network status by the transmission system operators.
6.	Introduce weather-dependent overhead power line operation	Systematic implementation of weather-dependent overhead power line operation by the transmission system operators.
7.	Control load flows with phase shifters	Commissioning of the phase shifters confirmed as ad hoc measures in Network Development Plan 2019. The German transmission system operators are aiming for commissioning by 2023 or 2025.
8.	Test reactive operations management	Realisation of the pilot plants confirmed in the Network Development Plan (NEP 2019) for trialling reactive operations management concepts.
9.	Increase incentives for investment in network expansion	The first measures to provide more appropriate incentives for investment measures that promote refinancing of major expansion and restructuring investments have already been taken in 2019. By the beginning of 2020 a stakeholder dialogue on further development of incentive regulation will be conducted in order to discuss the need for further legal adjustments for the financing of investments and for dealing with the cost of congestion management.
3	**Make more cross-border trading possible**	
	3.1 Optimise congestion management	
10.	Make redispatch more efficient	Implementation of the uniform redispatch regime for eliminating congestion, including renewable energy and CHP plants, as an industry solution by 1 October 2021.
11.	Continue with the network reserve as a transitional tool	Until implementation of co-ordinated regional cross-border redispatch, the network reserve will be continued as back-up for national redispatch potential.

12.	Make cross-border redispatch possible	Redispatch optimised for cross-border trading reduces redispatch volume and in particular reduces costs incurred for redispatch. On the basis of the “Capacity Allocation and Congestion Management” (CACM) network code, the European transmission system operators are currently developing methods for cross-border optimisation of redispatch as well as rules on cost allocation. In the meantime, Germany will continue and expand existing bilateral agreements.
13.	Retain cost-based redispatch	An expert appraisal commissioned by the Federal Ministry for Economic Affairs and Energy shows that a switch to market-based redispatch would lead to considerable distortions in the electricity market and to a massive increase in grid congestion. The appraisal shows that two of the exceptions provided for in Art. 13, Para. 3 of the EU Electricity Market Regulation are present: considerable strategic and therefore congestion-boosting behaviour is to be expected and there is not sufficient competition. Based on this finding, cost-based redispatch is being retained.
14.	Strengthen co-operation between transmission and distribution system operators	Improved co-operation between transmission and distribution system operators reduces the redispatch requirement. Joint working groups made up of transmission system operators and distribution system operators are already working on further concept development.
15.	Organise network-supporting load management with flexible consumers	The Federal Ministry for Economic Affairs and Energy presented key points for the introduction of an instrument for network-supporting load management in summer 2019. Since then a discussion with all stakeholders to firm up these key points has been held. Submission of a draft to adapt the legal framework is planned by mid-2020.

3.2 Coordinate network expansion and production structure

16.	Link expansion targets for offshore wind to network expansion progress	In the Coal Phase-out Act, inclusion of the Umbrella Act relating to the Renewable Energy Sources Act and the Wind Sea Act means that the increase in the expansion target for offshore wind energy from 15,000 MW to 20,000 MW by 2030 is conditional on the required network capacities for call-off, transmission and distribution of electricity being prepared in good time.
17.	Synchronise expansion of renewable energies with network expansion	Evaluation of the network expansion area and possibility of redefinition by the Federal Network Agency.

18.	Gradually reduce and phase out coal-fired power generation	Germany will phase out coal-fired electricity generation by 2038 at the latest. The Growth, Structural Change and Employment Commission issued recommendations for action in January 2019. In implementing the Commission's recommendations, particular attention is being paid to network aspects.
4	**Cooperate across borders in regional initiatives**	
19.	Carry out redispatch and countertrading across borders	Germany has already concluded various bilateral and multilateral agreements on the exchange of redispatch potential and countertrading. Two further agreements are currently being negotiated.
20.	Control cross-border network flows better with phase-shifting transformers	Germany, Poland and the Czech Republic have installed several phase-shifting transformers (PSTs) on their borders and are operating these in a co-ordinated manner. With the commissioning of the Uckermark power line two PSTs will be replaced by two new ones. Following conversion of the substation in Röhrsdorf, the PSTs installed there are to be better integrated into the southern area of the 50Hertz control zone.
5	**Calculation of start values and trajectory**	
21.	Monitoring compliance with minimum trading capacities	A two-stage monitoring process of the Federal Network Agency ensures that the transmission system operators provide information at short notice about suspensions of the minimum trading capacity and prepare reports each year on development of capacities. The capacity start values and the capacities in accordance with the linear phase-in are announced by the transmission system operators at www.netztransparenz.de and www.jao.eu. The Federal Network Agency has published the principles of start value calculation at www.bnetza.de/marketcoupling.

List of sources

Federal Network Agency (2019): Confirmation of the Electricity Network Development Plan for the Target Year 2030 (www.netzausbau.de/2019-2030-nep-ub).

Consentec GmbH and r2b Energy Consulting GmbH (2015): Security of Supply in Germany and its Neighbouring Countries: Transnational Monitoring and Evaluation. Investigation on behalf of BMWi, March 2015.

Consentec GmbH und r2b Energy Consulting GmbH (2019). Investigation on behalf of BMWi. Unpublished.

ENTSO-E (2017): Mid Term Adequacy Forecast 2017.

Ernst & Young (2018): Digitisation of the Energy Transition – Barometers and Main Issues. Investigation on behalf of BMWi (www.bmwi.de/Redaktion/DE/Publikationen/Studien/barometer-digitalisierung-der-energiewende.html).Fraunhofer ISI, Consentec, ifeu (2017): Long-term scenarios for the transition of the energy system in Germany; study on behalf of BMWi (https://www.bmwi.de/Redaktion/DE/Artikel/Energie/langfrist-und-klimaszenarien.html).

Neon, Consentec et al. (2019): Investigation into the Provision of Redispatch. Investigation on behalf of BMWi, October 2019 (www.bmwi.de/Redaktion/DE/Dossier/strommarkt-der-zukunft.html#id912106).

APPENDIX: NETWORK EXPANSION CONTROLLING

Federal Ministry
for Economic Affairs
and Energy

Results of the meeting in Hanover on 24 May between Minister Altmaier and the ministers of the Länder, the President of the Bundesnetzagentur and the managers of the transmission system operators on forward-looking internal auditing of the grid expansion

Speeding up the grid expansion

An efficient electricity grid is the cornerstone of the energy transition. It plays a particularly important role in transporting renewables-based electricity to the consumers. The phase-out of nuclear energy and coal-fired power generation means that an efficient electricity grid, combined with technologies to make generation and consumption more flexible, is a crucial precondition to ensure security of supply and of the grid. The existing power grid needs to be optimised and expanded to cope with the increasing volumes of electricity being transported between the regions, e.g. wind energy from northern Germany to the main centres of consumption in the south of the country. Decentralised expansion of renewable energy throughout the country is welcome, but it cannot remove the need to transport electricity between the regions.

