

Hydrogen market: Make mass balancing compatible for trade and establish market dialogue now

Proposals from EFET Deutschland - Verband Deutscher Energiehändler e.V. for the timely development of a competitive hydrogen market design

Berlin, Juni 2024 - Suitable market rules are required for the development of a competitive hydrogen market and liquid hydrogen trading. The establishment of a core network alone is not enough. EFET Deutschland is therefore calling for the decisive course to be set now for the development of a liquid hydrogen market. To this end, a market dialogue should be set up immediately and permanently, suggests the traders' association. In this format, a customised market design as well as standardised network access and network usage rules for the hydrogen infrastructure (network, storage, terminals and system services) should be developed that meet the requirements of all market participants. In addition, mass balancing, as a framework for the creditability of CO₂ savings from hydrogen products, must be made compatible for trading. This is because in its current form - highly complex, too bureaucratic, non-transparent and far away from market requirements - it is not a suitable basis for the development of liquid trading in hydrogen. From the perspective of energy traders, further development of the mass balancing system is urgently needed. Product characteristics should be bundled, and trading transactions standardised as far as possible. The more standardised and thus the smaller the number of tradable products, the more liquid trading will be.

Liquid markets and competitive trading are an important driver for the hydrogen ramp-up: they support transparent and reliable pricing, send investment signals to the hydrogen economy and enable competitive end-consumer prices. Price signals emanating from a liquid market not only strengthen market confidence and thus security of supply. System optimisation and the short-term balancing of supply and demand can also be brought about most efficiently via market price signals through trading transactions.

To date, energy policy measures have focussed primarily on setting the framework for investment in hydrogen production projects or their use and driving forward the development of the necessary infrastructure. The availability of a core network, an interconnected transport infrastructure - also with connected storage facilities - is an important basis for the creation/development of a hydrogen

market. For a competitive hydrogen market and liquid hydrogen trading to develop, the conditions for this must be created now.

From our experience in electricity and gas, we know that liquid trading does not automatically materialise after the market has been opened, but only got underway after fundamental changes to the law and the introduction of regulation. In the case of hydrogen, we do not have the time and must therefore set the right course for a customised market design from the start. To this end, the Federal Network Agency should promptly and permanently set up and moderate a market dialogue on the design of the market rules for the hydrogen core network. In addition to the market design, the market dialogue should develop uniform network access and network usage rules for the hydrogen infrastructure that meet the requirements of all market participants. In this paper, EFET presents the elements of a target model that are essential for a competitive and liquid hydrogen market (Chapter II). As the target model cannot be achieved in a single step, Chapter IV goes into more detail on the regulatory measures required for the individual phases of market development.

Legislation is driving forward mass balancing as the basis for achieving the decarbonisation targets in the industrial and transport sectors. In accordance with the third revision of the EU Renewable Energy Directive (RED III), the entire interconnected European gas and hydrogen infrastructure is regarded as a "single logistic facility". However, the system of mass balancing in its current form is not suitable as a basis for the development of liquid hydrogen trading - it is highly complex, too bureaucratic, non-transparent and far removed from market requirements. From the perspective of energy traders, the mass balancing system therefore needs to be further developed to enable trading activities between different hydrogen suppliers and consumers via intermediaries, i.e. traders (Chapter III).

I. Importance of trading for the hydrogen market ramp-up

If the regulatory framework for the economic realisation of hydrogen projects is set correctly, market liquidity will develop. With high liquidity, there are many market participants whose trading activities provide reliable price signals. Reliable market prices are the basis for investments in production, demand and imports. They therefore represent significant added value for producers, consumers, traders, suppliers and other players. They strengthen market confidence and therefore security of supply. In addition, system optimisation, i.e. the short-term use of flexibility and the short-term combination of supply and demand (e.g. electrolyzers, electricity generation, storage), can be brought about most efficiently via market price signals through trading transactions.

