Bundesnetzagentur

Position paper on the application of the regulations on the feed-in of biogas to the injection of hydrogen and synthetic methane into gas grids

Disclaimer: Only the German version is applicable.

1. Background

The conversion of electricity from renewable sources into hydrogen and of hydrogen and carbon dioxide (or carbon monoxide as well) into synthetic methane (power to gas) which can then be fed into the gas infrastructure, stored and transported to various customers appears to be a promising method of integrating renewable energies into other utilisation paths. Power to gas can make a useful contribution to reducing CO_2 emissions in various consumption sectors when gas produced from renewable sources replaces the use of fossil fuels for mobility, in industry, heating and electricity generation. Power to gas can also play a role as a medium of storing electric power in balancing out growing fluctuations in the volumes of electricity generated by wind or from solar power over longer periods of time or in making such power available over longer periods of time when large volumes of renewable energy cannot be fed directly into the electricity grid. The advantage of feeding hydrogen into the network is that eliminating the further step of converting hydrogen into synthetic methane is more efficient and, because there is no need for methane plants, the investment and operating costs are lower and there is no need to obtain carbon dioxide for the methanation reaction process. At the same time, however, there are strict constraints at present on the amount of hydrogen which can be admixed, as the consumption installations used by many final consumers, storage facilities and grids will only tolerate a limited amount of hydrogen. Adjustment measures would entail further costs, the scale and extent of which have not as yet been reliably studied. The advantage of feeding in synthetic methane, on the other hand, is that there are practically no technical restrictions to this injection method.

With the aim of promoting both the feeding in of both hydrogen and synthetic methane to the grid, both of these forms were included in the definition of biogas in section 3 para.10c of the Energy Act (EnWG), subject to the condition that they primarily originate from renewable energy sources. This means that part 6 of the Gas Network Access Ordinance (GasNZV), including sections 19(1) sentence 3, 20a and 20b of the Gas Network Charges Ordinance (GasNEV) is immediately applicable to the injection of renewable hydrogen and synthetic methane (privileged connection, privileged injection, biogas balancing, elimination of feed-in fees, fixed payment for avoided grid costs, allocation of the costs borne by gas network operators). This requires some interpretative work, however, owing to the differences between the required plant technology and the technology used in classic biogas production and processing (electrolyser and methanation plant instead of fermenters and digestive processing) and the properties of the gas. These interpretative issues have not yet been clarified for biogas injection. The legal position concerning the feed in of other biogases under section 3 para.10c of the Energy Act (EnWG) also applies in principle to the injection of renewable hydrogen and synthetic methane.[1]

[1] In this respect, the rulings of the regulatory authorities and courts on the feed in of biogas also apply: Bundesnetzagentur, ruling of 3 March 2010 (BK7-09-005), ruling of 25 February 2011 (BK7-10-191), ruling

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The very first inquiries submitted to the Bundesnetzagentur called for an assessment of the key legal principles and issues concerning the feeding in of hydrogen and synthetic methane. In order to achieve the greatest possible transparency this position paper presents and discusses the basic issues relating to the application of the regulations on the feed in of biogas to the injection of hydrogen and synthetic methane.

2. Connection to the grid

a) Field of application of regulations on biogas injection

Part 6 of the GasNZV and sections 19(1) sentence 3, 20a and 20b of the GasNEV comes into play according to section 3 para. 10c EnWG if hydrogen and carbon dioxide can be shown to primarily, i.e. at least 80 percent (BT DS 17/6072, p. 50), originate from renewable sources within the meaning of Directive 2009/28/EC of 23 April 2009 and if the carbon dioxide is produced from renewable energy sources. Energy from renewable sources is defined in Article 2(a) of Directive 2009/28/EG as energy from non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.[2] The period within which the property of the gas as originating primarily from renewable energy sources must be demonstrated is the calendar year or, in cases when injection begins mid year, the remaining period of the year.