The transmission system operators present a Network Development Plan every two years. This describes the measures needed to upgrade and expand the grid so that it can continue to be operated reliably in future. Key successes have already been attained in terms of expanding the grid. Projects like the Thuringian Electricity Bridge, which was completed in 2017, have substantially reduced the pressure on the grid.

Measures to speed up the grid expansion

The Federation and the Länder presented a package of measures to speed up the expansion of the power grid in September 2018. One key step has just recently been taken: the Grid Expansion Acceleration Act (NABEG revision) simplifies and expedites approval procedures. It also makes it easier to optimise the electricity grid and thus to transport more electricity via the existing system. This prunes superfluous red tape whilst upholding the rights of citizens to have their say.

The challenge now is to implement, as quickly as possible and within the existing legal framework, the grid expansion projects that have been adopted. In order to address this challenge, the Federation and the Länder have introduced an internal auditing system for the grid expansion.

Specific timetables with milestones

The energy ministers of the Länder and the Federation agree with the Bundesnetzagentur and the managers of the transmission system operators in Germany on specific timetables with milestones to be adhered to by all the participants. The six milestones mark the beginning and end of the Federal Sectoral Planning or spatial planning procedure and the planning approval procedure, as well as the commencement of construction and the commissioning of the grid. The timetables are both ambitious and realistic. They supplement the monitoring already being undertaken by the Bundesnetzagentur and are published on www.netzausbau.de. This enables the public to find out about the progress being made on expansion of the power grid at all times.

When they drew up the timetables, the Länder, Federation, Bundesnetzagentur and system operators agreed on a large number of practical measures to facilitate a rapid implementation, particularly of the projects which are already underway. These refer to the scope and detail of applications and documentation, an optimisation of procedures, and resources in authorities and system operators. In particular, all sides stress the importance of good communications between authorities and system operators with a view to ensuring that documents of the necessary quality are submitted as quickly as possible and can be accepted as being complete. Also, the Länder, Federation and system operators promise to provide adequate and, where possible, non-fluctuating human resources. The Federation and the Länder are continuing to work on boosting political backing for the grid expansion.

The ultra-high voltage direct current projects A-Nord, SuedLink and SuedOstLink are some of the most challenging projects in the current grid expansion programme. They extend from north to south Germany, and their planning and implementation gives priority to underground cables. This poses a particularly great challenge for approval procedures and construction. The various parties agree on dates for the completion of Federal Sectoral Planning and planning approval procedures. Due to the complexity of the projects, the later milestones of “Start of construction” and “Commissioning” entail additional uncertainties, since we are entering new territory. For this reason, the dates are cited not as specific quarters, but only as years. The aim is to commission the aforementioned DC projects by 2025/2026.

The timetables do not restrict the open-ended nature of the scrutiny in the approval procedures. Decisions are taken solely by the competent authorities of the Länder and the Federation, taking into account the relevant public and private interests in the context of the statutory requirements. A fundamental role is played by the need to uphold the quality of the decision-making.

The timetables disregard external influences beyond the control of the competent authorities and the system operators. These include court hearings against planning approvals, and new requirements deriving from case-law.

The energy ministers of the Federation and the Länder, the Bundesnetzagentur and the transmission system operators will meet annually, if possible twice a year, to discuss progress on grid expansion. The relevant directors-general will continuously drive the individual projects forward together with the system operators, go through them every six months, and resolve any problems together. Any time gained in individual projects or procedural steps is to be invested in a speedier implementation of the projects.

Increase in resources

The Länder and the Federation promise to furnish the competent authorities with the necessary resources (human and material) for the approval procedures to be completed as quickly as possible.

The Federation and the Länder will do their utmost to support the expansion projects to build an efficient grid. They stress the point that ambitious climate action and the expansion of renewable energy require greater transport capacities in the power grid and are thus two sides of the same coin. They call on the members of parliament at Federal and Länder level, and also on the municipalities and rural districts, to lend their support so that the energy transition can succeed.

For their part, the system operators promise to furnish the projects with adequate resources (financial, human, material) within the regulatory framework so that the grid expansion projects and all the measures relating to increased capacity utilisation of the existing grid infrastructure can be realised on schedule. For their part, the Federation and the Länder ensure that the regulatory framework is designed to ensure an appropriate and competitive degree of economic viability for the system operators within the meaning of Section 21 subsection 2 of the Energy Industry Act. Where this has yet to happen, the system operators will also submit the applications for approval of those projects in line with the dates agreed in the table of milestones.

Project (BNetzA)		Project manager (PM)	Length of grid (km)			Auditing milestones (quarter)					
			planned	approved	constructed	Submission of complete application for Federal Sectoral Planning	Federal Sectoral Planning decision	Submission of complete application for planning approval procedure	Planning approval decision	Start of construction	Commissioning
						Responsible party					
						PM	BNetzA	PM	BNetzA	PM	PM
	DC project										
Federal Requirements Plan Act No. 1	**Emden/Ost - Osterath (A-Nord)**										
	Emden Ost – Raum Bunde	Amprion	23	0	0	Q1/2018	Q3/2020	Q4/2020	Q1/2023	Q2/2023	2025
	Raum Bunde – Raum Wietmarschen	Amprion	81	0	0	Q1/2018	Q3/2020	Q4/2020	Q1/2023	Q2/2023	2025
	Raum Wietmarschen – Raum Borken/ Schermbeck	Amprion	93	0	0	Q1/2018	Q3/2020	Q4/2020	Q1/2023	Q2/2023	2025
	Raum Borken/Schermbeck – Osterath	Amprion	103	0	0	Q1/2018	Q3/2020	Q4/2020	Q1/2023	Q2/2023	2025
Federal Requirements Plan Act No. 2	**Osterath – Philippsburg (Ultranet)**										
	Ried – Wallstadt	Amprion	28	0	0	Q4/2014	Q1/2019	Q2/2019	Q3/2021	Q4/2021	2023
	Marxheim – Ried	Amprion	57	0	0	Q4/2014	Q1/2019	Q1/2020	Q3/2022	Q4/2022	2023
	Wallstadt – Philippsburg	TransnetBW	40	0	0	Q4/2014	Q2/2019	Q3/2019	Q4/2021	Q1/2022	2024
	Osterath – Rommerskirchen	Amprion	30	0	0	Q2/2015	Q2/2020	Q3/2020	Q4/2022	Q1/2023	2023
	Weißenthurm – Riedstadt	Amprion	110	0	0	Q4/2015	Q4/2019	Q1/2020	Q3/2022	Q4/2022	2023
	Rommerskirchen – Weißenthurm	Amprion	100	0	0	Q4/2015	Q2/2020	Q3/2020	Q4/2022	Q1/2023	2023
Federal Requirements Plan Act No. 3	**Brunsbüttel – Großgartach (SuedLink)**										
	Brunsbüttel – Scheeßel	TenneT, Transnet BW	105	0	0	Q2/2017	Q1/2020	Q2/2020	Q4/2022	Q1/2023	2026
	Scheeßel – Bad Gandersheim	TenneT, Transnet BW	179	0	0	Q3/2017	Q1/2020	Q2/2020	Q4/2022	Q1/2023	2026
	Bad Gandersheim/Seesen – Gerstungen	TenneT, Transnet BW	148	0	0	Q1/2017	Q1/2020	Q2/2020	Q4/2022	Q1/2023	2026
	Gerstungen – Arnstein	TenneT, Transnet BW	137	0	0	Q1/2017	Q1/2020	Q2/2020	Q4/2022	Q1/2023	2026
	Arnstein – Großgartach	TenneT, Transnet BW	133	0	0	Q2/2017	Q1/2020	Q2/2020	Q4/2022	Q1/2023	2026
Federal Requirements Plan Act No. 4	**Wilster – Grafenrheinfeld (SuedLink)**										
	Wilster – Scheeßel	TenneT, Transnet BW	99	0	0	Q2/2017	Q1/2020	Q2/2020	Q4/2022	Q1/2023	2026
	Scheeßel – Bad Gandersheim/Seesen	TenneT, Transnet BW	179	0	0	Q3/2017	Q1/2020	Q2/2020	Q4/2022	Q1/2023	2026
	Bad Gandersheim/Seesen – Gerstungen	TenneT, Transnet BW	148	0	0	Q1/2017	Q1/2020	Q2/2020	Q4/2022	Q1/2023	2026