Energy trading will play an important role in this market. Suppliers will support end customers with the purchase of hydrogen and the associated energy management. At the same time, traders can support hydrogen producers in marketing and feeding hydrogen into the grid and efficiently manage storage facilities. Through trading, all market participants along the value chain, from producers to consumers, can secure the price of their investments and trading transactions. Traders create competition, which in the medium-term leads to risk minimisation along the value chain and thus also to price stability.

A liquid market for hydrogen, in which companies are prepared to make long-term investments, is created when investors can identify a quantitatively and economically attractive demand potential. The willingness to pay for hydrogen associated with demand must be based on the decarbonisation potential and the resulting economic added value. The system of mass balancing provided for by law is problematic in its current form because the highly complex, bureaucratic and non-transparent organisation does not meet market requirements. Reference is made here to biomethane trading, including mass balance certification, where every transaction involves a great deal of (manual) effort. In addition, different certification requirements prevent the development of standardised products and thus make uncomplicated/direct trading via digital trading platforms more difficult.

EFET Deutschland is therefore in favour of further legal development of mass balancing. The aim must be to enable interactions between hydrogen suppliers and purchasers that are as simple as possible and compliant with regulation, to bundle product characteristics and to standardise trading transactions. The smaller the range of products/tradable products, the more liquid trading becomes.

II. Target model for a competitive hydrogen market

The elements of a target model that are central to a competitive and liquid hydrogen market are described below:

- **Establish an entry-exit system:**
 - Development of a coherent and cross-border infrastructure for hydrogen transport and storage and establishment of a hydrogen market area with a virtual trading point.
 - Separate marketing of freely allocable fixed entry and exit capacities that can be used in any combination and without restriction by the market participants.

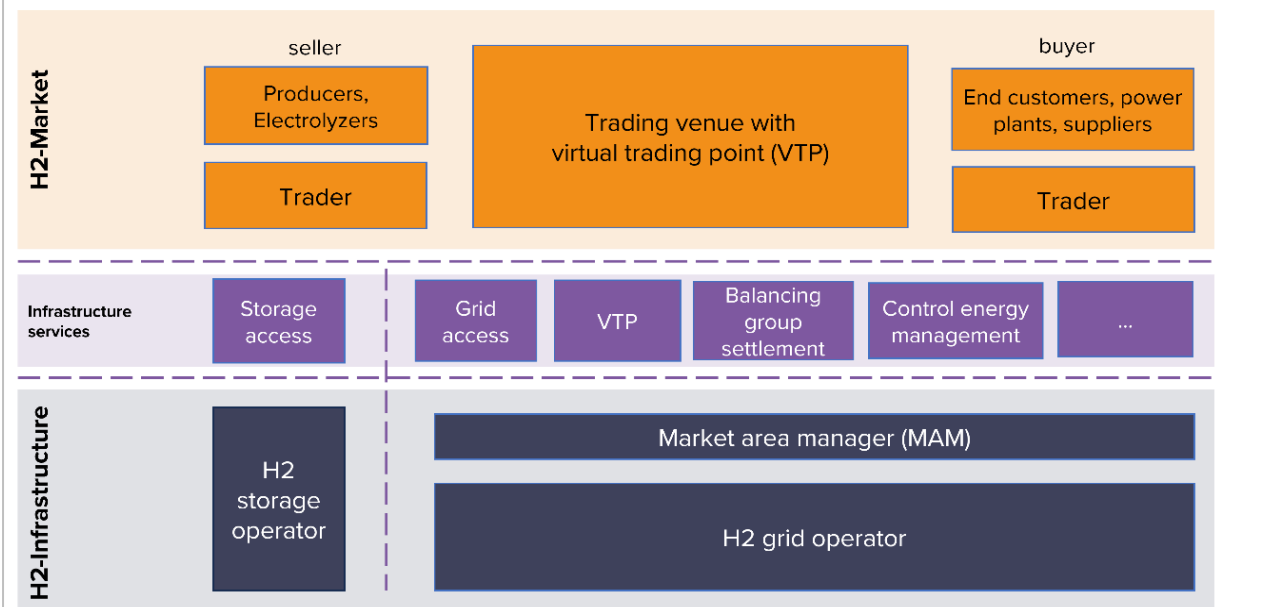
- Allocation of all hydrogen injections and withdrawals to balancing groups and transmission of hydrogen at a virtual trading point without capacity restrictions.
- **Consider unbundling in the value chain:**
 - Operators of the hydrogen infrastructure (network operators, storage operators) enable non-discriminatory access and provide balancing group management, balancing energy procurement and congestion management for market participants via a standardised central contact and contractual partner throughout Germany (e.g. in the form of a market area manager, MAM).
 - Market participants (traders, suppliers, consumers, producers, storage users) trade, transport and store hydrogen on a market price-based and competitive basis and communicate their use of the infrastructure via nominations.
 - From the beginning, the market roles in the hydrogen market must be defined according to the principle: "As much competition as possible, as little regulation as necessary". This immediately creates the necessary clarity for all players along the value chain and avoids subsequent and lengthy legal clarifications.
- **Develop a market-based balancing regime:**
 - Hydrogen balancing group managers are incentivised to balance entry and exit nominations as well as feed-ins in their own balancing groups. They receive real-time data on the balancing group status as the basis for balancing group management. The price system for balancing energy should be designed, as has been successfully practised in the natural gas trade for years, e.g. considering marginal purchase and sale prices for balancing energy (in the short-term market).
 - The market area manager counterbalances grid imbalances for hydrogen network operators that exceed the grid buffer with the help of market-based procured balancing energy. It therefore does not itself act as a flexibility provider on the hydrogen market.
 - The balancing period should be based on the transport characteristics of hydrogen, the design of the transport and storage infrastructure and the requirements of the competitive market participants. A balancing period that is too short creates unnecessary complexity and fragments liquidity in short-term trading. On the other hand, a balancing period that is

