

## **Specific regulation and state aid needed to foster Belgium's hydrogen strategy**

E-CUBE Strategy Consultants  
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On the eve of COP26, the Federal Council of Ministers in Belgium accepted the draft “Hydrogen Strategy for Belgium”<sup>1</sup> proposed by Minister of Energy Tinne Van der Straeten. Subsequently, the document has been shared with regional authorities (Wallonia, Flanders and Brussels) for reaching a coherent common political framework based on the strategy. As talks between the federal and regional levels are still ongoing, the “Hydrogen Strategy for Belgium” is not deemed final and has not been shared with the public.

This policy brief by E-CUBE Strategy Consultants starts by reframing the future role of the hydrogen sector in the Belgian economy. In the second section, we will expand on necessary features of a regulatory framework for hydrogen networks and of state aid for nascent segments in the hydrogen value chain in Belgium. This note also aims at recalling important peculiarities of the Belgian hydrogen sector that we believe the authorities should consider when finalizing provisions relative to regulation and state aid of the federal roadmap for hydrogen.

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## A. What role for hydrogen in Belgium?

### A.1 Hydrogen in a future industrial landscape

In the aftermath of the COP26, urgency to curb carbon emissions becomes increasingly pressing. Parallely, there is a growing consensus that hydrogen has an important role to play in a transformed economic system. The International Energy Agency pinpoints 4 key areas where hydrogen should be deployed at first for the building of a clean fuel energy system<sup>2</sup>:

1. introduction of hydrogen in gas grids,
2. in industrial hubs with chemical activities,
3. as fuel in heavy road transport and
4. the development of an international hydrogen trade system.

Besides substituting part of current fossil fuel use, hydrogen fulfils a series of systemic roles in an energy system in complete transition and heading towards “sector coupling” (i.e. a flexible energy system based on power and clean molecules operating interconnectedly). In this new energy system, hydrogen is particularly suited for long-term energy storage of intermittent power production, long distance energy transmission and as low-carbon fuel for high-temperature industrial processes of hard-to-abate sectors<sup>3</sup>.

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<sup>1</sup> SPF Chancellerie du Premier Ministre (2021). *Vision et stratégie hydrogène fédérales*.

<sup>2</sup> IEA (2019). *The Future of Hydrogen*. IEA, Paris.

<sup>3</sup> C. Van der Linde & J. Van Leeuwen (2019). *From an invisible to a more visible hand? Hydrogen and electricity towards a new energy system backbone*. Clingendael International Energy Programme Paper, 2019 – 2B.

## A.2 The case of Belgium

The coalition agreement of current government from September 2020 defines the primary role for green hydrogen production in the Belgian economy: feeding industry and hard to electrify freight transport<sup>4</sup>. Ruling parties agreed to direct a substantial amount of money from the recovery plan to pilot projects in these fields. Additionally, they announced that a regulatory framework would be devised to drive necessary innovations in the sector. Besides the government agreement, an important number of regional and European authorities, as well as private actors, devised plans and freed funds for hydrogen projects in Belgium by the end of 2021.

However, a commonly accepted direction and framework must be promoted widely to public and private stakeholders. As the sociologist Davenport suggests, *‘just making the decision’*<sup>5</sup> is almost as important as the decision itself. What industrial players need from policymakers is coherence, clarity and consistency. In particular within a context of transition which involves radical changes to business models, substantial investments and risk taking. For this reason, a reference strategy for the country, building on the existing efforts at regional, European and private level is in our opinion a prerequisite for long term success and a true impact on all parties involved.