The regulatory privileges which apply to the feeding in of biogas only come into play if the biogenic quality of the gas complies with the meaning of the section 3 para. 10c EnWG. This requirement can basically be met, however, by the plant operator simply providing information about the source of the electricity in the gas network operator's data sheets or forms when requesting the plant's connection to the grid.[3] The gas network operator only needs to and is only permitted to demand more detailed or recurring evidence from the supplier of the biogenic quality of the gas (for example, by means of certificates) in exceptional cases in which the gas network operator has firm grounds for believing that the gas in question does not have the required biogenic quality.

This basically complies with the requirements for the feeding in of other biogas. Expert opinions or similar on the type of input materials used are not required in this case either. Comprehensive, tried and tested verification methods are also needed when using the injected gas as a renewable product in the electricity, heating and fuel sectors, and this means that, for this reason alone, the risk of abuse is minor at the present time. The use of renewable hydrogen or synthetic methane as "grey" non-renewable products which would not require verification when used would seem, for economic reasons, to be rather unlikely. If this should change, however, or if potential abuse becomes apparent for other reasons, a change in the law – comparable to the proofs of use in the electricity and heat generation and fuel sectors – would be needed in order to demonstrate the renewable properties of the electricity used and to provide a detailed verification mechanism which would eliminate any related legal uncertainties. The risk of abuse attached to the use of renewable carbon dioxide would, as with the feeding in of any other biogas,

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of 26 February 2013 (BK7-12-215); North Rhine-Westphalia Regulatory Authority, rulings of 21 February 2011 and 18 June 2012 (V B 4 - 38-26), Düsseldorf Higher Regional Court, ruling of 14 December 2011 (VI 3-Kart 25/11), ruling of 22 August 2012 (VI 3-Kart 205/12), ruling of 19 December 2013 (VI-5 Kart 25/13); BGH, ruling of 11 December 2012 (EnVR 8/12).

[2] The terms aerothermal energy, hydrothermal energy and geothermal energy as well as biomass are themselves defined in Article 2(b) to 2(e).

[3] If the network operator's data sheets/forms do not provide for such entries to be made, an alternative method is for the plant operator to submit a plant operation plan which clearly shows where the electricity in question originates from.

appear to be even lower as the carbon dioxide is usually produced on site (such as in biogas treatment plants).

Application is not excluded by section 32 para. 1 to 3 GasNZV either. This regulation defines the connection as a link between the biogas treatment plant and an existing gas supply network, the connecting party as the operator of a plant for upgrading biogas to natural gas quality, and plant as plant for upgrading biogas to natural gas quality. At the same time, however, the definition of biogas in section 3 para. 10c EnWG must also be taken into account; this definition has been extended to include renewable hydrogen and renewable synthetic methane to enable the GasNZV and GasNEV biogas regulations to be applied to both of these other gases as well. This means that, for the purposes of these regulations, plants used to manufacture hydrogen and synthetic methane are legally on a par with biogas treatment plants.[4]

b) Obligation to connect

Under section 33(1) sentence 1 GasNZV, network operators must give priority to connecting electrolyser and methanation plants which primarily use renewable energies within the meaning of section 3 para. 10c EnWG to the gas supply network. Network operators can only be denied connection to the grid under section 17(2) EnWG and section 33(8) sentence 1 GasNZV if this is technically impossible or economically unreasonable. Network operators must check whether the specific circumstances applying in a particular case support the assessment of economic unreasonableness thereby weighing up all the matters which are relevant in each specific case.[5] Only if the concerns of the network operator have precedence over the concerns of the connecting party is the network operator then entitled to withhold a connection.[6]

