



Bundesnetzagentur

Establishing requirements 2019-2030

Fact Sheet on the Strategic Environmental Assessment based on the 2nd draft of the electricity NDP

MARCH 2020



Summary

The expansion of the extra-high voltage transmission network is of decisive importance for the success of the energy transition. The German Energy Industry Act (EnWG) was amended in 2011 with the aim of making progress on the necessary expansion of the network as fast and efficient as possible. A multi-stage process is used to find out where and to what extent the extra-high voltage network needs to be reinforced and expanded. The first such process was carried out in 2012 and resulted in the Federal Requirements Plan Act (BBPlG), which entered into force in mid-July 2013. In December 2015, the annual network development planning process was changed to become a planning period of two years. There were no changes as regards the process of establishing requirements or involving the public. In the calendar years in which a network development plan (NDP) does not have to be presented, the transmission system operators (TSOs) must submit an implementation report providing details of the progress of the most recently confirmed NDP¹.

A key part of the process, in which the authorities and the public are involved, is to identify, describe and evaluate the likely significant environmental effects of the necessary network expansion in a Strategic Environmental Assessment (SEA). This year's procedure focuses on establishing requirements for the target years 2019 to 2030. The results of the SEA are documented in the environmental report.

1.1 Background: what does the SEA include?

What is the process of establishing requirements?

In the first step, the likely development of the energy industry is laid down in the scenario framework as a basis of the network development planning. It has been used to identify the necessary network expansion each year since 2012 for the mainland in the network development plan (NDP) and since 2013 for coastal waters in the offshore network development plan (O-NDP). The four German TSOs (TenneT TSO GmbH, Amprion GmbH, 50Hertz Transmission GmbH and TransnetBW GmbH) draw up the NDP jointly and the Bundesnetzagentur checks and confirms it. In 2018, the contents of the O-NDP were transferred to the site development plan, which is drawn up by the Federal Maritime and Hydrographic Agency (BSH), and to the NDP, so as of 2019 the TSOs no longer have to produce an O-NDP. The process of identifying requirements is intended to

ensure that only those projects that are really necessary for the energy industry and have been examined for their environmental impact are included in the Federal Requirements Plan. As of 2019, this process is no longer carried out annually but has been changed to a two-year process. On the basis of the amended law, the Bundesnetzagentur now provides the federal government with the plan at least every four years to act as a draft for the Federal Requirements Plan.

What is the purpose of the SEA?

Environmental assessments are intended to ensure that possible effects on the environment, including people, are taken into account prior to or during the implementation of specific projects, plans and programs, such as those pertaining to network expansion in the context of the energy transition. An SEA starts at the planning level and not when the implementation of individual projects has already begun. Potential effects resulting from the expansion of the extra-high voltage transmission network should therefore be identified while preparing the Federal Requirements Plan. The SEA thus acts as an early warning system.

Are alternatives examined?

Alternatives must be considered in an SEA in order to effectively protect the environment. However, only "reasonable" alternatives will be reviewed – meaning they are feasible at a reasonable cost and largely support the achievement of the plan's objectives. Which alternative is ultimately included in the Federal Requirements Plan also depends on other aspects, such as technical feasibility and economic efficiency. These aspects are not the subject of the environmental assessment. As part of the approval of the Federal Requirements Plan, the legislature is required to consider all relevant aspects in combination and comparison with each other.

What is the environmental report?

The environmental report uses text and graphics to show the potential environmental impact of the network expansion identified and evaluated in the SEA. Only potentially significant, that is, severe, environmental effects on "protected assets" have been assessed. These protected assets are specified in the Environmental Impact Assessment Act (UVPG)² as:

- people, including human health³,
- fauna, flora and biodiversity,
- land, soil, water, air, climatic factors and landscape,

¹ see section 12d EnWG

² section 2(1) UVPG

³ Also referred to below as "protected asset: humans".

- cultural heritage and other material assets,
- interactions between the above protected assets.

What is the status of the current process of establishing requirements?

The scenario framework for the process of establishing requirements for the target years 2019-2030 was approved on 15 June 2018⁴. The TSOs launched a consultation on the first draft of the electricity NDP at the end of February 2019. They submitted the revised plans to the Bundesnetzagentur for evaluation on 15 April 2019⁵. The Bundesnetzagentur confirmed the NDP on 20 December 2019.

In preparation for the Federal Requirements Plan, the Bundesnetzagentur carries out an SEA based on the NDP. The SEA begins with a scoping exercise that includes defining the methodology and level of detail for the assessment. Following input primarily from those public authorities whose environmental and health remits are affected by the NDP, the scope of the assessment was defined and published in April 2019. This is the basis on which the draft environmental report was drawn up and made the subject of a consultation running from 6 August to 16 October 2019 with the participation of specialists and the affected general public. The Bundesnetzagentur also held three information events in Münster, Regensburg and Erfurt alongside the consultation process.

What has changed in comparison to the last environmental report?

A far-reaching overhaul of the SEA methodology for this round of establishing requirements was launched at the beginning of 2018 with expert support provided by a consortium led by Bosch & Partner GmbH.

As a result, changes have been made, including to

- the construction of the assessment areas,
- the identification, description and evaluation of the likely significant environmental impact,
- the reflection of environmental objectives in (additional) site categories,
- the more appropriate consideration of the planned expansion forms (based on the categories of "NOVA"-optimisation before reinforcement before expansion),
- the consideration of the existing impacts/environmental problems in the assessment area,
- the survey of the overall plan and the comparison of alternatives.

The overhaul of the methodology had the following goals:

- to enable a more realistic picture of the likely significant environmental effects to be gained without ignoring the lack of detail at the planning level. For example, circumstances are to be taken into account in the evaluation if it does not seem logical to exclude them (such as the expansion form). However, this is not intended to anticipate the examination of exact routes in the approval procedure.
- to achieve more reliable results for the comparison of alternatives which, along with the technical assessment, are to support the decision-making process. For example, alternatives are to be compared in a more systematic way than was previously the case. A geographic information system is to provide increased support, leading to reproducible, comprehensible results.

The list of site categories has also been slightly expanded since the last environmental report. These criteria are now selected and assigned to following planning levels in as consistent a way as possible.

