



Position Paper hydrogen certification

Summary

The energy transition demands the change from fossil fuels to renewable-based energy carriers. The Dutch government, the European Commission, and VEMW foresee a large role for Renewable fuels of Non-Biological Origin. Hydrogen can take this role but this transition has to be properly facilitated. This includes a certification scheme elaborating on the CO₂ emissions of the hydrogen produced. This certification scheme has the function to (1) unambiguously determine the carbon footprint of the production of hydrogen; (2) make the proposed EU regulations and targets executable, and (3) strengthen the hydrogen market regardless of the CO₂-emissions through trading of these guarantees in a liquid international marketplace.

Therefore, VEMW proposes in this position paper a certification scheme for Hydrogen Guarantees of Origin (GO) that should have the following characteristics:

- A GO for only hydrogen and not for mixtures;
- **Single** administrative system for both certification and trading;
- A transnational European valid GO scheme which includes import;
- A book and claim system;
- A transparent system with GO's based on CO₂-emissions;
- A cost-efficient system;
- A coupling with the other certification schemes throughout the supply-chain;
- No enforced additionality;
- No link in time and location;
- Trustworthy.

Furthermore, VEMW proposes to start the GO scheme on a voluntary basis which could gradually evolve into a full disclosure GO scheme. By starting on a voluntary basis the participants can learn and improve the GO scheme.

Hydrogen certification

Over the last couple of years, a consensus has emerged that hydrogen will be a key commodity during and after the energy transition. For many sectors, hydrogen will be a necessary raw material or energy carrier as part of the transition to a circular economy or to reduce CO₂-emissions efficiently. Reduction of CO₂-emissions will be achieved by switching from natural gas or fossil-based hydrogen to low-carbon hydrogen (e.g. Steam Methane Reforming in combination with Carbon Capture and Storage (CCS)) or renewable hydrogen (e.g. electrolysis using renewable energy). Currently, many preconditions for large-scale usage of low-carbon or renewable hydrogen are not fulfilled, as stated in the VEMW position paper Waterstof.¹ VEMW deems it important that these preconditions will be met to enable the different sectors to reach their climate goals while maintaining or preferably improving the competitive position of the Dutch and European industry. The positions of the Dutch Government and the EU Commission are in line with this vision as exemplified by the Dutch governmental coalition agreement,² and the proposed measures of the Fit For 55 and the Hydrogen and Decarbonized Gas Package.

One key precondition for facilitating the energy transition is the certification of energy carriers. Currently, the energy carriers for renewable electricity and biofuels have some forms of certification to prove that the energy carrier is renewable. The certification is divided into certification of the production plant and the certification of the energy carrier, from production to consumption. In this paper we will elaborate on the certification of energy carriers. Current examples of certificates of energy carriers are the Guarantees of Origin (GO) and Certificaten van Oorsprong (CvO)³ for electricity, Guarantees of Origin for green gas,⁴ and Hernieuwbare Brandstof Eenheden (HBE). The most important legislation on energy certificates in Europe concerns the GOs as defined in the Renewable Energy Directive⁵ and VEMW uses this scheme as an example in this paper.

GOs are defined as an electronic document which has the sole function of providing proof to a final customer that a given share or quantity of energy was produced from renewable sources. Currently, the GOs that exist by law are guarantees of origin for renewable electricity, for electricity produced by combined heat and power plants, green gas and heat produced from renewable origin. The introduction of certificates is crucial for the market creation of green hydrogen, especially when hydrogen will be supplied via the future hydrogen backbone, as renewable attributes of hydrogen will otherwise be lost in the grid.

To facilitate the hydrogen market, a **hydrogen Guarantee of Origin** is deemed to be crucial because it:

- unambiguously determines the carbon footprint of the production of hydrogen;
- Facilitates the implementation of the proposed EU regulations (e.g. the 50 % RFNBO target in the proposed revision of the RED II);
- and strengthens the hydrogen liquidity of commodity market independent of the actual CO₂-emissions (low-carbon hydrogen, RFNBO) through trade of these GOs in a liquid international marketplace.

¹ VEMW position paper: Waterstof, 6 May 2020.

² Coalition agreement: Omzien naar elkaar, vooruitkijken naar de toekomst, 10 January 2022.