Intermittent feed-in of the hydrogen or synthetic methane, i.e. fluctuating feed-in owing to flexible generation of hydrogen or synthetic methane from wind or solar power, for example, will not in itself provide grounds supporting an argument of economic unreasonableness. In particular, all-year-round feed-in is not a necessary criterion of economic reasonableness, and especially not if the plant concept does not envisage intermittent feed-in of hydrogen or synthetic methane. Business concepts of this kind must continue to be possible as the feeding in of hydrogen and synthetic methane from fluctuating sources of renewable energy for structural load balancing purposes is derived from precisely such intermittent conversion or feed-in. What is more, owing to the lower volume of gas flows in the summer months, it will not always be possible to feed in hydrogen throughout the whole year. This means that the connecting party will require a guaranteed connection for feeding in hydrogen and synthetic methane even if it is not actually used the whole year round.

c) Availability of connection and minimum feed-in capacity

Under section 33(2) sentence 1 GasNZV the network operator must ensure that the grid connection is at least 96 percent available. Availability relates to the calendar year. This means that the network operator is responsible for ensuring that the grid connection, i.e. the connection or injection facility and the connection pipeline itself, are available for the planned injection for at least 96 percent of a calendar year. The network operator must also guarantee to the connecting party, under section 33(6) sentence 4 GasNZV, a particular minimum feed-in capacity as stipulated

[4] This also applies to plants used to produce other biogas, in those cases in which non-upgraded (raw) biogas can be injected; see below. 4.

[5] BGH, ruling of 11.12.2012, EnVR 8/12, sentence 7. In this context, the concerns of the network operator may include the costs of the connection, and any capacity-increasing measures while, on the other hand, the extent to which the connecting party depends on the specific connection which has been requested is also taken into account.

[6] BGH, ruling of 11.12.2012, EnVR 8/12, sentence 7.

in the grid connection contract. This will usually be equal to the requested feed-in capacity, unless the grid is unable to accommodate the requested capacity and it is not technically possible to carry out capacity-increasing measures or, if such measures would be economically unreasonable; cf. sections 33(10), 34(2) sentence 3 GasNZV. The network operator can also adjust the minimum feed-in capacity to the determined permissible level of hydrogen injection, if the requested feed-in cannot be granted in full owing to a lack of grid compatibility.[7] Temporary fluctuations – both upwards and downwards – in otherwise permissible levels of hydrogen injection do not, however, have to be taken into account in the guaranteed minimum feed-in capacity, unless that is such fluctuations are foreseeable. If this is the case, these can be taken into account from the very beginning in the framework of the minimum feed-in capacity.

Intermittent use of the connection and injection will not release the network operator from its obligations under sections 33(2) and 6 sentence 4 GasNZV either. This means that the grid connection must also be available for 96 percent of the calendar year for intermittent operations as well. If, however, the network operator does not make the connection available for a period equal to more than four percent of a calendar year, and if the connection is not used by the supplier during the period in which it is not available, the failure to make a connection available will not have any consequences for the network operator. This situation is particularly relevant when interruptions in availability are planned for eventualities such as maintenance work. Similar rules apply to guaranteed minimum feed-in capacity: this must also be made available throughout the entire year. During a period in which the capacity is not being used by the supplier owing to intermittent operations, however, temporary withdrawal of capacity will not have any consequences.

The provisions of section 33(2) sentence 1 and section 6 sentence 4 GasNZV do not apply, however, as regards hydrogen compatibility. The obligation to ensure minimum connection availability does not relate to the hydrogen compatibility of the grid, but to the actual technical availability of grid connection equipment within the meaning of section 32 para. 2 GasNZV. Neither does the guaranteed minimum feed-in capacity provided under section 33(6) sentence 4 GasNZV apply here either as this relates solely to the capacity of the grid to accept supplies and not to the grid's compatibility with hydrogen.[8]

The guaranteed minimum feed-in capacity can therefore be reduced or withdrawn subsequently if it can be shown that a technical reduction or discontinuation of hydrogen injection will be required permanently i.e., not simply for a temporary period of time.[9] If the injection of hydrogen is reduced permanently, the guaranteed minimum feed-in capacity may only be reduced by a maximum of the same amount. If accordingly, in response to a merely temporary necessity to reduce the injection of hydrogen, the minimum feed-in capacity is not reduced, the network operator is liable for as long as hydrogen compatibility is lacking for the reasons referred to above, but not for the continuing requirement for guaranteed minimum feed-in capacity. Vice versa, the minimum feed-in capacity must be subsequently increased if a technical increase in hydrogen injection would be permanently possible. If it becomes apparent at a later stage that there will be temporary increases, these must also be taken into account in the guaranteed minimum feed-in capacity, unless such increases are unforeseeable.