too long leads to high balancing energy costs. At the same time, compatibility with the electricity markets must be considered. EFET therefore recommends a nationwide standardised hydrogen balancing period, no longer than one hour. Such a balancing period also incentivises forecasting sales as accurately as possible and balancing groups in the intraday market to be balanced promptly. The prompt availability of real-time data on feed-ins and feed-outs to the balancing group is a key prerequisite for balancing and helps to improve forecasts. The aim should be to allocate the costs for system stability in line with the causer.

▪ Creating the conditions for standardised trading products

- A liquid market can only be achieved through trading with standardised products and lean process chains.
- To achieve this, the trading interests of as many market participants as possible must be brought together in a marketplace with as few standardised products as possible.

Target model for the competitive hydrogen market



III. Framework for the credibility of CO2 savings from hydrogen products (mass balancing)

A market characterised by competition, which provides reliable price signals as a basis for investment decisions, needs a suitable regulatory framework for this. Instead of political guidelines on where hydrogen should be used, CO2 should be saved where it is most efficient. Therefore, the corresponding CO2 avoidance should be mapped for the H2 produced and utilised. A Europe-wide database (Union Database, UDB) will be introduced to make the quantities of hydrogen used and their contribution to decarbonisation fully traceable.

In principle, the necessary valuation and creditability can be mapped in mass balancing with the support of certificates. In mass balancing, the coupled transfer of commodities including documented properties, such as CO2 savings, takes place between market players. This is intended to ensure that the properties remain traceable throughout the chain despite physical transport via pipelines or transactions.

An existing transport infrastructure is required to track this coupled transfer. Without sufficient and consistent transport infrastructure - embedded in a central balancing system - potential suppliers and consumers cannot meet each other in the case of mass balancing. If the transfer takes place through individual agreements, there is a large market segmentation and the realisation of efficiencies through intermediaries is limited. In principle, there are alternative systems to mass balancing: In a certificate system, for example, the property to be traded, the CO2 saving, is valued independently of the physical commodity. This enables demand potential to be tapped more effectively and based on willingness to pay. In addition, a certificate system facilitates the bundling of market liquidity. Therefore, inadequately designed mass balancing can make the market ramp-up for hydrogen more difficult and more expensive.

