Federal Ministry
for Economic Affairs
and Climate Action

Electricity Storage Strategy

Fields of action and measures to ensure a persistent and dynamic expansion of electricity storage facilities and their optimal systems integration

bmwk.de

Imprint

Publisher
Federal Ministry for Economic Affairs and Climate Action (BMWK)
Public Relations
11019 Berlin
www.bmwk.de

Current as at
December 2023

This publication is available for download only.

Design
PRpetuum GmbH, 80801 Munich

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1. Summary

By no later than 2035, Germany's electricity supply is to be close to climate-neutral, i.e. almost entirely based on renewable energy. A great deal of flexibility within the energy system will be required to allow for the integration of ever larger shares of electricity from wind power (targets: 115 GW of onshore and 30 GW of offshore wind power by 2030) and photovoltaics (PV) (target: 215 GW by 2030).

Electricity storage has an important role to play in this, both for energy storage as such and also for the stabilisation of the electricity system and the grids. Currently, a strong and market-driven ramp-up of battery storage is taking place. This Electricity Storage Strategy tabled by the Federal Ministry for Economic Affairs and Climate Action (the Ministry) wants to support the ramp-up of electricity storage and achieve the optimal systems integration of electricity storage facilities used for short-term storage.

The Strategy sets out the Ministry's planned activities in the field of electricity storage. These will be set in motion during this parliament, with some already in the implementation stage. Where the Ministry does not have lead responsibility for a given field, the paper wants to set out our position on this, initiate a debate with all stakeholders and pave the way for shared positions through open dialogue.

In the Ministry's view, the objective of supporting the ramp-up and systems integration requires action to be taken in the following fields:

- Obstacles analysis
- Electricity storage in the context of the Renewable Energy Sources Act (RES Act)
- Grid use fees
- Financial contributions to grid construction costs and towards the cost of grid connection
- Speeding up grid connection
- Strengthening local communities
- Reduction of obstacles stemming from licensing law
- Ensuring systems stability
- Increasing the contribution to balancing power
- Evaluating 'grid boosters'
- Harnessing the potential of bidirectional charging
- Discussing obstacles standing in the way of pumped storage plants
- Electricity storage as a flexibility option
- Assessing the potential of electricity storage within the energy system
- Developing statistics on storage
- Supporting innovation and research
- Promoting the production of battery cells and systems components
- Surveying the sector

2. Introduction

2.1 Electricity storage in context: objectives under our energy policy

Germany has set itself the goal of achieving greenhouse gas neutrality by 2045. The electricity sector has a key role to play here. In order to achieve the goal of greenhouse gas neutrality by 2045, the electricity sector will have to manage largely without generating greenhouse gas emissions by 2035. At the same time, green electricity will increasingly drive the decarbonisation of buildings, the industrial sector and transport. By 2030, the share of renewable energies in Germany's gross electricity consumption is to increase to 80%, and this despite increasing electricity consumption due to decarbonisation in sectors outside the energy sector. Around 600 terawatt hours (TWh) of green electricity will be required for this in 2030. To put this figure into perspective: In 2022, around 254 TWh of green electricity was generated in Germany. Five sources will dominate our future electricity supply: onshore wind, photovoltaics (PV), offshore wind, imports of renewable electricity, and power plants using green hydrogen. Each of these sources is indispensable.

Electricity generation and electricity consumption must be balanced out at all times. To ensure this, a large number of measures is in place (cf. the Ministry's interim report on the System Development Strategy and reports about the work of the Climate-neutral electricity system platform (PKNS). In seasonal terms, electricity from wind and electricity from PV complement each other well, as there is more wind during the winter semester and more sunlight in the summer semester. The paths of expansion set out in the RES Act ensure a sound balance between wind power and PV, which means that the cumulated power generated using wind and PV power is well aligned with Germany's electricity consumption over the course of the year.

2.2 The role of electricity storage

a) What we need electricity storage systems for

A great deal of flexibility within the energy system will be required to allow for the integration of ever larger shares of electricity from wind energy (targets: 115 GW of onshore and 30 GW of offshore wind energy by 2030) and PV (target: 215 GW by 2030). This means that, in addition to a pan-European expansion of electricity grids, to the cross-border balancing of production peaks through the internal market in electricity, and to flexible consumption units (e.g. electric vehicles), we will also increasingly have to rely on energy storage (electricity, heat, hydrogen).

