REPORT

on a European Strategy for Hydrogen
(2020/2242(INI))

Committee on Industry, Research and Energy

Rapporteur: Jens Geier

Rapporteurs for the opinion (*):
Hildegard Bentele, Committee on the Environment, Public Health and Food Safety
Georg Mayer, Committee on Transport and Tourism

(*) Associated committees – Rule 57 of the Rules of Procedure
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MOTION FOR A EUROPEAN PARLIAMENT RESOLUTION

on a European Strategy for Hydrogen
(2020/2242(INI))

The European Parliament,

– having regard to the Treaty on the Functioning of the European Union, and in particular to Article 194 thereof,

– having regard to the agreement adopted at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21) in Paris on 12 December 2015 (the Paris Agreement),

– having regard to the special reports of the Intergovernmental Panel on Climate Change of 8 October 2018 entitled ‘Global Warming of 1.5°C’ and of 25 September 2019 entitled ‘The Ocean and Cryosphere in a Changing Climate’,

– having regard to the UN Environment Programme’s Emissions Gap Reports of 2019 and 2020,

– having regard to the OECD Declaration of 23 February 2018 on strengthening SMEs and entrepreneurship for productivity and inclusive growth,

– having regard to the Commission communication of 8 July 2020 on a hydrogen strategy for a climate-neutral Europe (COM(2020)0301),

– having regard to the opinion of the European Committee of the Regions of 1 July 2020 entitled ‘Towards a Roadmap for Clean Hydrogen – the contribution of local and regional authorities to a climate-neutral Europe’¹,

– having regard to the Commission communication of 8 July 2020 entitled ‘Powering a climate-neutral economy: An EU Strategy for Energy System Integration’ (COM(2020)0299),

– having regard to the Commission communication of 19 November 2020 on an EU strategy to harness the potential of offshore renewable energy for a climate-neutral future (COM(2020)0741),

– having regard to the Commission communication of 14 October 2020 on an EU strategy to reduce methane emissions (COM(2020)0663),


– having regard to the Commission communication of 17 September 2020 entitled

¹ OJ C 324, 1.10.2020, p. 41.
‘Stepping up Europe’s 2030 climate ambition – Investing in a climate-neutral future for the benefit of our people’ (COM(2020)0562),

– having regard to the Commission communication of 11 December 2019 on the European Green Deal (COM(2019)0640),

– having regard to the Commission communication of 10 March 2020 on a new industrial strategy for Europe (COM(2020)0102),


– having regard to Council Regulation (EU) No 559/2014 of 6 May 2014 establishing the Fuel Cells and Hydrogen 2 Joint Undertaking⁵,


Directive)\(^8\),

- having regard to its resolution of 10 July 2020 on a comprehensive European approach to energy storage\(^9\),

- having regard to its resolution of 10 July 2020 on the revision of the guidelines for trans-European energy infrastructure\(^10\),

- having regard to its resolution of 15 January 2020 on the European Green Deal\(^11\),

- having regard to its resolution of 28 November 2019 on the climate and environment emergency\(^12\),

- having regard to its resolution of 14 March 2019 entitled ‘Climate change – a European strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy in accordance with the Paris Agreement’\(^13\),

- having regard to its resolution of 25 October 2018 entitled ‘Deployment of infrastructure for alternative fuels in the European Union: time to act!’\(^14\),

- having regard to its resolution of 6 February 2018 on accelerating clean energy innovation\(^15\),

- having regard to Rule 54 of its Rules of Procedure,

- having regard to the opinions of the Committee on the Environment, Public Health and Food Safety and the Committee on Transport and Tourism,

- having regard to the report of the Committee on Industry, Research and Energy (A9-2242/2020),

A. whereas the EU has endorsed the Paris Agreement, the Green Deal and the goal of achieving a cost-efficient and fair transition leading to climate neutrality by 2050 at the latest;

B. whereas the Commission has suggested increasing the EU’s goal to reduce greenhouse gas emissions by 2030 to at least 55% below 1990 levels and whereas Parliament has endorsed the goal of reducing greenhouse gas emissions by 60% below 1990 levels by 2030;

C. whereas fossil fuels are largely responsible for global warming and whereas the Paris Agreement aims to contain the rise in the global temperature well below 2 °C above

\(^8\) OJ L 275, 25.10.2003, p. 32.
\(^12\) Texts adopted, P9_TA(2019)0078.
\(^14\) OJ C 345, 16.10.2020, p. 80.
pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C;

D. whereas the transition to a net-zero greenhouse gas economy requires a publicly guided swift and just transition to a largely renewables-based and highly resource- and energy-efficient energy system, ensuring sustainability and health, the participation of citizens, the alleviation of energy poverty across the EU, security of supply, accessibility and affordability of energy, and competitiveness of energy prices;

E. whereas it is necessary to use clean alternative fuels and develop their applications in order to phase out fossil fuels as soon as possible and ensure the competitiveness of EU industry; whereas renewable hydrogen has untapped potential to be such an alternative;

F. whereas hydrogen can be used as feedstock or a source of energy in industrial and chemical processes, in air, maritime and heavy-duty road transport, and in heating applications, decarbonising sectors in which direct electrification is not technologically possible or competitive, as well as for energy storage to balance, where necessary, the energy system, thereby playing a significant role in energy system integration;

G. whereas today, around 2 \% of the EU’s energy mix is made up of hydrogen, of which 95 \% is produced using fossil fuels, releasing 70-100 million tonnes of CO\(_2\) annually, while at the global level accounting for 2.5 \% of greenhouse gas emissions, with less than 1 \% of the hydrogen currently produced being used as an energy carrier; whereas some research shows that renewable energy could account for up to 100 \% of the EU energy mix in 2050, of which hydrogen could account for a share of up to 20 \% overall, between 20 \% and 50 \% of the energy used for transport and between 5 \% and 20 \% of the energy used in industry;

H. whereas hydrogen – 120 Mt of which is produced globally each year – is produced both as a by-product of the refining and chemical industries (70 Mt) and at dedicated production facilities (50 Mt); whereas most hydrogen is produced using fossil fuels – 6 \% of natural gas and 2 \% of coal globally is used for hydrogen production – with less than 0.1 \% of it being produced using water electrolysis;

I. whereas total hydrogen production capacity in the European Economic Area (EEA) at the end of 2018 was estimated to be 11.5 Mt per year and whereas the total installed capacity of electrolyser in the EEA is around 1 GW, which amounts to between 1 and 4 \% of total hydrogen production capacity; whereas the total share of EEA hydrogen production from fossil fuels with carbon capture and storage (low-carbon hydrogen) is around 0.7 \% (excluding by-products);

J. whereas 43 \% of the hydrogen produced globally is used to produce ammonia – which itself is mainly used to produce ammonia-based agricultural fertilisers – 52 \% is used for the refining and desulphurisation of hydrocarbons, and 5 \% is used for the synthesis of methanol and other purposes;

K. whereas the current cost of renewable and low-carbon hydrogen is EUR 2.5 to 5.5 per kg, while the cost of producing fossil-fuel-based hydrogen is about EUR 1.5 per kg; whereas the current electricity mix in most Member States would produce electricity-based hydrogen with higher emissions than fossil-based hydrogen;
L. whereas hydrogen can store energy in large quantities over a long period of time, and can therefore bridge seasonal demand fluctuations; whereas hydrogen can be transported by lorry, ship or pipeline and therefore enables renewable energy to be produced where it is most efficient and enables long-haul transport without putting a strain on the electricity grid;

M. whereas a higher share of renewable energy sources will be needed to decarbonise all sectors of the economy, which could lead to greater volatility in the electricity grid, while the demand for energy storage will need to be massively increased to secure the energy supply;

N. whereas steel production represents around 10 % of direct and indirect greenhouse gas emissions worldwide, and maritime transport emits about 2.5 % of greenhouse gas emissions, and whereas the development of renewable hydrogen could help cut emissions in those sectors;

O. whereas transport is responsible for approximately 27 % of the EU’s total greenhouse gas emissions; whereas hydrogen has multiple applications across industry and the electricity and building sectors and offers great potential as an alternative fuel for the transport sector, but whereas market-deployed hydrogen possibilities for the various modes of transport are still limited;

P. whereas battery electric cars have the potential to take over a significant part of the market for private vehicles; whereas heavy transport is a sector that is hard to decarbonise, with the possibilities for direct electrification being limited due to low cost-efficiency and technical reasons; whereas batteries pose practical problems in heavy-duty vehicles, trains on non-electrified lines, cargo ships and aeroplanes and whereas this will create opportunities for other energy carriers such as hydrogen, as large amounts of it can be stored onboard a vehicle or vessel, it allows for quick refuelling if necessary, and it only produces water as an exhaust output;

Q. whereas a sustainable and competitive hydrogen economy is an opportunity for the EU to strengthen its economy, especially after the economic downturn due to COVID-19, as it could create up to one million direct high-quality jobs by 2030 and 5.4 million by 2050, and whereas this could be an opportunity for regions which are currently heavily dependent on traditional sources of energy and will be at risk of poverty once fossil fuels are phased out; whereas the potential for job creation in the renewable hydrogen sector is estimated to be 10 300 jobs per billion euro invested, a figure that could be complemented by jobs generated in the renewable electricity sector;

R. whereas building a sustainable and competitive hydrogen market that contributes in a timely and cost-efficient manner to the EU’s climate-neutrality objective for 2050 requires well-developed transmission and distribution infrastructure to transport hydrogen efficiently from production sites to consumption areas in the EU;

S. whereas the development of hydrogen systems might be addressed differently by the Member States, taking into account differences in the structure of existing gas infrastructure, each country’s capacity to develop different hydrogen production technologies, the potential for innovation and the varying demand for hydrogen by different industries in each Member State;
T. whereas almost all Member States have included plans for hydrogen in their national energy and climate plans and 26 Member States have signed the Hydrogen Initiative;

U. whereas the EU’s energy system should be environmentally sustainable and economically competitive, and whereas any technological directions pursued should be based on proven and sound estimations that would lead to viable business cases within predictable timeframes, to ensure that their costs do not jeopardise the competitiveness of EU industries or the welfare of citizens;

V. whereas significant energy losses during the production, transport, storage and processing of hydrogen should be taken into consideration;

W. whereas the current legislative framework regulating natural gas has provided security of supply and affordability of energy for EU consumers for years and thus could be used as a blueprint to foster the development of a future pan-EU renewable hydrogen market;

1. Stresses the need to maintain and further develop EU technological leadership in clean hydrogen\textsuperscript{16} through a competitive and sustainable hydrogen economy with an integrated hydrogen market; emphasises the necessity of an EU hydrogen strategy that covers the whole hydrogen value chain, including the demand and supply sectors, and is aligned with national efforts to ensure that sufficient supplementary renewable electricity generation infrastructure is built for the production of renewable hydrogen and to bring down the costs of renewable hydrogen; notes in particular the added value of EU domestic production of renewable hydrogen in terms of the development and marketing of innovative electrolysis technologies; emphasises that the hydrogen economy needs to be compatible with the Paris Agreement, the EU’s climate and energy targets for 2030 and 2050, the circular economy, the action plan for critical raw materials and the UN Sustainable Development Goals;