In terms of roadmaps, various public authorities have published pathways and objectives for establishing the hydrogen economy, and amongst them, the Regions. In federal Belgium, competencies on energy and climate policy are shared between the federal level and the regional level. Therefore, the new federal hydrogen strategy shall take into account the hydrogen roadmap for Wallonia<sup>6</sup> published in December 2018 and the Flemish hydrogen strategy<sup>7</sup> of December 2020. Abroad, many neighbouring countries have already published their strategy on hydrogen. They need to be thoroughly analysed to identify synergies and possible areas of cooperation: the Netherlands, Norway, Germany, France, Spain and Portugal in 2020, UK and Italy in 2021. On the supra-national level, the European Union has disclosed its *“Hydrogen strategy for a climate-neutral Europe”*<sup>8</sup> in July 2020. More recently, proposals for the revision of the gas directive of the European Union<sup>9</sup> have been disclosed in December 2021. The Commission released proposals for review of rules for internal markets of green gases (primarily hydrogen). It includes for instance provisions for blending of hydrogen and natural gas, proposals for unbundling production and transport activities and cross-border tariff exemptions. The legislative train of these regulations and directives will be subject of intense discussions in 2022.

With regards to funding, concrete hydrogen projects have already received grants in Belgium. Some are supported by national, regional and EU money such as the construction of an additional 150 km of hydrogen pipeline, the development of high-capacity electrolysers,

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<sup>4</sup> A. De Croo & P. Magnette (2020). *Accord de gouvernement*.

<sup>5</sup> T.H. Davenport (2019). *When to Stop Deliberating and Just Make a Decision*. Harvard Business Review online article.

<sup>6</sup> Cluster Tweed (2018). *Roadmap H2 pour la Wallonie*.

<sup>7</sup> Hydrogen Industry Cluster (2020). *A Flemish Hydrogen Strategy 2025–2030*.

<sup>8</sup> European Commission (2020). *A hydrogen strategy for a climate-neutral Europe*. COM (2020) 301 final.

<sup>9</sup> European Commission (2021). *Proposal of regulation on the internal markets for renewable and natural gases and for hydrogen and proposal for directive on common rules for the internal markets in renewable and natural gases and in hydrogen*

research on hydrogen engines and integration of green hydrogen in industry and transport announced in the national recovery and resilience plan<sup>10</sup> of Secretary of State Thomas Dermine in June 2021. This plan foresees 608 million euros investment in new energy technologies, from which more than half directly for the hydrogen industry<sup>11</sup>. Private industrialists also announced the financing of new electrolysers, of a hydrogen transport system, R&D and other pilot projects. As an example, we will only mention the Hydrogen Import Coalition, where major Belgian sea ports Antwerp and Zeebrugge, and private industrialists Engie, Exmar, Fluxys and Deme united their forces to reflect on how to put in place an import value chain for green hydrogen by 2030<sup>12</sup>.

Therefore, when the Federal Minister Van der Straeten states the objective to ‘invest in cooperation’<sup>13</sup>, it shall be made sure that the new hydrogen and ambitious strategy builds on the different existing public roadmaps as well as public and privately funded projects that are already in place if an impactful cooperation is to be created.

## **B. Appropriate hydrogen policies for the Belgian economy**

Building on those ambitions, we wish to highlight some peculiarities of the current state of the hydrogen sector in the Belgian economy. They ought to be considered when designing regulation and state aid in the “Hydrogen Strategy”.

### **B.1 Regulatory framework for hydrogen transport linked to market’s state**

A repeatedly expressed need by actors active in hydrogen is the establishment of a regulatory framework. As hydrogen does not fall under the regulation applicable for natural gas, rules for participating to transport operations on the value chain are not clearly set. Hydrogen transport and distribution networks, however, are an essential facility potentially sharing characteristics of a natural monopoly. It is an essential facility because ‘the availability of energy infrastructure for connecting supply and demand is a condition for the widespread use of hydrogen as energy carrier’<sup>14</sup>. In her strategy, the Belgian minister aims at transforming Belgium into ‘a hub for import and transit of renewable molecules in Europe’<sup>15</sup>. Therefore, the development of a regulatory framework is a priority to address in the national hydrogen strategy.

Commonly accepted economic theory suggests that regulation shall only be put in place for addressing market failures such as the presence of monopolies on essential facilities. In Belgium, the 613 km of hydrogen pipelines existing at the moment are owned and operated exclusively by private actor Air Liquide<sup>16</sup>. Although this makes of the country one of the first countries worldwide in terms of network length, the infrastructure is currently only linking big industrial hubs (Antwerp, Ghent, Zeebrugge and the Sambre valley). In the years to come, an

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<sup>10</sup> Cabinet du Secrétaire d’Etat à la Relance et aux Investissements Stratégiques, en charge de la Politique Scientifique (2021). *Plan national pour la reprise et la résilience*.