The methodological changes were triggered by the rising expectations of members of the public and experts as regards weighing up the advantages and disadvantages of alternatives and taking better account of the form of expansion. The intention of the revised methodology is to be able to compare the likely significant environmental effects of alternatives in a systematic way. To take account of the fact that the examination is a general one corresponding to the abstract planning level and is carried out on the basis of existing data, it should be possible to provide lawmakers with an alternative that is preferable from the environmental perspective provided that there is a clear difference between alternatives.

The amended methodology is therefore intended to lead to more reliable conclusions as to the likely environmental impact. Specifically, this includes:

- taking account of the reduced impact of network reinforcement measures (adding or replacing cables)

Up to now, the SEA for the Federal Requirements Plan assumed that all projects would be new builds, even if the NDP stated that they were additional cables, for example.

⁴Bundesnetzagentur (2018)

⁵Bundesnetzagentur (2019)

Responses to the consultation often mentioned that it was important to take better account of the form of expansion (network reinforcement according to the NOVA principle) in order to have a more reliable comparison of alternatives. In the case of adding or replacing cables in existing overhead lines to reinforce the network, it may be assumed that there will be a lower impact than for the construction of a new line, even without looking at the individual interactions. A decision on the form of expansion is still only taken in the approval procedure.

- taking account of existing environmental problems

Existing environmental problems are taken into account to give a more realistic picture of the actual condition of the environment. To do so, the conflict risk is downgraded in a 200-metre-wide area on either side of extra-high voltage overhead lines (≥ 220 kV), Deutsche Bahn (DB) electricity lines, motorways and electrified rail tracks, because the current situation reduces the value/significance of the protection concerns in the area. Exceptions to which this blanket assumption does not apply are taken into account, eg there is no downgrade for settlements or Natura 2000 areas.

- taking account of interactions and the new protected asset "land"

The amended methodology allows interactions between the protected assets to be taken into consideration as required by the UVPG. Increased conflict risks that could arise in the assessment areas due to interactions between protected assets are reflected in the assessment.

The new protected asset, land, is also taken into consideration as set out in the amending Directive 2014/52/EU. Land take is calculated in a general way and presented for each measure and for the overall view of projects in the Federal Requirements Plan.

- changes to the form of assessment areas

The changes to the methodology made it necessary to alter the form of the assessment areas. Previously, an elliptical form was used for all measures. This has been replaced by an assessment area that acts as a buffer in parallel to the straight lines of new build measures or around the routes of existing lines that are due to be reinforced.

What has the Bundesnetzagentur examined for the environmental report?

The likely development of the energy industry as a basis of the network development planning is laid down in the scenario framework using certain assumptions (including proportions of fossil and renewable energies, increase of photovoltaic installations and onshore and offshore wind turbines, and annual consumption). The scenario framework approved by the Bundesnetzagentur for the NDP 2019-2030 sets out a conservative scenario (A 2030), a transformation scenario (B 2030) and an innovation scenario (C 2030).

In the draft for this year's SEA,

- 117 measures (106 onshore and eleven offshore measures) were assessed.

Additionally, the following alternatives were examined:

- Scenarios A 2030, B 2030 and C 2030 as alternative overall plans,
- 36 measure-related alternatives to proposal variants of the NDP.

"Start network measures" were not examined, since these have either been implemented already, are in an ongoing planning approval procedure or their necessity has already been determined in the Power Grid Expansion Act (EnLAG). "Point measures" such as substations were not looked at either. Point measures are not part of the Federal Requirements Plan and are therefore not the subject matter of the SEA and the environmental report. Offshore projects located in the Exclusive Economic Zone (EEZ) of the North and Baltic Seas and originally part of the O-NDP now undergo an SEA as part of the drawing up of the site development plan.

Following the consultation, the SEA focuses on:

- the 95 confirmed measures of the NDP (85 onshore and ten offshore measures), of which 88 measures (84 onshore and four offshore) were included in the provisional project list.

The other seven measures assessed in this SEA are made up of six offshore measures plus measure M690, which was initially confirmed as necessary for energy requirements but will probably not have to be included in the

Federal Requirements Plan because its planning is already at an advanced stage.

Additionally, the following alternatives were examined:

- Scenarios A 2030, B 2030 and C 2030 as alternative overall plans,
- 25 measure-related alternatives to proposal variants of the NDP.

1.2 Methodology: how does the Bundesnetzagentur go about the environmental report?

The focus of the SEA is to examine where and to what extent potential environmental effects are likely and how far they are to be viewed as significant.

In previous years, the methodology for the SEA for the Federal Requirements Plan was largely kept the same, with only some minor adjustments. However, in the current round of establishing requirements it has been overhauled. The aim was to improve the inclusion of existing impacts, to appropriately consider the expansion form (and thus also the NOVA principle) and to further develop the comparison of alternatives.

Changes have been made to:

- the construction of the assessment areas,
- the identification, description and evaluation of the likely significant environmental impact,
- the reflection of environmental objectives in (additional) site categories,
- the more appropriate consideration of the planned expansion forms (NOVA),
- the consideration of the existing impacts/ environmental problems in the assessment area,
- the survey of the overall plan and the comparison of alternatives.

The Bundesnetzagentur's methodology for identifying, describing and evaluating the likely significant environmental impact comprises the establishing of a basis (steps 1-5) and the subsequent derivation of results (steps 6-8). A more detailed explanation of the improved methodology may be found in section 4. The individual methodological steps are outlined in brief below.

The appraisal of possible effects on the protected assets under the UVPG is based on knowledge about the type and intensity of effects of the different types of implementation of the grid expansion (overhead lines, underground cables, submarine cables). These "impact factors" are first described in an abstract manner, without reference to location but with reference to individual protected assets. For example, the general effects of an overhead line on the protected asset of fauna, flora and biodiversity is considered, such as damage to habitats.

A further basis for the assessment of potential environmental impact is applicable environmental objectives, from which the significance of the affected environment may be derived.

Knowledge of the environmental characteristics of the area is needed to assess the likely significant environmental impact. Site categories, such as nature conservation areas, are used to indicate spatial characteristics at the abstract planning level of the Federal Requirements Plan, which evaluates the whole country. The site categories are based on national standardised and site-related data and are derived from the impact factors of the grid expansion and environmental objectives. Potential conflicts that could arise between the environmental objectives and the impact factors relevant to the respective site categories are identified for the environmental assessment. One site category can stand in for several potential conflicts because it usually reflects several relevant spatial and environmental characteristics. For example, for overhead line measures the site category "Wetlands of International Importance under the Ramsar Convention" (Ramsar Sites) might include bird collisions with power lines or changes to groundwater resources as potential conflicts. "Sites with limited availability" are also taken into account across site categories. For these areas, it can already be seen at the Federal Requirements Planning level that there is likely to be no or limited usage for power line construction.

