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Selected legal issues on the EU Hydrogen Strategy and its implementation in Belgium

September 2020

I. Introduction

A growing interest in green hydrogen – a need for a steady legal framework

An increasing number of businesses and policy-makers are now pinning their hopes on green hydrogen as a means to reconcile the climate objectives and the economic recovery of the European Union.

In Belgium, for example, recent initiatives such as the Hyoffwind and Hyport projects aim to develop industrial-scale electrolysers in Zeebrugge and Ostend to valorise the excess electricity production of offshore windfarms. In the south of the country, the HaYport project aims to equip Liège Airport with facilities for the production, distribution and use of green hydrogen to fuel its fleet of vehicles and, ultimately, all hydrogen vehicles transiting through the airport and its vicinity.

In spite of these business initiatives, large-scale development of green hydrogen requires a steadier dedicated legal framework. Decision-makers, first and foremost EU institutions, have taken up the issue, and made green hydrogen a cornerstone of both the Green Deal and their economic recovery agenda. On 8 July 2020, the European Commission presented its hydrogen strategy[1], which takes the form of a roadmap setting out the milestones of green hydrogen development up to 2050[2]. At the national level, several Member States have already moved to secure leadership in this promising technology. Although Belgium hosts ambitious projects, an inter-federal strategic vision on hydrogen and dedicated regional regulatory frameworks are still expected (and required) from public authorities.[3]

What is green hydrogen? Different kinds of hydrogen, their greenhouse gas emissions and relative competitiveness

Hydrogen (H_2) has long been used in industry as a basic commodity.[4] It can also be utilised as a fuel, with the advantage that its combustion produces a lot of energy without emitting CO_2.[5] Although hydrogen is the most widespread element on Earth, it does not exist in its natural state and must be produced (i.e. extracted from other compounds) through energy-consuming processes. Therefore, hydrogen is an energy carrier (and not an energy source) and its carbon footprint is measured by the amount of CO_2 released when it is produced rather than the amount CO_2 emitted when it is consumed (which is none).

Although hydrogen is a colourless gas, it is often referred to as grey, green or blue. On a molecular level, these different

1 European Commission, A hydrogen strategy for a climate-neutral Europe, Communication COM(2020) 301 final of 8 July 2020.

2 The European Commission proposes to reach 40 GW of clean hydrogen electrolysers in the EU by 2030. In addition, 50% of current hydrogen production from fossil sources should be upgraded to produce low-carbon hydrogen. From 2030 onwards and towards 2050, renewable hydrogen technologies should reach maturity and be deployed at large scale to reach all hard-to decarbon ise sectors where other alternatives might not be feasible or have higher costs.

3 The main institutional initiatives of the Belgian governments have so far been the publication in March 2019 of a draft "*Inter-federal brainstorming note on hydrogen*" and the signature on 11 May 2020 of the "*Joint Political Declaration of the Pentalateral Energy Forum on the role of hydrogen to decarbonise the energy system in Europe*".

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shades of hydrogen differ from each other only in respect of their production methods, which are more or less CO_2-intensive.

For cost reasons, the overwhelming majority of hydrogen used today is produced through carbon-emitting processes. Hydrogen produced in this way is referred to as grey hydrogen (or fossil-based hydrogen in the European Commission's terminology).

Industrial production methods that do not emit CO_2 exist, the most important of which is the electrolysis of water.[6] For hydrogen produced by electrolysis to be genuinely carbon-free, the electricity used must come from renewable energy sources, such as PV or wind power. Only then can it be referred to as green hydrogen or, in the words of the European Commission, clean hydrogen.

Blue hydrogen is obtained from all other production methods that emit little or virtually no CO_2. These include the electrolysis of water with electricity from nuclear power or the reforming of natural gas with carbon-mitigating technologies such as carbon capture & storage (CCS). In this sense, blue hydrogen is close to the definition of low-carbon hydrogen proposed by the Commission in its strategy.[7] Although less 'virtuous' than green hydrogen in terms of emissions, blue hydrogen is usually based on more mature technologies and is currently often more cost-competitive than green hydrogen.

