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Definition of the term "Energy storage facility"

Definition of term and proposal for an exemption from end consumer levies.

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1 Background

As far as "energy storage facilities" are concerned, there is currently a lack of constructive incentives for "research and development", as well as a lack of a suitable market environment and a uniform definition, nationally or in a European context. For instance, ever increasing numbers of new exemptions have been created, some of them technology specific, in the course of each reform of the law in order to provide a legal basis for the deployment of different energy storage technologies. The exemption from grid fees as per Sec. 118 (6) EnWG[1] and the exemption from the EEG[2] levy as per Sec. 60 (3) EEG 2014 are good examples of this. This not only leads to unnecessary bureaucracy; technology-specific regulations can impede the market entry of new storage technologies and constrain competition between storage technologies. Therefore, the regulations pertaining to energy storage facilities should be laid out uniformly across all relevant laws.

2 Definition: "energy storage facility"

A definition of "energy storage facility" and of the sub-category "electricity storage facility in the electricity supply system" is crucial. The associated differentiation from other groups of grid users such as generators, network operators and end consumers plays an important role, in particular, in the EnWG and the EEG. Whilst the end consumption represents a final use of the transported energy, storage facilities are, from an energy industry perspective, facilities which are able to receive energy and then release it again - e.g. in the form of electricity, gas or heating/cooling - at a later time.
The considerable financial burdens on energy storage facilities, which accompany the currently applicable regulations for energy storage facilities, not only forms a prohibitive barrier to the development of technology and of the market but also is fundamentally inappropriate in light of the function of energy storage in an energy economic respect.

Within the relevant laws, such as the German Energy Industry Act (EnWG), the function and obligations of energy storage facilities should be clearly regulated, in a manner as to enable the necessary distinction between temporarily stored and finally consumed energy as well as to avoid any scope for interpretation. In this context, no distinction should be drawn between the individual energy storage technologies or between new and existing plants in order to avoid legislative interference causing an impediment to competition between the storage technologies.

2.1 Proposal for a definition of the term "energy storage facility"

> "Facilities which receive energy with the objective of storing it electrically, chemically, electrochemically, mechanically or thermally and of making it available again for use at a later time."

Reasoning:
The proposal of the BDEW aims to formulate an umbrella term for all forms of energy storage by de-

[1] EnWG: German Federal Energy Industry Act

[2] EEG: German Renewable Energy Sources Act

fining the term, "energy storage facility", including, for example, pure electricity storage, heat storage or gas storage facilities. The definition would also cover cross-sector[3] energy storage such as power to gas, power to heat or power to liquid facilities[4]. There would be no relative evaluation of the various energy storage technologies, the choice for or against a particular technology should be the result of free market competition[5].

2.2 Proposal for a definition of the term, "electricity storage facility in the electricity supply system":

"Energy storage facilities which receive electrical energy from a general supply grid, temporarily store it and later feed the released energy back into a general supply grid. Drawing electrical energy for the purpose of temporary storage in an electricity storage facility does not constitute final consumption."

Reasoning:

The proposed definition of "electricity storage facility in the electricity supply system", which represents a sub-category of "energy storage facilities", describes the actions of energy storage facilities in the electricity grid. Examples of such "power to X to power" facilities are pumped storage power plants or battery storage facilities.

Contrary to their function as "buffers" for the electricity grid, currently, "electricity storage facilities in the electricity supply system" are treated as end consumers when drawing the electricity for storage, and as generators when feeding-back the electricity. This view is technically and physically fundamentally incorrect and conflicts with the "law of conservation of energy". If one used this approach, whereby the overall system is represented by the electricity supply system, the energy from regenerative sources or from fossil or nuclear sources is converted to electrical energy by power stations. This is then transported via the electricity grids. In the case of "electricity storage in the electricity supply system", the electrical energy is withdrawn from a general supply grid and temporarily stored. Finally, it is fed back in and transported on to the end consumers. In contrast, final consumption is not

[3] "Cross-sector" describes the link of different energy sectors, such as the electricity sector with the gas or heating sector. In the case of the power to gas technology, electrical energy is converted by means of water electrolysis and optional subsequent methanation into chemical energy (gas) and stored within the existing (natural) gas infrastructure. This can, in future, not only make a contribution in the market and system integration of renewable energies but may also be able to reduce the need for transport capacity in the electricity grid by shifting some demand to the gas grid or to the existing supply infrastructure for liquid fuels.

[4] Power to liquid (P2L): The hydrogen generated from regenerative excess energy by electrolysis can be stored in the same way as the "power to gas" technology by means of chemical conversion into liquid fuels ("power to liquid"). Examples of relevant processes are the production of methanol, formic acid or superior quality synthetic fuels from hydrogen as well as the reversible storage of hydrogen in liquid organic hydrogen carriers (LOHC). Through the P2L process, regenerative energy can be stored in liquid fuels and distributed in the existing infrastructure for liquid fuels. A reconversion into electricity as in the functionality of an electricity storage facility is also possible.