First, the energy supply system needs the possibility of storage to allow for different lengths of delays between energy generation and consumption. This does not mean that set capacities of individual specific storage technologies are required, but that the overall system must be capable of delivering the required storage functionalities. Second, electricity storage facilities are also required to stabilise our electricity supply. Here, the focus is not on electricity storage, but on the facilities' ability to quickly respond to power peaks in supply or demand at very short notice, so as to stabilise grid frequency.

Electricity storage facilities are best suited to allow for short-term delays between generation and consumption. The current state-of-the-art for long-term electricity storage, which is required to balance out supply and demand over a longer period and across seasons, is the conversion of electricity to other sources of energy, such as hydrogen, and back. Heat storage facilities embedded in heat networks and used in combination with large-scale heat pumps can also deliver greater flexibility for the electricity system.

b) Categories of electricity storage facilities and their fields of application

Electricity storage facilities are categorised as large-scale storage facilities (pumped storage plants, large-scale battery storage) and small-scale storage facilities (commercial storage facilities, home storage units and back-charging electric vehicles).

Pumped storage plants and battery storage (large-scale batteries and distributed home storage units) are currently the most important categories used for short-term electricity storage. For pumped storage plants, storage times rarely exceed four hours. However, in principle, it would be possible to further extend energy-storage times for both redox-flow storage facilities and pumped storage plants.

Pumped storage plants have been part of Germany's energy system for decades. However, the need for geographical differences in height means that they cannot be built everywhere in Germany. The potential for expansion is therefore limited. This is not the case for large-scale batteries, which are often housed in standard containers and do not, in principle, require any geographic particularities. For this reason, the sites for these facilities are usually selected for strategic reasons, often in the direct vicinity of a transformer station. This eliminates (or drastically limits) the need for dedicated electricity lines to be built to ensure grid integration.

The business models underpinning pumped storage plants and large-scale batteries are overwhelmingly based on these facilities' participation in intraday trading and on the provision of balancing power to grid operators who use it to maintain a stable frequency. Economic viability derives on the spreads (price differences) between high-price and low-price situations in intraday trading. According to the most recent figures, these spreads have increased considerably.

Pre-qualified battery storage facilities with a potential of 630 MW already account for a significant proportion of primary balancing power[1], which currently stands at 570 MW, and are therefore bringing down prices on the balancing energy market. Pumped storage plants currently account for a large share of Germany's secondary balancing power[2]. However, large-scale battery storage facilities are also increasingly entering this market.

For large-scale batteries, new fields of application continue to emerge: better market integration of electricity from large PV facilities and wind farms as part of innovation auctions, 'grid boosters' to support grid operations management (on a limited scale), and efforts to optimise energy management at large industrial sites.

The small-scale storage units currently being installed are mostly used to allow for better use of self-generated electricity. In individual cases, commercial storage facilities can also be used with a view to bringing down grid use fees by reducing peak loads. For the above reasons, small-scale storage units are overwhelmingly not used to store electricity from the grid, but only electricity from rooftop PV installations, so as to maximise the rate of self-consumption.

In future, (mobile) batteries of electric vehicles will also be ready to be included into the category of small-scale storage units. For this to happen, they will have to be suitable and approved for

1 **Primary balancing power** is used to stabilise is used to stabilize grid frequency at very short notice in cases where there is an imbalance between electricity generation and consumption. It must be completely available within 30 seconds and for a duration of at least 15 minutes.

2 **Secondary balancing power** is used to replace primary balancing power and to return the frequency back to its nominal level. It must be provided within 5 minutes and be available for a duration of 15 minutes.

'bidirectional charging', i.e. for providing electricity for self-consumption by the user or for feeding electricity back into the grid. This technology is close to market-readiness (as of November 2023).

Another use case that is growing in importance is electricity storage units used for power storage. At very short notice, these can take up or give off power peaks to support the stability of the electricity system, e.g. for the inertial reserve for frequency stabilisation.

2.3 Current status of the electricity storage expansion

In principle, the number of electricity storage facilities, their installed power and storage capacities are recorded in the Core Energy Market Data Register kept by the Bundesnetzagentur. In Germany, there are currently some 30 pumped storage plants with a combined capacity of approx. 24 GWh and a total power of approx. 6 GW. In addition, pumped storage plants in Luxembourg and Austria with a combined capacity of 15 GWh and a total power of 3.6 GW feed electricity straight into the German grid.