2. Welcomes the hydrogen strategy for a climate-neutral Europe proposed by the Commission, including the future revision of the Renewable Energy Directive, as well as the growing number of Member State strategies and investment plans for hydrogen; underlines that these strategies need to be aligned with the Member States’ national energy and climate plans, and calls for their swift and ambitious implementation; believes that the Commission should take these strategies into account in future legislative proposals; urges the Commission to align its approach on hydrogen with the new EU industrial strategy and make it part of a coherent industrial policy, taking into account the fact that the hydrogen strategy is not a goal in itself, but should be seen in the context of the EU’s overall efforts to reduce greenhouse gas emissions while securing long-term quality jobs and contributing to the competitiveness of EU industry;

3. Underlines the importance of a resilient and climate-neutral energy system based on the principles of energy efficiency, cost efficiency, affordability and security of supply; stresses that energy conservation and the ‘energy efficiency first’ principle should prevail, without preventing the development of innovative pilot and demonstration projects; notes that direct electrification from renewable sources is more cost-,

\textsuperscript{16} According to the Commission, ‘clean hydrogen’ refers to hydrogen produced through electrolysis of water with electricity from renewable sources. It may also be produced through the reforming of biogas or the biochemical conversion of biomass, if the process is compliant with sustainability requirements.
and energy-efficient than hydrogen, but also notes that factors such as security of supply, technical feasibility and energy system considerations should be taken into account when determining how a sector should decarbonise; underlines, in that regard, the importance of the principle of technology neutrality for achieving a climate-neutral EU;

4. Is convinced that hydrogen produced from renewable sources is key to the EU’s energy transition, as only renewable hydrogen can sustainably contribute to achieving climate neutrality in the long term and avoid lock-in effects and stranded assets; notes with concern that renewable hydrogen is not yet competitive; therefore urges the Commission and the Member States to incentivise the value chain and market uptake of renewable hydrogen, taking into account the fact that the relationship between price and yield would gradually improve in view of the development of industrial methods and value chains;

5. Recognises the efforts undertaken by hydrogen valleys in various regions throughout the EU to develop integrated, cross-sectoral hydrogen value chains; underlines their important role in initiating the production and application of renewable hydrogen with a view to developing the EU hydrogen economy; urges the Commission to build on these initiatives, support their development and help those involved to pool their know-how and investments;

6. Highlights that hydrogen-derived products, such as synthetic fuels produced with renewable energy, constitute a carbon-neutral alternative to fossil fuels and can therefore significantly contribute, together with other emission-reduction solutions such as electrification based on renewable electricity, to the decarbonisation of a wide variety of sectors; stresses that a cross-sectoral application is vital in order to significantly reduce the price of these energy carriers through economies of scale and to ensure sufficient market volume;

**Hydrogen classification and standards**

7. Believes that a common legal classification of the different types of hydrogen is of utmost importance; welcomes, as a first step, the classification proposed by the Commission; points out that rapid agreement on comprehensive, precise, science-based and uniform EU-wide terminology is necessary in order to adapt national legal definitions and establish a clear classification with a view to providing legal certainty; calls on the Commission to conclude its work on establishing such terminology as rapidly as possible, in the context of all relevant legislation;

8. Believes that the classification of the different forms of hydrogen should be determined according to an independent, science-based assessment, stepping away from the commonly used colour-based approach; is of the opinion that this classification should be based on the life cycle greenhouse gas emissions throughout hydrogen’s entire production and transport process, but should also take into account transparent and robust sustainability criteria in line with the principles of the circular economy and be based on averages and standard values per category, such as the objectives of sustainable use and the protection of resources, the handling of waste and the increased use of raw and secondary materials, pollution prevention and control, and finally, the
9. Notes that there is a discrepancy between different definitions of clean hydrogen used by different actors, such as the Commission and the European Clean Hydrogen Alliance, which creates confusion and should be avoided; stresses, in that regard, that the distinction between renewable and low-carbon hydrogen must be made absolutely clear; notes, in addition, that avoiding using two names for the same category of hydrogen, namely ‘renewable’ and ‘clean’, as proposed by the Commission, would provide further clarification, and underlines, in that regard, that the term ‘renewable hydrogen’ is the most objective and science-based option for that category of hydrogen;

10. Underlines the urgent need for EU and international standards and certification; further notes that guarantees of origin aligned with national registries should be considered to ensure that renewable hydrogen can be ramped up in a timely manner and that consumers can choose sustainable solutions consciously and minimise the risk of stranded investments;

11. Stresses that the standardisation system needs to be based on a holistic approach and must be applicable to imported hydrogen; calls on the Commission, in the context of the revision of the Renewable Energy Directive, to introduce a regulatory framework with robust and transparent sustainability criteria for the certification and tracking of hydrogen in the EU, taking into account its greenhouse gas footprint throughout the value chain, including transport, in order to also trigger investment in sufficient supplementary renewable electricity generation; also calls on the Commission to provide, as early as possible in 2021, a regulatory framework for hydrogen that ensures standardisation, certification, guarantees of origin, labelling and tradability across Member States, and to also use the upcoming revision of the EU Emissions Trading System (ETS) to examine what changes are needed to unlock the full potential of hydrogen to contribute to the EU’s climate goals, taking into account the risks of carbon leakage;

12. Underlines that the classification of different types of hydrogen would inter alia serve the purpose of providing consumers with information and is not meant to stall the expansion of hydrogen in general; notes that the current system of guarantees of origin for renewable electricity has not so far triggered adequate investment in additional capacity; stresses, therefore, the importance of further developing guidelines on conditions and criteria, in order to avoid double counting of renewable capacities;

13. Is strongly convinced that public acceptance is key to the successful creation of a hydrogen economy; stresses, therefore, the importance of public and stakeholder involvement, EU safety and technical standards for hydrogen, and high-quality hydrogen solutions respecting those standards; furthermore highlights that safety protocols in demand sectors need to be updated continuously with regard to hydrogen use; asks, therefore, that best-practice examples and a hydrogen safety culture be

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17 According to the 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 hydrogen produced using existing methods.
promoted throughout the EU;

Ramping up hydrogen production

14. Highlights that in order to ensure the internal hydrogen market functions well and predictably, regulatory barriers need to be overcome and a coherent, integrated and comprehensive regulatory framework for a hydrogen market should be swiftly proposed by the Commission, which should be aligned with other relevant legislation, and fully respect the principles of proportionality, subsidiarity and better regulation, including the SME test; highlights, in this regard, that a flexible hydrogen market is needed to enable innovative first movers to make full use of the benefits and drive down the costs of hydrogen production, taking into account that the hydrogen market is not yet mature and needs to be scaled up;

15. Believes that the EU gas market design and the Clean Energy Package could serve as basis and example for the regulation of the hydrogen market; highlights that the rapid and predictable development of functioning hydrogen production also requires democratic public planning, associating producers, workers and their trade unions, scientists and non-governmental organisations (NGOs); also encourages the Commission and the Member States to devise specific solutions in order to ramp up hydrogen production in less connected or isolated regions, such as islands, while ensuring the development of related infrastructure, including by repurposing it;

16. Calls on the Commission to include and assess the legal requirements that are necessary for an EU sustainable hydrogen economy in its impact assessments regarding the revision of the relevant legislation, in order to deliver on the EU’s increased climate ambition and make renewable hydrogen more economically attractive; urges the Commission to look, in particular, into the review of the Renewable Energy Directive, the Energy Taxation Directive and the ETS Directive, in order to ensure a level playing field and a future-proof regulatory framework for hydrogen;

17. Welcomes the Commission’s ambitious goals of increasing the capacity of electrolysers and renewable hydrogen production; calls on the Commission to develop a roadmap for the deployment and upscaling of electrolysers and to forge partnerships at the EU level to ensure their cost-effectiveness; urges the Commission and the Member States to remove existing administrative burdens and to incentivise the expansion of the value chain and the market uptake of renewable hydrogen in order to make it technologically mature and competitive by providing financial stimuli and dedicated funding schemes, including innovative solutions such as feed-in premiums for renewable hydrogen fed into the hydrogen grid, by revising State aid rules and by carrying out a comprehensive revision of energy pricing and taxation systems with a view to internalising external costs; stresses that renewable hydrogen could become competitive before 2030, provided that the necessary investments and an adequate regulatory framework are in place and renewable energy is competitive;

18. Notes that a sustainable hydrogen economy should allow capacities to be ramped up inside an integrated EU energy market; recognises that there will be different forms of

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hydrogen on the market, such as renewable and low-carbon hydrogen, and underlines
the need for investment to scale up renewable production fast enough to reach the EU’s
climate targets and environmental goals for 2030 and 2050, while recognising low-carbon hydrogen as a bridging technology in the short and medium term; calls on the Commission to assess approximately how much low-carbon hydrogen will be needed for decarbonisation purposes until renewable hydrogen can play this role alone, in
which cases, and for how long; calls on the Commission and the Member States to
reduce regulatory and economic hurdles in order to foster a quick market uptake of hydrogen; further notes the need to avoid unsustainable resource exploitation, continued methane emissions, carbon lock-in and stranded assets; underlines that the use of hydrogen should contribute to achieving EU climate goals and the fast development and deployment of renewable hydrogen;

19. Stresses the importance of phasing out fossil-based hydrogen as soon as possible,
foecussing on the cleanest technologies in terms of sustainability and greenhouse gas
emissions; urges the Commission and the Member States to immediately start planning
that transition carefully, so that the production of fossil-based hydrogen starts
decreasing swiftly, predictably and irreversibly and so that the prolongation of the
lifetime of fossil-based production facilities is avoided;

20. Underlines the role that environmentally safe carbon capture storage and utilisation
(CCS/U) can play in reaching the European Green Deal objectives; supports an
integrated policy context to stimulate the uptake of environmentally safe CCS/U
applications that deliver a net reduction in greenhouse gas emissions in order to make
heavy industry climate-neutral where no direct emission reduction options are available;
reaffirms, however, that the EU net-zero strategy should prioritise direct emission
reductions and actions maintaining and enhancing the EU’s natural sinks and reservoirs;
further notes, in this regard, the need for research and development in CCS/U
technologies;

21. Underlines that a hydrogen economy requires significant additional amounts of
affordable renewable energy and the corresponding infrastructure for the production of
renewable energy and its transport to hydrogen production sites and of the produced
hydrogen to the end users; calls on the Commission and the Member States to start the
roll-out of sufficient supplementary renewable energy capacity to supply the
electrification process and the production of renewable hydrogen, by inter alia
simplifying permit procedures, and to develop cross-border partnerships based on the
opportunities different regions have to produce renewable energy and renewable
hydrogen;