Going green

Green hydrogen is seen by its proponents as the missing link in the journey towards a net zero carbon economy, as it could theoretically reduce the carbon footprint of industrial sectors highly dependent on hydrogen (which today remains fossil-based) and could partly replace fossil fuels, even in sectors that have proved very difficult to electrify. For green hydrogen to live up to these ambitions, it needs to achieve a far larger scale and be cost-competitive with fossil-based fuels. Green hydrogen is not expected to become cost-competitive in the short-term and several stakeholders argue that the uptake of hydrogen as a whole necessitates including – temporarily – other types of low-carbon hydrogen in the various support measures envisaged for green hydrogen.[8]

Various legal and regulatory hurdles to the development of green hydrogen in various sectors

In each sector in which green hydrogen is expected to emerge, regulatory challenges will arise.

In section II, we examine the issue of developing green hydrogen as a **feedstock** in the industry. One of the first objectives of the European hydrogen strategy is to encourage the use of green hydrogen in hydrogen-intensive industries to reduce their carbon footprint. Industries targeted include oil refining and the production of ammonia, methanol and steel. This transition to clean hydrogen is hindered by several market constraints and requires well-calibrated forms of public intervention.

In section III, we examine how green hydrogen can be developed as a **fuel** in the transport and heating sectors. Indeed, green hydrogen can contribute to the decarbonisation of sectors that are usually difficult to electrify as it can replace to some extent natural gas and hydrocarbons. However, the partial replacement of fossil fuels by (green) hydrogen in those sectors will require many adaptations to permitting procedures for refuelling stations and market rules that have traditionally been designed for other applications.

In section IV, we examine how green hydrogen could be used as a means to **store** electricity. This process – targeted by the Hyoffwind and Hyport projects – would contribute to the further deployment and integration of intermittent renewable energy sources whose surpluses could be stored and later injected into the grid at a more opportune time, when prices and demand justify it. Also, these types of projects could be hampered by an unclear regulatory framework.

Finally, the competitiveness and large-scale deployment of green hydrogen require significant private and public **investments** to be channelled and allocated in the most efficient way possible. We will see in section V that the design of support measures in this context may raise considerable legal issues and we will present the main sources of public funding that will be available at EU level for green hydrogen projects.

4 See section II of this paper.

5 Per unit of mass, hydrogen releases three times more energy than oil or any fossil hydrocarbon (coal, gas, etc.). The combustion of hydrogen with oxygen produces water as its only product: $2 H_2 + O_2 \rightarrow 2 H_2O$.

6 The electrolysis of water is the decomposition of water (H_2O) in hydrogen (H_2) and oxygen (O_2) due to the passage of an electric current. In its strategy, the European Commission talks about 'electricity-based hydrogen' regardless of the electricity source.

7 According to the European Commission, 'low-carbon hydrogen' encompasses fossil-based hydrogen with carbon capture and electricity-based hydrogen, with significantly reduced full life-cycle greenhouse gas emissions compared to existing hydrogen production.

8 See notably the German National Strategy published on the 10 June 2020, url: https://www.bmbf.de/files/bmwi_Nationale%20Wasserstoffstrategie_Eng_s01.pdf.

II. Hydrogen as a feedstock in industrial processes

Most of the hydrogen produced today is used by industry, chiefly in oil refining (33% of worldwide hydrogen consumption), ammonia production (27%), methanol production (11%) and steel production (3%).[9] Virtually all this hydrogen is fossil-based and its production accounts for roughly 2.5% of global greenhouse gases emissions.[10]

Decarbonising these industries implies using "greener" hydrogen in their manufacturing processes, which is often technically feasible but not (yet) economically viable. The conversion to clean hydrogen is all the more challenging because these sectors are highly exposed to international competition, are sensitive to the changes in demand for downstream products and are at risk of delocalisation leading to carbon leakage. Technological progress and production support schemes could eventually bring down the price of clean hydrogen, but it might not fall fast or far enough to meet the European Union's medium-term climate objectives.