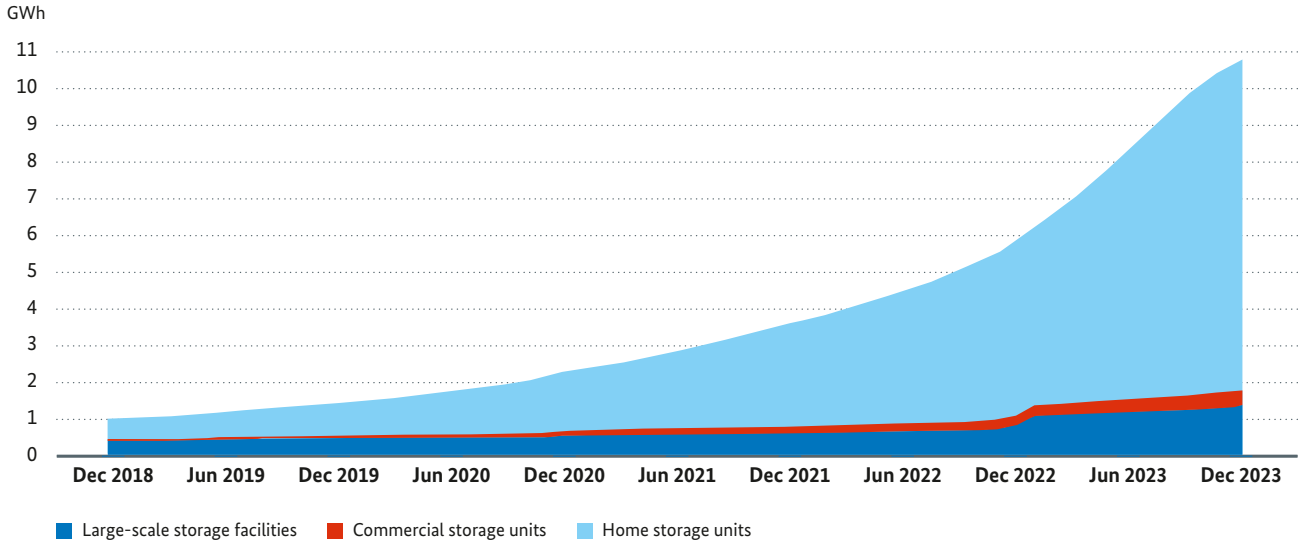
Apart from pumped storage plants, a growing number of large-scale battery storage facilities are being built, not least due to the shutdown of nuclear power plants and coal-fired power plants, which means that there are perfectly suited sites available, complete with the required grid capacity. RWE, for instance, is planning to build 3 GW worth of battery storage power by 2030. The Austrian VERBUND energy firm is planning to install large-scale battery storage facilities with a combined power of 1 GW by 2030, a portion of which took up operations in Bavaria in early 2023 already. LEAG says it is working on a large-scale storage facility with a planned power of approx. 750 MW in the Lausitz region.

Most battery storage units on record, however, fall into the category of home storage units. Their number, capacity and power have tripled within the last two years.

The market ramp-up for storage capacity and for installed power is illustrated in the figures below. These show that large-scale battery storage units are the second-largest market segment after home-storage units, followed by commercial storage facilities.

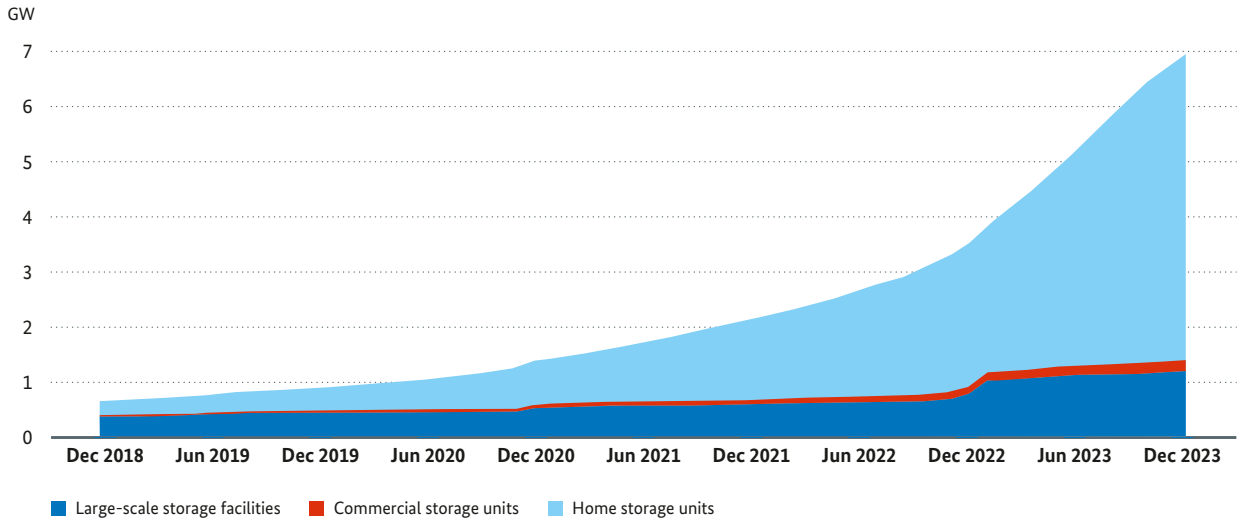
In terms of capacity, battery storage facilities are still lagging considerably behind Germany's pumped storage plants (11 GWh vs. 24 GWh), but their power is already higher (7 GW vs. 6 GW).