3. Grid access

a) Legal context

Under section 34(1) sentence 1 GasNZV network operators must give precedence to agreeing feed-in contracts with the suppliers of hydrogen and synthetic methane from primarily renewable

[7] Refer to 5f below.
[8] Refer to 5f below.
[9] Refer to 9f below.

sources of energy within the meaning of the section 3 para. 10c EnWG. However, under section 34(2) sentence 1 GasNZV network operators are entitled to deny access or injection if this is technically impossible or would be economically unreasonable. Under section 34(1) sentence 1 HS. 2 GasNZV and section 36(1) sentence 1 GasNZV network operators can also deny access or injection in the event of a lack of grid compliance or compatibility of the gas which would otherwise be fed in.

The current legal situation is that all grid users are required by section 19(1) and 2 GasNZV and by section 49(2) and 3 EnWG to ensure that the gas which they feed in is compatible with the grid. This means that the grid user is required to feed in gas which has properties which allow the grid to be operated and the gas to be used safely. Under section 49(2) sentence 1 para. 2 EnWG, the technical requirements are always based on the latest version of the DVGW worksheets. Under section 34(1) sentence 1 GasNZV and section 36(1) sentence 1 GasNZV this obligation also applies to biogas suppliers, subject to one limitation: as regards the threshold values which must be complied with by biogas suppliers under section 36(1) sentence 1 GasNZV, the regulatory body has referred to DVGW G 260 and G 262, as these applied in 2007, i.e. subsequent changes in the contents of these worksheets are not applicable to biogas suppliers.[10] The DVGW worksheets also specify combustion characteristics and threshold values for concomitant substances which would guarantee the compatibility of gas with the grid into which it is fed.

As hydrogen is a gas which differs significantly in composition and combustion quality from natural gas and other gases which are compatible with the grid, and – without blending – can damage pipelines, storage facilities and customer installations, pure hydrogen is not compatible with existing grids. Nonetheless, hydrogen may still be compliant with the grid if there is no reason to fear that blending upstream of the entry point with gas which is compatible with the grid will not negatively impact the interoperability of the gas supply network. This emerges from the interpretation of sections 49 EnWG and 19, 34 and 36 GasNZV. This is spelled out in detail in the DVGW worksheets: gases which are not compatible with the grid, such as pure hydrogen, can be fed into the grid as an "additive gas" to natural gas (the "basic gas") in existing gas supply networks; cf. No. 2.2 DVGW worksheet G 260 (2000). Initially, it is the combustion properties which determine the extent of mixing; cf. No. 2.2 DVGW worksheet G 260. In addition, additive gas must be injected in a way which meets the requirements for public gas supplies behind the entry point; cf. No. 4.1.3 DVGW worksheet G 262 (2004). This means that hydrogen can be fed in, to the extent permissible, as long as it is possible to guarantee the safety and interoperability of the entry network in question, any up or downstream gas supply networks, and the storage facilities and customers connected to the affected networks.

The network operator is not required, however, to upgrade the hydrogen compatibility of its network. The rules concerning minimum connection availability and minimum feed-in capacity do not apply in this case.[11] Nor do measures under section 34(2) sentence 3 GasNZV apply as the network operator is only required in this context to act to increase the capacity of its network, not to remedy the lack of compatibility of the network with the gas injected into it. This means that, although there may be sufficient capacity for the gas in the grid, gas which is injected into the grid may not necessarily be compatible with that grid.