³ <https://wetten.overheid.nl/BWBR0035971/2022-01-01>

⁴ <https://www.vertogas.nl/hoofdmenu/wat-doet-vertogas/wat-is-groen-gas-certificering>

⁵ Renewable Energy Directive, Article 15

VEMW wants to contribute towards accelerating the development of a GO system for hydrogen through this position paper by proposing a cost-efficient hydrogen GO system, from which the GO will be called hydrogen Guarantee of Origin (hydrogen GO). VEMW deems this system suitable to facilitate the development of the hydrogen market, the energy transition, and this system provides hydrogen users and the government the information needed to assess the carbon footprint. This system should be affordable, user-friendly and should result in a liquid market with efficient pricing for hydrogen GOs.

The scope of this paper is the GO system for hydrogen. VEMW also has views on how to optimally facilitate the development of a hydrogen market including the market regime, regulation, and infrastructure, which can be found in the Waterstof Position Paper⁶, and the response of IFIEC on the consultation of the Directive and Regulation on gas markets and hydrogen.

In this paper, VEMW will first state the preconditions the GO system will have to meet. Thereafter, we will elaborate on the bottlenecks in the current and proposed legislation that hinder the implementation of such a GO system.

Characteristics of a well-functioning hydrogen GO system

A well-functioning hydrogen GO system has multiple characteristics that together ensure that the system can generate an outcome with efficient prices based on unhindered supply and demand. Therefore, VEMW has the opinion that the system has to be set up according to the following principles:

- A GO for only hydrogen and not for mixtures;
- **Single** administrative system for both certification and trading;
- A transnational European valid GO scheme which includes import;
- A book and claim system;
- A transparent system with GO's based on CO₂-emissions;
- A cost-efficient system;
- A coupling with the other certification schemes throughout the supply-chain;
- No enforced additionality;
- No link in time and location;
- Trustworthy.

Furthermore, VEMW proposes to start the GO scheme on a voluntary basis which could gradually evolve into a full disclosure GO scheme. By starting on a voluntary basis the participants can learn and improve the GO scheme.

These principles are elaborated on underneath:

- *A GO for only hydrogen and not for mixtures*

In the current proposal by the European Commission of the Directive on Gas Markets and Hydrogen, blending of hydrogen into the gas infrastructure is being proposed. The commodity hydrogen, which has value as a feedstock and fuel, has different market value and uses depending on the purity and

⁶ VEMW position paper: Waterstof, 6 May 2020.

mixture. Hydrogen blended into the natural gas infrastructure is a different commodity due to its low purity and thus should be certified differently to prevent a mismatch and misuse of the hydrogen GO. Therefore, the hydrogen GO should have the same purity as the hydrogen purity in the future hydrogen grid.

- **Single** administrative system for both certification and trading

To decrease the costs and administrative burden for parties that want to produce, transport, trade, and consume hydrogen, the certification and trading scheme should be simple and cost-effective. This can be achieved by combining the certification and trading schemes with the administrative system to comply with different goals (e.g. renewable hydrogen consumption obligation), decreasing the administrative burden for the users and the administrative burden for the certifying body. This should reduce the overall costs of the certification and trading scheme.

- *A transnational European system including import*

Hydrogen will be, similar to natural gas, a globally traded commodity. To facilitate European trade and to launch the market it is necessary to have a GO scheme that allows for trade of GOs throughout the European single market, and which includes import from outside the EU. It should be possible to transport renewable hydrogen produced in Spain to Germany and to allocate the renewable hydrogen to the German consumer. This should also be the case for imported hydrogen, without – the risk of – doublecounting in Spain and Germany. When consumers import renewable hydrogen from outside the EU, they should also be able to allocate it as such and claim lower CO₂ emissions. This enables the industry to achieve the proposed CO₂-emission reduction goals, such as the proposed 50 % target for RFNBOs in the RED III, cost-effectively.⁷ The system should comply with the RED III article 30 and art 30(4) of the Implementing Regulation.

- *A book and claim system*

For the GO scheme, VEMW is in favour of a book and claim system. In a book and claim system, the sustainability claim made by the consumer of the commodity is not per definition linked to a specific quantity (in time and location) of hydrogen as would be the case in a mass balancing system. Book and claim systems contribute to liquid markets by decoupling the carbon footprint of the molecule from the molecule itself, thereby enabling the “greening” of hydrogen consumption whenever hydrogen is available. This also fits well with the development of a hydrogen backbone where different “colours” of hydrogen are blended within the same pipeline. This makes it impossible to trace specific molecules. A precondition for a well-functioning book and claim system is that creation and cancellation of GOs are well monitored and bound by clear rules.