However, the EU has now decided in favour of introducing mass balancing. **To avoid a more difficult market ramp-up for hydrogen, EFET Deutschland is in favour of a market-friendly design of mass balancing.** A distinction should only be made between a few standardised product properties. The entire connected European gas and hydrogen infrastructure is considered as a "single logistic facility" in accordance with RED III. As mass balancing only connects infrastructure-related market participants, a corresponding expansion of transport lines and storage facilities is required.

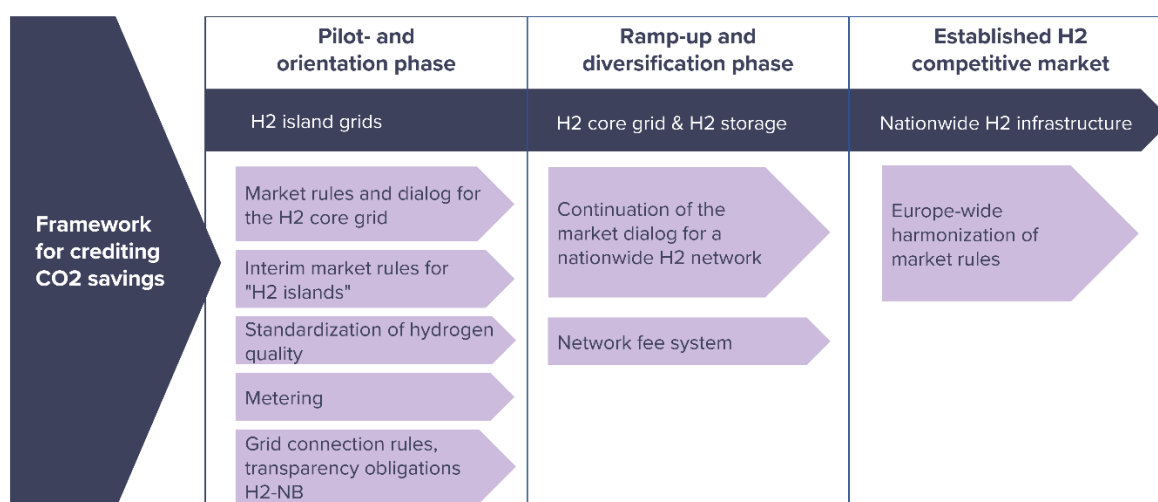
With these parameters, **mass balancing** sets the **framework for the creditability of CO2 savings from hydrogen products**:

- Design of the European interconnected gas and hydrogen infrastructure as a "single logistic facility" in accordance with RED III;
- Enabling trading activities via intermediaries (energy traders);
- Bundling of product characteristics;
- Swift and unbureaucratic authorisation processes for the rapid provision of the necessary infrastructure.

IV. Phases of hydrogen market development up to the target model

The target model for a liquid hydrogen market cannot be achieved in a single step. The market ramp-up for hydrogen will therefore have to be realised in successive phases. We know from experience in electricity and gas that liquid trading does not automatically materialise after the market has been opened, but only gets underway after fundamental changes to the law and the introduction of regulation. In the case of hydrogen, we do not have the time and must therefore set the right course for the development of a liquid market from the outset. Building on the market experience and expertise of its member companies, EFET Deutschland has developed a model of hydrogen market development in three phases. Each of the three phases of the market ramp-up is characterised by certain milestones.

Phases of the development of a competitive H2 market design



EFET Deutschland has developed an action plan for this phase model, which assigns and prioritises the necessary regulatory measures to phases. In this way, a liquid market for hydrogen characterised by competition without lock-in effects can be developed step by step.

(1) Pilot and orientation phase:

Eliminate regulatory "white spots" and start market dialogue for the hydrogen core network

The pilot and orientation phase are characterised by the following milestones:

- Realisation of pilot projects at various levels of the future hydrogen industry; there are no end-to-end value and supply chains.
- The CO₂ avoidance costs are too high at this stage to ensure the profitability of pioneering projects. Subsidies and market-related incentives support project realisation.
- The market is primarily characterised by direct 1:1 relationships between pilot projects and anchor customers.
- There is no nationwide hydrogen pipeline system. The (physical) consumption of hydrogen takes place near production and import facilities.
- Technological innovations and learning effects make it necessary to continuously adapt the regulatory framework with the involvement of market participants.
- The market roles are defined by the regulator.