Green hydrogen consumption quotas and sectoral agreements

For these reasons, the European Commission has indicated in its communication that it will examine the case for establishing low-carbon hydrogen consumption quotas[11] specific to industrial sectors. Although this mechanism is reminiscent of existing quantified targets for green electricity consumption[12], the low-carbon hydrogen consumption quotas would not be set for each Member State but for several industrial sectors, thus limiting distortion of competition within the internal market.

Setting sectoral quotas could prove tedious and controversial if these are not based on precise knowledge of the potentials and constraints of each industrial sector. Consumption quotas could be inspired by sectoral agreements ("*accords de branche*") or environmental conventions that have been successfully adopted in some Member States.[13] Instead of unilaterally introducing binding targets, sectoral agreements could be negotiated between public authorities and industrial representatives, which

9 International Energy Agency, The Future of Hydrogen, June 2019, p.89. Those commodities are the bottom of many value chains in global economy: all forms of transportation still largely depend on refined fuels, ammonia is mostly used to produce fertilisers for food production, methanol is used for energy purposes and for the production of plastics and iron and steel are used as construction materials for buildings.

10 According to the IEA, worldwide production of hydrogen is responsible for carbon dioxide (CO_2) emissions of around 830 million tonnes of carbon dioxide per year (Mt CO_2/year), equivalent to the CO_2 emissions of Indonesia and the United Kingdom combined (International Energy Agency, The Future of Hydrogen, June 2019, p. 17).

11 European Commission, *op. cit*., p. 11.

12 See Articles 3.1 and 3.2 of the Electricity Directive 2009/28/CE and Article 3 of the Electricity Directive 2018/2001/UE.

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would give long-term visibility while taking into account the specificities of each sector. This would also allow public authorities to negotiate side-measures in terms of employment and relocalisation of activities, for instance.

An original form of support: The Carbon Contracts for Difference

The introduction of consumption quotas (imposed or negotiated) will in any case imply additional costs for EU-based industries for as long as clean hydrogen is more expensive than fossil-based hydrogen. To mitigate loss of competitiveness or carbon leakage risks, certain hydrogen-intensive industries may benefit from offsetting support schemes, as has been done for the electro-intensive sectors with, for instance, degressivity schemes and free allocations of ETS allowances.

To support hydrogen-intensive companies producing low-carbon basic materials, the Commission has raised the idea of financing pilot projects by means of *Carbon Contracts for Difference* (CCfD). These CCfDs would be awarded based on a public tendering and would provide long-term subsidies to companies using innovative technologies to produce low-carbon basic materials. In practical terms, a fixed guaranteed price for each tonne of CO_2 avoided by the pilot project would be set contractually and the public counterpart would pay each year the difference between the fixed price and the annual ETS price times the CO_2 emissions that have actually been avoided, thus bridging the cost gap between fossil-based and clean hydrogen.[14]

CCfDs could build upon and be compatible with the current EU ETS system, since the price of carbon would be set at EU level and the industrial sectors concerned are already subject to ETS reporting obligations. The CCfDs could primarily be financed by ETS revenues and therefore avoid tax or energy bill increases. To mitigate inefficient investment and reduce administrative burden, CCfDs could be reserved for recipients of existing European and national innovation funds. This would also allow certain innovative projects to scale up to commercially viable projects.