<sup>11</sup> C. Scharff, M. Colleyn, et al. (2021). *Les 5 axes du plan de relance belge à la loupe*. L’Echo.

<sup>12</sup> Linklaters (2021). *Hy-Politics – political considerations shaping the evolution of clean hydrogen policy. Summary of the use case in Belgium*.

<sup>13</sup> Chancellerie Premier Ministre. *Vision et stratégie hydrogène*.

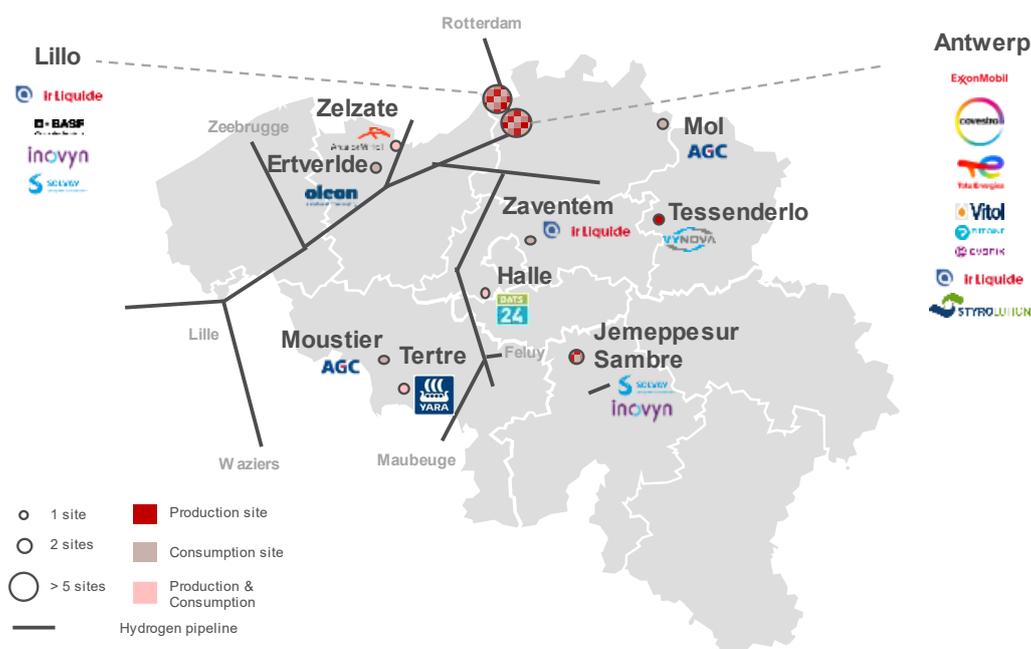
<sup>14</sup> ACER & CEER (2021). *When and How to Regulate Hydrogen Networks?* European Green Deal Regulatory White Paper series, paper #1 relevant to the European Commission’s Hydrogen and Energy System Integration Strategies, p.1.

<sup>15</sup> Chancellerie Premier Ministre. *Vision et stratégie hydrogène*.

<sup>16</sup> Linklaters, *Hy-Politics*.

expected new entrant is Fluxys, the Belgian gas network operator. Leveraging on its current gas infrastructure, they disclosed publicly their intention to participate in hydrogen transport activities. For instance, they published a white paper<sup>17</sup> for a “*European Hydrogen Backbone*”, together with a series of European transport system operators, grouped under the name “*gas for climate*”. It details a proposal for extension of a dedicated hydrogen infrastructure, partly thanks to the repurposing of sections of its natural gas pipelines.