Project (BNetzA)		Project manager (PM)	Length of grid (km)			Auditing milestones (quarter)					
			planned	approved	constructed	Submission of complete application for Federal Sectoral Planning	Federal Sectoral Planning decision	Submission of complete application for planning approval procedure	Planning approval decision	Start of construction	Commissioning
						Responsible party					
						PM	BNetzA	PM	BNetzA	PM	PM
	Gerstungen – Grafenrheinfeld	TenneT, Transnet BW	132	0	0	Q1/2017	Q1/2020	Q2/2020	Q4/2022	Q1/2023	2026
Federal Requirements Plan Act No. 5	**Wolmirstedt – Isar (SuedOstLink)**										
	Wolmirstedt – Raum Naumburg/ Eisenberg	50Hertz, TenneT	192	0	0	Q1/2017	Q1/2020	Q2/2020	Q3/2022	Q4/2022	2025
	Raum Naumburg/Eisenberg – Raum Hof	50Hertz, TenneT	83	0	0	Q2/2017	Q4/2019	Q1/2020	Q2/2022	Q3/2022	2025
	Raum Hof – Raum Schwandorf	50Hertz, TenneT	136	0	0	Q1/2017	Q4/2019	Q1/2020	Q2/2022	Q3/2022	2025
	Raum Schwandorf – Isar	50Hertz, TenneT	126	0	0	Q2/2017	Q4/2019	Q1/2020	Q3/2022	Q4/2022	2025
	AC projects										
Federal Requirements Plan Act No. 10	**Wolmirstedt – Wahle**										
	Wolmirstedt – Länder border	50Hertz	48	0	0	Q4/2019*	Q4/2019**	Q4/2020***	Q1/2021****	Q2/2021	Q4/2022
	Länder border – Wahle	TenneT	63			Q4/2019*	Q4/2019**	Q2/2020	Q1/2023	Q2/2023	Q4/2025
	Wolmirstedt – Länder border	50Hertz	48	0	0	Q4/2020	Q4/2022	Q1/2023	Q2/2025	Q3/2025	Q4/2027
Federal Requirements Plan Act No. 11	**Bertikow – Pasewalk**										
	Bertikow – Pasewalk	50Hertz	32	0	0	Q3/2014	Q2/2018	Q1/2019	Q3/2021	Q4/2021	Q4/2023
Federal Requirements Plan Act No. 12	**Vieselbach – PSW – Mecklar**										
	Vieselbach – PSW	50Hertz	27	0	0	Q1/2021	Q2/2023	Q3/2023	Q3/2025	Q4/2025	Q4/2027
	PSW – Mecklar	TenneT	108	0	0	Q3/2020	Q4/2022	Q1/2023	Q1/2025	Q2/2025	Q4/2026
Federal Requirements Plan Act No. 13	**Pulgar – Vieselbach**										
	Pulgar – Geußnitz	50Hertz	27	0	0	Q3/2017	Q3/2018	Q1/2019***	Q2/2019****	Q3/2019	Q4/2023
	Geußnitz – Bad Sulza	50Hertz	41	0	0	Q4/2017	Q3/2019	Q1/2020	Q1/2022	Q2/2022	Q4/2023
	Bad Sulza – Vieselbach	50Hertz	37	0	0	Q4/2017	Q4/2019	Q2/2020	Q2/2022	Q3/2022	Q4/2023
Federal Requirements Plan Act No. 14	**Röhrsdorf – Weida – Remptendorf**										
	Röhrsdorf – Weida	50Hertz	60	0	0	Q4/2016	Q4/2019	Q1/2020	Q2/2022	Q3/2022	Q4/2023
	Weida – Remptendorf	50Hertz	43	0	0	Q3/2016	Q4/2018	Q4/2019	Q4/2021	Q1/2022	Q2/2023