Parallel to the planning of the hydrogen core network, the BNetzA should set up and moderate a **market dialogue** as quickly as possible and on a permanent basis. In this market dialogue, the interests of future infrastructure operators and competitive players should be given equal consideration.

The task of this market dialogue is to **develop basic market and communication rules** for the future hydrogen market and to **define the market roles**. In addition, **principles for minimum technical standards, market access and balancing rules as well as transparency rules and information obligations should be established**. The market rules should be implemented as early as possible via specifications by the Federal Network Agency, which provide the basic framework. If further specification is required for practical implementation, this can be included in the hydrogen cooperation agreement to be drawn up. The balancing energy system should be designed from the beginning in a way that balancing energy is provided by market players.

Until the above-mentioned market rules are finalised or a connection to the core network is established, non-discriminatory and pro-competitive network access and market rules must be offered (**interim market rules**). Such interim market rules may be necessary to enable the infrastructure to be utilised from the beginning, considering the technical restrictions. The contracts and rules necessary for this should enable a rapid connection to the (regulated) hydrogen core network (and after connection to the core network, its regulations apply). Contractual clauses that hinder or delay connection to the hydrogen core network must be prohibited. The Federal Network Agency should specify key principles for fair and, where possible, standardised interim market rules. An EU-wide standardised regulation on the minimum purity of hydrogen must be introduced immediately. Such standardisation is necessary to promote nationwide and cross-border transport and thus competition and trade. To harmonise with neighbouring countries and thus enable the development of a hydrogen market in the sense of a global commodity market, German and European regulators should coordinate their efforts now.

The market ramp-up must be supported from the outset by a modern and **digital metering system**. To this end, as part of the market dialogue outlined above, uniform national requirements for efficient data provision using suitable metering technology should be developed as soon as possible and determined in a BNetzA regulation. Before metering technology is installed, it must be clear to all players who must provide which data for which market role at what time and in what format. The metering system should enable the real-time allocation of feed-in/off-take quantities to hydrogen balancing groups.

The provision of sufficient storage capacity for hydrogen will be central to the market ramp-up. It is important that the market role allocation from the natural gas sector is transferred to the hydrogen sector: **Hydrogen storage facilities** should be owned by storage operators and their capacity utilisation rights offered for booking to competitive market participants. The actual filling of the storage facilities should then be controlled by these market participants. In this way, the overall system is managed efficiently, as the market participants consider fluctuating hydrogen production and demand, imports and cross-border optimisation as well as the costs of storage in their injection and withdrawal decisions.

The conversion of natural gas storage facilities to hydrogen and any necessary construction of new storage facilities are caught in a field of tension. On the one hand, there is a need to plan the storage capacities required to ensure a secure supply on the natural gas market and, on the other hand, the storage requirements must be determined according to cost-efficient and location-relevant aspects

as part of the development of a hydrogen network and storage infrastructure. Here too, we advocate the establishment of a market dialogue to determine the future storage requirements for hydrogen. The results of this market dialogue should be bindingly considered in the Gas and Hydrogen Network Development Plan in the form of coordinated network/storage capacity planning. Whether subsidy mechanisms are necessary for the construction of storage facilities or whether market incentives are sufficient is being discussed as part of the German government's hydrogen storage strategy.

As a further component for a fast and smooth connection to the hydrogen network and the hydrogen storage facilities, **transparency obligations** (focussing on the actual capacity situation at various points in time at the potential booking point) and clear **deadlines** for non-binding and binding feedback from the hydrogen network and storage operators should be defined by law.