Step 1: identification of impact factors and environmental objectives

Figure 1: Methodology step 1



A conflict risk is determined for each potential conflict in a site category. To do this, each potential conflict is given one of three possible ratings using the following parameters:

- Sensitivity: estimate of the extent of reaction of environmental characteristics to the effects of types of implementation (overhead lines, underground cables, submarine cables).

- Ratings: the characteristics reflected in the site category are

not particularly sensitive, sensitive or highly sensitive to the impact factors of the type of implementation, giving rise to the ratings low, medium and high.

- Significance: reflection of the legal and social value of the site category

Step 2: selection of site categories and identification of potential conflicts

Figure 2: Methodology step 2



- Ratings: the values associated with the site category are

generally relevant but easy to overcome in the subsequent procedure

generally relevant but possible to overcome in the subsequent procedure given certain conditions or

highly relevant and can only be overcome in exceptional circumstances with high requirements.

- Accuracy: representation of the suitability of a site category for the assessment of a potential conflict

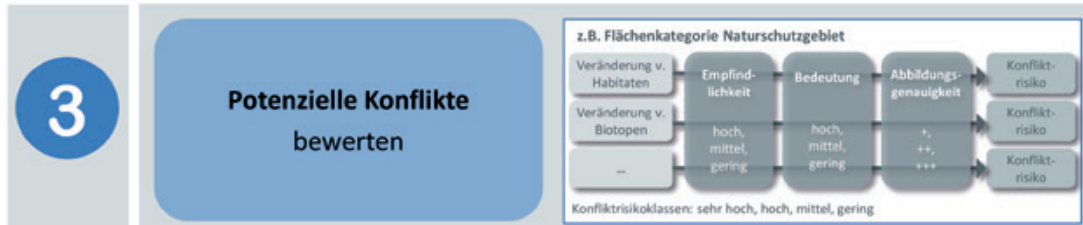
- Ratings: the site category reflects the spatial and environmental characteristics and the related conflicts in a way that is:

very inaccurate (+), not very clear and accurate (++) or very clear and accurate (+++).

The parameters are assessed independently. The individual ratings of the parameters "sensitivity" and "significance" are then merged into a conflict risk for each potential conflict using a matrix. The conflict risk can be lowered (++) or raised (+++) by one level according to the accuracy. If the accuracy is low (+), the conflict in question is not included anymore. The conflict risk is categorised into one of four conflict risk classes: "low", "medium", "high" and "very high".

Step 3: assessment of potential conflicts

Figure 3: Methodology step 3



The assessment of the conflict risk of the site categories is carried out separately for each type of implementation and may be found in the assessment tables of the site categories in the annexes.

The individual ratings of the conflict risks of all potential conflicts in a site category are merged into a conflict risk encompassing all protected assets per site category. The deciding factor for the conflict risk class of the site category is always the highest conflict risk for any potential conflict. For example, if there is a potential conflict (1) with a medium rating and a potential conflict (2) with a high rating, the conflict risk class for the site category will be "high". As well as the conflict risk that covers all protected assets, a conflict risk per protected asset can also be identified. To do this, all potential conflicts in the site category that can be assigned to the same protected asset are also merged according to the principle of the highest rating. The conflict risks are converted into conflict risk points (1 = low to 4 = very high).

Because site categories often reflect individual protected assets particularly well, the related conflict risk is particularly relevant for assessing the interaction between the protected assets. Each site category is therefore assigned a main protected asset, which can also be found in the annexes.

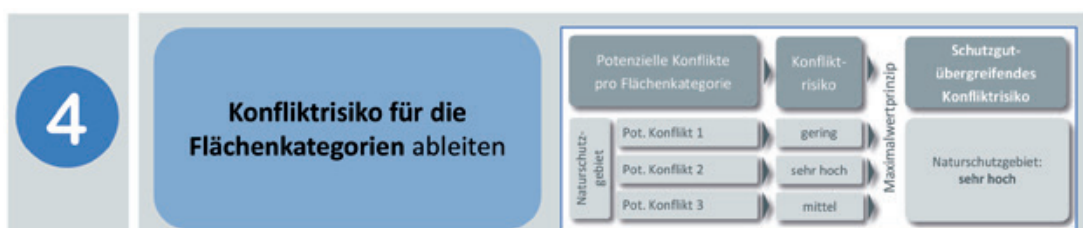
Exactly where lines and routes will run is not determined at the level of the Federal Requirements Plan. Only the grid connection points that have to be joined up are decided on. The straight line between the grid connection points is surrounded by a buffer to help delineate the assessment areas for new construction measures. This is designed in the ratio of length to width 2.5:1. For reinforcement measures, a corresponding buffer is put around the line to be reinforced that is mentioned in the NDP. The standardised construction of the assessment areas is intended to prevent the assessment area having an influence when comparing different types of implementation and forms of expansion. The areas behind each grid connection point, which are also taken into account, are calculated by forming a circle around the mid-point of the straight line or, in the case of deviating lines to be reinforced, around an auxiliary point. They are capped at a maximum 5 km.

Particular designs of the grid connection points require the assessment area to be adjusted. This applies to:

- measures with supports and/or search areas
- measures whose assessment area touches a national border and
- offshore transmission links.

Step 4: derivation of the conflict risk for the site categories

Figure 4: Methodology step 4



The basic principle is, however, always followed as far as possible.

The transboundary environmental impact is not taken into consideration at this level. However, the Bundesnetzagentur notified the potentially affected neighbour states of the processes in which requirements are established, that is to say the examination of the NDP and of the SEA. Denmark subsequently consulted its public authorities. The Bundesnetzagentur was informed on 20 January 2020 that the Danish authorities have no remarks on the SEA.