Project (BNetzA)		Project manager (PM)	Length of grid (km)			Auditing milestones (quarter)					
			planned	approved	constructed	Submission of complete application for Federal Sectoral Planning	Federal Sectoral Planning decision	Submission of complete application for planning approval procedure	Planning approval decision	Start of construction	Commissioning
						Responsible party					
						PM	BNetzA	PM	BNetzA	PM	PM
Federal Requirements Plan Act No. 17	**Mecklar – Grafenrheinfeld**										
	Mecklar – Grafenrheinfeld	TenneT	130	0	0	Q4/2021	Q3/2024	Q4/2024	Q4/2027	Q1/2028	Q4/2031
Federal Requirements Plan Act No. 19	**Urberach – Pfungstadt – Weinheim – G380–Altlußheim – Daxlanden**										
	Urberach – Pfungstadt – Weinheim	Amprion	66	0	0	Q1/2017	Q3/2019	Q1/2020	Q1/2022	Q2/2022	Q4/2024
	Altlußheim – Daxlanden	TransnetBW	42	0	0	Q4/2017	Q3/2020	Q4/2020	Q1/2023	Q2/2023	Q3/2028
Federal Requirements Plan Act No. 20	**Grafenrheinfeld – Kupferzell – Großgartach**										
	Grafenrheinfeld – Rittershausen	TenneT	50	0	0	n/a*****	n/a*****	Q1/2020	Q2/2022	Q3/2022	Q4/2024
	Rittershausen – Kupferzell	TransnetBW	60	0	0	n/a*****	n/a*****	Q1/2020	Q4/2021	Q1/2022	Q4/2024
	Kupferzell – Großgartach	TransnetBW	48	0	0	Q4/2016	Q4/2019	Q1/2020	Q4/2021	Q1/2022	Q2/2025
Federal Requirements Plan Act No. 25	**Wullenstetten point – Niederwangen point**										
	Wullenstetten point – Niederwangen point	Amprion	88	0	0	Q2/2018	Q4/2018	Q2/2019	Q2/2021	Q3/2021	Q3/2023
Federal Requirements Plan Act No. 40	**Neuravensburg point – national border (AT)**										
	Neuravensburg point – National border point (AT)	Amprion	7	0	0	Q4/2020	Q3/2022	Q4/2022	Q4/2024	Q1/2025	Q4/2025
Federal Requirements Plan Act No. 44	**Lauchstädt – Wolkramshausen – Vieselbach**										
	Lauchstädt – Wolkramshausen	50Hertz	90	0	0	Q3/2020	Q4/2022	Q1/2023	Q2/2025	Q3/2025	Q3/2028
	Wolkramshausen – Vieselbach	50Hertz	65	0	0	Q1/2020	Q2/2022	Q3/2022	Q3/2024	Q4/2024	Q4/2027

*Application to dispense with Federal Sectoral Planning

**Decision to dispense with Federal Sectoral Planning

***Application for notification procedure

****Decision on notification procedure

***** N/a due to designation in Federal Requirements Plan Act

Projects (Länder)		Project manager (PM)	Length of grid (km)			Auditing milestones (quarter, responsible party)					
			planned	approved	constructed	Submission of complete application for spatial planning procedure	Decision in spatial planning procedure	Submission of complete application for planning approval procedure	Planning approval decision	Start of construction	Commissioning
Brandenburg (BB)						Responsible party					
						PM	Länder authority	PM	Länder authority	PM	PM
Power Grid Expansion Act No. 3	**Neuenhagen – Bertikow/Vierraden – Krajnik (PL)**										
	Neuenhagen – Bertikow	50Hertz	115	115	0	Q4/2006	Q4/2007	Q4/2017	Q3/2019	Q4/2019	Q4/2022
	Vierraden – Krajnik (PL)	50Hertz	3	3	3	n.A	n.A	Q1/2012	Q2/2012	Q1/2013	2013
	Vierraden transformer connection	50Hertz	5	5	0	n.A	n.A	Q1/2012	Q2/2013	Q4/2020	Q4/2022
Power Grid Expansion Act No. 11	**Neuenhagen – Wustermark (Nordring Berlin)**										
	Wustermark – point west of Birkenwerder (Mast 189)	50Hertz	29	29	29	Q4/2008	Q3/2011	Q3/2012	Q3/2013	Q4/ 2015	Q4/2021
	Point west of Birkenwerder (Mast 189) – Neuenhagen	50Hertz	51	0	0	n.A.	Q4/2015	Q4/2017	Q2/2019	Q4/2019	Q4/2021
Power Grid Expansion Act No. 12	**Eisenhüttenstadt – Baczyna (PL)**										
	Eisenhüttenstadt – Baczyna (PL)	50Hertz	8	0	0	n.A	n.A	n.A	n.A	n.A	delayed until 2030
Federal Requirements Plan Act No. 39	**Güstrow – Parchim Süd – Perleberg – Stendal West – Wolmirsted**										
	Länder border (MV/BB) – Perleberg	50Hertz	18	0	0	n.A	n.A	Q1/2019	Q4/2020	Q1/2021	Q4/2022
	Perleberg – Länder border (BB/ST)	50Hertz	16	0	0	n.A	n.A	Q1/2014	Q2/2021	Q3/2021	Q3/2023
Baden-Württemberg (BW)						Responsible party					
						PM	Länder authority	PM	Länder authority	PM	PM
Power Grid Expansion Act No. 23	**Neckarwestheim – Mühlhausen**										
	Neckarwestheim – Mühlhausen	TransnetBW	25	25	25	deleted	deleted	completed	completed	completed	completed
Federal Requirements Plan Act No. 21	**Daxlanden – Kuppenheim – Bühl – Eichstetten**										
	Daxlanden – district border	TransnetBW	45	0	0	deleted	deleted	Q2/2019	Q3/2020	Q2/2021	Q3/2028
	District border – Weier transformer	TransnetBW	23	0	0	deleted	deleted	Q1/2019	Q2/2020	Q2/2023	Q3/2028
	Weier point – Neuried/ Meißenheim municipal border	TransnetBW	15	0	0	Q1/2019	Q3/2019	Q4/2020	Q2/2022	Q2/2026	Q3/2028

Projects (Länder)		Project manager (PM)	Length of grid (km)			Auditing milestones (quarter, responsible party)					
			planned	approved	constructed	Submission of complete application for spatial planning procedure	Decision in spatial planning procedure	Submission of complete application for planning approval procedure	Planning approval decision	Start of construction	Commissioning
	Neuried/Meißenheim municipal border – Eichstetten transformer	TransnetBW	36	0	0	deleted	deleted	Q4/2019	Q2/2021	Q4/2021	Q3/2028
Federal Requirements Plan Act No. 24	**Rommelsbach point – Herbertingen**										
	Rommelsbach point – Herbertingen	Amprion	61	61	0	deleted	deleted	Q4/2016	Q1/2018	Q4/2018	Q2/2021
Federal Requirements Plan Act No. 35	**Birkenfeld – Mast 115A**										
	Birkenfeld – Mast 115A	TransnetBW	13	0	0	completed	completed	Q1/2019	Q1/2020	Q2/2020	Q4/2021
Bavaria (BY)						**Responsible party**					
						PM	**Länder authority**	**PM**	**Länder authority**	**PM**	**PM**
Power Grid Expansion Act No. 4	**Lauchstädt – Redwitz (Thuringia electricity bridge)**										
	Länder border TH/BY – Redwitz	TenneT	31	31	31	Q3/2007 Supplementary procedure: Q2/2012	Q2/2008 Supplementary procedure: Q3/2012	Q3/2013	Q1/2015	Q1/2015	Q4/2015
Power Grid Expansion Act No. 10	**Redwitz – Grafenrheinfeld**										
	Redwitz – Ofr/Ufr border	TenneT	52	52	52	deleted	deleted	Q3/2013	Q2/2015	Q2/2015	Q3/2015
	Ofr/Ufr border – Grafenrheinfeld	TenneT	43	43	43	deleted	deleted	Q3/2013	Q1/2014	Q1/2014	Q2/2014
Federal Requirements Plan Act No. 18	**Redwitz – Mechlenreuth – Etzenricht – Schwandorf (Ostbayernring)**										
	Schwandorf transformer – Etzenricht transformer	TenneT	43	0	0	Q4/2015	Q4/2016	Q2/2018	Q1/2021	Q3/2021	Q3/2024
	Mechlenreuth transformer – Oberpfalz/Oberfranken (Süd) border	TenneT	52	0	0	Q4/2015	Q4/2016	Q4/2018	Q3/2021	Q1/2022	Q3/2025
	Mechlenreuth transformer – Oberpfalz/Oberfranken (Nord) border	TenneT	37	0	0	Q4/2015	Q4/2016	Q4/2018	Q3/2021	Q1/2022	Q3/2025
	Mechlenreuth transformer – Redwitz transformer	TenneT	50	0	0	Q4/2015	Q4/2016	Q2/2018	Q1/2021	Q3/2021	Q3/2024
Federal Requirements Plan Act No. 32	**Federal border (AT) – Altheim with Matzendorf junction – Simbach and Simhar junction – Pirach, national border (AT) – Pleinting**										
	National border (AT) – Simbach	TenneT	13	0	0	Q2/2011	Q4/2012	Q3/2016	Q1/2020	Q4/2020	Q3/2022
	Matzenhof – Adlkofen	TenneT	66	0	0	Q2/2015	Q2/2016	Q1/2018	Q1/2021	Q3/2021	Q4/2023
	Adlkofen – Altheim	TenneT	7	0	0	Q1/2014	Q4/2015	Q1/2014	Q4/2019	Q3/2020	Q4/2023