22. Considers that the deployment of appropriate renewable energy capacity in proportion
to the need for renewable hydrogen can help to avoid conflict between the capacity
required for electrification, electrolysers and other purposes and the need to meet the
EU’s climate goals; welcomes, in that regard, the Commission’s plans to increase the
EU renewable energy target for 2030 and its proposed strategy on offshore renewable
energy;

23. Calls for the revision of the Energy Taxation Directive; calls on Member States to
consider reducing taxes and levies on renewable energy across the EU, as appropriate,
to eliminate double-charging of taxes and fees on electricity generated from hydrogen
facilities, which are a barrier to the further deployment of hydrogen, and to strengthen
financial incentives to produce renewable energy, while simultaneously further working
towards the phase-out of fossil fuel subsidies, tax and levy exemptions;

24. Underlines that renewable hydrogen can be produced from several renewable energy
sources, such as wind, solar and hydropower (including pumped storage); stresses the
potential of brownfield sites to provide space for renewable energy production; invites
the Commission, in view of the recently published strategy on offshore renewable
energy, to assess how offshore renewable energy sources could pave the way for the
wider development and uptake of renewable hydrogen;

25. Stresses the potential to convert some existing industrial sites into renewable hydrogen
production facilities; underlines the necessity to publicly plan such conversions of
industrial sites with the workers and their trade unions, opening up the possibility,
including for workers, to collectively reopen disused sites in a legal orderly manner, for
example in order to produce hydrogen;

26. Notes that the transition to a climate-neutral energy system should be planned carefully,
taking into account today’s starting points and infrastructure, which may differ across
the Member States; emphasises that the Member States should be flexible when
designing support measures, including State aid measures, for the development of their
national hydrogen economies; asks the Commission, in that regard, to provide more
information on planned differentiation and the flexibility of support measures;

27. Underlines the significant amount of natural resources, such as water, needed for
hydrogen production and the problems this may cause for water-scarce regions in the
EU; stresses the importance of increasing resource efficiency, minimising the impact on
regional water supplies, ensuring the careful management of resources and land use for
the production of hydrogen and avoiding any contamination of water, air or soil,
deforestation or loss of biodiversity, as a result of the hydrogen-related production
chain;

Citizen engagement

28. Underlines that citizen engagement will play an important role in the implementation of
a fair, successful, participative and inclusive energy transition; underlines, therefore, the
importance of ensuring that all stakeholders share the costs and benefits in an integrated
system;

29. Underlines that renewable energy communities can be involved in the production of
hydrogen; recalls the obligation to provide them with an enabling framework in
accordance with the Directive on common rules for the internal market for electricity\(^{19}\)
and requests that they benefit from the same advantages as other stakeholders;

30. Stresses that in order to have a properly functioning EU hydrogen market, people with

specialised skills are needed, especially with regard to safety; underlines the necessity of a strong public and free vocational training system; calls on the Commission to adopt an action plan aimed at guiding Member States to develop and maintain dedicated training programmes for workers, engineers, technicians, and the general public, and to create multi-disciplinary teaching programmes for economists, scientists and students; stresses that more must be done to promote equal opportunities in the hydrogen sector, and calls for the launch of an EU initiative focused on employment, training and development for women, with a view to identifying and removing obstacles and building networks and models;

31. Regrets that training, upskilling and reskilling strategies and a just transition towards a hydrogen-ready workforce have not played a role so far in the EU hydrogen strategy; stresses the importance of preserving and tapping into the potential of workers with technical skills employed in existing industries, and recalls the right of workers to be trained and upskilled during working hours with their wages guaranteed;

32. Calls on the Commission to produce data on the possible impacts, opportunities and challenges of the transformation of industry and the transport and energy sectors in relation to the scaling-up of hydrogen; calls on the Commission and the Member States to develop sectoral transformation strategies in this regard, together with industry and trade unions; suggests the launch of an EU skills partnership on hydrogen under the Pact for Skills;

**Hydrogen infrastructure**

33. Emphasises the urgent need to develop infrastructure for hydrogen production, storage and transport, to incentivise adequate capacity-building, and to develop demand and supply in parallel; also highlights the importance of developing hydrogen networks with non-discriminatory access; notes the synergy-related benefits of combining hydrogen production and infrastructure with other aspects of flexible, multi-energy systems such as waste heat recovery from electrolysis for district heating; welcomes the Commission’s proposal to amend the TEN-E Regulation; appreciates the inclusion of hydrogen as a dedicated energy infrastructure category and notes that these hydrogen assets may be newly constructed or converted from natural gas, or a combination of the two; takes note, in addition, of the newly proposed system of governance for the planning of infrastructure that involves hydrogen operators;

34. Notes that, in parallel to the focus on industrial clusters in the first phase, the planning, regulation and development of infrastructure for the transmission of hydrogen over longer distances and storage, as well as adequate financial support for that infrastructure, should already be being undertaken in order to secure the deployment of hydrogen across many sectors; welcomes, in this regard, the future inclusion of hydrogen infrastructure in EU plans, such as the Ten-Year Network Development Plans;

35. Stresses the importance of transparent, inclusive and science-based future infrastructure and integrated network planning with the guidance of public bodies like the European Union Agency for the Cooperation of Energy Regulators (ACER) and the participation of stakeholders and scientific bodies; suggests, in that regard, that cost-benefit calculations for the location of renewable hydrogen production, transport and storage
infrastructure be made and that the need to build new ones be examined, in order to avoid stranded assets, make a positive impact on livelihoods and ecosystems and minimise costs for consumers, taking into account their specific needs; highlights the financial benefits of placing hydrogen production facilities close to renewable energy production sites or on the same site as demand facilities, especially for small-scale consumers and industrial clusters, and linking different demand sectors; also highlights the importance of cross-border cooperation between regions and Member States in order to support projects that would enhance security of supply by building an EU hydrogen backbone, which should ensure interconnection and interoperability across Member States;

36. Encourages the Commission and the Member States to make a science-based assessment of the possibility of repurposing existing gas pipelines for the transport of pure hydrogen and the underground storage of hydrogen, taking into account various factors, such as a cost-benefit analysis, from both techno-economic and regulatory perspectives, overall system integration and long-term cost efficiency; notes that repurposing appropriately located gas infrastructure that already exists or is under development could maximise cost efficiency, minimise land and resource use and investment costs and minimise the social impact; underlines that the repurposing of gas infrastructure can be relevant for the use of hydrogen in the priority sectors of emission-intensive industries, including connections between industrial sites and multimodal transport centres, keeping in mind the need to transport hydrogen through the most efficient means; urges the Commission and the Member States to ensure that any potential future gas infrastructure is compatible with pure hydrogen; calls on the Commission to assess where hydrogen blending is currently used and to scientifically assess its demand for meeting demonstrated industrial hydrogen needs, as well as its advantages and disadvantages, with a view to identifying infrastructure needs while avoiding stranded assets;

37. Underlines the necessity of regulating hydrogen infrastructure, in particular regarding its operation and connection to the energy network, and the need to uphold unbundling as a guiding principle for the design of hydrogen markets while taking into account that the hydrogen market still needs to be developed; stresses that unbundling plays a key role in ensuring that innovative new products are put on the energy market in the most cost-efficient manner; notes that any derogation from this regulatory principle in the medium term would come at an unnecessarily high cost to end consumers; calls on the Commission and the Member States to establish clear guidelines on the ownership of new and repurposed pipelines in order to provide planning security;

38. Stresses the strategically essential role of multimodal maritime and inland ports as innovation pools and hubs for the import, production, storage, supply and utilisation of hydrogen; underlines the need for space for and investment in port infrastructure to promote the use of new zero- and low-emission technologies on national coasts and at ports, and to create an industrial value chain for hydrogen along multimodal transport corridors;

**Hydrogen demand**

39. Acknowledges that the focus of hydrogen demand should be on sectors for which the
use of hydrogen is close to being competitive or that currently cannot be decarbonised using other technological solutions; agrees with the Commission that the main lead markets for hydrogen demand are industry, air, maritime and heavy-duty transport; believes that, for these sectors, roadmaps for demand development, investment and research needs should be established at EU level, based on independent scientific studies, and in cooperation with social partners, taking into account the individual circumstances of Member States and regional differences with respect to hydrogen deployment, technology readiness and infrastructure;

40. Welcomes the Commission’s consideration of various options for incentives on the demand side; agrees with the Commission that demand-focused policies and clear incentives for the application and use of hydrogen in end-consumer sectors in order to trigger the demand for hydrogen – such as quotas for the use of renewable hydrogen in a limited number of specific sectors, European Investment Bank guarantees to reduce the initial risk of co-investments until they are cost-competitive, and financial tools, including Carbon Contracts for Difference (CCfD) for projects using renewable or low-carbon hydrogen – could be considered for a transitional period to promote decarbonisation through hydrogen where that is vital in order to preserve the competitiveness of end users; notes the need to ensure that the compensation remains proportionate and to avoid the duplication of subsidies for both production and use, the creation of artificial needs and undue market distortions; calls for the swift development of a pilot scheme for CCfD, in particular for clean steel; highlights that public procurement of sustainable solutions, such as green steel for construction or renovation, can also contribute to tangible and predictable demand; stresses that demand-focused policies should be consistent with other policy measures and subject to a thorough impact assessment to avoid negative effects on energy-intensive industries facing international competition;

41. Notes that there are obstacles in some of the current regulatory frameworks to the use of hydrogen; encourages the Commission and the Member States to adapt those regulatory frameworks in order to stimulate hydrogen demand and to eliminate disincentives such as legal uncertainties;

42. Urges the Commission to promote lead markets for renewable hydrogen technologies and their use for climate-neutral production – especially in the steel, cement and chemical industries – as part of the update and implementation of the New Industrial Strategy for Europe; calls on the Commission to assess the option of recognising steel produced with renewable hydrogen as a positive contribution to meeting fleet-wide CO₂ emission reduction targets; further urges the Commission to soon come forward with an EU strategy for clean steel, which should include an appropriate focus on the use of renewable hydrogen;

43. Recalls that the transport sector is responsible for a quarter of CO₂ emissions in the EU and is the only sector where emissions have not been reduced compared to the 1990 baseline; underlines the potential of hydrogen to be one of the instruments used to reduce CO₂ emissions in transport modes, in particular where full electrification is more difficult or not yet possible; stresses that the deployment of refuelling infrastructure is necessary to boost hydrogen use in the transport sector; underlines, in that regard, the
importance of revising the TEN-T (trans-European transport network) Regulation\(^{20}\) and the Alternative Fuels Infrastructure Directive to ensure the availability of publicly accessible hydrogen refuelling stations across the EU by including concrete objectives to integrate hydrogen infrastructure in transport systems; welcomes the Commission’s intention to develop hydrogen refuelling infrastructure under the Sustainable and Smart Mobility Strategy and to review the Alternative Fuels Infrastructure Directive; further underlines the need to create synergies between TEN-T, TEN-E and alternative fuel strategies, leading to a phased deployment of hydrogen filling stations accompanied by the essential technical requirements and harmonised standards based on a risk assessment;

