H Y P O S HYDROGEN POWER STORAGE & SOLUTIONS EAST GERMANY

HYPOS

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Position Paper on the Legal Framework for Green Hydrogen

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1. Introduction

Hydrogen Power Storage & Solutions, HYPOS for short, stands for the development of innovative solutions for the economical supply of power-based green hydrogen. The focus is on the development of a model region in Central Germany, which offers favorable conditions due to already existing infrastructures and future marketing potential.

HYPOS represents a network of more than 100 members from industry, SMEs and research who are working together to establish a green hydrogen economy. Founded on the basis of the "Twenty20 - Partnership for Innovation" programme in 2013, 11 R&D projects are currently driving forward the development for green hydrogen technology. While technology development is progressing positively and individual hydrogen value chains have reached market maturity, it is increasingly the regulatory framework that is standing in the way of the technology rollout. In this context, green hydrogen technology can already make a valuable contribution to the cost-efficient design of the energy turnaround. In the medium to long term, electricity-based hydrogen technology is the key technology for achieving climate targets and successfully shaping the energy system transformation.

With this position paper, HYPOS outlines the current legal framework for the use of electricity-based hydrogen technology. To this end, the paper takes up current positions from the coalition agreement and then presents the necessary energy law adjustments from HYPOS' point of view.

2. Coalition agreement and sector coupling

Germany will miss its climate protection targets for 2020[1] because its greenhouse gas (GHG) emissions have stagnated at the same level for years [cf. UBA, 2018]. Nevertheless, all parties have reaffirmed their commitment to the climate targets agreed in the Paris Climate Change Convention and have identified the first important starting points for implementation in the coalition agreement.

For example, the expansion targets for renewable energies in electricity supply are to be significantly increased in order to cover the additional electricity requirements for achieving the climate protection targets in transport, buildings and industry [cf. BReg, 2018; p. 71]. This is a commitment to sector coupling and an acknowledgement of the fact that the GHG reduction targets in the heating and transport sectors can only be achieved through coupling with the electricity sector. The uninterrupted positive cost development for wind and photovoltaic plants [cf. ISE, 2018] confirms the declaration of intent in favor of increased RE expansion.

With the implementation of these goals, the technologies for integrating the increasing quantities of renewable energies into the electricity grid and for energy transfer to the heat and transport sectors (energy storage, electricity storage, sector coupling technologies) are increasingly coming to the fore. The energy policy triangle of security of supply[2], affordability and envi-

[1] GHG emissions of 750 million tonnes CO2 equivalent
[2] In addition to the provision of short-term system services for grid stabilization, technologies are needed that can guarantee supply security during dark periods, e.g. in the first quarter of 2017 [cf. BNetzA, 2017].

ronmental compatibility will remain. It should be noted here that cost efficiency can only be achieved if system efficiency and system costs are taken into account [cf. dena, 2018; p. 21]. In future, therefore, properties such as storage capacity and storage duration must be taken into account and remunerated to a greater extent.

The recognition of the future important role of green hydrogen technology in the coalition agreement is therefore only logical [cf. BReg 2018; p. 76]. It is therefore all the more important to maintain the principle of technological openness, so that energy law regulations do not favour individual technologies. It must be ensured that the planned exemption of electric buses from the EEG apportionment [cf. BReg, 2018; p. 77] also applies to hydrogen produced by electrolysis and used in fuel cell buses. The same must also apply to the planned exemptions in port areas [cf. BReg, 2018; p. 78]. In order to be able to take grid availability into account when selecting a location for electrolysis, the exemption should be independent of location.

Establishing real laboratories for the demonstration and market launch of "power-to-gas" as a further pillar of energy research is a correct step [cf. BReg, 2018; p. 74]. However, individual technologies and applications are already ready for the market today. Market entry faces the challenge of building up production capacities in order to realise the great cost reduction potential of the technologies. In analogy to the technologies promoted by the EEG, there is therefore a need for further support for market ramp-up. Such a market ramp-up goes beyond the mere establishment of "power-to-gas" as a pillar of energy research.