Projects (Länder)		Project manager (PM)	Length of grid (km)			Auditing milestones (quarter, responsible party)					
			planned	approved	constructed	Submission of complete application for spatial planning procedure	Decision in spatial planning procedure	Submission of complete application for planning approval procedure	Planning approval decision	Start of construction	Commissioning
	Simhar junction – Pirach	TenneT	27	0	0	Q4/2019	Q3/2020	Q2/2022	Q1/2025	Q2/2025	Q3/2027
	Pleinting – national border (AT)	TenneT	43	0	0	Q2/2020	Q1/2021	Q4/2022	Q3/2025	Q4/2025	Q2/2028
Federal Requirements Plan Act No. 41	**Raitersaich – Ludersheim – Sittling – Altheim**										
	Raitersaich – Ludersheim	TenneT	40	0	0	Q1/2021	Q1/2022	Q3/2024	Q4/2025	Q1/2026	Q4/2028
	Ludersheim – Sittling	TenneT	59	0	0	Q1/2021	Q1/2022	Q3/2023	Q4/2024	Q1/2025	Q1/2028
	Sittling – Altheim	TenneT	40	0	0	Q1/2021	Q1/2022	Q2/2023	Q2/2024	Q3/2024	Q4/2026
BBPlG-Nr. 46	**Redwitz – Landesgrenze BY/TH (Tschirn point)**										
	Redwitz – Landesgrenze BY/TH (Tschirn point)	TenneT	38	0	0	deleted	deleted	Q4/2019	Q4/2020	Q1/2021	Q4/2021
Federal Requirements Plan Act No. 47	**Oberbachern – Ottenhofen**										
	Oberbachern – Ottenhofen	TenneT	50	0	0	Q2/2021	Q1/2022	Q3/2023	Q2/2026	Q4/2026	Q3/2029
Hesse (HE)						**Responsible party**					
						PM	**Länder authority**	**PM**	**Länder authority**	**PM**	**PM**
Power Grid Expansion Act No. 6	**Wahle – Mecklar**										
	NI/HE Länder border – Mecklar	TenneT	66	66	0	Spatial planning procedure completed		Planning approval procedure completed	Q1/2018	Q3/2018	Q1/2024**
Power Grid Expansion Act No. 8	**Kriftel – Eschborn**										
	Kriftel – Eschborn	Amprion	10	10	10	Q3/2010	Q3/2010	Q4/2012	Q2/2017	Q2/2017	Q4/2017
Power Grid Expansion Act No. 20	**Dauersberg – Hünfelden**										
	RP/HE Länder border – Limburg	Amprion	28	28	28	before 2000	Q4/2000	Q4/2003	Q1/2006	Q2/2006	Q4/2008
	Limburg – Hünfelden point	Amprion	13	13	13	2000	Q1/2001	Q1/2005	Q1/2007	Q2/2007	Q4/2008
Power Grid Expansion Act No. 21	**Marxheim – Kelsterbach**										
	Marxheim – Kelsterbach	Amprion	7	7	7	deleted	deleted	Q4/2007	Q4/2008	Q1/2009	Q4/2009
Federal	**Borken – Mecklar**										

Projects (Länder)		Project manager (PM)	Length of grid (km)			Auditing milestones (quarter, responsible party)					
			planned	approved	constructed	Submission of complete application for spatial planning procedure	Decision in spatial planning procedure	Submission of complete application for planning approval procedure	Planning approval decision	Start of construction	Commissioning
Requirements Plan Act No. 43	Borken – Mecklar	TenneT	41	0	0	Spatial planning not required	Spatial planning not required	Q2/2021	Q2/2022	Q3/2022	Q3/2023
Federal Requirements Plan Act No. 45	**Borken – Twistetal**										
	Borken – Twistetal	TenneT	43	0	0	Spatial planning not required	Spatial planning not required	Q2/2021	Q2/2022	Q3/2022	Q3/2023
Mecklenburg-Western Pomerania (MV)						**Responsible party**					
						PM	**Länder authority**	**PM**	**Länder authority**	**PM**	**PM**
Power Grid Expansion Act No. 9	**Hamburg/Krümmel – Schwerin**										
	Görries – MV/SH Länder border	50Hertz	48.5	48.5	48.5	Q2/2005	Q4/2005	Q2/2007	Q3/2009	Q3/2009	2012
Federal Requirements Plan Act No. 28	**Parchim Süd junction – Neuburg**										
	Parchim Süd junction – Neuburg	50Hertz	1	1	1	n.A	n.A	n.A	n.A	Q1/2014	2014
Federal Requirements Plan Act No. 39	**Güstrow – Parchim Süd – Perleberg – Stendal West – Wolmirstedt**										
	Güstrow – Parchim Süd	50Hertz	50	0	0	n.A	n.A	Q4/2019	Q2/2021	Q1/2022	Q3/2023
	Parchim Süd – Länder border (MV/BB)	50Hertz	21	0	0	n.A	n.A	Q1/2019	Q2/2020	Q1/2021	Q4/2022
Lower Saxony (NI)						**Responsible party**					
						PM	**Länder authority**	**PM**	**Länder authority**	**PM**	**PM**
Power Grid Expansion Act No. 1	**Kassø (DK) – Dollern (NI) (central axis)**										
	Dollern – Haseldorf/Elbe crossing	TenneT	10	10	0	deleted	deleted	Q2/2015	Q2/2016	Q3/2018	Q2/2019
Power Grid Expansion Act No. 2	**Ganderkesee – Wehrendorf**										
	Wehrendorf – St. Hülfe (NI part)	Amprion	30	30	3	deleted	deleted	Q2/2010	Q1/2016	Q3/2017	Q1/2021
	St. Hülfe – Ganderkesee	TenneT	61	61	0	Q3/2004	Q4/2006	Q2/2012	Q1/2016	Q4/2017	Q1/2023
Power Grid Expansion Act No. 5	**Diele – Niederrhein**										
	Haddorfer See point – Meppen point	Amprion	57	0	0	Q2/2011	Q1/2013	Q3/2017	Q3/2019	Q4/2019	Q2/2022
	Meppen point – Dörpen/West	TenneT	31	31	7	Q2/2011	Q1/2013	Q4/2014	Q4/2017	Q4/2017	Q2/2020
Power Grid	**Wahle – Mecklar**										