Actions:

In the pilot and orientation phase, **regulatory "white spots"** must be **eliminated** as quickly as possible. This includes in particular:

- Further developing **mass balancing**, i.e. bundling the properties of tradable products and enabling standardised trading transactions;
- Establish **standardised and uniform market rules for the hydrogen core network as a target model**;
- Define **interim market rules for hydrogen stand-alone/island networks** until they form a coherent hydrogen core network;
- Standardise **hydrogen quality and properties**;
- Prepare the introduction of a **metering system to record real-time data** in hydrogen balancing groups and develop specifications and a timetable with implementation deadlines.

(2) Ramp-up and diversification phase:

Involve as many suppliers and consumers in trading as possible

The ramp-up and diversification phase is characterised by these developments:

- "Gaps" along the value chain can be closed and cost depressions can be leveraged through further projects (economy of scale). The need for subsidies and incentives decreases.
- CO₂ avoidance is the key currency of decarbonisation.

- A Europe-wide mass balancing scheme for market participants connected to the infrastructure has been set up.
- A nationwide hydrogen core network for pipeline-based transport between hydrogen production plants, import terminals, hydrogen storage facilities and consumer centres has been established.
- Establishment of liquid spot and futures market products for hydrogen as a trading commodity.

After the orientation phase, the focus of the subsequent market ramp-up and diversification phase is on closing any remaining gaps along the value chain (e.g. in imports, infrastructure or on the demand side) and enabling trade between as many market players as possible. Liquid spot and futures markets with robust price signals must be promoted and the necessary trading products set up. In addition to connecting as many consumers and suppliers as possible to the hydrogen infrastructure based on firm capacities, the feed-in of hydrogen into the natural gas grid should be made possible to support other customer groups in their decarbonization.

Actions:

The market dialog initiated for the hydrogen core network must be continued and expanded thematically. Experience from previous market developments should be considered. The focus of the market dialog in this phase should be on the **rules for the nationwide market area**:

- Hydrogen **balancing rules** for a nationwide hydrogen market area,
- Hydrogen **control energy system** for a nationwide hydrogen market area.

(3) Established competitive hydrogen market: Driving forward European harmonization of regulation

Important milestones have been reached in the phase of the established competitive hydrogen market:

- Intense competition has developed along the entire value chain.
- Portfolio development is possible, consumers can purchase hydrogen from several suppliers, more imports and storage facilities are available.
- CO₂ avoidance is the key currency of decarbonization.

- A Europe-wide hydrogen backbone network has been completed, in particular through the rededication of natural gas pipelines, and is being used. However, hydrogen stand-alone islands networks can still exist alongside the hydrogen backbone.
- Within the Europe-wide hydrogen backbone network, there are sufficient fixed entry and exit capacities that can be freely allocated and combined as required within the market areas.

An established competitive market for hydrogen should be characterized by intensive trading activity along the value chain and thus high liquidity. The expansion of a comprehensive and cross-border hydrogen infrastructure, i.e. a European pipeline and storage system, will also be an important building block for increasing liquidity. In addition, liquidity development will benefit from automated settlement processes for trading transactions and a high degree of standardization in the design of trading products. In this final market development phase, market rules should be harmonized across Europe. To enable efficient trading markets for the commodity hydrogen and balancing energy in the comprehensively developed hydrogen infrastructure, all aspects of the target model (described in Chapter II) should be implemented in this phase.

Actions:

Europe-wide harmonization of market rules to promote cross-border hydrogen trading:

- **Capacity allocation:** There is sufficient freely allocable firm capacity that is offered to market players for booking on a central platform.
- **Nomination rules:** Nominations are made via standardized communication channels and matching dates and deadlines are harmonized across Europe.
- **Balancing rules:** The balancing period is defined uniformly across Europe, as are the mechanisms for offsetting balancing energy. Real-time data is recorded, and market players are obliged to balance their balancing groups in accordance with the requirements of the balancing system (incl. short balancing period).
- **Balancing energy market:** Balancing energy is procured on a market basis and provided in accordance with the market role model.

ⁱ In the context of this paper, the commodity hydrogen refers exclusively to hydrogen in its gaseous state and not to hydrogen derivatives such as ammonia.