Figure 1 - **Industrial scale hydrogen production and consumption sites in Belgium**



Since Belgium intends to become a transport hub for hydrogen in Europe, especially as the market is expected to grow, a gradual and dynamic approach for regulation of hydrogen networks would be beneficial, as well as a predictable legislative environment.<sup>18</sup> The needed regulatory framework should cover topics such as third-party access, blending with natural gas and tariff setting but stay minimalist. As the hydrogen market is still in an early stage of development, regulation creating important barriers to entry would be harmful to competition in the transport segment of the value chain. In comparison, when gas and power networks started to become heavily regulated, they were already established with considerable supply and demand volumes in existence for a prolonged period of time<sup>19</sup>.

## B.2 Appropriate state aid to develop the hydrogen value chain

The development of a new hydrogen economy is primarily intended to benefit climate policy by reducing carbon emissions. Therefore, appropriate state aid is required for making green and low carbon hydrogen use competitive with carbon-emitting alternatives in the short run. In the medium to long term, policymakers shall keep in mind that the nascent hydrogen activities ought to become economically viable and state aid to be phased-out.

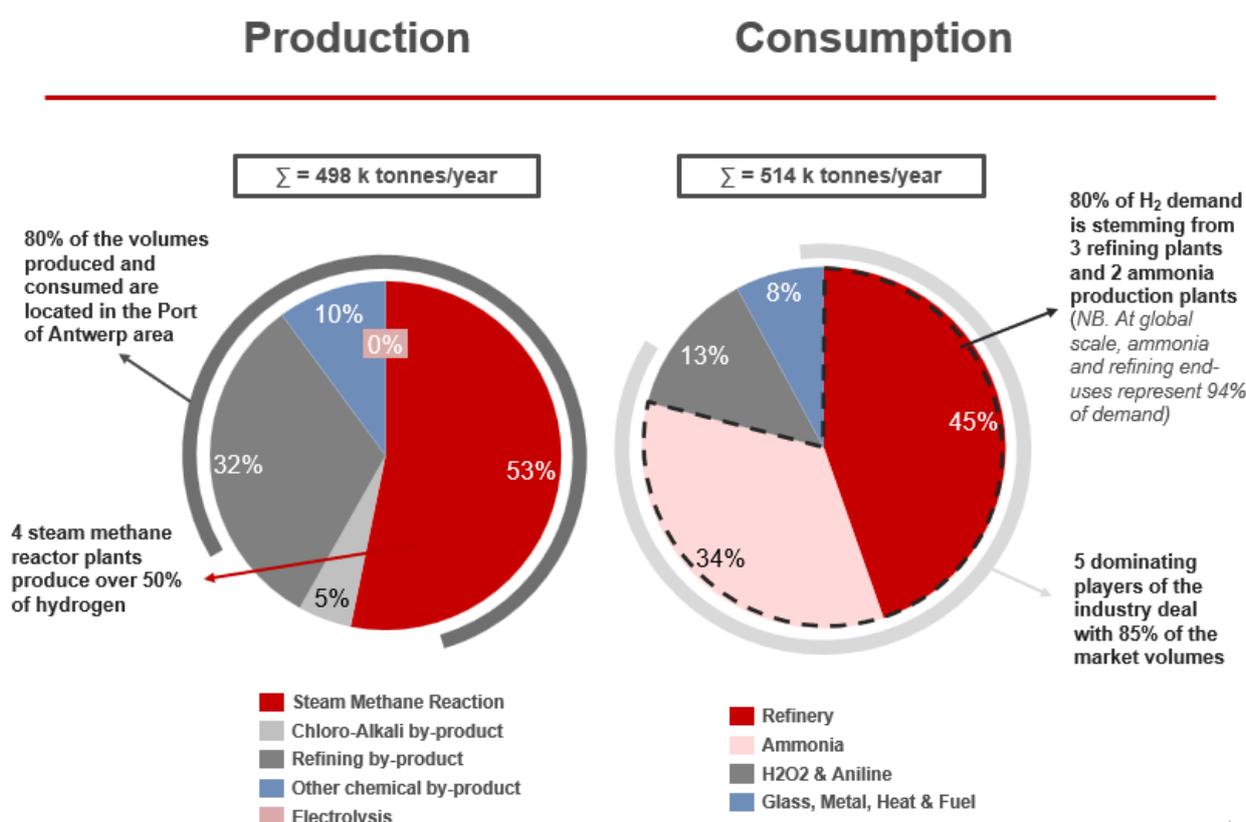
<sup>17</sup> A. Wang, K. van der Leun, D. Peters & M. Buseman (2020). *European Hydrogen Backbone. How dedicated hydrogen infrastructure can be created*. Gas for climate 2050 white paper.