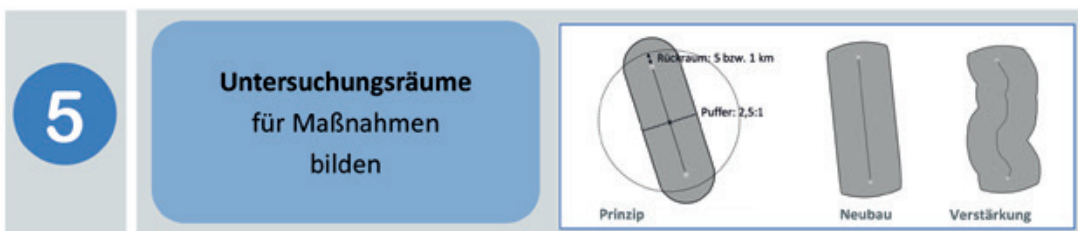
The survey of measures encompasses the analysis of the actual state of the environment using the site categories

and the identification and evaluation of the likely significant environmental impact. The evaluations of the measures are presented in fact sheets that contain general information such as location, size of the assessment area etc and document the evaluation result of the measures, including any partial evaluations undertaken.

The survey of measures is carried out both for each protected asset and across protected assets. For the evaluation of the likely environmental impact across assets, the site categories in the assessment area are first laid over each other on a map. In 50m x 50m raster cells, the highest individual value of the overlapping conflict risk points determines the conflict risk of the raster cell (highest rating principle).

Step 5: forming assessment areas for the measures

Figure 5: Methodology step 5



Interactions, existing impacts and expansion forms are then taken into account by adding and deducting conflict risk points. The consideration of interactions is explained in more detail in the subsection, "Consideration of the protected assets "land" and "interaction".

The total conflict risk points per assessment area in combination with its size results in the first evaluation parameter: conflict risk density. The conflict risk density is classed as "below average", "average" or "above average". The second evaluation parameter is the expected length of the measure: for the lengths of new construction measures, which are "as the crow flies", a detour factor of 1.3 is applied to allow comparison with reinforcement measures. The lengths are divided into three classes (short, medium, long). Using the ordering of areas with the highest conflict risk, where applicable in conjunction with sites of limited availability, the assessment area is also examined for possible obstacles that have to be crossed (known as "bars"), which form the third evaluation parameter. The rating reflects whether there is a bar (bar class 1 or 2) or not (bar class 0).

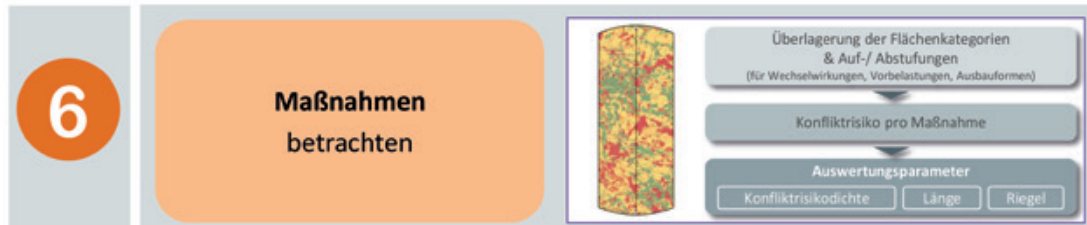
These three evaluation parameters are combined giving rise to a final category for the likely significant environmental impact of the measure in question: it can be seen whether the scale of likely significant environmental impact on the protected assets is expected to be very small, small, moderate, large or very large.

The Germany-wide survey of the overall plan is conducted on the basis of the results of the environmental effects described and evaluated for the individual measures. The significant environmental effects are evaluated as a whole and in connection with other effects not reflected in the site categories. The representations relating to specific measures are analysed as a whole, making it possible to look at positive effects that might arise from the implementation of the plan as well, such as climate protection.

First the assessment area of the overall plan is formed from the individual assessment areas of the measures (without alternatives).

Step 6: survey of measures

Figure 6: Methodology step 6



Then the actual state of the environment and the likely environmental impact are evaluated using the conflict risk density of the individual protected assets. Finally, there is the evaluation across all protected assets of the potential environmental impact of the overall plan, which is based on a statistical assessment of the individual measures. An assessment of the overall plan is also made regarding the total likely measure lengths of the types of implementation, the total size of expected land take and the distribution of areas that would form bars across the overall plan.

In the comparison of alternatives, the proposal variants for a measure are compared to various other planning options with the methodologically identified likely significant environmental effects. As in the survey of measures, the comparison of alternatives to the measures is documented in fact sheets. The comparative parameters – conflict risk points, conflict risk density, expected length of the measures and bars – are used to compare the proposal variants and the other planning options. The comparative parameters are ranked (ie for conflict risk density, the proposal variants are ordered with the one having a higher conflict risk density being given the rank 2 and the alternative with a lower one being given the rank 1) and then the ranks are added together.

The alternative with the lowest ranking is preferable from the environmental perspective, because the fewest significant environment effects are to be expected. Nevertheless, a preference is only stated for alternatives in the environmental report when there is a clear difference of at least two ranks from the comparative variants. The result is used as a basis for the overall consideration to decide on the measures for the Federal Requirements Plan Act.

The comparison of alternatives of the overall plan is conducted based on the parameters of Scenario B 2030 and the resulting grid expansion requirements identified by the TSOs. First the likely significant environmental effects of the individual grid expansion measures from Scenario B 2030 are identified, described and evaluated. Then the individual evaluations are summarised in a survey of the overall plan and compared with the overall plan surveys for Scenarios A 2030 and C 2030 as concept alternatives. The bases of the study of the environmental aspects were all individual measures of Scenario B 2030 proposed by the TSOs in the second draft of the NDP 2030.

Step 7: Survey of the overall plan

Figure 7: Methodology step 7



Consideration of the protected assets "land" and "interaction"

In contrast to the other protected assets, for "land" and "interaction" different methodologies are used:

Land

With the adoption of the amending Directive 2014/52/EU, the protected asset "land" was included in the UVPG and must now be taken into consideration in environmental impact assessments. Land, which used to come under the protected asset "soil", is now specifically assessed for each measure and at the overall planning level as regards the effects of quantitative land take. Nevertheless, the qualitative aspect of land as a protected asset is not neglected either, because it is already covered by the evaluation of the interactions between the other protected assets and included with the different intensities (temporary, permanent) of land take.