- *A transparent system with GO's based on CO₂-emissions*

The book and claim system should gradually be developed towards a full disclosure system because of its transparency. Full disclosure ensures certification of all hydrogen produced and claiming of all hydrogen consumed resulting in a closed system. This prevents parties from claiming emission reduction based on the hydrogen mixture. The GOs in this system should be based on the CO₂ emissions of the hydrogen produced in g CO₂/kg H₂. Exact emission data is preferred (compared to working with arbitrary emissions threshold levels) as it prevents “gaming” resulting in an overestimation of CO₂-savings. The users of hydrogen can use these GO's to verifiably declare to their customers the CO₂-emissions of the hydrogen used to produce the end product. This results in

⁷ Article 22a in the proposed RED III.

different GOs for hydrogen of 1, 5, 150, etc... g CO₂/kg H₂. This should be combined with a statement on the means used to decrease the CO₂-emissions, such as CCS, biomass or electrolysis.

- *The system should be as cost-efficient as possible*

Certification is split up into certification of the production plant and certification of the produced hydrogen (commodity) through hydrogen GOs. Currently, in the GO systems for electricity and green gas, a fee is paid for the generation, transaction, and write-off of a GO. The costs of these different transactions have an influence on the price and business case for renewable hydrogen. The administrative costs can, especially in the beginning with a limited amount of users, be a relatively large percentage of the overall costs and hamper the business case for renewable hydrogen. Furthermore, low trading costs of GOs will increase the liquidity of the market and thus allow the market to reach a more efficient price. The European Union wants to enforce a fast energy transition towards renewable hydrogen. A GO scheme is part of the hydrogen market and the market should only be forced to pay for the efficient costs and not be forced to pay for profit margins for the certification scheme. The certifying body for the GOs should possibly be subsidized during the development of the market to increase the number of market participants and strengthen the market. Thereafter the costs can be paid through transactional costs on trades.

For the certification of the electrolyzers, a competitive market should be developed of trustworthy companies who determine the emissions of the production plant.

- *A coupling with other certification schemes*

To strengthen the trade and increase the value of a GO the different certification schemes throughout the supply chain from electricity production to end product (e.g. GO electricity, GO green gas) should be coupled. When an electrolyser uses renewable electricity to produce renewable hydrogen the owner should write off the electricity GOs and obtain hydrogen GOs in return stating the exact CO₂ footprint of the hydrogen produced. When these hydrogen GOs are written off with the production of low-carbon fuels or renewable fuels of non-biological origin a certificate for renewable fuels should be provided (e.g. HBE, hernieuwbare brandstof eenheid). The hydrogen GO can be used to prove the CO₂ footprint of the end product. This coupling will increase the demand and thus the value of the GO and support the market in setting a fair price for the CO₂ footprint of the commodity. The other GO schemes should be set up similarly to this proposed GO scheme with similar characteristics for compatibility purposes, to simplify the GO schemes, and to ensure the trustworthiness of the system. For the end consumer, it should be possible to see at a glance what the CO₂ emissions are for this part of the supply chain.

Furthermore, the different certification systems for RFNBO and their products should be compatible with the certification schemes for bio-based fuels. Hydrogen for instance can be made fossil-based, biobased, or through electrolysis. For the simplicity of the system, it would be best to make these certification systems compatible.

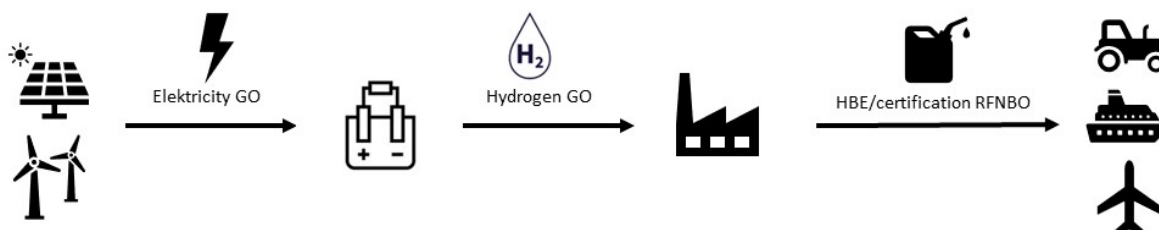


Figure 1: An example of a coupling of different certification schemes throughout the supply chain.