<sup>18</sup> ACER & CEER. *How to Regulate Hydrogen Networks?*

<sup>19</sup> N. Van Hulst (2021). *How to regulate hydrogen networks*. Euractiv.

Incentives may take a variety of different forms. Guarantees of origin, contracts for differences, direct support schemes, tax exemptions for final uses and many other market instruments should be analysed and possibly put in place in Belgium.<sup>20</sup> Inspiration from other countries’ policies are helpful<sup>21</sup>. Finland for instance favours indirect support mechanisms through additional environmental taxation on fossil fuels. Germany uses indirect support mechanisms as well, through tax and other surcharges exemptions for electricity used in electrolysers. Norway on the contrary engages in direct support. It commits to develop production technologies still at R&D stage through public procurement programs with significant endowments.

Figure 2 – **Hydrogen industrial-scale production and consumption volumes in Belgium**



Putting in place the required budgets and incentives for triggering investment requires thorough understanding of a market’s characteristics.<sup>22</sup> An joint investigation between E-CUBE Strategy Consultants and Hydrogen Europe provides an overview of the state of the market in Belgium<sup>23</sup>. On a yearly basis, 514 kt of hydrogen are consumed and 498 kt are produced. The remainder volumes are imported for more than 90% from the Netherlands

<sup>20</sup> A. Barnes & K. Yafimava (2020). *EU Hydrogen Vision: regulatory opportunities and challenges*. Oxford Institute for Energy Studies, Energy Insight: 73.

<sup>21</sup> A. Costescu, J. Eisaks, N.Hansen et al. (2021). *Comparison of the German national hydrogen strategy to the Norwegian, Finnish and Australian strategies*. Florence School of Regulation paper.

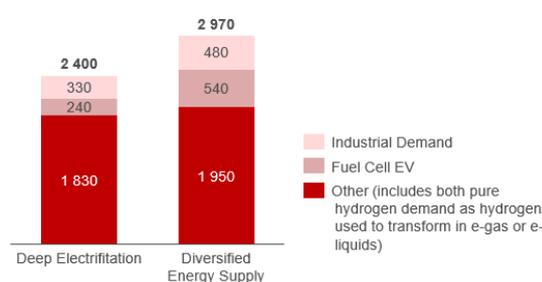
<sup>22</sup> M. Lambert & S. Shulte (2021). *Contrasting European hydrogen pathways: An analysis of differing approaches in key markets*. March 2021. Oxford Institute for Energy Studies, OIES PAPER: NG 166.

<sup>23</sup> Data constructed in collaboration with Hydrogen Europe.

through Air Liquide’s pipes. The market is almost exclusively structured around the chemicals industry, with 80% of the consumption stemming from 3 refining plants and 2 ammonia production plants. 53% of the production comes from 4 steam methane reaction sites while 47% are by-products from other chemical reactions. Considering that in most cases, hydrogen volumes consumed in industry are produced on-site by the actors themselves, only half of the Belgian market volumes are effectively commercially traded between actors and need to be transported. In terms of geographical coverage, close to 80% of all volumes are produced and consumed in the Port of Antwerp area, where 4 of the 5 dominating actors of the industry, totalling 85% of the market volume, are located. Consequently, we can state that the Belgian market is an oligopoly structured around refining and ammonia in the Antwerp area with little liquidity (few bilateral trade contracts of important volumes).

Figure 3 – **Forecast of hydrogen demand in Belgium in 2050 [in kt/y]**

Minister van der Straeten aims at ‘establishing a robust market for hydrogen<sup>24</sup>’ and to ‘maintain leadership in hydrogen technologies’ in Belgium. According to a study of the Federal Planning Bureau<sup>25</sup>, hydrogen market volumes in Belgium may peak to more than 2500 kt yearly by 2050 (5x current market size). To develop this broader hydrogen market, incentives shall be designed to boost diversification to new market segments such as electrolysis, refuelling stations or heating processes in industry.