Projects (Länder)		Project manager (PM)	Length of grid (km)			Auditing milestones (quarter, responsible party)					
			planned	approved	constructed	Submission of complete application for spatial planning procedure	Decision in spatial planning procedure	Submission of complete application for planning approval procedure	Planning approval decision	Start of construction	Commissioning
Expansion Act No. 6	Wahle – Lamspringe	TenneT	58	0	0	Q2/2010	Q3/2011	Q3/2013	Q2/2019	Q1/2020	Q4/2022
	Lamspringe – Hardegsen	TenneT	50	50	0	Q2/2010	Q3/2011	Q2/2014	Q4/2017	Q1/2018	Q4/2022
	Hardegsen – NI/HE Länder border	TenneT	47	0	0	Q2/2010	Q3/2011	Q1/2015	Q3/2019	Q1/2020	Q1/2024
Power Grid Expansion Act No. 16	**Wehrendorf – Gütersloh**										
	Wehrendorf – Lüstringen	Amprion	21	0	0	Q2/2019	Q4/2019	Q2/2021	Q4/2022	Q1/2023	Q4/2026
	Lüstringen – NW/NI Länder border	Amprion	21	0	0	Q3/2014	Q3/2019	Q1/2021	Q3/2022	Q4/2022	Q4/2026
Power Grid Expansion Act No. 18	**Lüstringen – Westerkappeln**										
	Lüstringen – Gaste point	Amprion	14	14	14	deleted	deleted	Q3/2014	Q4/2016	Q1/2017	Q4/2017
Federal Requirements Plan Act No. 6	**Conneforde – Merzen**										
	Conneforde – Cloppenburg	TenneT	77	0	0	Q2/2017	Q4/2018	Q2/2020	Q4/2021	Q1/2023	Q2/2026
	Cloppenburg – balancing zone border	TenneT	21	0	0	Q4/2017	Q2/2019	Q2/2020	Q4/2021	Q1/2023	Q2/2026
	Balancing zone border – Merzen	Amprion	30	0	0	Q4/2017	Q2/2019	Q1/2021	Q3/2022	Q4/2022	Q2/2026
Federal Requirements Plan Act No. 7	**Stade (previously: Dollern) – Landesbergen**										
	Stade – Sottrum	TenneT			0						
	Stade – Dollern	TenneT	10	10	0	deleted	deleted	Q3/2016	Q2/2018	Q3/2018	Q2/2021
	Dollern – Sottrum	TenneT	60	0	0	Q2/2017	Q2/2018	Q4/2019	Q2/2021	Q3/2022	Q2/2026
	Sottrum – (Wechold) Mehringen	TenneT	42	0	0	Q2/2017	Q2/2018	Q2/2020	Q4/2021	Q2/2023	Q4/2026
	Mehringen (Wechold) – Landesbergen	TenneT	45	0	0	Q2/2017	Q2/2018	Q1/2020	Q3/2021	Q1/2023	Q2/2026
Federal Requirements Plan Act No. 31	**Wilhelmshaven – Conneforde**										
	Wilhelmshaven – Conneforde	TenneT	30	30	0	deleted	deleted	Q3/2016	Q2/2018	Q4/2018	Q4/2020
Federal Requirements Plan Act No. 34	**Emden Ost – Conneforde**										
	Emden Ost – Conneforde	TenneT	61	0	0	(Q1/2014)	(Q2/2015)	Q4/2017	Q2/2019	Q1/2021	Q2/2023
Federal Requirements Plan Act No. 37	**Emden – Halbemond**										
	Emden/Ost – Halbemond	TenneT	30	0	0	Clarification in NDP 2030 V19	undecided	undecided	undecided	undecided	undecided

Projects (Länder)		Project manager (PM)	Length of grid (km)			Auditing milestones (quarter, responsible party)					
			planned	approved	constructed	Submission of complete application for spatial planning procedure	Decision in spatial planning procedure	Submission of complete application for planning approval procedure	Planning approval decision	Start of construction	Commissioning
Federal Requirements Plan Act No. 38	**Dollern – Elsfleth West**										
	Dollern – Elsfleth West	TenneT	100	0	0	Clarification in NDP 2030 V19	undecided	undecided	undecided	undecided	undecided
North Rhine-Westphalia (NW)						**Responsible party**					
						PM	**Länder authority**	**PM**	**Länder authority**	**PM**	**PM**
Power Grid Expansion Act No. 2	**Ganderkesee – Wehrendorf**										
	Wehrendorf – St. Hülfe (NW part)	Amprion	3	3	0	Q1/2007	Q1/2007	Q2/2011	Q2/2016	Q2/2019	Q1/2021
Power Grid Expansion Act No. 5	**Diele – Niederrhein**										
	Wesel – Bredenwinkel point	Amprion	15	15	15	Q3/2006	Q2/2008	Q1/2012	Q4/2014	Q4/2014	Q2/2016
	Bredenwinkel point – Borken Süd point	Amprion	11	11	11	Q4/2007	Q2/2008	Q1/2012	Q1/2014	Q1/2014	Q2/2016
	Borken Süd point – Nordvelen point	Amprion	13	13	13	Q4/2007	Q2/2008	Q4/2014	Q1/2016	Q1/2016	Q4/2018
	Nordvelen point – Legden Süd point	Amprion	15	0	0	Q4/2007	Q2/2008	Q1/2015	Q2/2020	Q3/2020	Q2/2022
	Legden Süd point – Asbeck point	Amprion	5	0	0	Q4/2007	Q2/2008	Q4/2018	Q4/2020	Q1/2021	Q4/2023
	Haddorfer See point – Wettringen point – Asbeck point	Amprion	34	0	0	Q4/2007	Q2/2008	Q2/2018	Q1/2020	Q2/2020	Q1/2022
Power Grid Expansion Act No. 7	**Bergkamen – Gersteinwerk**										
	Bergkamen – Gersteinwerk	Amprion	8	8	8	deleted	deleted	Q3/2009	Q4/2009 (Sections 43 f Energy Industry Act)	Q4/2009	Q4/2009
Power Grid Expansion Act No. 13	**Niederrhein/Wesel – national border NL**										
	Wesel – Wittenhorst point	Amprion	18	18	18	Q3/2009	Q3/2011	Q1/2014	Q4/2016	Q4/2016	Q3/2018
	Wittenhorst point – national border NL	Amprion	12	12	12	Q4/2009	Q3/2011	Q1/2014	Q4/2015	Q1/2016	Q3/2018
Power Grid Expansion Act No. 14	**Niederrhein – Utfort – Osterath**										
	Wesel – Utfort	Amprion	21	0	0	Q2/2011	Q3/2012 and Q3/2018	Q4/2019	Q3/2022	Q4/2022	Q4/2024
	Utfort – St. Tönis point	Amprion	14	0	0	Q1/2009	Q1/2009 and Q3/2018	Q4/2019	Q3/2022	Q4/2022	Q4/2024