Figure 1: Battery capacity in Germany (Core Energy Market Data Register)



Source: Figgener et al., www.battery-charts.de, analysed by RWTH Aachen on the basis of the Core Energy Market Data Register kept by the Bundesnetzagentur, current as of 1 December 2023)

Figure 2: Battery power in Germany (Core Energy Market Data Register)



Source: Figgener et al., www.battery-charts.de, analysed by RWTH Aachen on the basis of the Core Energy Market Data Register kept by the Bundesnetzagentur, current as of 1 December 2023)

2.4 Economic viability of electricity storage

The market-driven ramp-up of electricity storage power financed by households and companies almost without direct investment promotion shows that electricity storage facilities are already economically viable. It is important to note that the further development of the market for electricity storage will depend not only on the regulatory framework, but also and significantly on the development of investment costs.

For battery storage, Goldman Sachs Research[3] expects that prices for battery packs will decrease by an annual average of 11% between 2023 and 2030, meaning that there is no reason to expect growth to be hampered by costs anymore.

As for pumped storage plants, a report by the Federal Government (Bundestag printed paper 20/1653) contains detailed explanations, including about their economic viability. Evidently, the latter depends on the price spread between electricity feed-ins and feed-outs. At present, however, these are not expected to change significantly in the foreseeable future.

2.5 Legal framework; improvements delivered by recent amendments and decisions

The national legal framework for electricity storage has continuously been updated and privileges have been introduced in recognition of the important role energy storage has to play in the success of the energy transition.

These include the favourable treatment of electricity storage facilities in terms of grid use fees and surcharges, which partially stem from the fact that they are used for self-consumption and partially from dedicated favourable rules.

As for the future treatment of electricity storage facilities in terms of grid use fees it is important to note that, following the European Court of Justice's Judgment on the independence of regulatory authorities, only the Bundesnetzagentur (BNetzA) will be able to take decisions in this regard.

a) Definition of energy storage facilities

A part of the '2022 Easter package', the definition of 'energy storage' as per Article 2 (59) of the Electricity Market Directive 2019/944 was taken over into the Energy Industry Act. It is the Ministry's view, however, that this does not change the fact that electricity storage units must be treated as both final consumers and producers under energy law, given that the storage service per se consists of having a controllable delay between electricity generation and consumption. This classification is in line with the European Commission Recommendation of 14 March 2023 on 'Energy Storage – Underpinning a decarbonised and secure EU energy system' and does not result in a (dis-)advantageous treatment of electricity storage facilities compared to other producers, consumers or flexibility providers. Instead – and as prescribed by Union law – it reflects the various functionalities of electricity storage facilities in terms of the energy industry and in technical terms and does so in a way that is, in principle, correct, thus allowing for non-discriminatory participation in the market.

3 https://www.goldmansachs.com/intelligence/pages/electric-vehicle-battery-prices-falling.html

b) Electricity storage declared a matter of 'overriding public interest'

The Act amending the Regional Planning Act and other provisions of 22 March 2023 stipulates that there is an overriding public interest in the establishment of electricity storage facilities, amending section 11c Energy Industry Act accordingly. The main purpose here is to grant privileges to electricity storage projects in the context of approval procedures, thus giving them the same relevance as the expansion of renewables.

c) Grid use fees

Section 118(6) Energy Industry Act and section 19(2) and (4) Grid Fee Ordinance contain special rules for large-scale storage facilities that largely or completely exempt these from grid use fees; this also applies to electricity volumes lost through storage. Section 19(2) sentence 1 Electricity Grid Fee Ordinance creates incentives for operating the facilities in a way that reduces the strain on the grid – something that can be achieved especially well by electricity storage units.