44. Underlines that hydrogen’s characteristics make it a good candidate to replace fossil fuels and reduce greenhouse gas emissions for certain types of transport; stresses that the use of hydrogen in its pure form or as a synthetic fuel or biokerosene is a key factor in the substitution of fossil kerosene for aviation; further underlines that hydrogen is, to a limited extent, already used in the transport sector, in particular in road transport, public transport and specific segments of the railway sector, especially where electrification of the line is not economically feasible; stresses that stronger legislation is needed to incentivise the use of zero-emission fuels, as well as other clean technologies, including renewable hydrogen, and, once they are fully available, possibly to start using them in heavy-duty vehicles and for aviation and maritime transport;

45. Calls on the Commission to increase research and investment within the framework of the Sustainable and Smart Mobility Strategy and to assess whether the Renewable Energy Directive needs to be revised in order to ensure a level playing field for all renewable energy solutions in transport;

**Research, development, innovation and financing**

46. Stresses the importance of research, development and innovation along the whole value chain and of carrying out demonstration projects on an industrial scale, including pilot projects, and of their market uptake, in making renewable hydrogen competitive and affordable and in completing the integration of the energy system, while ensuring geographical balance with a special focus on carbon-intensive regions; calls on the Commission to stimulate research and innovation efforts relating to the implementation of large-scale high-impact projects in order to secure technology transfer throughout the hydrogen value chain; welcomes in this regard the launch of mobility laboratories in EU cities to promote sustainable public transport experiments based on the use of alternative fuels and encourages the inclusion of hydrogen as one of the fuels to be used to carry out these experiments;

47. Underlines that significant amounts of money need to be invested to develop and increase the production capacity of renewable hydrogen, make it competitive and foster hydrogen solutions that are often still at the early stages of development, which would also require de-risking renewable hydrogen investments, for example through CfD (Contracts for Difference); stresses that EU programmes and financing instruments such

as the Recovery and Resilience Facility, Horizon Europe, the Connecting Europe Facility, InvestEU, including the new strategic EU investment window, the European Regional Development Fund, the Cohesion Fund, the Just Transition Fund and the ETS Innovation Fund have a key role to play in fostering the cohesive development of a hydrogen economy across the EU; stresses furthermore the important role of local and regional public-private partnerships in boosting the development and uptake of hydrogen;

48. Stresses the need to make sure there are synergies between all available investment funds, programmes and financial instruments, in order to ensure cooperation between the public and the private sector for investments in a wide range of projects; notes with concern the decrease in research and innovation investments in clean energy technologies, as demonstrated by the 2020 report on the State of the Energy Union;

49. Calls on the Commission to develop a coordinated renewable energy and hydrogen investment strategy aligned with national research and innovation strategies, taking into account the different starting points of the Member States;

50. Calls on the Commission to put an emphasis on the significant role of SMEs in that strategy; stresses the need to include regulatory safeguards and to ensure access to finance and innovation assets, such as incubators and joint research projects, so that start-ups and SMEs can take root in the hydrogen industry; calls on the Commission to ensure equal market access and facilitation of market entry for such undertakings and to promote their participation, inter alia by proactively appointing them for round tables and including them in public consultation processes; calls on the Commission to estimate the needs of SMEs and the costs of decarbonising their production processes and energy supply through hydrogen, and to monitor their progress using a suitable set of key performance indicators in order to contribute to evidence-based policymaking;

51. Emphasises that the EU is a leader in the manufacturing of electrolysers and needs to maintain and advance this competitive edge; believes that EU research and development efforts should focus on a wide range of potential new renewable hydrogen sources and technologies, such as hydrogen from photosynthesis, algae or electrolysers with sea water, in order to raise technology readiness levels;

52. Welcomes the European Clean Hydrogen Alliance (the Alliance), other renewable hydrogen initiatives and associations, the European Hydrogen Forum, and the important projects of common European interest (IPCEIs), as important means to enhance investment in renewable hydrogen; encourages the Member States, the Commission and economic operators to rapidly unlock the potential of IPCEIs in order to support projects of relevance for the EU hydrogen economy; calls for a pragmatic approach to facilitate the approval of these projects; also welcomes the Commission’s plan to revise the State aid guidelines for environmental protection and energy to facilitate the production of hydrogen and its rapid market uptake;

53. Encourages the Alliance to come up, in cooperation with the Fuel Cells and Hydrogen Joint Undertaking (FCH JU), with an investment agenda and a project pipeline that can ensure the implementation of the hydrogen goals as soon as possible; underlines that the Alliance should focus on the development of renewable hydrogen and commit clearly to
achieving the EU 2030 and 2050 climate targets; stresses that the Alliance should also ensure a balanced representation of all relevant EU stakeholders including renewable energy producers, scientists, independent experts, think tanks, environmental NGOs and social partners; stresses that the Alliance’s decision-making procedure should be improved with regard to transparency and inclusiveness, and that this process should be led by the Commission and supported by an independent body of scientific experts, and aim to define the transition pathways and provide guidance for hydrogen needs; notes the current delays in implementing the work of the Alliance and urges the Commission to speed up the process;

54. Welcomes the renewal of the FCH JU under Horizon Europe; stresses the importance of its work and asks the Commission to use it as a competence centre for hydrogen and provide it with sufficient financial resources to play its role in delivering the European Green Deal objectives; highlights that it should promote research and development activities across the value chain in order to ensure cost-efficient use of funding for hydrogen and better coordination; underlines that it should carry out synergies with the joint undertakings in the transport sector in order to promote adequate integration between hydrogen technology and transport infrastructure and services; calls on the Commission to make use of the experience gained through the FCH JU and to incentivise further research into fuel cell and hydrogen energy technologies;

55. Requests the Commission to assess the potential inclusion of hydrogen deployment in the general objectives of the Partnership for Research and Innovation in the Mediterranean Area (PRIMA) in line with the priorities of Horizon Europe, in order to strengthen research and innovation capacities and to develop knowledge and common innovative solutions across the Mediterranean region;

**International cooperation on hydrogen**

56. Emphasises that the EU’s leading role in the production of hydrogen technologies presents an opportunity to promote EU industrial leadership and innovation on a global level while reinforcing the EU’s role as a global climate leader; stresses that priority should be given to building a hydrogen supply chain in the EU to foster first mover advantages, industrial competitiveness and security of energy supply; underlines, in that regard, the goal of increasing domestic hydrogen production, while acknowledging that Member States may also, in accordance with their needs, explore the possibility of importing energy, hydrogen and hydrogen pre-products from neighbouring regions and non-EU countries, to cater for increasing domestic demand for hydrogen;

57. Calls, therefore, on the Commission and the Member States to engage in an open and constructive dialogue in order to establish mutually beneficial cooperation and partnerships with neighbouring regions, such as North Africa, the Middle East and the Eastern Partnership countries, safeguarding the EU’s strategic interests and the energy security of both the EU and its partners; underlines that this cooperation would be beneficial for creating clean and new technology markets through the transfer of knowledge, enhancing the transition to renewable energy and achieving the UN Sustainable Development Goals; stresses the need to avoid the relocation of environmental impacts, including greenhouse gas emissions, and any delay in the decarbonisation of the power grid in non-EU countries;
58. Emphasises that international cooperation on hydrogen with non-EU countries, in particular with the UK, the European Economic Area, the Energy Community and the US, established on the basis of mutually respected rules and principles such as third-party access, ownership unbundling, transparency and non-discriminatory tariffs, should be further developed in order to strengthen the internal market and energy security; stresses that cooperation should be avoided with non-EU countries that are subject to EU restrictive measures, such as economic sanctions, and with those that do not guarantee compliance with safety, environmental standards and transparency requirements, or where this cooperation would undermine the security of the EU and the Member States;

59. Stresses that the EU should promote its hydrogen standards and sustainability criteria internationally; calls in this regard for the development of international standards and the setting up of common definitions and methodologies for defining overall emissions from each unit of hydrogen produced, as well as international sustainability criteria as a prerequisite for any hydrogen import and imports of pre-hydrogen products; emphasises that, in order to avoid any carbon leakage, all hydrogen imports should be certified in the same way as EU-produced hydrogen, including production and transportation, and should be consistent with the future carbon border adjustment mechanism of the European Union; also calls on the Commission and the Member States to invest in the necessary infrastructure and the transformation of existing infrastructure at ports and in cross-border connections for the import of renewable hydrogen; encourages the Commission to promote the role of the euro as the reference currency in the international trade of hydrogen;

60. Considers that hydrogen should become an element of the EU’s international cooperation, inter alia within the framework of the International Renewable Energy Agency’s (IRENA’s) work, research cooperation, climate and energy diplomacy and the European Neighbourhood Policy;

The role of hydrogen in an integrated energy system

61. Underlines the need for an integrated energy system in order to achieve climate neutrality by 2050 at the latest and reach the goals of the Paris Agreement; welcomes in that regard the inclusion of hydrogen in the Commission’s Strategy for Energy System Integration; believes that the integration of energy sectors and carriers as well as the coherent planning of the electricity, heat, gas and hydrogen networks is beneficial for sustainability, energy transition and a well-functioning hydrogen and energy market; considers that more emphasis needs to be placed on innovative projects combining the production and recovery of electricity, hydrogen and heat;

62. Notes that the development of the hydrogen economy can contribute to reducing imbalances in the energy system as a whole; reiterates that hydrogen can play a key role in terms of storing energy to compensate for fluctuations in renewable energy supply and demand; stresses, therefore, that the development of hydrogen transport and storage infrastructure must be planned, anticipating the need to develop energy production facilities in order to ensure technical and economic optimisation;

63. Highlights that an ambitious and timely strategy for energy storage through the use of
hydrogen in innovative industrial and mobility solutions is required; notes, however, that the use of hydrogen for energy storage is not competitive yet due to high production costs and that energy losses associated with energy storage by means of hydrogen are currently estimated to be around 60% on a so-called round trip; thus underlines once again the need to bring down costs for renewable hydrogen production and to promote a level playing field for flexibility and balancing solutions across the energy system; therefore encourages the Commission to analyse options and capacities for hydrogen storage; notes that hydrogen storage might be subject to conflicting regulatory regimes, namely those relating to gas and electricity storage, and therefore highlights the need to also clarify this aspect in the relevant legislation;

64. Instructs its President to forward this resolution to all EU institutions and Member States.
EXPLANATORY STATEMENT

The European Union has endorsed the Paris Agreement and has committed with the European Green Deal to achieve climate neutrality by 2050 through a just transition. This transition implies the decarbonisation of all economic sectors, including the energy and hard-to-decarbonise sectors. The transition towards a clean energy system needs to ensure security of supply and affordability of energy.