[5] However, competition must occur on a comparable basis. Electricity storage facilities in the electricity market balance overall supply and overall demand, thereby earning a margin from the difference in electricity price on the wholesale market. Photovoltaic own use storage facilities earn much higher margins as they can increase their revenue from the now quite low EEG levy up to the level of saved household electricity price (including all end consumer levies). Statutory regulations for a fair competition between storage facilities thus requires an overall view of the revenue possibilities.

followed by feeding back the electrical energy into the grid. A comparison with phase shifters, transformers or with the power grid also makes this clear: Phase shifters, transformers or the power grid also store electricity for a few milliseconds through their inductive or capacitive effect and then release it, minus the respective efficiency losses. It becomes clear that viewing "electricity storage facilities in the electricity supply system" as end-consumer grid users does not reflect the real life situation.

A special form is represented by cross-sector energy storage facilities (see above), where the energy storage by such facilities occurs without any subsequent reconversion and feeding back of the previously stored electricity. In this case, only the umbrella term, "energy storage facility" would apply. If, however, in particular in the case of power to gas or power to liquid technologies, a reconversion and feed back does occur, such facilities would also fall within the definition of "electricity storage facilities in the electricity supply system".

2.3 "Gas storage facilities in the gas supply system"

For gas storage facilities which in accordance with the aforementioned BDEW proposal represent a specific form of "energy storage facility" the existing definition of the term "storage facility" in Sec. 3 No. 31 EnWG should apply. The term "storage facility" should be modified to "gas storage facility in the gas supply system" in order to better differentiate it from the term "electricity storage facility in the electricity supply system".

With regard to feed-in and discharging fees for natural gas storage facilities as well as to the market conversion levy, the BDEW would highlight the following points:

Natural gas storage facilities are an essential element of the German gas supply system as well as of an independent energy supply in the European common market. The consumption of natural gas is subject to large fluctuations dependent on the season but also on the time of day, whereby large stored volumes are required as a result of seasonally shifted transport and possibly high daily peak demand for gas from storage facilities. The 51 German underground gas storage facilities at 40 locations, are able to receive almost 24 billion standard cubic metres of process gas[6] which corresponds to around a quarter of the total volume of natural gas consumed in Germany in 2012.

Natural gas storage facilities were deployed in the past, as they are today, primarily to balance and to compensate for seasonal fluctuations in consumption in Germany. In addition to shifting transported gas volumes to the summer months, where demand is weaker, in order to optimise the management of the transport infrastructure, storage facilities also provide gas for peak demand. As a result of the present legal situation, the changed market situation and the currently available market instruments, the behaviour of market participants has altered and this is reflected in the management of the gas storage facilities. The management of the storage facilities is today largely driven by the market and indirectly makes an important contribution to security of supply. That is also reflected in the growing demand from gas traders for flexible capacity which can be traded at short notice. The BDEW there-

[6] according to information of the State Authority for Mining, Energy and Geology (LBEG)

fore believes that an assessment of the regulated network charges and the state induced price elements for gas storage facilities is necessary. In the scope of the German Federal Network Agency's process to determine feed-in and discharging fees (BEATE) and in the scope of its work on the gas market design, the BDEW will make proposals on the topic of network charges for gas storage facilities. These proposals will, in particular, take into account the role of gas storage facilities in ensuring system stability and security of supply.

3 Exemption from electricity network charges

Background:

As far as energy storage facilities are concerned, the EnWG, as yet only contains a definition of the term "storage facility" and this definition is aimed at gas storage facilities. Other energy storage facilities, such as facilities for storing electrical energy ("electricity storage facilities"), are referred to within the above Act or in the EEG, however, without any definition of the term existing thus far. On the contrary, the courts have found that the storage process in respect of pumped storage facilities is "from an economic perspective, a system in which energy is to be stored. However, as the energy is initially consumed, by converting it into mechanical energy, this constitutes an act of final consumption" (German Federal Court of Justice, BGH, decision of 17 November 2009, EnVR 56/08). The implementation of this decision means, for example, that, when storing electricity, electricity storage facilities are treated as end consumers in the scope of the EnWG when receiving electrical energy and when feeding the energy back they are treated as generating plants. The situation regarding competition with other flexibility options in the various sectors is not comparable, either. The legislator has indeed made certain isolated legislative modifications to take this into account. However, an all-encompassing view is still lacking.

Changes to German Federal Energy Industry Act (EnWG):

The BDEW proposes amending the EnWG so that all "electricity storage facilities in the electricity supply system", irrespective of when they started operating, be exempt from any obligation to pay charges for network access, including all associated statutory fees and levies – e.g. KWK (CHP) levy, offshore liability levy, StromNEV (Ordinance on Grid Changes) levy, AbLaV (German Interruptible Loads Ordinance) levy etc. – according to the definition above if they withdraw electricity and then feed it back in. In addition, the exception for "facilities in which hydrogen is produced through electrolysis of water or in which gas or biogas is produced from hydrogen extracted by way of electrolysis of water and subsequent methanation", as already provided for in the current Sec. 118 (6) EnWG, should be preserved.

Reasoning:

Generally, it should be taken into account that the storage of electricity, as explained above, does not constitute a final consumption of transported electrical energy. The transport of electricity to the end consumer is simply interrupted for a certain length of time at the electricity storage facility and then resumed after it has been fed back (and then transported to the end consumer who does not feed it back in).