A report by the Federal Government (Bundestag printed paper 20/1653) contains detailed information about the practical implications of all reductions of grid use fees. The report confirms that the provisions in application usually facilitate market participation for storage facility operators and ensure a privileged position for them under energy law.

Under the 'Act amending energy industry law in line with the provisions of Union law and amending other provisions under energy law', which was adopted by the Bundestag on 10 November 2023, the time limit on the complete exemption from grid fees as per section 118(6) Energy Industry Act, which is designed as a transitional regulation, has been extended by three more years up until 2029.

d) Surcharges

Since 2023, electricity storage facilities have been exempted from all surcharges as per section 21 (1) (2) Energy Financing Act (Combined Heat and Power Act surcharge, offshore grid surcharge), provided that they are used bidirectionally: under the offsetting rule, the surcharge is reduced where electricity is taken from the grid and fed back into the grid at the time of removal from storage. This offsetting rule provides a targeted incentive for market participation and a bidirectional use of electricity storage facilities, without exempting all electricity volumes taken off the grid from the surcharge. At the same time, the rule provides for general requirements for a clear, metrological distinction and categorisation of electricity volumes. This allows for offsetting to be also used in a typical context of a home-PV + storage unit, where electricity volumes generated and consumed on the spot must also be factored in (section 21 (1) (4) Energy Financing Act).

The offsetting rule designed to reduce the surcharge applies to bidirectional charging points accordingly (section 21(3) Energy Financing Act). Offsetting thereby encourages the bidirectional use of electric vehicle charging points and their participation in the market. Attributing electricity volumes generated and consumed to a given charging point allows for uniform and comparatively straightforward billing, regardless of whether a charging point is used by one or more electric vehicles.

e) Electricity storage and the Renewable Energy Sources Act (RES Act)

The Innovation Auctions Ordinance provides targeted incentives for combining renewable energy installations with battery storage units. Furthermore, electricity storage facilities are categorised as installations within the meaning of the RES Act if they use only electricity from renewables or from

mine gas (section 3 no. 1 RES Act 2023). The entitlement to funding under the RES Act for electricity volumes generated in a renewables installation continues where these electricity volumes, prior to being fed into the grid, are put in interim storage in an electricity storage facility classified as an installation within the meaning of the EEG (section 19(3) RES Act).

f) Storage facilities as controllable consumption devices; section 14a Energy Industry Act

Following the decision of the Bundesnetzagentur on the integration of controllable consumption devices as per section 14a Energy Industry Act of 27 November 2023, electricity storage facilities are registered as controllable consumption equipment with regard to feed-ins. On the one hand, this is to ensure behaviour that is compatible with grid stability, on the other, it allows operators to benefit from grid fee reductions. For the future, the decision also provides for the possibility to introduce an obligation of grid operators to offer time-of-use grid fee charges – something for which distributed battery storage systems would be especially suited.

g) Electricity tax

As per section 5(4) Electricity Duty Act, stationary battery storage facilities are exempt from electricity duty where they feed the electricity released from storage into the grid. Pursuant to section 9(1) no.2 Electricity Duty Act in conjunction with section 12(1) no. 2 Electricity Duty Ordinance, the same applies to pumped storage plants. For electricity fed in by prosumers, there are further reduction and exemption rules.

h) Financial contributions to grid construction costs

The recently adopted 'Act amending energy industry law in line with the provisions of Union law and amending other provisions under energy law' stipulates that the Bundesnetzagentur has power to take decisions ensuring that the financial contributions to construction costs levied for electricity storage facilities connected to the higher voltage grids (medium voltage an higher) do justice to the role of electricity storage within the electricity supply system. Storage facilities connected to the low voltage grid and with a power of up to 30 kW are exempt from payments of financial contributions to construction costs (section 11(3) Low-Voltage Connection Ordinance).