If implemented at national level, these CCfDs would probably constitute aid measures within the meaning of European state aid law and would therefore have to be declared compatible with the internal market before being implemented. Although such a mechanism is not foreseen in the state aid guidelines on energy and environment (EEAG),[15] it might seem to be in line with its general principles: it undeniably pursues the objective of common interest of reducing greenhouse gas emissions and this objective could not be achieved without public intervention. Moreover, the CCfDs seem particularly suited to fulfil the appropriateness, incentive effect and proportionality requirements set out in the EEAG. The CCfD could be set as a market-based mechanism limiting public subsidies to the strictly necessary (the cost gap between fossil-based and clean hydrogen), only benefiting efficient technologies (CCfDs would be awarded following competitive auctions) and only covering eligible costs (beneficiaries are only remunerated for the avoided CO_2 emissions).

Furthermore, the European authorities have already announced that support for hydrogen will be explicitly addressed in the new EEAG to be adopted in 2022, or even that hydrogen would to some extent be exempted from state aid control.

13 See for instance the Accords de branche Energie/CO_2 that have been implemented in Wallonia.

14 For more details, see O. Sartor and C. Bataille, "*Decarbonising basic materials in Europe: How Carbon Contracts-for-Difference could help bring breakthrough technologies to market*", IDDRI, issue 6, October 2019.

15 Communication from the European Commission - Guidelines on State aid for environmental protection and energy 2014-2020 (EEAG 2014), OJ C 200, 26.6.2014, 1-55.

III. Hydrogen as a fuel

The role of hydrogen in transport

Hydrogen is also touted as an option to decarbonise road transport, particularly heavy goods vehicles and buses, but also regular passenger cars. The development of hydrogen as a transport fuel requires the deployment of refuelling infrastructure within Member States. In this respect, the Alternative Fuel Infrastructure Directive[16] provides for a legal framework for such installations but does not oblige or impose targets on Member States to actually deploy hydrogen refuelling infrastructure.[17] That said, the Alternative Fuel Directive is expected to be amended in 2021, which led MEPs and interest groups to advocate for the inclusion of national binding targets in terms of hydrogen infrastructure deployment.[18]

The permitting process for hydrogen refuelling stations is often burdensome and costly and its outcome is uncertain. This is partly because refuelling infrastructure is not subject to a dedicated legislation and the permitting authorities must draw both from the permitting rules applicable to conventional refuelling stations and the regulations applicable to industrial storage of goods and products.[19] Furthermore, hydrogen is categorised as a dangerous good, for which specific safety studies must be performed, and must abide by multiple pieces of legislation related to health and safety, industrial emissions, major hazards and explosion risks.[20] Such requirements imposable on hydrogen production and storage might be unreasonably burdensome for hydrogen refuelling stations.[21]

The integration of hydrogen into the gas market would require a significant overhaul of the gas regulatory framework

The European Commission indicated that the development of an EU hydrogen market requires the application of third party access rules[22], transparent and straightforward rules on the connection and access of electrolysers to the

16 Directive 2014/94 of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure, OJ L 307/1, 28.10.2014, 1-20.

17 See article 5 of Directive 2014/94 that states that "*Member States which decide to include hydrogen refuelling points accessible to the public in their national policy frameworks […]*", which implies that it is not obligatory for Member States to do so.

18 See Hydrogen Europe, Position Paper on the Alternative Fuels Infrastructure Directive, 3 September 2020, url: https://hydrogeneurope.eu/sites/default/files/Hydrogen%20Europe's%20position%20paper%20on%20the%20AFID.pdf; and European Parliament, resolution of 25 October 2018 on deployment of infrastructure for alternative fuels in the European Union: time to act! (2018/2023(INI)).

19 HyLaw (Isabel François) National Policy Paper Belgium, pp. 6-8; url: https://static1.squarespace.com/static/5c350d6bcc8fedc9b21ec4c5/t/5ca1633c0d92972348cc1b62/1554080577906/National+policy+paper_+Belgium.pdf (retrieved 10 August 2020).