The exemption of "electricity storage facilities" from grid fees is also justified in light of the benefits to the electricity supply system as a whole which are provided by electricity storage facilities. Electricity storage facilities stabilise the electricity grid in the case of system failures and they restore the grid in the case of a power outage (black start capability). In addition, the storage facilities serve as providers of short notice positive and negative balancing power, due to their high degree of flexibility and availability and thus they make an important contribution to the management of network bottlenecks (redispatch). They are also in a position to provide other important ancillary services for the purpose of frequency and voltage stability. In this way, electricity storage facilities reduce the need for balancing power from other sources (feed-in and load management, gas-fired power stations etc.) as well as must-run services in the supply system.

Subject for further scrutiny: Exceptions for power to gas, power to heat, power to liquid and other flexibility options

Differing positions can be taken in respect of power to gas and power to heat technologies, depending on their market role:

- From the perspective of electricity grid operators an exemption of additional energy storage facilities from network charges beyond the "energy storage facilities in the electricity supply system" would not be appropriate as these do constitute end consuming network users if not feeding back of electricity occurs. However, if these storage facilities, when compared to other network users, have an operation which is beneficial to the network, they could and indeed should be incentivised (for example through a reduction in network charges, exemption from the EEG levy etc.).
- From the perspective of the operators of such energy storage facilities, imposing grid fees (only) on power to gas, power to liquid and power to heat plants does not make sense as that leads to distortions in competition whereby these storage technologies have a disadvantage compared to pure electricity storage facilities (power to power). The focus should be on the so-called storage service so that free competition between technologies can decide which energy storage technology is best suited to which time at which place in the overall system from a technical economic perspective.
- An exemption from network charges should be examined in relation to other providers of services within the energy supply system, insofar as the benefits to the operation of the overall system are comparable. Such a service could also be stabilising the electricity grid in the case of system failures or receiving excess generated electricity at short notice. This type of flexibility option is offered, for example, by thermal storage facilities, heating pumps and CHP facilities in buildings in conjunction with intelligent demand side management which are already available in large numbers and must simply be integrated in load management operations. Rapid availability and comparably low investment costs would be advantageous.

A final regulation on the part of the legislator would be desirable in this context.

4 Exemption from EEG levy

Parallel to the necessary clarification in the EnWG mentioned above, the BDEW proposes that the legislator undertake a corresponding clarification in the German Renewable Energy Sources Act (EEG), with reference to the definitions of "energy storage facilities" and "electricity storage facilities in the electricity supply system" proposed for the EnWG.

Sec. 60 (3) EEG 2014 already regulates the exemption of electricity storage facilities from the EEG levy (e.g. pumped storage power plants and battery storage facilities), if the stored electricity is exclusively fed back into the grid from which it is originally drawn. This regulation should be adjusted according to the definition for "electricity storage facility in the electricity supply system" as proposed by the BDEW, in order to provide a uniform understanding of technology in the respective laws.

Furthermore, in the opinion of the BDEW, other energy storage facilities which store electricity in the form of heat (power to heat facilities, P2H), in the form of gas (power to gas facilities, P2G) or in the form of liquid fuels (power to liquid facilities, P2L) should also be generally exempted from the EEG levy. P2G, P2H and P2L facilities can also provide a considerable contribution to the market integration and system integration of renewable energies by transferring energy from the electricity sector into the gas, heating or (liquid) fuel sector. In this way, a limiting of already remunerated renewable energy plants could be avoided and fossil fuels could be saved in other sectors with regenerative excess electricity.

In addition, the criterion requiring the withdrawal of power to be exclusively for the purpose of feeding back in should be abandoned, not only in relation to the aforementioned cross-sector technologies but also for power to power technologies in comparison with the existing regulations in Sec. 60 (3) EEG 2014. In a technology neutral approach, technologies should also be taken into account which partially feed back in/recover electricity (e.g. drinking water turbines). In this context, the term "electricity storage facility in the electricity supply system" should only cover the proportion of electricity originally withdrawn from the electricity grid (e.g. by drinking water pumps) which is subsequently fed back into the electricity system/grid (e.g. using drinking water turbines).
This approach represents a fairer distribution of the EEG levy, as otherwise the EEG levy would have to be paid for more electricity than the net volume ultimately consumed. At the same time, the incentive to further develop and increase the efficiency of energy recovery is preserved.

In addition to the introduction of a uniform definition of "energy storage facility" in the German Federal Energy Industry Act (EnWG) and in the German Renewable Energy Sources Act (EEG), the BDEW recommends that the legislator examine the other levies on "energy storage facilities" (e.g. electricity duty etc.) associated with their current definition as end consumers to ascertain if they are appropriate. These jeopardise the profitability of energy storage facilities and can impede the market entry of new technologies.

5 Outlook

The proposed definition of the term "energy storage facility" and the sub-category "electricity storage facility" reflects the current status of the discussion in the industry. It should be stressed, however, that this process has not yet been concluded. The aim is to arrive at a common definition for energy storage facilities to cover all technologies which could potentially be relevant.