As hydrogen produced through electrolysis with electricity from renewable energy sources is a clean alternative to fossil fuels and can be used for various purposes, including feedstock for industrial processes, fuel cells and energy storage, it can make a valuable contribution to this transition. It can help to decarbonise hard-to-decarbonise sectors in which direct electrification is not yet possible or cost-efficient. However, hydrogen represents only a small part of the European energy mix and 95% of our hydrogen production is currently based on fossil fuels. Furthermore, clean hydrogen is not yet competitive with fossil-based hydrogen and low-carbon hydrogen.

Thus, the EU needs to develop a sustainable hydrogen economy that aims at making clean hydrogen competitive as soon as possible. A successful hydrogen economy with European technological leadership could help the EU to strengthen its economy and create future-proof jobs, especially after the economic downturn due to the COVID-19 pandemic. For this, a hydrogen strategy that covers the whole hydrogen value chain, includes demand and supply sectors and coordinated with national efforts, is necessary. The European Commission has made a first step in this direction by adopting ‘A hydrogen strategy for a climate-neutral Europe’ in July 2020. This report aims at analysing the political, economic and technological needs for a sustainable hydrogen economy in the EU, thereby complementing the strategy proposed by the Commission.

The Rapporteur underlines that hydrogen is not the silver bullet solution to decarbonisation. Instead, the ‘energy efficiency first principle’ should prevail and direct electrification should be considered the preferable option for decarbonisation, where technologically and economically possible, as it can be more cost- and energy-efficient due to efficiency losses in hydrogen production.

The EU needs to base its hydrogen economy on clean hydrogen, as only clean hydrogen is sustainable in the long term. In order to ramp up hydrogen production and establish the clean hydrogen economy fast enough to achieve our climate goals, low-carbon hydrogen can play a transitional role, as clean hydrogen is not yet sufficiently abundant and competitive. The Commission should assess for how long and how much low-carbon hydrogen would be needed during this transitional phase. It is important that fossil-based hydrogen is phased out as soon as possible.

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1 European Commission: Hydrogen generation in Europe: Overview of key costs and benefits, July 2020
2 In this report, the Rapporteur is using for the different types of hydrogen the terminology proposed by the Commission in the Communication “A hydrogen strategy for a climate-neutral Europe”.
Hydrogen classification and standards

The Rapporteur believes that, in order to define the different types of hydrogen, a single European classification system is needed. The Commission’s proposed classification, based on the carbon content of hydrogen and stepping away from the commonly used colour-based approach, seems to be a good solution. However, different names for the same type of hydrogen, such as ‘renewable’ and ‘clean’ hydrogen, should be avoided.

In addition, we need to be able to clearly identify clean hydrogen. For this purpose, the Rapporteur suggests the development of standards and a European certification and labelling system based on an independent science based review of the lifecycle emissions of hydrogen production. As clean hydrogen production is based on renewable electricity, we also need guarantees of origin for renewable electricity. These elements are important for hydrogen consumers to be able to invest consciously in clean hydrogen options.

Public acceptance is key to developing a sustainable hydrogen economy. In order to increase public acceptance, citizen and stakeholder involvement in the hydrogen economy is crucial. We also need to ensure that the EU has the highest safety standards and technical norms for hydrogen and applies only hydrogen solutions that respect those standards. In this regard, the Rapporteur commends the work on safety already done by the Fuel Cells and Hydrogen Undertaking that could serve as a competence centre on hydrogen for the European Commission.

Ramping up hydrogen production

We need to take action now to increase clean hydrogen production in Europe. The Commission presented in its strategy ambitious goals for scaling up the production of clean hydrogen by increasing the capacity of renewable hydrogen electrolysers. To achieve those goals and establish a functioning and predictable clean hydrogen market that attracts investments, regulatory barriers need to be overcome and a comprehensive regulatory framework of the hydrogen market needs to be put in place. The EU gas market regulatory framework, due the common features of hydrogen and gas, and the Clean Energy Package, due to its holistic approach to reviewing the functioning of the energy market, could serve as blueprints for this regulatory framework.

In order to produce clean hydrogen, significant amounts of renewable electricity are required. Hence, in order to ramp up clean hydrogen production, the EU needs to create sufficient additional renewable energy production. This goes hand in hand with providing the necessary infrastructure to transport renewable energy to hydrogen production sites. As there are still gaps in the renewable energy infrastructure within the EU, the Commission and the Member States should ensure that the missing infrastructure is provided as soon as possible. In addition, as renewable electricity is responsible for a significant part of clean hydrogen production costs, it is important, in order to achieve competitiveness, to reduce costs by abolishing taxes and levies on renewable electricity.

Hydrogen infrastructure

The Rapporteur notes the lack of hydrogen infrastructure in the EU. The EU should avoid a chicken and egg problem between hydrogen infrastructure, production facilities and demand.
We need to develop all elements from the start. The EU should incentivise infrastructure development, e.g. by revising the TEN-E Regulation. The Rapporteur agrees with the Commission’s approach to start planning the medium range and backbone transmission infrastructure from the start to develop a fully-fledged internal hydrogen market as soon as possible.

As the establishment of a hydrogen economy will require significant amounts of investment, cost-efficiency is important. The existing gas infrastructure could be repurposed for pure hydrogen use, which could minimise investment costs and levelised costs of transmission. Hence, this possibility should be assessed at European and national level.

**Hydrogen demand**

The demand side is a crucial aspect for developing a clean hydrogen market, as high demand can speed up market uptake of clean hydrogen. In addition, it can contribute to decarbonisation. However, for demand to increase, clean hydrogen needs to become an attractive business case. Investments into clean hydrogen need to be more attractive than investments into fossil-based solutions. Only then, the EU would be able to prevent carbon lock-ins. Thus, the use of clean and, for a transitional period, low-carbon hydrogen should be concentrated on sectors for which the use of hydrogen is close to competitive or that currently cannot be decarbonised by other means.

In order to have a better oversight of the clean and low-carbon hydrogen needed, the Rapporteur proposes to draw up sector roadmaps that lay out the development of hydrogen demand and investment and research needs for the demand sectors. These roadmaps should be drafted on a European level in close cooperation between stakeholders and European institutions.

The Commission states in its strategy the importance of policies to support and develop the demand-side. Due to the current lack of competitiveness of clean hydrogen, we should indeed consider putting in place policies such as quotas for the use of clean hydrogen in the focus sectors. Innovative measures such as carbon contracts for difference (‘CCfD’) should also be taken into account. The Commission needs to detail, however, how such measures could be financed and implemented.

**Research, development, innovation and financing**

In order to reduce costs of clean hydrogen and for optimisation purposes, research, development and innovation along the whole value chain of clean hydrogen are necessary. We also need demonstration projects on an industrial scale to be able to implement hydrogen solutions in demand sectors. The EU needs to ensure the full involvement of SMEs, as some can deliver innovative solutions and some may have limited resources to benefit from clean hydrogen solutions for their own decarbonisation. We also need to ensure that our workforce is equipped with adequate knowledge on clean hydrogen technologies to ensure their safety.

The Rapporteur underlines the high investment needs to establish a clean hydrogen economy. European programmes can play an important role to help financing clean hydrogen projects and to attract additional public and private investments. Especially, Horizon Europe, the Connecting Europe Facility, InvestEU and the ETS Innovation Fund can foster a clean hydrogen economy. It is imperative that those programmes are equipped with sufficient financial resources. Thus,
the Rapporteur deplores the financial cuts by the Council compared to the Commission’s proposal.

Besides those programmes, the Clean Hydrogen Alliance and Important Projects of Common European Interest (IPCEIs) can help to finance the hydrogen economy. The Alliance, based on the expertise it unites, should help to identify concrete promising projects and investment needs drawing up a project pipeline and an investment agenda. In addition, a revision of State aid guidelines should establish a chapter on clean hydrogen technologies, so that the guidelines can support and not hamper clean hydrogen development. In addition, considering the abundance of European programmes that can help to finance clean hydrogen, it is essential that the EU develops a coordinated investment strategy that allows projects to receive funding from different programmes and makes sure that they logically build on each other.

**International cooperation on hydrogen**

The Rapporteur believes that European production of clean hydrogen alone may not suffice to cater to European demand, as some sectors will require large amounts for decarbonisation purposes. Therefore, the EU should start cooperation on clean hydrogen production with neighbouring regions like the Balkans or North Africa for import purposes. It should guarantee that such cooperation is beneficial for the cooperating regions in terms of their fight against climate change and to achieving the UN Sustainable Development Goals and sustainable economic development.

Clean hydrogen should also become an integral part of the EU’s international cooperation in general, including climate diplomacy, to exchange best practices and promote European hydrogen standards.

**The role of hydrogen in an integrated energy system**

Finally, the Rapporteur underlines the importance of an integrated energy system to promote renewable energy and to achieve climate neutrality by 2050. For this purpose, the gas, electricity and hydrogen grids should be coordinated. Here, hydrogen can play a key role in terms of energy storage to balance intermittent renewable energy supply and demand. This solution is not competitive yet and the EU needs further investments for this purpose. The Rapporteur welcomes the alignment of the hydrogen and the energy system integration strategies.
ANNEX: LIST OF ENTITIES OR PERSONS
FROM WHOM THE RAPPORTEUR HAS RECEIVED INPUT

The following list is drawn up on a purely voluntary basis under the exclusive responsibility of the rapporteur. The rapporteur has received input from the following entities or persons in the preparation of the draft report:

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28.1.2021

OPINION OF THE COMMITTEE ON THE ENVIRONMENT, PUBLIC HEALTH AND FOOD SAFETY

for the Committee on Industry, Research and Energy

on a European strategy for hydrogen
(2020/2242(INI))

Rapporteur for opinion: Hildegard Bentele

(*) Associated committee – Rule 57 of the Rules of Procedure

SUGGESTIONS

The Committee on the Environment, Public Health and Food Safety calls on the Committee on Industry, Research and Energy, as the committee responsible, to incorporate the following suggestions into its motion for a resolution:

A. whereas the goal of the Paris agreement is to contain the rise in the average temperature of the planet to well below 2° C compared to pre-industrial levels and to continue the action taken to limit the rise in temperature at 1.5° C from pre-industrial levels;

1. Welcomes the Commission’s intention to establish the European Union as a standard-setting and world-leading region for hydrogen; stresses that hydrogen is an important tool to decarbonise the energy system, carbon intensive industrial processes and parts of the transport system in the transition towards the Union’s updated 2030 climate goals and the Union’s climate neutrality target for 2050 at the latest, as enshrined in the proposal for a European Climate Law (COM/2020/0080) to achieve the goals of the Paris Agreement; notes that an ambitious strategy can generate up to 1 million jobs and EUR 150 billion in annual revenue by 2030, while reducing annual CO₂ emissions by roughly 560 Mt by 2050¹, depending on the technologies used, and should aim to bring benefits to all Member States by fostering a Hydrogen Union;