Projects (Länder)		Project manager (PM)	Length of grid (km)			Auditing milestones (quarter, responsible party)					
			planned	approved	constructed	Submission of complete application for spatial planning procedure	Decision in spatial planning procedure	Submission of complete application for planning approval procedure	Planning approval decision	Start of construction	Commissioning
	Fellerhöfe point – St. Tönis point	Amprion	7	7	0	Q3/2006	Q4/2006	Q3/2010	Q4/2012 and Q2/2019	Q2/2013	Q3/2020
Power Grid Expansion Act No. 15	**Osterath – Weißenthurm**										
	Osterath – Gohrpunkt	Amprion	20	20	0	Q3/2008	Q4/2008	Q2/2012	Q1/2018	Q2/2019	Q2/2021
	Gohrpunkt – Rommerskirchen	Amprion	10	10	0	Q3/2008	Q4/2008	Q2/2012	Q1/2018	Q4/2018	Q4/2019
	Rommerskirchen – Sechtem	Amprion	38	38	13	Q3/2008	Q4/2008	Q1/2012	Q4/2016 and Q4/2019	Q1/2017	Q4/2022
	Sechtem – Länder border NW/RP	Amprion	29	29	29	Q3/2006	Q4/2006	Q3/2010	Q1/2012	Q3/2012	Q4/2013
Power Grid Expansion Act No. 16	**Wehrendorf – Gütersloh**										
	Länder border NI/NW – Hesseln	Amprion	8	0	0	Q4/2011	Q1/2012	Q3/2020	Q3/2022	Q3/2023	Q4/2026
	Hesseln – Gütersloh	Amprion	20	0	0	Q4/2011	Q1/2012	Q4/2013	Q2/2019	Q4/2019	Q3/2021
Power Grid Expansion Act No. 17	**Gütersloh – Bechterdissen**										
	Gütersloh – Friedrichsdorf point	Amprion	12	12	12	Q3/2002	Q2/2003	Q2/2008	Q1/2010	Q1/2011	Q2/2012
	Friedrichsdorf point – Bielefeld Ost – Bechterdissen	Amprion	19	19	19	Q3/2002	Q2/2003	Q2/2011	Q1/2013	Q4/2013	Q4/2014
Power Grid Expansion Act No. 18	**Lüstringen – Westerkappeln**										
	Gaste point – Hambüren point	Amprion	4	4	4	deleted	Q1/2002	Q4/2006	Q4/2008	Q1/2009	Q4/2009
	Hambüren point – Westerkappeln	Amprion	2	2	2	deleted	deleted	Q4/2013	Q4/2013	Q2/2014	Q4/2014
Power Grid Expansion Act No. 19	**Kruckel – Dauersberg**										
	Kruckel – Garenfeld	Amprion	11	11	0	Q1/2011	Q4/2011	Q2/2015	Q3/2018	Q1/2019	Q4/2021
	Garenfeld – Ochsenkopf point	Amprion	10	0	0	Q1/2011	Q4/2011	Q4/2019	Q4/2021	Q4/2021	Q3/2023
	Ochsenkopf point – Attendorn point	Amprion	46	0	0	Q1/2011	Q4/2011	Q4/2018	Q4/2020	Q4/2020	Q4/2023
	Attendorn point – Länder border NW/RP	Amprion	42	0	0	Q1/2011	Q4/2011	Q4/2017	Q3/2020	Q2/2022	Q4/2025
	Länder border NW/RP – Eiserfeld	Amprion	1	1	0	Q1/2011	Q4/2011// Q1/2012	Q3/2013	Q3/2015	Q3/2017	Q2/2022
Federal Requirements Plan Act No. 9	**Hamm–Uentrop – Kruckel**										
	Hamm–Uentrop – Kruckel	Amprion	60	60	60	deleted	deleted	Q1/2016	Q1/2016	Q3/2016	Q4/2017

Projects (Länder)		Project manager (PM)	Length of grid (km)			Auditing milestones (quarter, responsible party)					
			planned	approved	constructed	Submission of complete application for spatial planning procedure	Decision in spatial planning procedure	Submission of complete application for planning approval procedure	Planning approval decision	Start of construction	Commissioning
Federal Requirements Plan Act No. 30	**Oberzier – national border (BE) (Alegro)**										
	Oberzier – national border (BE)	Amprion	40	0	0	deleted	deleted	Q2/2017	Q4/2018	Q4/2018	Q4/2020
Rhineland-Palatinate (RP)						**Responsible party**					
						PM	**Länder authority**	**PM**	**Länder authority**	**PM**	**PM**
Power Grid Expansion Act No. 15	**Osterath – Weißenthurm**										
	Länder border NW/RP – Neuenahr point	Amprion	3	3	3	Q3/2006	Q4/2006	Q3/2010	Q2/2011	Q3/2012	Q4/2013
	Neuenahr point – Weißenthurm	Amprion	36	36	36	deleted	deleted	Q1/2009	Q4/2009	Q1/2010	Q4/2011
Power Grid Expansion Act No. 19	**Kruckel – Dauersberg**										
	Länder border NW/RP – Dauersberg	Amprion	16	16	0	Q2/2011	Q1/2012	Q3/2013	Q2/2015	Q1/2017	Q2/2022
Power Grid Expansion Act No. 20	**Dauersberg – Hünfelden**										
	Dauersberg – Länder border RP/HE	Amprion	19	19	19	2000	Q2/2002	Q2/2007	Q3/2008	Q3/2011	Q4/2012
Federal Requirements Plan Act No. 15	**Metternich point – Niederstedem**										
	Metternich point – Pillig point	Amprion	19	19	19	deleted	deleted	Q3/2014	Q3/2016	Q3/2016	Q4/2018
	Pillig point – Wengerohr	Amprion	47	0	0	Q3/2014	Q2/2015	Q2/2019	Q3/2021	Q3/2021	Q2/2024
	Wengerohr – Niederstedem	Amprion	39	0	0	Q3/2016	Q3/2017	Q2/2020	Q1/2022	Q1/2022	Q4/2023
Schleswig-Holstein (SH)						**Responsible party**					
						PM	**Länder authority**	**PM**	**Länder authority**	**PM**	**PM**
Power Grid Expansion Act No. 1	**"Kassø (DK) – Dollern (NI) (central axis)"**										
	Haseldorf/Elbe crossing – Hamburg/Nord	TenneT	35	35	30	deleted	deleted	completed	Q2/2016	Q1/2018	Q2/2019
	Hamburg/Nord – Audorf	TenneT	70	70	70	deleted	deleted	completed	Q1/2015	Q1/2015	Q4/2017
	Audorf – Flensburg–Handewitt	TenneT	70	70	0	deleted	deleted	completed	Q1/2018	Q2/2018	Q3/2020
	Flensburg–Handewitt – Kassø (national border)	TenneT	10	0	0	deleted	deleted	Q2/2019	Q3/2019	Q3/2019	Q3/2020
Power Grid	**Hamburg/Krümmel – Schwerin**										