This assessment does not contradict the inclusion of hydrogen in the definition of biogas in section 3 para. 10c EnWG. This is apparent if we compare the legal situation which applies to the feeding in of non-upgraded biogas (referred to as raw biogas) which is not compatible when it is injected into grids either. The rules on the feeding in of biogas in sections 31ff. GasNZV also apply to the injection of raw biogas under 3 para. 10c EnWG as the definition of biogas in sec-

[10] In addition, the network operator is also responsible for providing the required feed pressure and for complying with the requirements for gas billing specified in DVGW worksheet G 685; cf. section 36(1) sentence 5 and (3) GasNZV.
[11] Refer to page 4 above.

tion 3 para. 10c EnWG encompasses, in terms of raw materials, every possible form of biogas, i.e. gas derived from biomass, sewage treatment plant gas, landfill gas and mine gas, regardless of the level of treatment in each case, its specific composition or its compliance with the grid.[12] However, if – contrary to the existing legal position as stated in sections 34(1) sentence 1, 36(1) sentence 1 GasNZV – network operators were made responsible for ensuring that injected biogas was grid compliant and compatible then, if injected hydrogen, raw biogas or other non-compatible gases which fall within the definition of section 3 para. 10c EnWG was not compatible with the grid, the network operator would either be required to upgrade its network or – if this was technically impossible or uneconomic – to build and operate the required biogas treatment plant or methanation plants itself. This is not, however, the purpose and intent of section 3 para. 10c EnWG and – as a comparison with raw biogas in particular reveals – not the purpose and intent of the amendment to section 3 para. 10c EnWG to include renewable hydrogen and renewable synthetic methane. An interpretation along these lines would violate the principle set down in sections 19(1) and (2) and 2, 34 (1) sentence 1 and 36(1) sentence 1 GasNZV according to which the supplier must ensure that the gas injected into the grid is compatible and compliant with it.

b) Assessment of grid compatibility[13]

After receiving a request for connection the network operator must first, as part of its analysis of the status quo position and any changes in the operator's grid which are already foreseeable at the time the request for connection is made, determine what maximum volume of hydrogen its network would be capable of accommodating. Under section 33(5) sentence 5 GasNZV the costs of this assessment are always borne by the connecting party, provided that the assessment does not relate to capacity boosting measures within the meaning of section 34(2) sentence 3 GasNZV, such as reverse feed-in to an upstream network. As part of the connection assessment, the network operator must in particular calculate the maximum permissible hydrogen content in its network and the permissible feed-in volume or capacity. In order to do this, the network operator must determine the factors in its network and any upstream or downstream networks which might have a limiting impact on the volume of hydrogen which can be injected. In this context a distinction must be drawn between limitations which arise in relation to the general gas supply and limitations which are merely related to the requirements of particular customer groups (e.g. use of natural gas as an input material in the chemical industry). The provisions of sections 49 EnWG and of 19, 34 and 36 GasNZV basically only protect the requirements relating to general gas supplies. The requirements concerning general gas supplies and thus the interoperability of the gas supply network also cover the requirements for grid and storage operations and the general and customary use of gas in the production of heat and electricity. This relates in particular to the quality of gas and hydrogen concentrations required by gas turbines, CHP motors and pore storage facilities as well as the failure to capture hydrogen concentrations using process gas chromatography (PGC).[14]

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[12] The inclusion of biomethane in section 3 para. 10c EnWG is thereby purely declaratory in nature and has no significance apart from the other substances listed; it does, however, emphasise the fact that even gases which are not compatible with the grid are also biogases as defined in section 3 para. 10c EnWG.

[13] The next two sections only consider the injection of hydrogen into the grid as the procedure for assessing an application for the feeding in of synthetic methane does not differ substantially from the procedure for feeding in upgraded biogas.