Interaction between protected assets

Because of the high level of abstraction and for reasons of proportionality, in the overall evaluation of measures and their alternatives the SEA for the Federal Requirements Plan focuses on identifying and evaluating the increased risks of conflict arising from the interactions between protected assets. Interactions that are expected to occur regularly, such as between the protected assets of soil and water, are already covered by the method for the assessment of conflict risks in the individual site categories. To derive the conflict risk that covers all protected assets, the potential conflicts of the individual protected assets are considered and evaluated with all other relevant protected assets in their functional relationships. To identify increased conflict risks caused by interaction, the protected assets are divided into three groups: abiotic, biotic and anthropogenic. In the groups, those protected assets between which interaction is routinely expected are summarised.

Step 8: comparison of alternatives

Figure 8: Methodology step 8



It is assumed that there are increased risks of conflict if a site contains protected assets that already have an increased conflict risk (at least three conflict risk points) and that can be assigned to at least two different protected asset groups.

If these conditions are fulfilled, one conflict risk point is added to the total for the affected area.

The size of sites for which there is an increased conflict risk owing to interactions between the protected assets is given in the relevant measure fact sheet.

1.3 On the findings: what significant environmental effects are likely?

Effects of the overall plan

The Bundesnetzagentur has examined the likely significant environmental effects of the 95 measures included in the second draft of the NDP and confirmed by the authority. There are 85 onshore measures (78 overhead lines and seven underground cables) and ten offshore measures. The individual measures are each examined in a fact sheet (see part II "Environmental report – detailed assessment results").

As can be seen in Figure 13, all federal states are potentially affected by measures from the NDP 2019-2030. The size and form of the assessment area for the overall plan results from the type and location of the sub-areas of the measures examined. The sub-areas range in size from about 3 km to about 690 km. They thus cover areas that may be just a few hectares or stretch across several federal states.

The overview below shows, and then explains, the results of the categorising of the environmental effects of all measures.

For about 27% of all measures in the overall plan, as regards the conflict risks identified and the expected length of measures, significant environmental effects in relation to the protected assets are likely only on a very small scale, corresponding to 26 of the total 95 measures.

For about 38% of measures, as regards the conflict risks identified and the expected length of measures, significant environmental effects in relation to the protected assets are likely on a small scale, corresponding to 36 of the total 95 measures under consideration.

For 16 measures (17% of the total), likely significant environmental effects in relation to the protected assets are expected on a moderate scale.

Meanwhile, for 15 (proposal variants) of the 95 measures – around 16% of the total – likely significant environmental effects on the protected assets are expected on a large scale.

For two measures or around 2% of the total, the likely significant environmental effects on the protected assets are expected on a very large scale.

For the subsequent evaluation of the environmental impact of the overall plan across protected assets, the environmental effects of all measures are categorised using the conflict risk density, the expected length of the measures and the bar situation. Figure 15 shows the evaluated measures, with their locations, for each type of expansion.

The evaluation of projects with underground cabling priority and offshore transmission links gives rise to worse results in terms of environmental impact than those with overhead lines. This is due to the evaluation parameters of the likely length of the measures and the conflict risk density for the categorisation of the environmental effects. For one thing, the measures with underground cabling priority and offshore transmission links are generally longer than the overhead line measures, measured by the distance between grid connection points. Moreover, for underground cables and offshore transmission links the whole sub-area under assessment is used to calculate the conflict risk density. For overhead lines planned as reinforcement measures, the conflict risk density of the "near zone" is used for the categorisation and this tends to be better due to the downgrading of the conflict risk points.

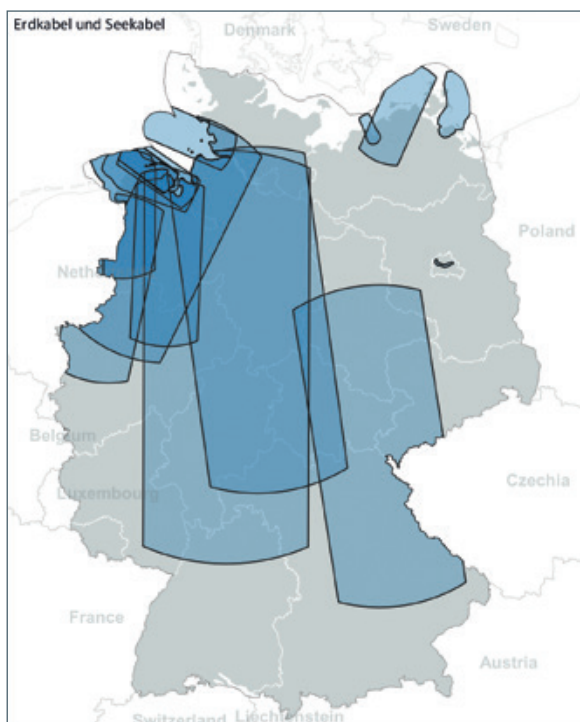
The evaluation of the overall plan also gave rise to an increase in the conflict risk in an area of 2,058,270 hectares as a result of the assessment of the interaction between protected assets (see Figure 63, "Areas with an increased conflict risk due to interactions, regardless of type of expansion").

Cumulative effects

A statistical evaluation is used to identify the sites where the assessment areas/impact areas of the measures overlap. It is assumed that in these sites there is a greater probability of cumulative effects of the overall plan.

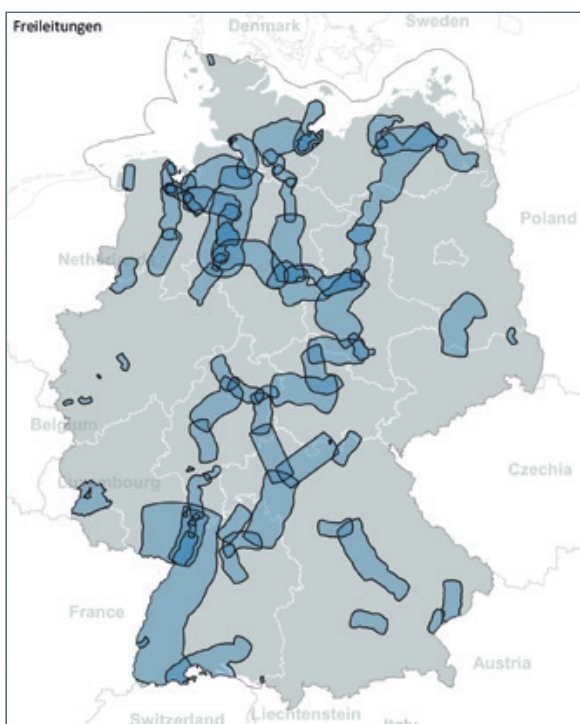
The assessment areas of overhead lines, underground cables and submarine cables overlap across an area totalling 12,999,457 hectares, corresponding to about 54% of the total assessment area. There is a maximum of ten overlaps among the confirmed measures.