20 E.g. Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods; Directive 94/33/EC on Young People at Work, 20 August 1994, as amended by Dir 2014/27/EU, March 5, 2014; Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives; Council Directive 98/24/EC of 7 April 1998 on the protection of the health and safety of workers from the risks related to chemical agents at work (fourteenth individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC).

21 E.g. it is not entirely clear in what way hydrogen refuelling stations would be compatible with the destination and use in residential areas according to Flemish VLAREM legislation on environmental permits.

networks[23] and possibly the application of unbundling rules[24], all inspired by legislation governing natural gas networks. In the event that hydrogen networks are developed, the question will arise as to what extent the Gas Directive is suited to apply to this type of infrastructure.[25]

Existing gas infrastructure can be used to transport hydrogen and provide large seasonal energy storage capacity. However, there are no common EU technical and safety standards applicable to the injection of hydrogen and its blending with natural gas. Currently 65% of Member States do not even accept the injection of hydrogen into their networks.[26] In Member States where hydrogen in the network is explicitly accepted (Austria, France, Germany, Latvia, Slovakia, Spain and Sweden), it is only accepted at a very low concentration by volume.[27] National regulators are aware that quality problems may arise if very different intake levels are established across Member States and expressed their wish to set mixing limits of at least 2% by volume[28], but national approaches are very variable.

In order to encourage the production and storage of hydrogen and its transportation through the natural gas network and avoid problems at cross-border connection points, common EU rules regarding hydrogen quality will have to be adopted. The reason for introducing a maximum percentage of hydrogen and quality standards is partly due to the need to preserve the integrity of the transmission or distribution networks, but is also found on the exit level of the chain: some gas consumers use appliances (e.g. gas turbines, gas engines, burners,…) that cannot deal with blended gas for reasons of attrition or safety.[29] The ability of appliances to withstand a blended gas could be gradually ensured by adopting targeted eco-design policies, for example. This point highlights the difficulty of setting common standards that could not take account of the diversity of network users within the Member States.

Other questions will arise, for example on energy metering (since hydrogen does not have the same density as natural gas) and on pricing methodologies, which will become increasingly complex.

22 European Commission, *op. cit.*, p. 16.

23 European Commission, *op. cit.*, p. 16.

24 European Commission, *op. cit.*, p. 16. The European Commission states that "*[i]n order not to distort the level playing field for market-based activities, network operators must remain neutral*". This could entail that network operators should refrain from having interests in the supply or trading of hydrogen.

25 On this issue see R. Fleming and G. Kreeft, "*Power-to-Gas and Hydrogen for Energy Storage under EU Energy Law, European Energy Law Report*" in M. Roggenkamp (ed.), European Energy Law Report, Cambridge: Intersentia, vol. XIII, pp. 101-123.

26 ACER, NRA Survey on Hydrogen, Biomethane, and Related Network Adaptations – Evaluation of Responses Report, 10 July 2020, p. 3.

27 ACER, op. cit., p. 9.

28 ACER, op. cit., p. 9 and 16.

29 In 2019, the European Commission and Fuel Cells and Hydrogen Joint Undertaking (FCH 2 JU) selected the THyGA (Testing Hydrogen Admixtures for Gas Appliances) project for funding as part of the FCH 2 JU work programme. The main goal of the project is to enable the wide adoption of H2NG (hydrogen in natural gas) blends by closing knowledge gaps regarding technical impacts on residential and commercial gas appliances. The project consortium will identify and recommend appropriate codes and standards that should be adapted to answer the needs and develop a strategy for addressing the challenges for new and existing appliances.

IV. Hydrogen as a means to store electricity

Hydrogen can be used as an energy carrier to store electricity. In particular, the electrolysis of water makes it possible to produce hydrogen using electricity and water without emitting CO_2. The hydrogen produced can be stored in its liquid or gaseous form before being reused to produce electricity with fuel cells. This process, which would be used in the Belgian Hyoffwind and Hyport projects, may contribute to the deployment and integration of intermittent renewable energy sources, whose excess or uneconomic electricity production could be stored before being injected into the grid at a more opportune moment, when prices or demand are high.