[14] Refer also to DVGW worksheet G 262, 2011, sentence 17, which describes threshold values for different gas applications. It is also possible that network operators outside Germany may refuse to feed in hydrogen at cross-border interconnection points or may apply more stringent thresholds than apply under German law. At present, therefore – as there are no uniform European regulations – the law of the neighbouring country in each case still applies, even in those cases in which German law should in fact apply to offtake volumes at cross-border interconnection points, and therefore the assessment of domestic interconnection points described in the following ought also to be applied. If an international network operator violates a country's national law or if national law violates higher-ranking EU law on non-discriminatory access to the gas grid – perhaps because exclusion of hydrogen injection or more stringent thresholds are

One exception in this context are PGCs used in the calibrated measurement of combustion value for correct gas billing purposes. Under section 36(3) GasNZV the network operator is required to exchange the PGC if this is necessary in order to comply with the gas billing requirements in DVGW worksheet G 685 following injection of (renewable) hydrogen and if the associated costs would not make the entire connection economically unreasonable. The costs incurred in this context are always borne by the network operator in whose network they are incurred, even if such costs arise as a result of conversions in an upstream network area. This means that if new PGCs need to be set up in a downstream network as a result of the injection of hydrogen in an upstream network, this is the responsibility of the downstream network operator. However, this operator can pass on these costs where this would be economically reasonable and subject to cost efficiency considerations under section 20b GasNEV. The affected network operators must exchange all the information required for this purpose.

It is questionable whether further requirements concerning the quality of gas for CNG filling stations should be recorded ahead of the stipulations on the interoperability of the gas supply network. This is doubtful bearing in mind the relatively insignificant volumes of natural gas currently being consumed as vehicle fuel compared to the volumes used for heating purposes or even electricity generation. The current situation, and not any future or expected developments, are critical in this context. Protection in the form of interoperability of the gas supply network is supported, however, by the circumstance that, with around 900 filling stations, a large number of final customers are directly affected and, with over 96,000 natural gas-driven vehicles in Germany and around one million such vehicles in Europe as a whole, an even larger number of final customers are indirectly affected. A final evaluation of this situation as it relates to the injection of hydrogen is not strictly necessary given that, when determining the maximum permissible hydrogen content in each case, the requirements for existing CNG filling stations also need to be taken into account.[15] As pure hydrogen is not compatible with the grid, but can only be fed in after it has been sufficiently mixed with gas which is compatible with the grid, an existing customer who is not protected by the requirements for interoperability of the gas supply network must, as a minimum, be able to rely on receiving supplies of grid-compatible gas[16] which complies with the thresholds stipulated in the DVGW worksheets.[17]

After determining hydrogen-sensitive applications in the grid, the network operator must - drawing on the binding data from the hydrogen supplier and in the framework of the request for connection for the planned injection purposes - determine the required data from its own network[18] and whether and to what extent hydrogen might come into contact with sensitive applications or interconnection points in downstream or (in the case of reverse feed-in) upstream networks. If this is the case, the network operator may have to assess, where applicable with the affected customer, whether the application or affected customer (such as a storage or power plant operator) may exceptionally be able to accept a higher hydrogen content or higher volume of hydrogen (for example: very short-term exceedances); an affected customer is not, however, required to accept higher hydrogen content for a short period if damage cannot be completely excluded, even if such content is increased for only a very short period of time. If this is not the case, the

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not technically justified in specific cases – the basic rule is that the national regulatory authorities and courts in the neighbouring state have jurisdiction for the German network operator.

[15] Refer also to DVGW worksheet G 262, 2011, p. 17.

[16] This must also apply to the specific requirements which existing industrial customers have of hydrogen contents but which are not part of general gas supplies.

[17] DVGW worksheet G 262, 2011, p. 17. As the provisions of the revised DVGW worksheets simply describe in more specific terms the contents of No. 2.2 DVGW worksheet G 260 (2000) and No. 4.1.3 DVGW worksheet G 262 (2004), that is have only declaratory effect compared with the provisions of the old regulations, the contents also apply to the injection of hydrogen where this must be treated as biogas within the meaning of section 3 No. 10c EnWG.