Figure 9: Assessment areas of underground and submarine cable measures and overhead line measures



To create a spatial reference, the result of the evaluation of the risk of the cumulative effects of the overall plan is related to the nature areas (see Figure 16).

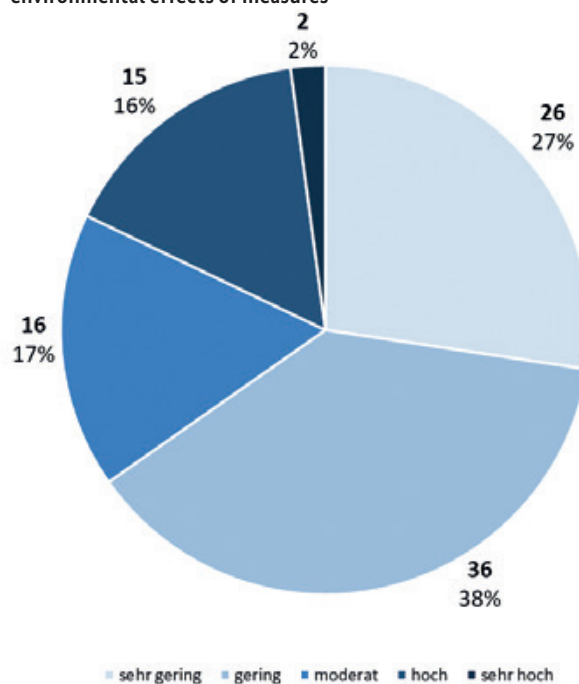
The risk of cumulative effects of the overall plan due to overlapping assessment areas is to be classified as high in parts of the following nature areas due to seven to nine overlapping assessment areas: Deutsche Bucht (excluding Felssockel Helgoland; D70), Dümmer Geestniederung and Ems-Hunte-Geest (D30), Ems-Weser-Marsch (D25), Ostfriesisch-Oldenburgische Geest (D26), Stader Geest (D27), Untere Elbniederung (Elbmarsch; D24) and Weser-Aller-Tiefland (D31). There is a very high risk of cumulative effects of the overall plan due to ten overlapping assessment areas in the nature area of Ostfriesisch-Oldenburgische Geest (D26) and Ems-Weser-Marsch (D25).



Legende

Teiluntersuchungsräume der bestätigten Maßnahmen des NEP 2019-2030

Figure 10: Distribution of the evaluation of likely significant environmental effects of measures



Connection with other evaluations (Natura 2000 assessment)

Determinations are made in the Federal Requirements Plan that could potentially affect Natura 2000 sites (FFH and bird protection areas), once the plan has been made more specific at later stages of the procedure.

The environmental report thus only identifies Natura 2000 areas that could potentially be affected as they are within the sub-areas under assessment by conducting a Natura 2000 assessment as appropriate to the planning stage (see Natura 2000-Abschätzung). It also identifies and states whether Natura 2000 areas form a "bar", meaning that they would definitely have to be crossed. If it seems possible that the protection objectives of the Natura 2000 areas might be affected by the more specific planning stages, a note to this effect is put in the fact sheet.

The potential effects of the individual measures that have been examined give rise to the following information about the extent of potential impact on Natura 2000 areas: A total of 3,995,211 hectares of Natura 2000 areas are located within the total assessment area (net area), corresponding to about 10% of it. The examination also reveals that for 29 of the 95 measures in the total assessment area there are contiguous areas with the highest risk of conflict (bars) due to Natura 2000 sites.

Whether, in cases of bars in the sub-areas under assessment or in probably affected areas, there will actually be a significant impact on Natura 2000 areas must be the subject of examination at subsequent planning levels, for example using conservation objectives and preventive and reduction measures.

Figure 11: Results of the evaluation of the confirmed measures of the NDP 2019 -2030 for all protected assets pursuant to the UVPG