The coalition agreement includes a reference to the need to adapt the regulatory framework for green hydrogen [cf. BReg, 2018; p. 76]. The necessary adjustments correspond to a paradigm shift in energy law and go beyond the exemptions outlined above for electric buses and port areas. After a brief digression on the effects of the current legal framework, the necessary legal adjustments from the HYPOS perspective are outlined below.

3. Impact of the current legal framework

Under the current legal framework, the majority of the costs for the production of green hydrogen from grid electricity are attributable to taxes, duties and levies. Figure 1 shows this fact using the example of a 100 MW PEM electrolysis plant[3] at medium voltage level without a predefined use path for the hydrogen. In this case, about 65 % of the hydrogen production costs are accounted for taxes, duties and levies for electricity procurement. Only an exemption of the grid fees in the narrower sense according to §118 (6) EnWG for 20 years is currently possible[4]. In comparison, the taxes and charges for natural gas procurement for household supply, without taking into account the grid fees, correspond to about 27 % [cf. BDEW, 2018].

On the other hand, exemptions from the EEG levy can only be achieved for the application as electricity storage or for privileged electricity consumers.

[3] Input data: ηLHV = 65 %; investment spec. = 1000 €/kW; plus planning costs = 5 million €; depreciation period = 20 years; degradation = 1.5 %/a; interest rate = 5 %; full load hours = 6000 h/a; electricity procurement = 3.2 cent/kWh (Ø EEX day-ahead market 2017); Stack renewal = 10 years

[4] Furthermore, hydrogen is exempt from the network fees for feeding into the gas network. Since the example only considers the hydrogen production costs after electrolysis, any charges and costs for further transport are not included in the analysis. In relation to the charges on electricity, these are considered to be low.

Figure 2 shows the effects on electricity generation costs when comparing the application paths without predefined end use of hydrogen (Power-to-X) and as electricity storage (Power-to-Power). It can be seen that, mainly due to the abolition of the EEG levy, the hydrogen production costs in the power-to-power path are halved compared to the power-to-x path.

The example shows that the current legal framework conditions are opposed to the use of hydrogen produced by water electrolysis, especially in the promising sectors of heat and mobility. The current regulations thus penalise in particular the flexibility of electricity-based hydrogen technology under its possibilities for ensuring a stable and sustainable energy supply.