Projects (Länder)		Project manager (PM)	Length of grid (km)			Auditing milestones (quarter, responsible party)					
			planned	approved	constructed	Submission of complete application for spatial planning procedure	Decision in spatial planning procedure	Submission of complete application for planning approval procedure	Planning approval decision	Start of construction	Commissioning
Expansion Act No. 9	Länder border MV/SH – Krümmel	50Hertz	16.5	16.5	16.5	deleted	deleted	completed	completed	completed	2012
Federal Requirements Plan Act No. 8	**Brunsbüttel – Barlt – Heide– Husum – Niebüll – national border (DK) (West Coast Line)**										
	Süderdonn (previously Barlt) – Heide	TenneT	23	23	8	deleted	deleted	Q4/2015	Q2/2016	Q4/2016	Q4/2019
	Brunsbüttel – Süderdonn (previously Barlt)	TenneT	14	14	14	deleted	deleted	Q4/2014	Q2/2015	Q2/2015	Q4/2016
	Heide – Husum	TenneT	46	46	0	deleted	deleted	Q3/2014	Q1/2017	Q3/2018	Q3/2021
	Husum – Klixbüll	TenneT	38	0	0	deleted	deleted	Q4/2019	Q1/2020	Q2/2020	Q3/2022
	Klixbüll – national border (DK)	TenneT	16	0	0	deleted	deleted	Q1/2020	Q3/2021	Q4/2021	Q4/2023
Federal Requirements Plan Act No. 33	**SH – southern Norway (NO) (NORD.LINK)**										
	Wilster – Büsum	TenneT	54	54	0	deleted	deleted	completed	completed	Q2/2016	Q3/2021
	Büsum – coastal sea border	TenneT	64	64	62	deleted	deleted	completed	Q2/2014	Q2/2018	Q3/2021
Federal Requirements Plan Act No. 42	**“Kreis Segeberg – Lübeck – Siems – Göhl (East Coast Line)”**										
	Kreis Segeberg – Hansestadt Lübeck	TenneT	55	0	0	deleted	deleted	Q1/2020	Q1/2023*	Q3/2023*	Q4/2025*
	Hansestadt Lübeck – Siems	TenneT	12	0	0	deleted	deleted	Q4/2020*	Q4/2023*	Q2/2024*	Q1/2026*
	Hansestadt Lübeck – Göhl	TenneT	65	0	0	deleted	deleted	Q2/2021*	Q4/2024*	Q2/2025*	Q2/2027*
Saxony (SN)						**Responsible party**					
						PM	**Länder authority**	**PM**	**Länder authority**	**PM**	**PM**
Federal Requirements Plan Act No. 26	**Bärwalde – Schmölln**										
	Bärwalde – Schmölln	50Hertz	46	46	46	deleted	deleted	completed	completed	completed	completed 2014
Saxony-Anhalt (ST)						**Responsible party**					
						PM	**Länder authority**	**PM**	**Länder authority**	**PM**	**PM**
Power Grid Expansion Act No. 4	**Lauchstädt – Redwitz (Thuringia electricity bridge)**										
	Lauchstädt – Länder border ST/TH	50Hertz	43	43	43	Q2/2004	Q4/2005	Q1/2007	Q4/2007	n.A	2008
Federal Requirements Plan Act No. 27	**Welsleben junction – Förderstedt**										
	Welsleben junction – Förderstedt	50Hertz	12	12	12	n.A	Q2/2011	n.A	Q1/2013	Q2/2013	2015

Projects (Länder)		Project manager (PM)	Length of grid (km)			Auditing milestones (quarter, responsible party)					
			planned	approved	constructed	Submission of complete application for spatial planning procedure	Decision in spatial planning procedure	Submission of complete application for planning approval procedure	Planning approval decision	Start of construction	Commissioning
Federal Requirements Plan Act No. 39	**Güstrow – Parchim Süd – Perleberg – Stendal West – Wolmirstedt**										
	Länder border (BB/ST) – Stendal West	50Hertz	47	0	0	n.A	n.A	Q3/2014	Q4/2020	Q2/2021	Q3/2023
	Stendal West – Wolmirstedt	50Hertz	37	37	0	n.A	n.A	Q1/2015	Q1/2018	Q1/2019	Q4/2020
Thuringia (TH)						**Responsible party**					
						PM	**Länder authority**	**PM**	**Länder authority**	**PM**	**PM**
Power Grid Expansion Act No. 4	**Lauchstädt – Redwitz (Thuringia electricity bridge)**										
	Länder border ST/TH – Vieselbach	50Hertz	33	33	33	Q3/2004	Q1/2006	Q1/2007	Q4/2007	n.A	2008
	Vieselbach – Altenfeld	50Hertz	57	57	57	Q2/2006	Q1/2007	Q1/2009	Q1/2012	Q1/2012	2015
	Altenfeld – Länder border TH/BY	50Hertz	26	26	26	Q1/2010	Q1/2011	Q3/2013	Q1/2015	Q1/2015	2017

*Provisional timeline for Federal Requirements Plan Act No. 42 (East Coast Line); faster roll-out desired

** Operationally ready in Q4/2022; commissioning together with commissioning of Power Grid Expansion Act No. 6, Section C (Q1/2024)