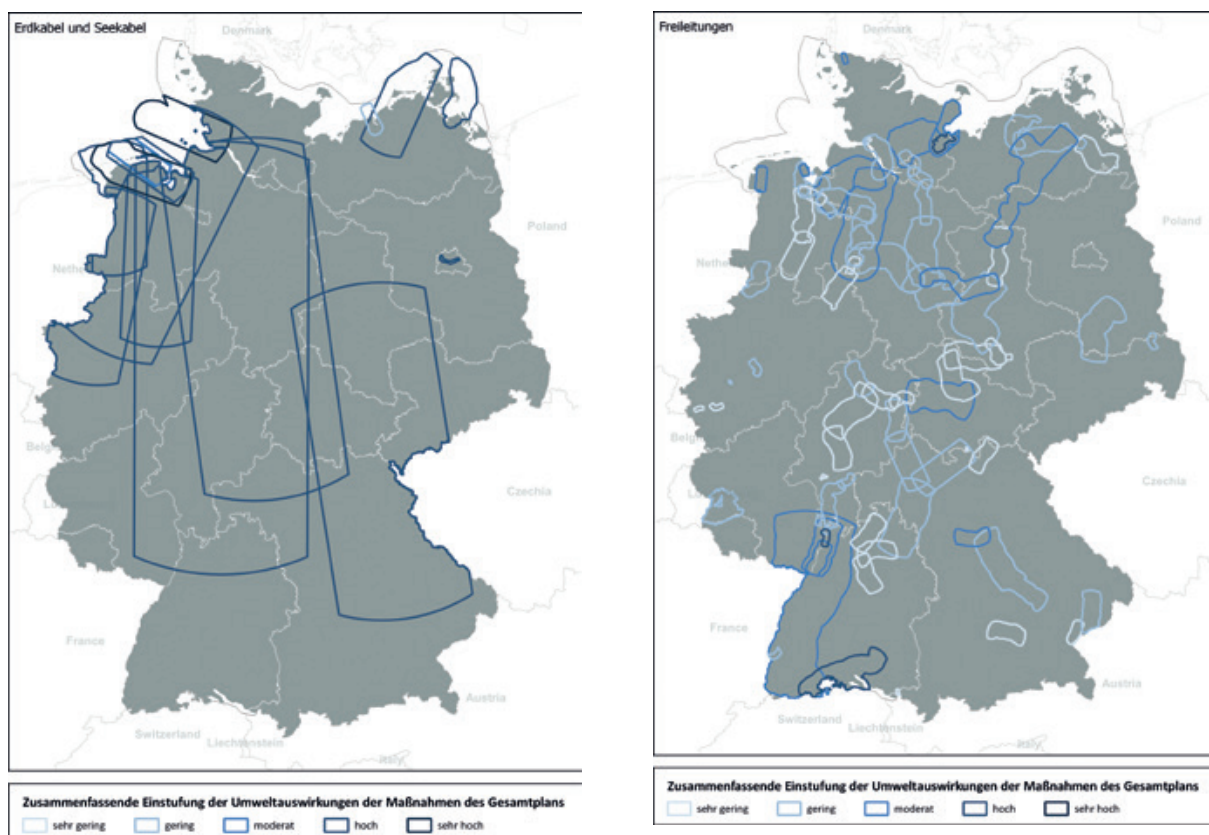
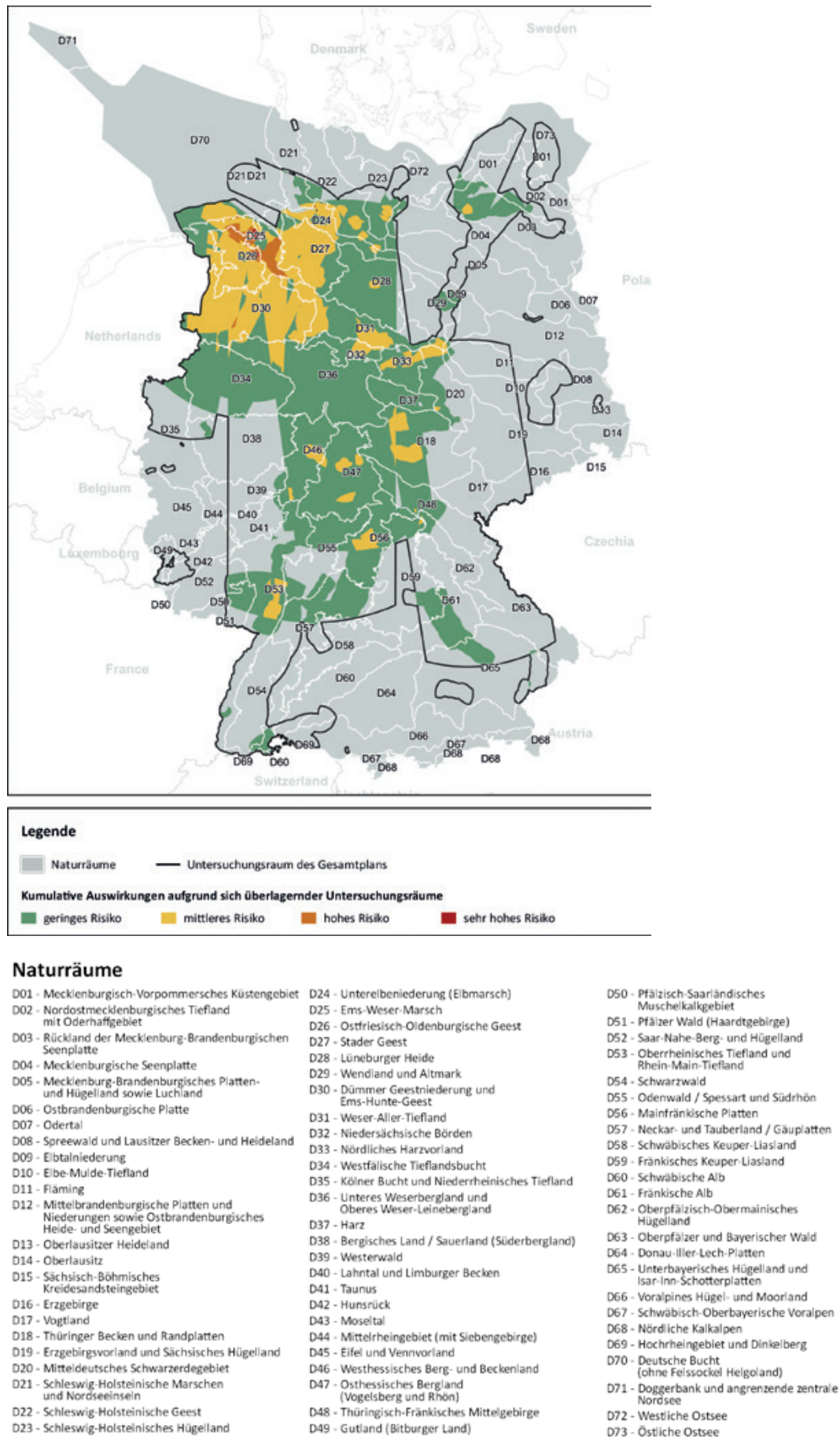


Figure 12: Evaluation of the risk of cumulative effects of the overall plan in nature areas



Comparison of alternative measures

An extensive examination revealed spatial alternatives from the other planning options for 22 measures for the draft environmental report on the basis of the NDP 2019-2030. These alternatives were assessed as regards their likely significant environmental impact and compared. Once the consultation was complete and the NDP had been confirmed, the comparisons of alternatives were adjusted to the confirmed measures for this environmental report. There are 15 comparisons of alternatives remaining. The results of the comparisons of alternatives are summarised in Figure 17 below to provide a better overview and to assist in the decision-making process about the acceptance of/amendment to the Federal Requirements Plan. The alternatives that are preferable from an environmental perspective are marked with the symbol ▲. Alternatives that are clearly worse and for which there are better alternatives from an environmental perspective, even if no single clearly preferable alternative was identified during the comparison process, are marked with the symbol ▼. No preference has been identified for the other alternatives.

The benchmarks and evaluation results are compared in the fact sheets for the comparison of alternative measures (see part II).