2. Regrets the current multitude and lack of clear terms used to qualify different types of hydrogen; calls, therefore, on the Commission to introduce comprehensive terminology and European-wide standards and criteria for the certification of hydrogen on the basis of life-cycle emissions assessments, since this is crucial to ensuring transparency regarding the EU’s carbon footprint and transparency regarding the origins of hydrogen, and constitutes the basis for any future investments; considers that such terminology needs to fit into a robust international framework in order to avoid mislabelling or the double counting of environmental impacts;

3. Notes that hydrogen may be produced through a variety of processes; stresses the importance of a clear commitment to the rapid transition towards renewable - hydrogen, with a bridging role for low-carbon hydrogen that significantly reduces life-cycle GHG emissions and avoids future lock-in effects to achieve the Union’s 2050 climate neutrality target, while ensuring technological neutrality and a cross-sectoral approach in order to maximise scale effects and drive down costs across applications; notes that the cost of renewable hydrogen is currently up to three times as high as the cost of fossil-based hydrogen; notes that studies suggest that costs for the production of hydrogen from renewable energy could fall significantly\(^2\) and reach cost parity with fossil-based hydrogen by 2030 in regions where renewables are cheap; stresses that investments are important in order to improve the cost-competitiveness of renewable hydrogen as compared to fossil-based hydrogen; welcomes the fact that Next Generation EU highlights hydrogen as an investment priority, and calls on the Commission to also develop a roadmap for the deployment and upscaling of electrolysers and to forge partnerships at EU level to ensure their cost-effectiveness in the main sectors of hydrogen use; stresses, in this context, the importance of allowing for flexibility to use various available production pathways, including innovative technologies such as pyrolysis and residual waste treatment that ensures efficient use of resources and fully respects the waste hierarchy; notes the role of environmentally safe carbon capture and storage in making heavy industry climate neutral, where no direct emission reduction options are available;

4. Is of the opinion that in order to achieve the transition towards the Union’s updated 2030 climate goals and the Union’s climate neutrality target for 2050 at the latest, fossil-based hydrogen should gradually be phased-out and replaced;

5. Calls on the Commission, the Member States and industry to ramp up additional renewable electricity capacity in order to avoid a counterproductive competition between electrolysers for the production of hydrogen and other direct uses of renewable electricity and to ensure an overall reduction of greenhouse gas (GHG) emissions; emphasises the need for better incentives for using surplus renewable energy for the production of hydrogen and underlines the need for transparency regarding the certification of origins of electricity-generated hydrogen and of life-cycle emissions; notes, in particular, the potential of offshore renewable energy and on-site closed loop systems combining renewables production in the proximity of industrial sites and sites that distribute renewable hydrogen, as a large share of demand will be needed in pure form (as industrial feedstock or as an energy carrier in high-temperature processes such as steel production); calls on the Commission to explore the potential of hydrogen production by renewable energy communities in order to strengthen decentralisation and the engagement of citizens in the energy transition; stresses, furthermore, the need to continue investing in research in potential new renewable hydrogen sources, such as hydrogen from photosynthesis, from algae or from electrolysers with sea water;

6. Points out that a reliable regulatory framework and temporary incentives during a transitional period will be required to ensure a level playing field, remove unintended and redundant regulatory hurdles and scale-up renewable hydrogen, while having a

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bridging role for low-carbon hydrogen that significantly reduces life-cycle GHG emissions and avoids future lock-in effects;

7. Underlines that adequate CO$_2$-pricing and funding are key factors for fully developing the potential of renewable hydrogen in a cost-effective manner; calls on the Commission to use the upcoming revision of the EU Emissions Trading System (ETS) to examine which changes are needed to allow hydrogen to fully unfold its potential to reach our climate goals, while taking into account the risks of carbon-leakage; calls for coherent and coordinated support on a European scale to allow producers and users to roll out predictable hydrogen production with long-term security; calls, in this regard, on the Commission to consider the development of innovative instruments, such as carbon contracts of difference (CCfD) covering the difference in cost from moving away from fossil-based hydrogen, end-use targets for specific sectors, or European Investment Bank guarantees to reduce the initial risk of co-investments until they are cost-competitive and a carbon border adjustment mechanism; notes that, in order to allow for such targeted support, the Renewable Energy Directive$^3$ and Energy and Environment State Aid Guidelines should also be adapted accordingly;

8. Welcomes the Commission’s initiative to revise EU energy taxation; calls on the Commission to take the necessary measures in accordance with the Treaties, to adequately include external costs into fossil fuel consumption prices, ensure the cost-competitiveness of hydrogen generated from electricity, and level the playing field across energy carriers to facilitate sector integration and decarbonisation;

9. Underlines the importance of the energy-efficiency-first principle; is of the opinion that hydrogen is an important and necessary supplement to direct electrification and provides added value as a vector for renewable energy storage and for the decarbonisation of hard-to-abate sectors, where direct electrification is not the most optimal choice due to cost- and energy efficiency, technological possibilities and regional conditions in the short and medium term;

10. Underlines that hydrogen, as an energy carrier, has the potential to enable the renewable energy transition through energy storage and sector coupling, as it can balance and provide flexibility and security of supply in the electricity network and can contribute to decarbonising heat production in limited cases; notes the potential of using existing infrastructure for hydrogen transmission; asks, therefore, the Commission to update and harmonise regulations on hydrogen blending in the short term, while ensuring that this does not lead to a lock-in of fossil gas mixed with hydrogen, and, where relevant and following a thorough impact assessment of infrastructure plans, technical possibilities, possible injection points and demand clusters and while taking into account corresponding costs and benefits and GHG reduction possibilities, support the gradual retrofitting and repurposing of existing networks and prudently invest in the development of missing hydrogen networks, including transnational infrastructure, to facilitate the creation of a common European hydrogen network;

11. Stresses the potential for hydrogen to decarbonise energy intensive industries and its importance as an industrial feedstock; notes, however, that up to 95 % of hydrogen used

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in EU industry today is fossil-based; strongly believes that the rollout of renewable hydrogen to decarbonise these existing hydrogen applications should be prioritised, while acknowledging a bridging role for low-carbon hydrogen and calling for a comprehensive approach to avoid further locking-in dependence on fossil-based hydrogen; calls, therefore, for the significant scaling up of research, investments and knowledge exchange, in particular for renewable and innovative hydrogen at lower technology readiness applications in industry, including simplifying access to funding for research projects, smaller actors and start-ups, and for State-aid rules to allow for targeted support;

12. Recalls that the transport sector is responsible for a quarter of EU CO₂ emissions and is the only sector where emissions have not been reduced compared to the 1990 baseline; underlines the potential of hydrogen as one of the instruments contributing to the reduction of CO₂ emissions in transport modes, in particular where full electrification is more difficult or not yet possible; stresses that hydrogen in pure form or as synthetic or biokerosene is a key factor in the substitution of fossil kerosene for aviation; emphasises the great potential for hydrogen to reduce GHG emissions in the maritime transport sector for medium and long distances, while also noting the advantages of green ammonia over long distances; emphasises the role of hydrogen for the medium-term decarbonisation of parts of heavy-duty vehicles, in particular long-haul transport, buses, construction or agriculture machinery; notes that hydrogen-powered cars could also be a supplement to battery electric cars; further underlines the potential of hydrogen as an energy carrier in the railway sector to replace diesel where track electrification is not economically feasible and welcomes the successful use and serial production of hydrogen powered trains in several Member States;

13. Calls on the Commission to increase research and investments in this regard, under the Sustainable and Smart Mobility Strategy; notes the comparatively high willingness to pay for clean fuels across mobility and transport modes; calls on the Commission to assess whether the Renewable Energy Directive needs to be revised in order to ensure a level playing field with other renewable energy and calls on the Commission to accelerate the development of an EU-wide hydrogen refuelling network in the upcoming revision of the Alternative Fuels Infrastructure Directive⁴;

14. Notes that the Union’s high future demand for cost-competitive renewable energy and hydrogen is likely to exceed Europe’s potential⁵; calls on the Commission to better assess renewable hydrogen production and consumption potential in the EU; underlines that renewable hydrogen may in time also be sourced cost-efficiently outside Europe and stresses, in this regard, the strategic role of ports; calls, therefore, for the establishment of new energy partnerships and for inter-connectivity with neighbouring countries, taking into account the fact that new partnerships, especially those with African countries, could arise as a win-win opportunity, provided that the strategies are aligned with the partnering countries’ economic, social and environmental interests, concerns and decarbonisation objectives, are non-detrimental to the energy security of the partnering countries and the Union, human rights or sustainable community

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livelihoods, and contribute to sharing know-how;

15. Calls on the Commission and the Member States to make the development of the electricity grid and research and development of renewable hydrogen, hydrogen compatible infrastructures a key spending priority under the Recovery and Resilience Plans, Just Transition Plans, InvestEU, Horizon Europe, the Trans-European Networks for Energy (TEN-E) and the Trans-European Transport Network (TEN-T), European Structural Investment Funds and the ETS Innovation Fund; while acknowledging a bridging role for low-carbon hydrogen that significantly reduces life-cycle GHG emissions and avoids future lock-in effects; underlines that subsidies for fossil hydrogen should be phased out; underlines that dedicated support tools should be accessible for small and medium-sized enterprises (SMEs) in the Union given the significant role they play in hydrogen research and innovation; calls on the Commission to further explore synergies between TEN-T and TEN-E to optimise the production, use and transport of hydrogen; stresses the importance of important projects of common European interest to enable EU-wide cooperation on investments and projects and connect actors at all levels to share know-how and pool knowledge so as to move towards a robust interconnected European hydrogen value chain; underlines, furthermore, the importance of applying the do-no-significant-harm principle to ensure that infrastructure build-out supports the most cost-efficient decarbonisation paths;

16. Calls on the Commission and the Member States to develop sectoral transformation strategies in this regard, together with social partners; stresses the need to promote training and learning for skilled workers in the sectors concerned as well as for future professionals; calls on the Commission to collect data about the possible impacts, opportunities and challenges in the transformation of industry, transport and energy towards the scaling-up of hydrogen; highlights the opportunity that hydrogen represents for regions that are currently in the transition towards decarbonisation; stresses that the Hydrogen Strategy, in line with the Just Transition Fund and Recovery and Resilience Facility, should look into the potential access to funding for renewable hydrogen infrastructure for these regions;

17. Holds the opinion that, given the specific properties of hydrogen, such as molecular size, low density and high flammability, high safety standards for its production, transport and storage are of utmost importance to minimise the risks of natural and man-made disasters and for a wide public acceptance of hydrogen; requests, therefore, that best-practice examples and a hydrogen-safety culture be promoted throughout the Union;