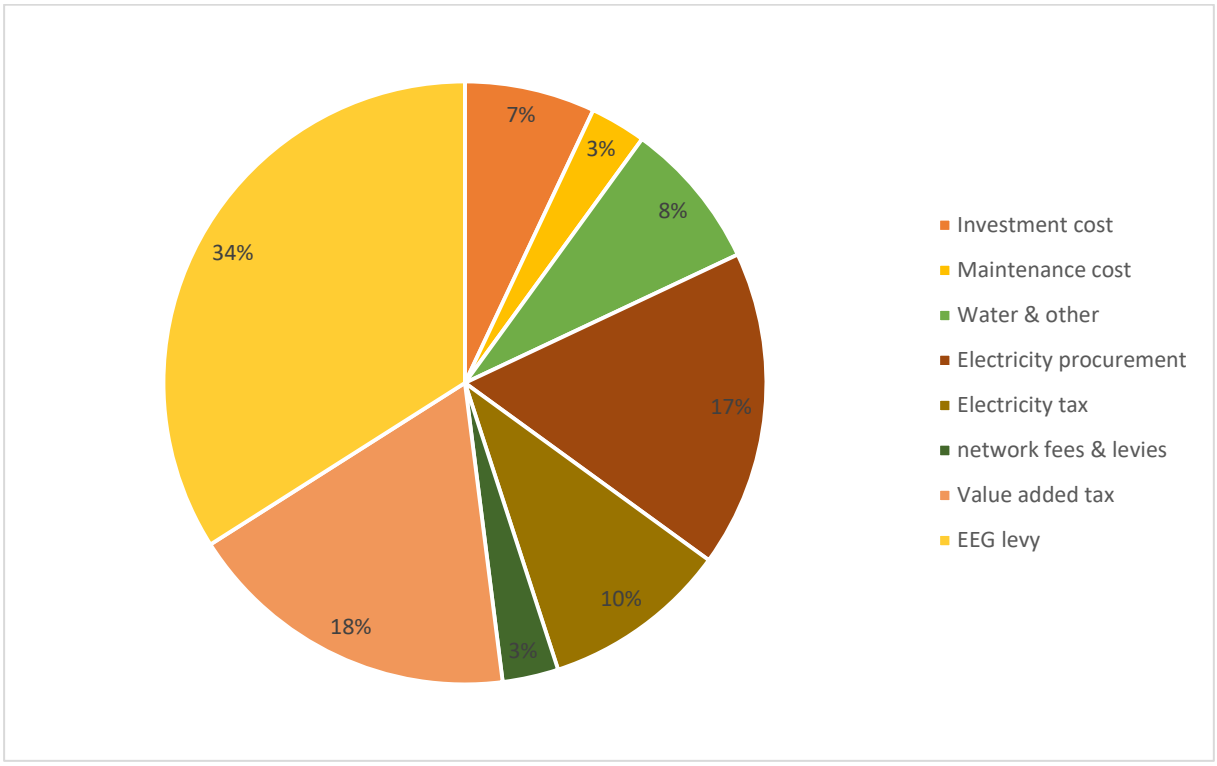

Figure 1: Distribution of H2 production costs for a P2X system@100MW

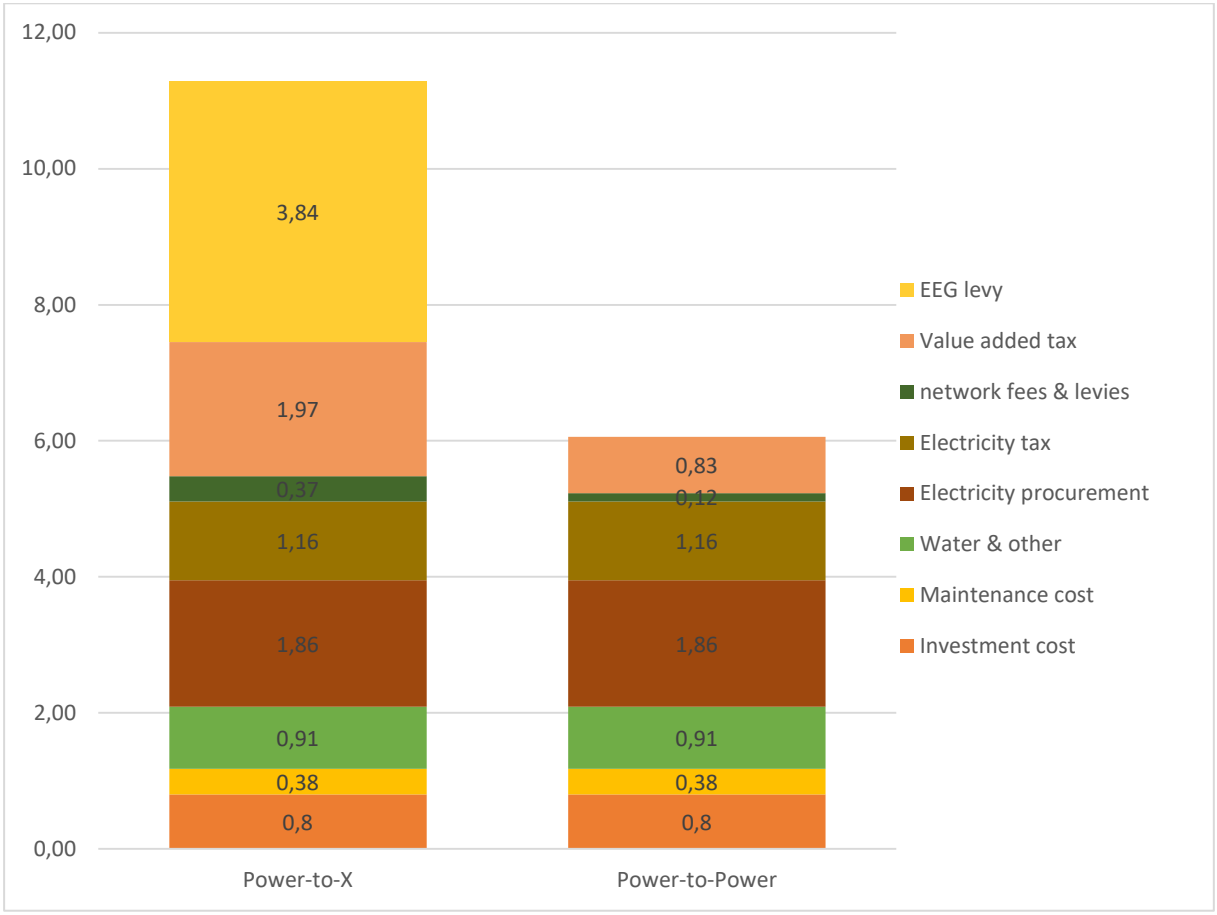

Figure 2: Comparison of H2 production costs Power-to-X and Power-to-Power

4. Necessary energy law adjustments

4.1. Lead instrument EU ETS trade

The Federal Government stands for a further strengthening of the EU Emissions Trading Scheme (EU-ETS). As a leading instrument for the implementation of climate protection goals, emissions trading plays a key role in the cost-efficient transformation of energy systems. At present, the EU ETS is almost ineffective because the price incentives for investments in GHG-free or poor technologies are too low[5]. Accordingly, a further timely reform of the EU ETS is necessary. Important elements of such a reform would have to be:

- the inclusion of all sectors in emissions trading;
- ending the free allocation of CO_2 allowances for phase IV of the EU ETS;
- the further reduction of the quantity of allowances, in line with the Paris climate protection targets.

The introduction of a minimum price should also be considered. If no rapid reform of the EU ETS is in sight, a joint CO_2 tax should be introduced between Germany and France and possibly other countries, based on the Franco-German resolution of January 2018[6].

4.2. Definition of energy storage

At present, there is no uniform energy law definition for energy storage systems or technologies that can be used for the transfer of energy from the electricity sector to the heating and transport sector[7]. Under current law, energy storage facilities are considered both as end consumers when storing energy and as producers when withdrawing energy. This means that energy storage facilities are initially charged with all end user charges as long as they are connected to a public grid. The only possible exemptions for hydrogen production by water electrolysis are conventional grid charges according to §118 para. 6 EnWG. Additionally other exemptions already granted for the operator[8] might be effective independently of the water electrolysis itself. For electricity storage facilities, an exemption from the EEG levy is still possible under the EEG 2017.