The comparison of alternative measures gives the following general results:

- In five of the 15 comparisons, the difference between the alternatives is great enough to single out one alternative as preferable from the environmental perspective (▲).

In four of these, the variant proposed by the TSOs in the NDP is preferable from the environmental perspective and associated with a lower environmental impact than the alternatives it was compared with.

In the remaining comparison, one of the other planning options of the NDP is preferable and thus better from an environmental perspective than the other proposal variants.

In ten of the comparisons of alternatives, the difference in total ranking is too small to highlight any one alternative as preferable. Nevertheless, these comparisons also provide results that can be taken into account

when deciding on the acceptance of/amendment to the Federal Requirements Plan.

In three of these ten comparisons, the variant proposed by TSOs in the NDP may be expected to lead to a far greater environmental impact than the alternatives it was compared with. In these comparisons, the proposal variant of the TSOs is clearly worse (▼) and there are clearly one or more alternatives that are preferable from an environmental perspective.

In another three, one of the other planning options of the NDP is clearly worse (▼). In these cases, the proposal variant of the TSOs or one of the other alternatives from the comparisons is preferable from an environmental perspective.

Alternative overall plans

From the vantage point of a survey of all the scenarios, only those measures are confirmed that are feasible and sustainable in any case and which, as a rule, are called for in all the scenarios. The examination of the alternative overall plans for the Scenarios A, B and C was carried out and put out for consultation in the draft environmental report. The environmental report also contains a presentation of the findings of this study of alternatives for documentation purposes. The overall plan for the 95 confirmed measures of the second draft of the environmental report has been drawn up. Scenarios A, B and C no longer represent reasonable alternatives to this overall plan.

Table 1: Results of comparisons of alternatives, including symbols for better/worse alternatives

Proposal		Alternative planning options acc to NDP	
project 5 BBPLIG: extra-high voltage line Wolmirstedt – Isar („SuedOstLink“)			
DC5: Wolmirstedt – Isar	AL1-DC5: Lauchstädt – Meitingen	AL2-DC5: Wolmirstedt – Gundremmingen/Gundel- fingen	▼
project 6 BBPLIG: extra-high voltage line Conneforde – Cloppenburg rural disctrict – Merzen/Neuenkirchen			
M51b: Landkreis Cloppenburg 2 – Merzen/Neuenkirchen	AL-M51b: Landkreis Cloppenburg 2 – Westerkappeln		
project 10 BBPLIG: extra-high voltage line Wolmirstedt – Helmstedt – Walle			
M24b: Wolmirstedt – Helmstedt – rur. dis. Peine/Braun- schweig/ Salzgitter – Mehr- um/Nord	AL1-M24b: Wolmirstedt – Helmstedt – Hattorf – Walle	AL2-M24b: Stendal/West – Walle	▼
project 46 BBPLIG: Redwitz - state border Bavaria/Thuringia			
M420: Redwitz – state border BY/TH (point Tschirn)	AL2-M420: Schalkau – Würgau – Ludersheim		▲
project 59 BBPLIG: extra-high voltage line Landesbergen – Mehrum north			
M469a: Landesbergen – Mehrum/ north	AL-M469a: Landesbergen – Grohnde – Mehrums – Walle		▲
project 66 BBPLIG: extra-high voltage line Schalkau – Grafenrheinfeld			
M28a/M28b: Schalkau – Landesgrenze TH/BY (Mast 77) – Grafenrheinfeld	AL-P44: Klein Rogahn - Isar		▲
project 70 BBPLIG: extra-high voltage line Güstrow – Sweden (Hansa PowerBridge)			
M460: Güstrow – southern Sweden	AL1-M460: Bentwisch – border corridor OST-III	AL3-M460: Lubmin – border corridor OST-III	
NOR-3-2: DC transmission link NOR-3-2 (DolWin4)			
M14: North Sea Cluster 3 – border corridor II – Hanekenfähr	AL1-M14: North Sea Cluster 3 – border corridor II – Meppen	AL2-M14: North Sea Cluster 3 – border corridor II – Rural district Cloppenburg 1	AL3- M14: North Sea Cluster 3 – border corridor II – Unterweser
▲			

Proposal	Alternative planning options acc to NDP		
NOR-6-3: DC transmission link NOR-6-3 (BorWin4)			
M29: North Sea Cluster 6 – border corridor II – Hanekenfähr ▼	AL1-M29: North Sea Cluster 6 – border corridor II – Meppen	AL2-M29: North Sea Cluster 6 – border corridor II – Landkreis Cloppenburg 1	AL3-M29: North Sea Cluster 6 – border corridor II – Unterweser
NOR-7-2: DC transmission link NOR-7-2 (BorWin6)			
M32: North Sea Cluster 7 – border corridor V – Büttel	AL1-M32: North Sea Cluster 7 – border corridor V – Brunsbüttel	AL2-M32: North Sea Cluster 7 – border corridor V – Heide/West	AL3-M32: North Sea Cluster 7 – border corridor V – Segeberg district ▼
NOR-9-1: DC transmission link NOR-9-1 (BalWin1)			
M234: North Sea Cluster 9 – border corridor III – Unterweser	AL-M234: North Sea Cluster 9 – border corridor II – Wilhemshaven 2		
NOR-10-1: DC transmission link NOR-10-1 (BalWin4)			
NOR-10-1: DC-Netzanbin- dungssystem NOR-10-1 (BalWin4)	AL-M231: North Sea Cluster 10 – border corridor II – Wilhelmshaven 2 ▲		
NOR-12-1: DC transmission link NOR-12-1 (LanWin1)			
M243: North Sea Cluster 12 – border corridor III – Wilhelmshaven 2 ▲	AL-M243: North Sea Cluster 12 – border corridor II – Unterweser		
OST-1-4: AC transmission link OST-1-4			
M73: Baltic Sea Cluster 1 – border corridor I – Lubmin/Brün- zow/Wusterhusen/Kemnitz ▼	AL1-M73: Baltic Sea Cluster 1 – border corridor I – Lubmin	AL2-M73: Baltic Sea Cluster 1 – border corridor I – Lüdershagen	
OST-7-1: AC transmission link OST-7-1 (nordwestlich Warnemünde)			
M85: Baltic Sea Cluster 7 – Municipality of Papendorf	AL-M85: Baltic Sea Cluster 7 – Bentwisch		

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