3. Fields of action and current developments

As shown by the comments above, electricity storage is currently benefitting in principle from a favourable market environment and targeted legal privileges. In the view of the Federal Ministry for Economic Affairs and Climate Action, the existing environment now needs to be enhanced, appropriate measures taken to support the further ramp-up of electricity storage and incentives provided for its optimal systems integration. This Strategy thus seeks to give a comprehensive overview of the fields of action that seem most relevant for the further support of the market ramp-up and systems integration. The related measures are diverse and touch upon different technical and legal areas and thus different responsibilities. In the view of the Ministry, the fields of action in which specific measures should be implemented are:

3.1 Obstacles analysis

The market-based ramp-up of electricity storage shows that, in principle, the right environment is in place. At the same time, aspects that could slow down the ramp-up need to be detected as early as possible. The Ministry and the Bundesnetzagentur are therefore assessing the extent to which obstacles to the expansion of electricity storage exist or might be expected, with the aim of removing these or reducing their impact to stabilise the further expansion.

3.2 Electricity storage in the context of the RES Act (EEG)

a) Separation between green and grey electricity

The Ministry is looking to improve the environment for the operation of electricity storage facilities – and ultimately also for the operation of bidirectional charging stations for electric cars – in a way that will enable these not only to store the electricity coming directly from renewable energy facilities (green electricity) but also to take in and feed out electricity from the grid (grey electricity) without losing the funding provided for the green electricity part of the electricity that is temporarily stored. The goal is to make it possible for storage to be used for different purposes and thus make the best possible use of its flexibility for the benefit of the entire electricity supply.

b) Integration of RE installations by establishing storage close-by

There have been repeated announcements by the renewables sector that new solar farms will be equipped with battery storage as a general rule. Given the low market prices on sunny middays, this is an economically attractive option that can also help reduce strain on the grid.

In light of this welcome development, the Ministry will assess whether further incentives for the establishment of storage close to generation sites, especially for wind turbines and existing installations, are needed. In this context, the Ministry will look into options to refine the ‘innovation auctions’.

3.3 Grid use fees

a) Large-scale storage facilities in the grid

The latest revision of the Energy Industry Act extended the rule under which storage facilities are exempted from grid fees, sending an encouraging sign for the further expansion of large-scale electricity storage. The Bundesnetzagentur, provided that it does not make use of its power to deviate, will engage in dialogue with all the stakeholders involved to discuss a follow-up rule for the temporary grid fee exemption for new and expanded

large-scale storage facilities set out in section 118(6) of the Energy Industry Act, which will expire in August 2029.

b) Small-scale storage facilities

In light of the strong growth registered for home energy storage units and the market ramp-up for e-vehicles, the question is how energy policy can be used to support this development in a way that ensures small-scale storage facilities are used optimally from a systems perspective. As the energy transition makes headway, small-scale storage facilities are the central pillar for integrating as much as possible of self-generated electricity from solar PV into the system. This is because these small-scale facilities not only allow for optimisation at the micro-economic level (by maximising the percentage of electricity that can be used by the generator) but also hold great potential for flexibility.

The current grid fee structure in the low voltage segment, which uses energy-based prices, encourages using as much of the self-generated electricity as possible; this generally makes the purchase of electricity from the grid unprofitable. The Bundesnetzagentur's provisions on controllable consumer devices introduced in section 14a of the Energy Industry Act of 27 November 2023 will change this to some extent. Controllable consumer devices (incl. heat pumps, home storage units and charging infrastructure for electric cars) can now benefit from reduced grid fees and, following the introduction of time-of-use based grid fees from 2025, there will be targeted incentives for using these devices in a way that benefits the grid.

3.4 Financial contributions to grid construction costs and towards the cost of grid connection

The Bundesnetzagentur is assessing whether procedures are needed for introducing binding requirements governing financial contributions to the grid construction costs (BKZ) and towards the cost of grid connection (NAKB) of electricity storage. These should be based on the principles of transparency and causation and on regional harmonisation.

The reason for these considerations is that the sector has named contribution variations between regions and thus the impossibility to calculate these contributions beforehand as a clear obstacle to an accelerated ramp-up of large battery storage. In addition, the regional distribution of storage capacity such as is currently being incentivised does not serve the needs of the entire system. It would make more sense to distribute storage capacity in a way that takes account of the needs of supply and demand and/or existing or foreseeable (grid) bottlenecks.

3.5 Acceleration of grid connections

The Ministry will work closely with the Bundesnetzagentur and the industry to swiftly implement the proposals developed as part of the 'Acceleration of grid connections' dialogue, which are currently being discussed with the industry, and/or encourage and closely monitor their implementation.