Due to the requirement of sector coupling, energy storage or sector coupling technologies play an important role as interfaces between the sectors, which goes far beyond the purpose of electricity storage. While electricity storage will play an important role for security of supply in the medium term, there is already a need for sector coupling technologies to reduce GHG emissions in the heat and mobility sector.

It is therefore imperative to have a uniform definition of the term "energy storage". From HYPOS' point of view, storage facilities cannot be assigned to any of the three pillars "generation", "consumption" and "transport". An independent fourth pillar for "energy storage" should therefore be established. Energy storage facilities should be specifically exempted from

[5] Although the CO2 price as of April 2018 is at a record level of around 12 €/tCO2, it would have to be around 20 €/t in the long term just to be effective for the electricity sector.
[6] Assemblée Nationale and German Bundestag on the 55th anniversary of the Élysée Treaty on 22 January 2018
[7] For example, the term "storage" or "storage facilities" according to EnWG has so far only included natural gas storage facilities (EnWG § 3, No. 9 or No. 31).
[8] e.g. under §60 (1) - compensation scheme for electricity intensive enterprises

end user charges, without disregarding incentives for grid-connected locations. A uniform European definition of the term "energy storage" through the revision of the Renewable Energy Directive (RED II) and rapid implementation in German energy law is therefore to be advocated.
Irrespective of the definition of the term "energy storage" and the associated classification as an end consumer, the additional electricity costs components are discussed below and further approaches to an appropriate adaptation of energy law are outlined.