[18] These include in particular past and anticipated load flows, including zero flows and changes in the direction of gas flow, as well as the quality of the gas in the network, including any hydrogen components it may already contain.

network operator must calculate the amount of hydrogen which can be injected at the requested connection point. If the hydrogen finds its way into downstream or upstream networks, the network operator must determine the extent to which hydrogen is able to penetrate into the upstream or downstream network via the relevant interconnection point and must communicate this finding to the operator of the relevant network. This must then carry out a separate assessment to determine whether, in that operator's network, there are applications which are sensitive to hydrogen and must then calculate the extent to which hydrogen can be fed in at the relevant interconnection point. The assessment conclusions must be notified to the (feed-in) network operator. The (feed-in) network operator must then use this information to assess the extent to which hydrogen can be injected at the requested connection point. As part of this assessment, the network operator (where applicable in cooperation with the affected network operators of downstream or upstream networks) must also take into account foreseeable fluctuations which may occur during the year. If it is predictable that it may be possible to feed in higher levels of hydrogen at certain times, the network operator must allow the supplier to do this. If this requires the installation of a hydrogen-sensitive PGC, the costs must be assumed by the network operator if such a PGC could also, as a minimum, be used to comply with the provisions of DVGW worksheet G 685; refer to section 36(3) GasNZV.[19]

The network operator (where applicable in cooperation with any upstream or downstream network operators who may be affected) must assess whether changing hydrogen-sensitive equipment for equipment which is capable of withstanding a large volume of hydrogen or modifying current dispatching arrangements and other adjustments which might segregate higher hydrogen concentrations from sensitive applications, it may be possible to increase the hydrogen admixture without violating or endangering fulfilment of the network operator's obligation under sections 11, 15, 16 and 16a EnWG to operate a secure, reliable and efficient grid. While the network operator is not required to change or install new equipment or to accept the costs which this would entail,[20] the network operator must, however, provide the supplier with all the information to enable the latter to decide whether it may be more efficient in business terms to change dispatching arrangements or convert customer plant to optimise the injection of hydrogen at the latter's own cost rather than not making the required increase in the hydrogen admixture or not setting up and running an additional methanation plant. This may be relevant if several hydrogen suppliers would benefit from such measures and if it was possible to distribute costs among several suppliers.

c) Changes in critical parameters following assessment of the request for connection

The injection of hydrogen may also be subject to modification following assessment of the request for connection as a result of a change in the gas flow in the entry network or with an impact on the entry network or other changed framework conditions. This may be due to changed import/export flows or commissioning/decommissioning, changed mode of operating gas storage facilities, changed acceptance structure (such as the loss or gain of customers), the conversion of L gas and H gas, market area conversion from L gas to H gas and the decentralised feeding in or reverse feed-in of gases (such as biomethane) or the injection of hydrogen at a later time (if the permissible injection was to be distributed among several plants).[21]

The imposition of limits on hydrogen injection may lead to further hydrogen injections being connected at a later time. However, a limitation on hydrogen injection on the grounds of injection at

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[19] Refer to page 7 above.

[20] Both a change in dispatching arrangements and an adjustment would have the same effect as the establishment of higher grid compatibility by the network operator. However, creating the latter is the responsibility of the supplier, refer to 5 f above.