Two scenarios detailed in the study by the Federal Planning Bureau:

- **Deep Electrification:** a deep electrification of uses. A large part of electrification is direct, i.e. replacing a fossil fuel car by an EV
- **Diversified Energy Supply:** a development of applications using gaseous energy carriers. An important part of direct electrification, but also indirect. E.g., replacement of a fossil fuel vehicle by a hydrogen vehicle

Today, a few pilot projects exist with little volumes and a handful of new projects are in construction. A potential penetration rate of 50% of hydrogen in heavy transport (public buses, trucks and ships/barges) and in manufacturing is deemed possible in Flanders on the medium term<sup>26</sup>. Incentives such as tax exemptions on power for electrolysis, excise duty relief for hydrogen as a fuel, and aid at investment stage would be particularly helpful to grow the number of such initiatives. Not only are those segments of the value chain technologically advanced and strategic in the medium term, but they also open up the hydrogen market to a diverse range of smaller actors, both in production and consumption. Such actors may be geographically more scattered in the country and consume smaller, more flexible volumes than large upfront bilateral contracts typical in the chemical industry. This, in turn, prepares the necessary conditions for a well-functioning spot market for hydrogen, where prices could be set through supply and demand bids.

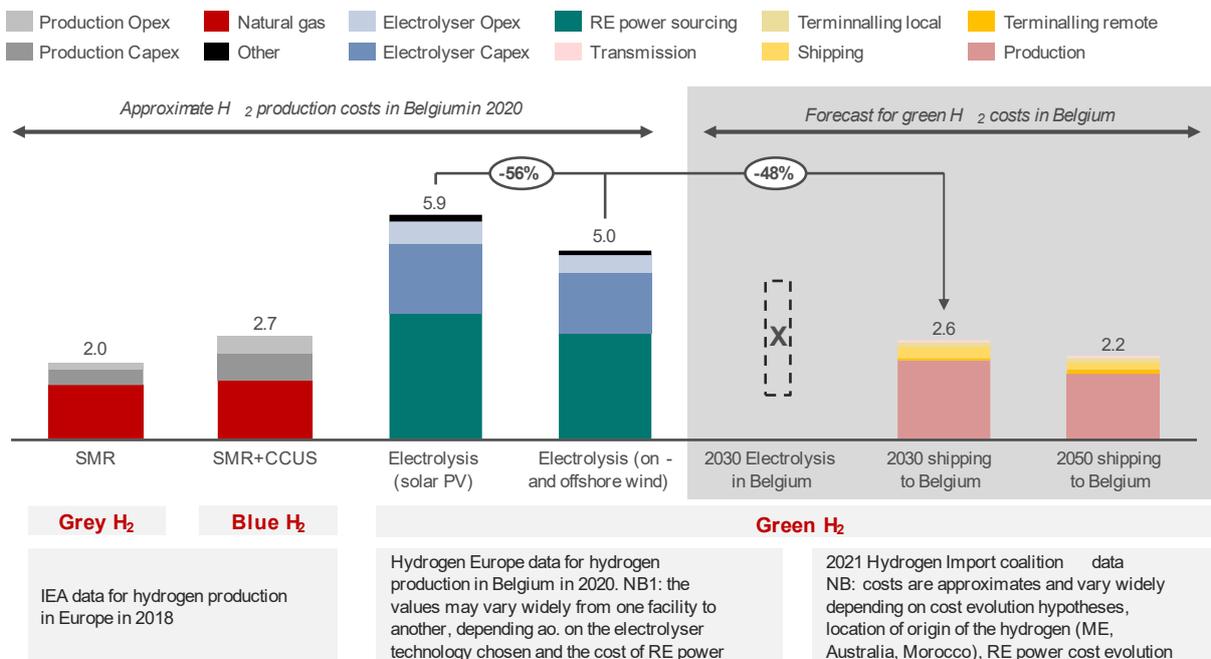
<sup>24</sup> Chancellerie Premier Ministre. *Vision et stratégie hydrogène*.