5. Electricity costs – charges and levies

5.1. EEG levy

As a result of the EEG support mechanism, the current electricity procurement costs on the electricity exchange and in OTC trading no longer reflect the actual generation costs. While institutions exempted from the EEG levy benefit from the lower electricity procurement costs on the electricity exchange as a result of RE, the levy is a major obstacle to the economic implementation of Power-to-X concepts and the associated increase in the share of RE in the energy and basic materials supply.

In this context HYPOS advocates a fundamental exemption from the EEG levy for energy storage facilities. As an alternative to a change in the status of the end consumer, the implementation can be based on the exemption from grid fees according to §118 para. 6 sentence 1 EnWG, by exempting energy storage facilities from the EEG levy in the Renewable Energy Sources Act for a certain period of time or by adapting the term or extending §61k para. 1 EEG 2017 to include energy storage facilities or sector coupling technologies. The resulting additional burdens for the EEG levy are to be estimated as low. Firstly, a reduction in EEG support costs in the medium term and, secondly, no relevant electricity volumes[9] are to be expected in the short term compared to "privileged customers". Furthermore, energy storage facilities improve the integration possibilities for renewables and can thus reduce the grid fees on the other hand.

5.2. Electricity tax

The electricity tax is understood as an economic instrument under environmental law, the purpose of which is to provide incentives for reducing energy consumption. In the context of sector coupling, this incentive tax acts as an obstacle and thus works against its original objective. On the basis of an adequate definition of energy storage and sector coupling technologies, it is therefore appropriate to be considered an exemption. In the event that energy storage facilities should after a definition continue to be classified as final consumers or if a quick definition is not expected, implementation can be achieved by means of a supplement to §9 StromStG on tax exemptions, or on tax reductions for energy storage facilities or Power-to-X systems.

5.3. Grid charges

[9] In 2017, around 105 TWh, or about one-sixth of the electricity consumption in Germany was exempted from the EEG levy [cf. BMWi, 2016].

Grid charges serve as compensation for the use of grid infrastructure, the provision of system services and the coverage of transport losses. For energy storage and Power-to-X technologies, which offer both positive and negative system services and can guarantee security of supply in the future on the basis of hydrogen technology, grid charges are the main cost driver, along with the EEG levy. Exemption and reduction possibilities currently exist through §118 (6) EnWG with a limitation to 20 years.

The limitation to 20 years leads, due to the large share of the grid charges in the hydrogen production costs, to the fact that the operation of the electrolysis plants will probably become uneconomic after this period. This increases the pressure on the amortisation period of the investment. Nevertheless, incentives must continue to be provided for grid-compatible operation and grid-compatible site selection.

Based on the Federal Environment Agency's proposal from 2015, HYPOS accordingly recommends adapting the regulation for atypical grid usage in accordance with § 19 para. 2 sentence 1 StromNEV [cf. UBA, 2015]. According to the Federal Environment Agency, an increase in the grid fee reduction to 100% is recommended. Furthermore, there is a need for a short-term and dynamic definition of the peak load time windows to ensure actual grid serviceability. The control system is to be extended from the current limitation on electricity storage to energy storage. In this way an exemption from the grid charges for Power-to-X systems can be achieved even after the regulation according to EnWG has expired.

5.4. Other grid fee-related electricity price components

In addition to the grid charge in the sense of the StromNEV - i.e. "in the narrower sense" - there are various other levies and costs passed on via the grid charge. This includes:

- Concession fees
- CHP levy
- Offshore liability levy
- StromNEV levy
- Allocation for loads that can be switched off (AbLaV allocation)

Following the argumentation for exemptions from the EEG levy and grid fees, an exemption of the grid fee-related levies is also appropriate.