Regarding storage projects, the following four issues are of particular importance: 'Harmonisation of the technical conditions for grid connection', 'Streamlining of the grid connection procedure', 'Development of grid capacity' and 'Cost transparency'.

In addition, the Ministry will assess whether the rule set out in section 8(1) of the RES Act under which 'green electricity storage' is given priority for grid connection is to be expanded to all energy storage facilities.

3.6 Strengthening local communities (to raise acceptance)

Even though large storage projects do not impact the landscape character as much as most other renewables projects do, they still need the acceptance of the municipalities in which they are located and the people living there. The Ministry believes that, in principle, there are two ways to raise acceptance:

a) Trade tax distribution to local communities

The Ministry advocates amending trade tax legislation in line with the existing provisions on renewables installations so that the local communities in which large storage projects are located will benefit more from the trade tax revenue associated with these. It will contact the Federal Ministry of Finance to advocate a change in this direction to section 29 of the Trade Tax Act.

b) Financial participation of municipalities in electricity storage projects

Section 6 of the RES Act gives project developers of wind energy and ground-mounted solar PV installations the possibility to make a financial contribution to the municipalities in which the installations are being built for the electricity they generate and feed into the grid. This can help raise local acceptance for the expansion of these installations in a targeted manner. The Ministry will assess the role of electricity storage in the context of section 6 of the RES Act.

3.7 Reduction of obstacles stemming from licensing law

In order to harness the potential for the construction of new and the expansion of existing pumped storage plants and other large storage facilities, it needs to be assessed how licensing procedures can be adequately shortened and streamlined. For this purpose, consultations with the industry are to be held to discuss which measures should be undertaken and in which order so as to speed the process up as much as possible.

In this context, the term 'licencing procedures' is defined broadly and meant to cover both Federal and Länder law. It extends to building regulations (especially outdoor construction, section 35 of the Federal Building Code) and also safety and security regulations such as the Ordinance on Installations to Handle Substances Posing a Threat to Water Quality (AWSV) or the Ordinance on the Construction of Premises for Operating Electrical Equipment (EltBauV).

3.8 Ensuring system stability

As set out in the System Stability Roadmap compiled by the Ministy with the involvement of the industry, electricity storage will need to make a greater contribution to system stability than before. This means that the technical properties of electricity storage facilities and the procurement procedures need to be refined. As a rule, there are three possibilities to obtain electricity storage contributions: first of all, by introducing binding technical requirements under the grid connection rules, secondly, via voluntary market-based procurement, and, thirdly, as part of the grid operator's grid elements.

For market-based procurement, the Bundesnetzagentur sets out procurement systems for non-frequency-related system services under section 12h of the Energy Industry Act. This section already includes a market-based procurement system for black start capability. The Bundesnetzagentur is currently working on developing market-based procurement systems for voltage control/reactive power and inertial reserve – services for which electricity storage facilities are very well suited. The relevant provisions for this are to be added in 2024. This will allow for an enhancement of electricity storage technology and additional contributions from electricity storage facilities to system stability via the market, and encourage the further expansion of electricity storage.

As part of the grid operator's grid elements, electricity storage facilities can cover a much broader range of tasks in the area of ancillary services. At present, the Bundesnetzagentur is assessing the expansion of functions requested by the TSOs as part of the 2023 Development Plan (NDP) Electricity.

3.9 Increasing balancing power

The Bundesnetzagentur is assessing the extent to which the environment can be improved (through requirements and licensing proceedings) to allow electricity storage to provide more balancing power in the future.

3.10 Evaluating 'grid boosters'

Sections 11a and 11b of the Energy Industry Act allow grid operators under certain conditions to set up and operate battery storage for the sole purpose of grid operation. Upon this legal basis, the Bundesnetzagentur has confirmed two 'grid booster pilot plants' in the the 2019 Network Development Plan (NDP) Electricity. According to the current plans, these are to start operation by 2025. The transmission system operators have requested three additional projects in the current 2023 Network Development Plan (NDP) Electricity, of which two are to be used as decentralised 'grid boosters' in the distribution network.

The transmission system operators will submit a report on their experience with the first 'grid boosters' once they can carry out an analysis, which will provide the basis for an evaluation of the existing legal framework by the Bundesnetzagentur and the Ministry.