However, a variety of technical, economic and legal barriers hinder the large-scale deployment of hydrogen as a means of storing electricity. From a techno-economic point of view, significant energy losses diminish the economic interest of the operation and other storage methods are currently more profitable. In addition, the market for hydrogen production is still largely captured by industry, which favours fossil-based hydrogen and processes. Electrolysis of water is not yet cost-competitive and may be even more expensive if it uses green electricity bought above the market price. The deployment of green hydrogen as a means of electricity storage may also be hampered by an unsuitable or unspecific legal framework. As an example, we show below that the current narrow definition of "electricity storage" in Belgium is not in line with the EU definition and, as a consequence, does not fully embrace the potential of clean hydrogen as a means of storage.

The transformation of Belgium's electrical systems towards more intermittent production has increased the need to develop flexibility tools such as storage. To attract investment in this area, in 2017 the federal legislator introduced the legal notion of electricity storage, which is defined as "*any process consisting, by means of a single installation, of taking electricity from the grid with a view to subsequently reinjecting it into the grid in its entirety, subject to yield losses*".[30] Operations falling within the scope of this definition are exempt from payment of the federal levy on electricity and are subject to advantageous pricing defined by the federal regulator.[31]

In June 2019, the new European Electricity Directive introduced the concept of electricity storage into European law, defined as "*the postponement of the final use of electricity in the electricity system until after it has been produced, or the conversion of electrical energy into a form of energy that can be stored, the conservation of this energy and its subsequent conversion back into electrical energy or its use as an alternative energy carrier*".[32] In addition, the Directive very purely defines an energy storage facility as the installation in the electricity system where energy is stored.

Both the wording of this definition and the preparatory work for the Directive indicate that the use of electricity to produce hydrogen is also a form of electricity storage.[33] In particular, the Hyoffwind or Hyport projects seem to fit fully within this European definition of storage as they aim to keep excess electricity in the form of hydrogen so that it can be fed back into the grid.[34]

30 Article 2, §63 of the Law of 29 April 1999 on the organisation of the electricity market.

31 See Article 12, §5, 27° and 21bis, §1bis of the Law of 29 April 1999 on the organisation of the electricity market.

IV. Hydrogen as a means to store electricity

However, the Belgian definition of storage is more restrictive in several respects. Contrary to the European directive, the Belgian definition provides that storage operation must take place "*through the same installation*". This means that the triple operation (i) electrolysis of water (ii) conservation of hydrogen and (iii) production of electricity by means of fuel cells would have to be integrated within the same installation (potentially also within an environmental permitting context), and probably performed by the same operator and would not be considered as storage if the hydrogen is moved or sold alternatively.

In further contradiction to the Directive, the Belgian definition of storage only covers electricity that has been off-taken from the grid. However, we could imagine that operators of power generation units would want to invest in their own electrolysers to manage their surpluses and avoid paying unnecessary grid charges. Yet, this operation would not qualify as storage under current Belgian law.

Finally, the Belgian definition of storage stipulates that the electricity withdrawn must be reinjected in its entirety into the network, subject to yield losses. However, the European definition refers to "t*he subsequent conversion of [energy] into electrical energy or its use as another energy carrier*". Therefore, the European definition of storage applies to *power-to-gas* operations such as Hyoffwind and Hyport, which would not convert all the hydrogen produced back into electricity, but which would inject some of their green hydrogen into the gas grid, or use it for transport or industrial purposes. Again, such operations would not fall within the scope of the Belgian definition since not all the electricity used is reinjected.