- *Start on a voluntary basis when legislation does not provide clarity*

The GO scheme should facilitate the market and provide clarity to market participants. Such a system starts with learning by doing. When a certification system starts the system probably still has to improve, rules have to be made, and the participants probably still have to learn. In short, it has to develop into a well-functioning market. To enforce the entire market to participate at the start is excessive and inefficient. As long as the rules are not well established and understood, full-disclosure should not be enforced and the system should be run on a voluntary basis. The rules of this GO scheme should be developed over a period of time toward a full-disclosure system.

- *No enforced additionality*

The European Commission proposed in the delegated act a demand for additional renewable energy production for renewable hydrogen production. This demand could be detrimental to the business case of electrolyzers and thus renewable hydrogen. Shortages in “additional” energy from renewable sources can make it impossible to produce enough renewable hydrogen to achieve the proposed goals for renewable hydrogen, even though enough renewable energy can be produced by wind or solar. Furthermore, the lead times will be crucial and can prevent projects to go online, or else the coupling with the electrolyzer might be prevented. If a solar park or wind park is connected to the grid too soon, because installation of the electrolyzer might be delayed due to material shortages or delayed licensing, it might prevent the electrolyzer from obtaining hydrogen GOs. Therefore, for hydrogen and its raw materials, electricity, and green gas, the additionality principle should not be part of the GO scheme. The opinion of VEMW is further elaborated on in the response to the consultation on the Delegated act on the production of renewable liquid and gaseous transport fuels of non-biological origin.

- *No link in time and location*

Hydrogen is different from electricity as it can be stored and transported relatively easily over large distances. Therefore, a link in time and location between production and consumption of hydrogen should not be necessary. Hydrogen will probably be used in the future as seasonal storage of renewable energy and the GO scheme should take this into account. Hydrogen production and usage should be linked through the certification schema and should not be obliged to be booked within a set period as enforced for electricity in the RED.

Furthermore, within the energy system, it is optimal if the GOs can be used in multiple situations as depicted in Figure 2. Case 1 depicts a direct line between an electrolyzer and a hydrogen user, in which case the user also is allowed to write off the GOs to prove that their hydrogen is either low-carbon or renewable. Here you can prove that renewable hydrogen is claimed and used by the same consumer. In the second case, the electrolyzer is connected to a hydrogen grid, in which case the electrolyzer can sell the hydrogen through an anonymous market, through a PPA, or over the counter. Because the electrolyzer is connected to a grid the hydrogen molecules cannot be traced and the CO₂ content can only be proven through the acquisition of GOs. When these GOs can be sold separately this will strengthen the market optimizing the hydrogen price and the GO price since more market participants will be able to compete for these GOs. In the final case, a user of hydrogen wants to reduce its CO₂ emissions, but they are still physically separated from the hydrogen grid and are not able to produce renewable or low-carbon hydrogen itself. In this case, the user of hydrogen wants to buy renewable or low-carbon hydrogen even though they are not physically connected to a producer of renewable or low-carbon hydrogen. This should be made possible within the hydrogen GO scheme

because it strengthens the market for low-carbon or renewable hydrogen and increases the viability of decarbonization projects.

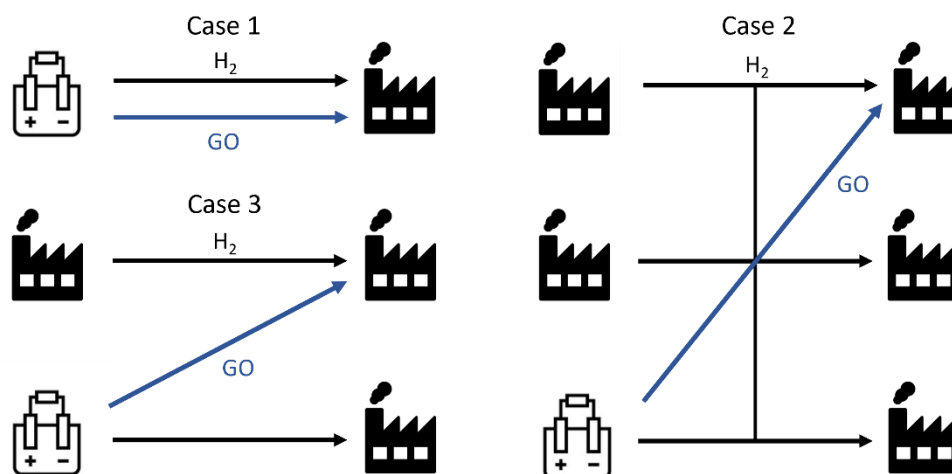


Figure 2: Three cases that depict the proposed decoupling of the physical streams of hydrogen from the GOs.