5.5. GHG abatement rate & electricity based fuels

Direct crediting of the use of electricity-based fuels against the greenhouse gas reduction quota of the fuels "placed on the market" has been possible since 01.01.2018. The details are regulated in the 37th BImSchV (Ordinance on the Crediting of Electricity-based Fuels to the Greenhouse Gas Quota). Electricity-based fuels are at a disadvantage compared to biofuels, despite equal or better GHG reduction quotas. Accordingly, HYPOS advocates:

- the eligibility of electricity-based fuel for grid purchase with proof of green electricity purchase for the balance sheet [10]
- the equivalence of credit quotas to domestically produced biofuels on the basis of actual GHG emissions.

5.6. "Experimental clause" for real labs

The necessary adjustments that have been identified must also be part of the planned real laboratories for power-to-gas. The implementation can be based on the "Experimental Clause" from the SINTEG programme. In contrast, however, exemptions for plants installed within the real laboratories must be valid for at least 20 years. This is the only way to achieve the necessary investment security and to evaluate the effect of the legal adjustments.

The HYPOS region around the Central German Chemical Triangle is ideally suited as a real laboratory for Power-to-X. The region has both a high potential for RE and needs in all target markets. At 3.6 billion Nm^3/a, there is already a high demand for hydrogen in the local chemical industry, refineries and ammonia production. The integrated raw material network also allows the testing of a recycling economy and low carbon industrial processes (cf. CARBONTRANS project). Furthermore, the given infrastructure offers the possibility of large-scale storage (cf. H2 research cavern) and a first complete conversion of a natural gas transport grid to 100% hydrogen. Applications are already being developed, demonstrated and implemented in the target markets of mobility (e.g. in rail transport) and heat supply (cf. H2-NETZ and H2-HOME). To this end, HYPOS and the HYPOS region can not only contribute to the results of the R&D projects, but also, through the grid, map out all the necessary expertise in the relevant subject areas.

[10] If necessary, the green electricity certification process must be adapted or a separate system for the certification of origin has to be developed.

6. Summary

Electricity-based hydrogen technology is not only a key element in the cost-efficient implementation of energy system transformation and industrial security, it is also a global market of the future. The task now is to transfer the advanced technology development to the market and thus to economically exploit the competencies built up in companies located throughout Germany. To this end, adjustments to the regulatory framework are absolutely necessary and purposeful. In summary, HYPOS therefore calls for the following appropriate adjustments to be made with regard to Power-to-X applications:

A uniform definition of the term "energy storage" and the establishment of energy storage as an independent fourth pillar in energy supply.

- Exemption from the EEG levy as an "enabler" for further increasing the share of renewables in the electricity supply and optimal integration of renewable electricity generation.
- The exemption from the electricity tax, as this tax diametrically counteracts its purpose in the context of energy storage and power-to-x concepts.
- Time-independent exemption from grid fees in the narrower sense, taking into account grid usability and grid fees in the broader sense.
- Equating electricity-based fuels to biofuels for crediting against the GHG reduction quota.

The HYPOS region offers the best conditions for demonstrating the potential of Power-to-Gas and Power-to-X - in the sense of a real-laboratory - and converting it into sustainable economic applications.

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About HYPOS

HYPOS is a broad network open to all interested in the hydrogen economy. Numbering over 100 members, HYPOS combines the potential of innovative SMEs, the expertise of companies from chemical industry and energy and plant engineering sectors, and the capabilities of universities and research centers for the joint development of a cross-sector green hydrogen economy. 32 project consortia are researching innovation potential from the provision of electricity to the production, storage, distribution and use of green hydrogen in the fields of chemistry, refinery, mobility and energy supply. The German Federal Ministry of Education and Research is funding HYPOS within the program "Zwanzig20 - Partnerschaft für Innovation" with 45 million Euro.

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