<sup>25</sup> D. Devogelaer (2020). *Fuel for the future*.

<sup>26</sup> I. François, A. Martens, T. Winkel & W. Vanhoudt (2018). *Het potentieel voor groene waterstof in Vlaanderen. Een routekaart*. Report for the Vlaamse Energie Agentschap.

At the same time, incentives for replacing grey hydrogen by green hydrogen in current uses are necessary to reduce industrial carbon emissions. Introduction of guarantees of origin for green hydrogen and minimal percentages of green hydrogen in industrial consumption volumes would be powerful regulation tools to this end. Current production costs for grey hydrogen in Belgium are between 2 and 2.5 euros per kg depending on natural gas prices while production costs for green hydrogen rang between 5 and 6 euros per kg. We estimate the cost for shipping green hydrogen from middle eastern countries to around 2.5 euros per kg by 2030<sup>27</sup>. Reduction of production costs from electrolysis with incentives on investment and power sourcing or through contracts for differences, while disincentivizing steam methane production through environmental taxation should aim to reach parity below 3 euros per kg in the near term. It is estimated that a penetration of 5 to 15% of green hydrogen in volumes used for refining and ammonia purposes could be reached by 2030.<sup>28</sup> For Belgium this would mean at least 40 kt of green hydrogen consumed in the chemicals industry yearly and about 356 kt CO<sub>2</sub> emissions avoided.<sup>29</sup>

Figure 4 – **Hydrogen sourcing costs per channel in Belgium [in EUR/KG]**



In short, as the hydrogen market in Belgium is currently neither enough diversified geographically nor between sectors and that traded volumes are non-liquid and bilaterally traded between few actors, public incentives should favour segments of the value chain stimulating flexible and diversified actors on the value chain. Production through electrolysis and consumption in transport and manufacturing are appropriate targets for such aids as they bear additional advantages such as the creation of technology leadership.

<sup>27</sup> E-CUBE Strategy Consultants internal knowledge and modelling, based on data from the Hydrogen Import Coalition, IEA, Hydrogen Europe.

<sup>28</sup> Trinomics (2020). *Opportunities for Hydrogen Energy Technologies Considering the National Energy & Climate Plans*. Final report of a study for FCH JU, Ref. FCH/OP/Contract 234.

<sup>29</sup> Emission factor assumption for natural gas reforming of 8.9 kgCO<sub>2</sub>/kgH<sub>2</sub> according to IEA G20 Hydrogen report.

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### **Ensure the bridge with wider economic and climate policies**

As a conclusion, we restate the importance of building on the diverse hydrogen roadmaps and strategies already announced by public and private actors active in Belgium. Expected EU initiatives in the coming months may be game changers, in particular with regards to terminology and certification of hydrogen “colours”, extension of the carbon market to hydrogen (ETS) or revision of the gas directive (as explained in the introduction).

To meet the announced objectives of creating ‘a robust market’ and an international hub for hydrogen transport in Belgium, a more liquid, diverse and “green” hydrogen market is needed. To this end, we have recalled characteristics of the Belgian hydrogen sector leading to the following two conclusions. Firstly, a regulatory framework for hydrogen transport activities shall be carefully designed in order not to kill the bird in the egg of a transitioning Belgian hydrogen market. Secondly, state aid should be directed towards high-technology segments of the value chain that help to create a liquid and competitive market with a large number of participants.

Finally, for the “*Hydrogen Strategy for Belgium*” to be coherent, clear and impactful, we also stress the importance to place this strategy in a wider industrial policy narrative with bridges to Belgian federal and regional climate and energy policies, employment, transport, R&D and education policies for citing only a few.

**E-CUBE Strategy Consultants** was created in early 2009 out of the will of strategy consulting professionals to put their expertise to work for private companies and public authorities, helping them address three of the main challenges of the 21st century:

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- Environment
- Mobility

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