- A trustworthy system

The last point is the trustworthiness of the system. The GO scheme for import and usage of hydrogen should be trusted by the users of the scheme, the European Union, certifying bodies, and the consumers. Without trust in the system, the value of renewable and low carbon hydrogen will not be properly represented by the market which decreases the value of these commodities. Therefore VEMW demands that the system must not be prone to fraud, prevent double counting and have a normalized certification process for the production of hydrogen inside and outside the EU to prevent misuse. The system should therefore be designed with at least the following components:

- External parties should measure the CO₂-emissions and hydrogen production on the production site and allocate the GOs;
- The certifying authority should be independent and auditable;
- There should be controls from the European Union on the producers of hydrogen and the organizations that measure hydrogen production and usage and allocate the rights through the issuing bodies to prevent fraud.

Future bottlenecks:

The legislative framework for the GO system of hydrogen is currently in development. The current European and national legislation enforces a different GO scheme. These directives, regulations, laws, and lower legislations have to change to properly facilitate the objectives set by the European Union and the Dutch Government. In this chapter, the future bottlenecks and main caveats in the current and proposed legislation are stated. In Annex I are the changes in the legislation stated that are needed to facilitate the ideal GO system.

Main caveats in the legislation:

- Definition RFNBO, including renewable and low carbon hydrogen

The definition of the RFNBO is crucial for the development of a certification system. Currently, the European Commission is finishing the Delegated Act of the RED II, which defines the preconditions

for energy produced to produce RFNBOs, such as renewable hydrogen. These definitions should be suitable to the vision of the industry to accelerate the decarbonization of the industry while keeping the industry competitive and preventing carbon leakage. More information can be found in the response of VEMW to the consultation of the Delegated Act.

- Import (from outside the EU)

Certification of import, even though it is a necessity, will be a big challenge since it can reduce the trustworthiness of the system and compromise the competitiveness of the hydrogen producers. It's unclear whether producers outside of the EU can be trusted and which requirements have to be set to ensure that the renewable hydrogen consumed was produced via electrolysis with renewable electricity. It should be impossible for hydrogen producers outside of the EU to import grey hydrogen as certified renewable hydrogen on the European market.

- Coupling with other certification schemes

The current and proposed certification schemes for different commodities do not necessarily provide for a matching infrastructure with our proposed GO system. This hampers the development of a linked GO system. The proposed Implementing Regulation on rules to verify sustainability and greenhouse gas emissions saving criteria and low indirect land-use change-risk criteria puts demands on biomass which makes the certification scheme incompatible with the proposed GO scheme for hydrogen. Problematic is the enforcement of a track and trace system for physical molecules and strict regulations for the label sustainable.

- Enforced additionality

An important demand of the European Union is the additionality of unsubsidized renewable electricity for the production of RFNBO's including renewable hydrogen, either through a direct line or a PPA. This demand arises from the wish to accelerate the production of renewable electricity. This demand intervenes in the hydrogen and electricity market and can have undesirable outcomes, such as increased hydrogen prices and an unlevel playing field in the electricity market for renewables.

Annex I

The article by article comments from VEMW on the current and proposed legislation.

EU legislation:

Renewable Energy Directive

- Article 2

Definition of Guarantee of Origin: 'guarantee of origin' means an electronic document that has the sole function of providing evidence to a final customer that a given share or quantity of energy was produced from renewable sources;

*Since this article uses the term energy, and not electricity, this article prevents the rollout of a European full disclosure system for any energy carrier within the term of a Guarantee of Origin. A combination of different terms can be used, as is currently the case with a GO and a Certificate of Origin, but this increases confusion. Furthermore the current definition states that Guarantees of Origin have the **sole function of providing evidence that a given share or quantity of energy was produced from renewable sources**. This is too limited since GOs have multiple functions in practice. A clear terminology should be defined within the RED III that encompasses the proposed certification scheme.*

- Article 19

Paragraphs 3 & 4: For the purposes of paragraph 1, guarantees of origin shall be valid for 12 months after the production of the relevant energy unit. Member States shall ensure that all guarantees of origin that have not been cancelled expire at the latest 18 months after the production of the energy unit. Member States shall include expired guarantees of origin in the calculation of their residual energy mix.