3.11 Harnessing the potential of bidirectional charging

As part of the implementation of the 'Charging Infrastructure Master Plan 2' (measure 47), the Ministry is working to unlock the potential of bidirectional e-vehicle charging and to improve the relevant framework conditions. It has recently initiated several successful processes for this purpose. The advisory board to the National Charging Infrastructure Coordination Office has compiled a set of specific recommendations for action for a non-discriminatory roll-out of bidirectional charging. These include a joint roadmap by the automotive industry and the energy sector, which sets out the decisions that will need to be taken in the next few years.

On 27 November 2023, the Ministry hosted a European summit on bidirectional charging which will be followed up by more in-depth discussions of the topic in European working groups. The goal is to compile a work programme for the next European Commission by September 2024. A sub-working group will develop proposals for improving the environment for bidirectional charging at the national level.

3.12 Discussing obstacles standing in the way of pumped storage plants

The Ministry is engaging in intensive dialogue with the industry to remove obstacles standing in the way of the construction and operation of pumped storage plants. It is working to ensure that pumped storage can contribute optimally to the electricity system both today and in the future.

3.13 Electricity storage as a flexibility option

The Ministry will take account of the discussions held in the context of the Climate-neutral electricity system platform in order to strengthen electricity storage as a flexibility option on the market and in the grid. Here, the possibility to combine different revenue streams should also be taken into account, as has been proposed for example by the European Commission in its recommendation of 14 March 2023.

3.14 Calculating the potential of electricity storage within the energy system

The assumptions and figures which are currently being debated regarding the need for both battery storage and pumped storage capacity vary greatly. The Ministry is seeking to make this debate more objective and concrete and will model a number of scenarios with much stronger battery growth in its Long-term Scenarios for the Transformation of the Energy System in Germany so as to analyse the effect this will have on the energy system. Based on these considerations and analyses, it will be assessed how to proceed with the ramp-up of electricity storage.

3.15 Developing statistics on storage

The number and capacity of the electricity storage facilities that are registered in the Core Energy Market Data Register is increasing fast. It can be assumed that the Register has a high coverage rate. This means that the Register holds plausible statistical data for both the present and the past.

The Ministry will engage in dialogue with the industry to discuss how an expansion prognosis for electricity storage could be developed. This prognosis should be based not only on the generation capacities needed for the relevant types of energy storage but also on the availability of additional system components and skilled labour required for construction. In addition, more detailed and up-to-date data on the ramp-up of storage should be provided.

3.16 Supporting innovation and research

Electricity storage technology for both mobile and stationary use is already being enhanced under the 8th Energy Research Programme. Applied research projects will focus on the overarching goals of stable grid operation and a more flexible energy system. In addition, the Ministry is providing support for transferring research results to practice. The Ministry is continuously assessing how it can improve its support for innovation and research in the field of energy storage.

3.17 Promoting the production of battery cells and systems components

Since 2020, the Ministry has been funding the expansion of production capacities in battery cell manufacturing and the entire battery value chain, not least under the two IPCEI projects on batteries. This is being supplemented by training and reskilling measures for skilled staff in the battery industry – both in the context of reskilling measures in regions undergoing structural change and in the context of initial vocational training in the Länder. In addition to this, the Ministry is promoting digitisation and sustainability in battery cell manufacturing, for example under the Battery Pass project – which will provide the basis for the digital battery passport to be introduced by the new Battery Regulation.

3.18 Surveying the sector

The Ministry will engage in dialogue with the electricity storage sector to discuss which additional measures could be taken to supplement the fields of action set out here in an effective manner. This process is to look further ahead and thus go beyond the fields of action mentioned here, which are to be implemented rather in the short term. For this purpose, the Ministry and the electricity storage sector are to establish new formats to deepen the dialogue and put it on a permanent footing.

4. Outlook

This Electricity Storage Strategy serves as the central basis for the Federal Ministry for Economic Affairs and Climate Action's work on electricity storage in this legislative term. The next step now is to consult other stakeholders about the Strategy. The Ministry has already started work on statutory measures that can be implemented in the short term. In cases where it does not have the lead responsibility for a measure, it is maintaining communication with the body that has, for example the Bundesnetzagentur or the Federal Ministry of Finance, to work towards the implementation of the measures.

The main goal of the implementation of the Electricity Storage Strategy's measures is to optimise the environment in a way that perpetuates the dynamic expansion of electricity storage seen today and to ensure that electricity storage and its multiple functions can be used optimally by both the market and the grid.

The Ministry thanks everyone who has provided input for the development of this Electricity Storage Strategy thus far. We encourage you to continue to provide your expertise and become actively involved in the consultation process.