18. Calls for work to be carried out to assess and improve the resource use in hydrogen production, in line with the circular economy, especially regarding raw material use for electrolyser and water use; insists on the importance of investing in research and innovation to develop reliable recycling and dismantling techniques and infrastructures for precious and scarce materials in hydrogen fuel-cells in the European Union; recalls that such an industry is both indispensable to ensuring an environmentally friendly use of renewable hydrogen, and to establish European leadership in the energy transition; stresses, furthermore, the need to minimise the impact on regional water supply from hydrogen production from electrolyser, notably through careful spatial planning when establishing renewable hydrogen production facilities, and to avoid any contamination
of water, air or soil, deforestation or loss of biodiversity, as a result of the hydrogen-related production chain;

19. Emphasises the importance of communication campaigns with both industry and society to explain the upcoming economic and environmental benefits of the hydrogen energy transformation;

20. Notes that currently only 0.1% of worldwide hydropower comes from renewable energies, meaning that hydrogen production is still responsible for 830 million tonnes of world CO$_2$ emissions every year;

21. Welcomes the efforts made by European steel producers to switch from fossil fuels to green hydrogen as a way of producing fossil-free steel;

22. Supports measures to coordinate efforts of different stakeholders to create a common approach among policymakers, industry, and investors;

23. Welcomes the Clean Hydrogen Alliance as a tool to coordinate the deployment of clean hydrogen throughout the EU, with an expected cumulative investment from EUR 180 to EUR 470 billion by 2050 and notes the potential for EU leadership in clean hydrogen; calls for strategic investments into the production and use of clean hydrogen, into the creation of a network for infrastructure, research and innovation; supports, therefore, the efforts made by the Alliance in order to establish a workable pipeline of renewable hydrogen projects eligible for funding, as a role model for public-private partnerships;

24. Stresses the importance of national and regional implementation of the strategy to ensure full usage of all potential coherent national legislation, and the possibility of inter-regional cooperation;

25. Welcomes the fact that almost all Member States have included plans for clean hydrogen in their national energy and climate plans and 26 Member States have signed the Hydrogen Initiative;

26. Calls for the establishment of a framework for sharing progress reports and best practices between the Member States so as to ensure that the most effective and cost-effective technologies are implemented, that they cooperate successfully and have a common usage of assets;

27. Encourages the Commission to boost the identification and promotion of areas in the EU considered to be hydrogen clusters or hubs; calls for special support for these environments to ensure that they can carry out their work as a driving force in the implementation of the European hydrogen strategy; underlines the importance of conferring leadership on the European Hydrogen Valleys Partnership as the key stakeholder for the organisation and transfer of knowledge between European clusters;

28. Stresses the potential of decentralised hydrogen production for the creation of jobs and value in rural areas; calls on the Commission and the Member States to consider incentives for the creation of local and regional hydrogen clusters in the relevant programmes;
29. Calls for transparency and inclusion of the civil and scientific society in all coordination and planning bodies, especially the European Clean Hydrogen Alliance.
INFORMATION ON ADOPTION IN COMMITTEE ASKED FOR OPINION

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-: 16  
0: 3 |
| **Substitutes present for the final vote** | Hildegard Bentele, Manuel Bompard |
| **Substitutes under Rule 209(7) present for the final vote** | Veronika Vrecionová |
## FINAL VOTE BY ROLL CALL IN COMMITTEE ASKED FOR OPINION

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Key to symbols:
+ : in favour
- : against
0 : abstention
25.2.2021

OPINION OF THE COMMITTEE ON TRANSPORT AND TOURISM

for the Committee on Industry, Research and Energy

on a European Strategy for Hydrogen
(2020/2242(INI))

Rapporteur for opinion: Georg Mayer

(*) Associated committee – Rule 57 of the Rules of Procedure

SUGGESTIONS

The Committee on Transport and Tourism calls on the Committee on Industry, Research and Energy, as the committee responsible, to incorporate the following suggestions into its motion for a resolution:

- having regard to the Agreement adopted at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21) in Paris on 12 December 2015 (the Paris Agreement),

- having regard to the Commission communication of 8 July 2020 entitled ‘A hydrogen strategy for a climate-neutral Europe’ (COM(2020)0301),

- having regard to the Commission communication of 11 December 2019 entitled ‘Stepping up Europe’s 2030 climate ambition – Investing in a climate-neutral future for the benefit of our people’ (COM(2020)0562),

- having regard to the Commission communication of 11 December 2019 on the European Green Deal (COM(2019)0640),

- having regard to the Commission communication of 10 March 2020 entitled ‘A New Industrial Strategy for Europe’ (COM(2020)0102),

sources\textsuperscript{1},


A. whereas the transport sector needs to decarbonise by 2050, but this will not be easy, and each mode of transport has its own sector-specific particularities, special challenges and requirements;

B. whereas transport is responsible for approximately 27\% of the EU’s total greenhouse gas (GHG) emissions, and hydrogen has multiple applications across industry and the electricity and the building sectors, and offers great potential as an alternative fuel for the transport sector, but market-deployed hydrogen possibilities for the various modes of transport are still limited;

C. whereas battery electric cars have the potential to secure a significant part of the market for private vehicles; whereas heavy transport is a hard to decarbonise sector, where direct electrification is limited owing to low cost efficiency and for technical reasons; whereas batteries pose practical problems in sectors such as those making use of heavy-duty vehicles, trains on non-electrified lines, cargo ships or aircraft, and this will create opportunities for other energy carriers such as hydrogen, as it could store large amounts of energy on board a vehicle or vessel, allow for quick refuelling if necessary and produce only water as an exhaust output;

D. whereas direct electrification from renewable sources is the preferred option to decarbonise transport and reach our climate goals while respecting the principles of ‘energy efficiency first’ and technological neutrality, and whereas hydrogen should primarily be used to help cut emissions in hard-to-decarbonise sectors, such as in heavy land transport, the aviation and maritime sectors;

E. whereas demand for hydrogen should be stimulated in order to gradually incorporate new applications and make the European Union a standard-setting and world-leading region for hydrogen; whereas an ambitious strategy can secure hydrogen benefits for all Member States by fostering a Hydrogen Union, and can generate up to one million jobs and EUR 150 billion in annual revenue by 2030, while reducing annual CO\textsubscript{2} emissions by roughly 560 megatonnes by 2050;

F. whereas in 2018, the Commission projected that hydrogen would make up 13 to 14\% of the share of the Union’s energy mix by 2050\textsuperscript{3};

G. whereas new technologies and innovations need to evolve, and therefore substantial investments are needed in order to upscale production and distribution, which would lead to economies of scale, while the competitiveness of the EU transport sector needs to be safeguarded;

H. whereas high European safety and classification standards for the production,

\textsuperscript{1} OJ L 328, 21.12.2018, p. 82.
transportation, storage and utilisation of hydrogen should be drawn up, guaranteed and based on cost-effectiveness and independent scientific research;

I. whereas in terms of the development of hydrogen infrastructures, low carbon can play a complementary role in reaching the Union’s climate goals;

J. whereas the availability of additional renewable energy infrastructure is an essential condition for introducing and developing the use of hydrogen in the transport sector;

K. whereas the Fuel Cells and Hydrogen Joint Undertaking (FCH JU) will have to achieve synergies with the joint undertakings in the transport sector in order to promote adequate integration between hydrogen technology and transport infrastructures and services; whereas the focus should be on building European hydrogen supply chains by means of joint efforts, with the goal of creating an interwoven and fully fledged European hydrogen energy system in order to make Europe less energy-dependent on third country suppliers and to become the world leader on the hydrogen market;

Road

1. Stresses the vast GHG reduction potential in road transport through modal shift, efficiency and direct electrification, especially for passenger cars and buses; notes that for road transport, given the current state of technological developments, the focus should be on an intensified uptake of electric vehicles; points out, however, that since in the near future not all road transport will be electrifiable, hydrogen applications offer interesting options for those segments of the transport system where CO₂ reduction is difficult to achieve and where large-scale electrification is virtually impossible, such as long-haul heavy-duty road transport; underlines, furthermore, the significant particularity of hydrogen in terms of charging time (fast) and autonomy (comparable to internal combustion vehicles);

2. Stresses the need to maintain and further develop European technological leadership in renewable and low-carbon hydrogen through a competitive and sustainable hydrogen economy; welcomes the launch of mobility laboratories in European cities to promote sustainable public transport experiments based on the use of alternative fuels, and encourages the inclusion of hydrogen in the options to be used to carry out these experiments; notes that the combined effect of all hydrogen road vehicles being too expensive, and the absence of a suitable hydrogen transport infrastructure and distribution network with sufficient refuelling stations, is hampering mass development;

3. Highlights that urban transport offers a particularly interesting testing ground for experiments addressing the major technological challenges of this type of alternative energy in transport, with the availability of recharging points, storage, and fast refuelling opportunities; stresses, in this context, the important role of local and regional public-private partnerships in order to boost the development and uptake of hydrogen;

4. Highlights that the production of hydrogen is not an aim in itself but must deliver emissions reductions; calls for a harmonised EU strategy for the development of infrastructure and the use of hydrogen in heavy-duty vehicles; points out that in order to achieve the market ramp-up needed to provide these sectors with cost-efficient, affordable and climate-neutral alternatives to fossil fuels, a broad application of
renewable hydrogen-derived products should be promoted;

5. Stresses that, in line with the ‘energy efficiency first’ principle and the Green Deal, a higher level of ambition in renewable energy and energy efficiency is needed in order to ensure the green transition, while respecting the energy mix of Member States and their respective starting points; recalls that the forthcoming revision of the Alternative Fuels Infrastructure Directive will need to include concrete objectives in terms of the integration of hydrogen infrastructure into transport systems;

Aviation

6. Stresses the importance of boosting EU companies and monitoring their progress in order to develop a wide range of technologies, including hydrogen, to enable a comprehensive approach towards cleaner aviation from small and medium-sized through to large aircraft;

7. Highlights that direct electrification and the use of batteries for hybrid and/or full electric planes might fit on board small-sized aircraft and rotorcraft, whereas this poses practical problems for long-distance freight and passenger transport, as it is not possible either to charge the batteries sufficiently or to pack the requisite number of batteries on board, making hydrogen one of the most promising options for the decarbonisation of the aviation sector for long-haul flights;

8. Points out the possibility of exploring the integration of electrical and/or hybrid enablers and fuel cells in planes and that, in the short- to mid-term, hydrogen could be used as a basis for synthetic aviation fuel, which could be applied as a ‘drop-in’ fuel in existing aircraft, while in the long term, the direct use of hydrogen could be envisaged, via hydrogen-powered fuel cells or hydrogen-based jet engines, following aircraft engine and system innovations;

9. Calls on the Commission to provide incentives to the sector to use alternative and synthetic fuels, as well as other clean technologies, and, once fully available, possibly introduce a blending mandate into the aviation sector to boost Europe’s technological leadership and its international competitiveness;