Since hydrogen requires transportation and can be stored for periods longer than 12 months this article must be removed or altered to differentiate based on the energy carrier.

Paragraph 7: A guarantee of origin shall specify at least:

- (a) the energy source from which the energy was produced and the start and end dates of production;
- (b) whether it relates to:
 - (i) electricity; or
 - (ii) gas, or
 - (iii) heating or cooling;
- (c) the identity, location, type and capacity of the installation where the energy was produced;
- (d) whether and to what extent the installation has benefited from investment support, and whether and to what extent the unit of energy has benefited in any other way from a national support scheme, and the type of support scheme;
- (e) the date on which the installation became operational; and
- (f) the date and country of issue and a unique identification number.

This article should also include hydrogen and potentially other Renewable Fuels of Non-biological Origin

Changes to the Renewable energy directive as part of the Fit For 55 package

As part of the package no real changes are being made to the GO scheme. Marcus Pieper rapporteur of the European Parliament proposes to strengthen the position of Guarantees of Origin by linking the usage of Guarantees of Origin with the following:

- Article 1 paragraph 6

Addition of: Electricity that has been taken from the grid may be counted as fully renewable provided that it is produced exclusively from renewable sources and the renewable properties have been demonstrated, ensuring that the renewable properties of that electricity are claimed only once and only in one end-use sector. ***This can be achieved by either following any of the following:***

(b) a granular guarantee of origin pursuant to Article 19(2) may be used in order to demonstrate the renewable properties of the electricity used for the production of renewable fuels of nonbiological origin and to ensure that the renewable properties of that electricity are claimed only once and only in one end use sector.

VEMW is in favour of the proposed change since it links the different GO schemes and strengthens the market for GOs.

- Article 19 paragraph 2

To that end, Member States shall ensure that a guarantee of origin is issued in response to a request from a producer of energy from renewable sources ***as well as from a producer of low-carbon hydrogen***. Member States ***shall provide for guarantees of origin to be issued for low-carbon hydrogen and*** for energy from other non-renewable sources. ***Member states shall provide for a uniform system of Union guarantees of origin for all renewable and low-carbon hydrogen. Member States shall introduce supplementary schemes to enable guarantees of origins for renewable electricity that include refined time granularity and locational matching, while avoiding double counting with the existing guarantee of origin system. The Commission shall adopt delegated acts in accordance with Article 35 to supplement this Directive by introducing a common scheme for guarantees of origin.*** Issuance of guarantees of origin may be made subject to a minimum capacity limit. A guarantee of origin shall be ***no greater than 1 MWh***. No more than one guarantee of origin shall be issued in respect of each unit of energy produced. ***By ... [one year after the entry into force of this amending Directive], the Commission shall issue guidance on relevant safe***

GOs should be broadened in their function even further than just low-carbon hydrogen as Pieper proposes. Furthermore, VEMW agrees that member states should provide a unionwide uniform system of guarantees of origin that can be traded throughout the Union.

Dutch legislation:

Currently, the Dutch legislation for GOs is divided over the Warmtewet, Elektriciteitswet, and Gaswet. To facilitate the proposed GO scheme changes have to be made in these laws to connect the GO schemes to ensure that renewable electricity certified with a GO can be exchanged, during conversion, to a hydrogen GO and, potentially, the heat produced from renewable hydrogen can be transferred, during conversion, to a heat GO.

The Elektriciteitswet and Gaswet are currently being merged into the Energiewet. With the latest version of the proposed Energiewet, the Dutch government proposes in Article 2.56 to simplify the Guarantees of Origin and Certificates of Origin system for electricity to Guarantees of origin of electricity produced by renewable sources, electricity produced in a combined heat and power plant, and electricity produced by non-renewable sources. This is a simplification that is in line with the vision of VEMW.

One major shortcoming of the draft texts for the Energiewet according to VEMW is the absence of hydrogen. The Energiewet has to make large steps in relation to the other points stated in this Position Paper to facilitate the hydrogen market properly through GOs. These points need to be addressed at a European and national level and the crucial legislation (including the Energiewet and the underlying legislation including the Regeling garanties van oorsprong en certificaten van oorsprong) have to be changed to facilitate the energy transition