The European directive must be fully transposed by Belgium before 31 December 2020. On one hand, the electricity law of 29 April 1999 will have to be amended to comply with European law. On the other, it seems appropriate to consider green hydrogen projects to benefit from the existing regulatory framework of exemptions in favour of storage in view of the European and Belgian climate and resource adequacy objectives.[35]

32 Directive 2019/944 of 5 June 2019 concerning common rules for the internal market in electricity.

33 R. Fleming and G. Kreeft, *op. cit.*, p. 108.

34 It should be noted that the European definition of storage applies to the conversion of electricity into hydrogen, regardless of the source of the electricity. Grey or blue hydrogen produced from conventional fossil fuel electricity would therefore also be included in the favourable legal framework for storage.

35 For further discussion and analysis of this issue, cf.: W. VANDORPE and R. CALLAERTS, (Federal regulation of flexibility and storage of electricity: a slight step ahead of Europe) "De federale regulering van flexibiliteit en opslag van elektriciteit: een lichte voorsprong op Europa" in K. DEKETELAERE and B. DELVAUX (eds.), Jaarboek Energierecht 2017 (2018, Antwerpen, Intersentia), p. 185-219; W. VANDORPE, D. HAVERBEKE and R. CALLAERTS, "Energy Demand Response and Energy Storage as Sources of Flexibility: Which Role for Regulatory Authorities?, Oil, Gas & Energy Law Intelligence (OGEL), Volume 17, issue 1, February 2019.

V. Aid schemes and funding opportunities

The objectives set out in the European Commission's strategy require investments amounting to hundreds of billions of euros.[36] A legal framework conducive to private investment must therefore be put in place and the coherence and efficiency of public support must be ensured throughout European and national institutions. The Commission will propose a European definition of clean hydrogen to delineate the types of hydrogen to be supported and will also propose a common certification procedure. The Commission indicated that for hydrogen to be considered "clean" and eligible for support mechanisms, production facilities should not exceed a life-cycle greenhouse gas emission threshold. This approach is intended to be technology-neutral and not to favour only hydrogen produced by electricity from renewable energy sources where cheaper and equally carbon neutral alternatives exist.

Guarantees of origin

The traceability of green hydrogen is a crucial condition for its EU-wide trading, as it is for renewable electricity production. The extension of the guarantee of origin regime to hydrogen could also serve as a stepping-stone for possible production support schemes as well as forms of corporate power purchase agreements and gas supply agreements supporting hydrogen production and use.

Although green hydrogen is not yet explicitly listed as a renewable energy source[37], the new EU Directive 2018/2001 on the promotion of renewables has made it possible to include green gases in the guarantee of origin regime.[38] In Belgium, the Regions are working on reforming their systems of labels and guarantees of origin (LGO) to include green hydrogen in the list of renewable energy sources and possibly foresee innovative support schemes.[39] Since August 2019, Fluxys may grant LGOs for the production of green hydrogen in Flanders. Wallonia has set up an indirect scheme for the production of biomethane (which is a green gas like hydrogen) based on the LGO system. Biomethane producers receive LGOs that can be sold to electricity producers who use the biomethane in their gas-fired installations. Since the use of biomethane to generate electricity qualifies for green certificates, power producers are willing to pay a certain price for LGOs and therefore support biomethane production. Despite its relative complexity, it is conceivable that such a system could be extended to green hydrogen used for electricity generation.

36 European Commission, *op. cit.*, p. 2.

37 Article 19 of Directive 2018/2001 provides for the establishment of guarantees of origin which serve to demonstrate to the final customer that a given share or quantity of energy has been produced from renewable sources. These schemes allow guarantees to be transferred from one holder to another irrespective of the energy they relate to, but must avoid double counting of the same unit of renewable energy.

38 See recital (59) of Directive 2018/2001.

39 As an example of support mechanism for green hydrogen, Wallonia has set up an indirect scheme for the production of biomethane (which is a green gas like hydrogen) based on the LGO system. Biomethane producers receive LGOs that can be sold to electricity producers who use the biomethane in their gas-fired installations. Since the use of biomethane to generate electricity qualifies for green certificates, power producers are willing to pay a certain price for LGOs and therefore support biomethane production. Despite its relative complexity, it is conceivable that such a system could be extended to green hydrogen used for electricity generation.