[21] Subsequent changes in hydrogen injection, i.e. changes in the supplier's area of responsibility, would justify the network operator performing a new assessment.

a later time would contravene the principle of giving priority to an earlier connection or request for connection. It may be possible, by deviating from this principle of priority, to achieve a higher (overall) level of hydrogen injection, because feed-in locations which would be feasible from both technical and business perspectives would not be disregarded just because of the existence of earlier feed-in projects. However, the operator of plant which was connected earlier will have reached its investment decision on grounds which would be undermined if the priority principle were to be disregarded. In this respect the legitimate expectations of an earlier connecting party must be protected and have priority ahead of technically optimised maximum injection into a particular network or part of a network. Ultimately, this must also apply to requests for connection made at an earlier time in those cases in which the connection assessment has not yet been completed. Regulators have taken sufficient action to prevent improper (blockade) requests by requiring that network operators (under section 33(6) sentence 1 GasNZV) are only bound by positive assessment findings for three months and (under section 33(6) sentence 5 GasNZV) to grid connection contracts for a maximum of 18 months.

Apart from that, the network operator must take into account any subsequent changes in the framework conditions under which hydrogen is injected. In particular, the network operator is not entitled – if a change in the gas flow is anticipated at a later time as a result of the feeding in or reverse feed-in of gas which is compatible with the grid (such as biogas which has been upgraded to natural gas quality) – to refuse such changes in order to facilitate unchanged injection of hydrogen. Any such refusal could only be based on the grounds of technical impossibility, economic unreasonableness or lack of grid compatibility. Such grounds of refusal do not apply in the constellation described, however.

If circumstances arise which the network operator must take into account, the network operator must assess whether this would also have an impact on the injection of hydrogen. This assessment must be undertaken in the same way as the assessment of the request for connection. The assessment may lead to an increase or to a reduction in the amount of hydrogen injected. If the network operator comes to the conclusion that the injection of hydrogen must be reduced in order to maintain the interoperability of the gas supply network, the network operator must check whether alternative measures (change in dispatching arrangements, change of plant) might offer means of avoiding any such reduction. The costs of any measures which may be required would have to be borne by the hydrogen supplier, however.[22] The provisions of section 36(2) GasNZV, under which the network operator must make adjustments to the supplier's plant at its own cost if the network has been converted to a different quality of gas, do not apply in the case in which the hydrogen supplier subsequently sets up a methanation plant or has to make any other changes to its electrolyser. This is because the provision only covers the conversion of gas quality from L gas to H gas, but does not apply to any changes in gas quality or changes in any other circumstances which have an influence on a grid's capacity for accepting hydrogen.[23] If alternative measures would be excessively expensive for the hydrogen supplier, the network operator is entitled, as an ultima ratio, to reduce the amount of hydrogen injected or to suspend such injection altogether if necessary.[24] The network operator is therefore entitled to reserve the right to limited injection if the technical framework conditions change if, as a result of such changes, it becomes essential to reduce the amount of hydrogen injected on grounds of safety and interoperability of the gas supply network.

As the possibility of changing gas flows as a result of evolving procurement and consumption structures is growing, it is all the more important that the hydrogen supplier selects a location which absolutely guarantees the planned injection or a gas flow which can be reliably planned

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[22] Refer to page 8 above.

[23] Refer to the reasoning for the regulations in section 36(2) GasNZV, BR-Drs. 312/10, page 96; refer also to section 19a EnWG, which governs the costs of adjustments by final consumers following an L gas/H gas conversion.

[24] In this case, the network operator's connection costs can also be passed on after write downs if the costs themselves are efficient or were efficient at the time of realisation.

on an ongoing basis for the entire year, and that the network operator notifies the connecting party as soon as it becomes aware of even the remotest possibility of a negative change in gas flows and then supports the connecting party to the best of its knowledge and ability to minimise the risk of damages which may arise from a suspension or reduction in injection. By spreading risks in this way it will be possible to create energy-related business incentives to relocate hydrogen injection facilities to topological network positions which provide high and reliable levels of long term hydrogen compatibility. At topological positions in a network at which there is a high probability of injection being limited, the distribution of risk is such as to create incentives in favour of methanation.

4. Notes

It is important to note that the positions of the Bundesnetzagentur presented here do not lend themselves to a re-evaluation of matters already concluded in the past.