V. Aid schemes and funding opportunities

The difficulty of providing different support schemes depending on the use of hydrogen

The versatility of hydrogen makes it difficult to establish differentiated support schemes according to the final use of hydrogen. For instance, projects such as Hyoffwind and Hyport will choose, on a price comparison basis, the share of hydrogen they will retain for electricity storage and the share of hydrogen they will sell to the market. If green hydrogen is produced only for storage purposes, it may not receive a guarantee of origin, as it will not be commercialised. Nor should electricity produced from hydrogen be eligible for support mechanisms for renewable energy production since it is not strictly speaking electricity production.

In Wallonia, for example, the electricity taken from the grid for storage purposes is not included in the green certificate quota and the resulting reduction in surcharge is passed on to the operator of the storage facility.[40] For such a mechanism to be applicable to a green hydrogen production installation, it would be necessary to know precisely how much of the hydrogen has been "reprocessed" into electricity. There is also the question of how to deal with green hydrogen that has been displaced or introduced into the gas grid and then converted into electricity by another operator. Will the hydrogen concerned be subject to a green gas support mechanism or a storage support mechanism?

Sources of financing at EU level

The European Commission proposes to reach 40 GW of clean hydrogen electrolysers in the EU by 2030. In addition, 50% of current hydrogen production from fossil sources should be upgraded to produce low-carbon hydrogen.[41] To meet these targets, the Commission estimates that €24-42 billion is needed for investment in electrolysers, while €220-340 billion is still needed for investment in solar and wind power by 2030. The Commission also estimates the investment needed to modernise current production at between €11 billion and the investment needed for hydrogen transport, distribution, storage and refuelling stations at €65 billion.[42]

Public and private investments will be coordinated through the Clean Hydrogen Alliance, announced in March 2020, and the InvestEU programme, aimed at European economic recovery. Funding will also come from the ETS Innovation Fund, which will raise around €10 billion to support low-carbon technologies over the period 2020-2030. Other envelopes from the Just Transition Mechanism and the Structural Funds can also be mobilised.

Furthermore, many European voices have suggested that clean hydrogen projects should be designated as Important Projects of Common European Interest ("IPCEIs")[43], which give EU Governments greater freedom to grant State aid to such projects, in line with the Commission's 2014 state aid notice on IPCEIs.[44]

40 See Article 25, §5, paragraphs 9 and 12 of the Walloon Government Decree of 30 November 2006 on the promotion of electricity produced by means of renewable energy sources or cogeneration.

41 European Commission, *op. cit.*, p. 3.

42 European Commission, *op. cit.*, p. 7.

43 IPCEIs is an instrument under state aid rules to find aid compatible with the internal market. It is used as a financing instrument for environment, transport, energy projects of strategic European importance. See European Commission, *op. cit.*, p. 8.

44 See Communication from European Commission - Criteria for the analysis of the compatibility with the internal market of State aid to promote the execution of important projects of common European interest (2014/C 188/02), OJ C 188, 20.6.2014, p. 4–12.

Summary & Contacts

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David Haverbeke
Partner, Energy & Utilities
Competition, Regulatory and Trade Group,
Fieldfisher, Brussels
+32 2 742 70 13
david.haverbeke@fieldfisher.com

Samuel Verschraegen
Associate, Energy & Utilities
Competition, Regulatory and Trade Group
Fieldfisher, Brussels
+32 2 742 70 38
samuel.verschraegen@fieldfisher.com

Wouter Vandorpe
Of Counsel, Energy & Utilities
Competition, Regulatory and Trade Group
Fieldfisher, Brussels
+32 2 742 70 18
wouter.vandorpe@fieldfisher.com