Maritime and inland waterways

10. Supports the uptake of hydrogen, hydrogen-based fuels and fuel cells for inland waterways, short-sea and deep-sea shipping purposes where direct electrification is difficult; stresses the strategically essential role of multimodal maritime and inland ports as innovation pools and hubs for the import, production, storage, supply and utilisation of hydrogen, and highlights that solutions based on renewable hydrogen are of particular importance to islands and outermost regions;

11. Recalls the importance of transitional fuels for transport modes where hydrogen does not provide a cost-competitive solution yet; in this regard, stresses the potential of liquefied natural gas (LNG) and compressed natural gas (CNG) as a transitional solution, while avoiding fossil fuel lock-ins and stranded assets;

12. Underlines the need for space and investments in port infrastructure to promote the use
of new zero- and low-emission technologies on national coasts and in ports, in order to facilitate the development of the hydrogen economy and to create an industrial value chain for hydrogen along multimodal transport corridors;

13. Encourages the Commission to remove barriers and provide the necessary funding to ensure a level playing field across energy carriers in order to support decarbonisation;

14. Calls on the Commission to come up with an overall risk-based transport safety framework across Europe; highlights, as an example, that the maritime transport and inland navigation safety framework should include standardised bunkering procedures for both ship and shore, storage and ventilation on board, procedures for the safe handling and management of emergency situations and training for the personnel working with hydrogen;

15. Recalls the importance of transitional fuels for transport modes where hydrogen does not provide a cost-competitive solution yet; in this regard, stresses the potential of LNG as a transitional solution to reduce GHG emissions in the inland waterways, as well as the maritime transport sectors, as an increasing number of ships operate on LNG, which emits less CO₂, NOₓ and particulate matter than conventional marine fuels; highlights, moreover, that in the medium to long term, the vessels currently operating on and the distribution infrastructures used for LNG could be converted to use biogas, and that it will therefore be essential to scale up bio-LNG as a marine fuel; stresses the importance, therefore, of investing in potential zero-emission fuels such as hydrogen, as well as low-carbon fuels, while respecting the principle of technological neutrality;

**Rail**

16. Notes that 46 % of the main line train network is still being served with diesel technology, but that the European rail sector is developing innovative solutions to contribute substantially to the decarbonisation of land transport;

17. Stresses, in this regard, the possibility of using battery-electric and hydrogen fuel-cell trains and retrofitted diesel locomotives in those parts of the train network where direct electrification is too costly or not suitable, or where service frequencies are too low to achieve cost-effectiveness, such as on small regional lines;

18. Points out that the European rail industry is at the forefront of innovation in relation to hydrogen-powered trains; notes that such rolling stock provides an excellent alternative to the costly electrification of small regional lines for both freight and passengers, and stresses that by using clean hydrogen where direct electrification is not possible, rail can be made fully environmentally neutral;

**R&I: the development of safety standards**

19. Recalls that there are various EU financing instruments and sources which can support investment in hydrogen such as InvestEU, the new Recovery and Resilience Facility, the European Regional Development Fund (ERDF) and the Cohesion Fund, the new initiative REACT-EU and the forthcoming Connecting Europe Facility (CEF); stresses that the possibilities offered by the Just Transition Mechanism should be further explored to support investment in hydrogen; calls on the Commission to explore
synergies between the different EU programmes;

20. Underlines the need to prioritise investments in research and development, as hydrogen solutions in transport are currently still in the early stages of development; stresses that further research and innovation efforts are needed across the entire hydrogen value chain, to look into multimodal solutions, in particular as regards increasing energy efficiency and reducing costs, in order to expand and improve the use of hydrogen; emphasises the need for pre-normative research, including into the safety aspects, in addition to deployment plans and roadmaps, thereby ensuring improved and harmonised standards, security of supply and high levels of sustainability;

21. Welcomes the Commission’s intention to revise the State aid framework, including the State aid guidelines for energy and environmental protection, envisaged for 2021;

22. Supports the European Clean Hydrogen Alliance, the Renewable Hydrogen Alliance and the Important Projects of Common European Interest (IPCEIs); recalls that the FCH JU ensures synergetic collaborations with EU joint undertakings and with all stakeholders involved in the development of hydrogen applications;

23. Highlights that, in line with the external dimension of the European Green Deal, the EU and the Member States should actively promote new opportunities for cooperation on clean hydrogen and swiftly develop strategic partnerships with neighbouring and third countries, thereby helping to re-design our global energy partnerships, promote EU standards and regulations, and safeguard Europe’s strategic interests;

24. Highlights the importance of providing support to research following a technology-neutral approach based on life cycle GHG emissions and science-based sustainability criteria, in order to accelerate the transition to the next generation of decarbonised transport systems;

25. Believes that involving industry and equipping workers with adequate knowledge about hydrogen are of the utmost importance; emphasises that the safety dimension must always take priority;

26. Welcomes the European Investment Bank (EIB) Climate Bank Roadmap 2021-2025 and the possibility of combining advisory and technical assistance from the EIB Advisory Hubs and under Horizon Europe; in this context, stresses that special attention should be given to mobilising investment for the deployment of hydrogen in transport;

Recommendations

27. Notes the importance of coordination in attaining harmonised high safety standards for transport infrastructure, and calls on the Commission to clarify and highlight the synergies between the CEF Energy and the CEF Transport; insists on the creation of synergies between TEN-T and TEN-E, as well as alternative fuels strategies, leading to a phased deployment of hydrogen filling stations suitable for all vehicles and other alternative fuels along transport corridors and at strategic locations, such as at sea and inland ports, airports and train stations, implemented in existing multi-fuel areas, if possible, and accompanied by the requisite essential technical requirements and harmonised standards based on risk assessments;
28. Calls for an integration of the different sources of EU funding, combining direct co-financing under the CEF with the ERDF and the Cohesion Fund, while making full use of the private financing available, to ensure adequate integration between the TEN-T network, the hydrogen infrastructure and the transport systems and services at regional and local levels;

29. Welcomes the Commission’s intention to develop hydrogen-refuelling infrastructure in the Sustainable and Smart Mobility Strategy and the review of the Alternative Fuels Infrastructure Directive;

30. Notes that the Hydrogen Strategy does not elaborate on the significant role small and medium-sized enterprises (SMEs) play in the EU’s energy and transport value-chains; calls on the Commission to facilitate access to research and finance and to monitor the progress of SMEs by using a suitable set of key performance indicators in order to contribute to evidence-based policy making; underlines that dedicated hydrogen support tools must be accessible to SMEs in the EU;

31. Stresses that the evaluation of the environmental benefits of hydrogen in terms of GHG emissions should be linked to a precise analysis from production to usage; calls on the Commission to gather such data for the different types of hydrogen;

32. Welcomes the Commission’s initiative to revise EU energy taxation; calls on the Commission and the Council to level the playing field across energy carriers in order to facilitate sector integration, while fully respecting, and not interfering with, Member State competences in tax policy;

33. Recalls the 14 % renewable energy target set for fuel suppliers in the Renewable Energy Directive II (RED II); highlights that the application and use of hydrogen in the transport sector contributes to zero-emission solutions; calls on the Commission to clarify the role of hydrogen in RED II as soon as possible, particularly in relation to the issues of certification requirements and the potential application of multipliers, as they constitute the basis for future investments.
### INFORMATION ON ADOPTION IN COMMITTEE ASKED FOR OPINION

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| **Members present for the final vote** | Magdalena Adamowicz, Andris Ameriks, José Ramón Bauzá Díaz, Izaskun Bilbao Barandica, Marco Campomenosi, Massimo Casanova, Ciarán Cuffe, Jakop G. Dalunde, Andor Deli, Karima Delli, Anna Deparnay-Grunenberg, Ismail Ertug, Gheorghe Falcă, Giuseppe Ferrandino, João Ferreira, Mario Furore, Søren Gade, Isabel García Muñoz, Jens Gieske, Elsi Katainen, Elena Kountoura, Julie Lechanteux, Boguslaw Liberadzki, Peter Lundgren, Benoit Lutgen, Elżbieta Katarzyna Łukacijewska, Marian-Jean Marinescu, Tilly Metz, Giuseppe Milazzo, Cláudia Monteiro de Aguiar, Caroline Nagtegaal, Jan-Christoph Oetjen, Philippe Olivier, Rovana Plumb, Dominique Riquet, Dorien Rookmaker, Massimiliano Salini, Sven Schulze, Vera Tax, Barbara Thaler, István Ujhelyi, Petar Vitanov, Elissavet Vozemberg-Vrionidi, Lucia Vuolo, Roberts Zīle, Kosma Złotowski |
| **Substitutes present for the final vote** | Clare Daly, Carlo Fidanza, Marianne Vind |
# FINAL VOTE BY ROLL CALL IN COMMITTEE ASKED FOR OPINION

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<td>José Ramón Bauzá Díaz, Izaskun Bilbao Barandica, Søren Gade, Elsi Katainen, Caroline Nagtegaal, Jan-Christoph Oetjen, Dominique Riquet</td>
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<tr>
<td>S&amp;D</td>
<td>Andris Ameriks, Giuseppe Ferrandino, Isabel García Muñoz, Bogusław Liberadzki, Rovana Plumb, Vera Tax, István Ujhelyi, Marianne Vind, Petar Vitanov</td>
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<tr>
<td>5</td>
<td>-</td>
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<tr>
<td>Verts/ALE</td>
<td>Ciarán Cuffe, Jakop G. Dalunde, Karima Delli, Anna Deparnay-Grunenberg, Tilly Metz</td>
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<td>6</td>
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<tr>
<td>ECR</td>
<td>Carlo Fidanza, Roberts Zīle, Kosma Złotowski</td>
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<tr>
<td>The Left</td>
<td>Clare Daly, João Ferreira, Elena Kountoura</td>
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**Key to symbols:**
- + : in favour
- - : against
- 0 : abstention
**INFORMATION ON ADOPTION IN COMMITTEE RESPONSIBLE**

<table>
<thead>
<tr>
<th>Date adopted</th>
<th>18.3.2021</th>
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<tbody>
<tr>
<td>Result of final vote</td>
<td>+: 46</td>
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<tr>
<td></td>
<td>-: 25</td>
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<td>0: 5</td>
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**Members present for the final vote**


**Substitutes present for the final vote**

Matteo Adinolfi, Andrus Ansip, Damien Carême, Jakop G. Dalunde, Cyrus Engerer, Cornelia Ernst, Elena Kountoura, Elena Lizzi, Marian-Jean Marinescu, Sven Schulze, Nils Torvalds
## FINAL VOTE BY ROLL CALL IN COMMITTEE RESPONSIBLE

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<table>
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<tr>
<td>46</td>
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<tr>
<td><strong>PPE</strong></td>
<td>François-Xavier Bellamy, Hildegard Bentele, Tom Berendsen, Vasile Blaga, Cristian-Silviu Bușoi, Jerzy Buzek, Maria da Graça Carvalho, Pilar del Castillo Vera, Christian Ehler, Seán Kelly, Andrius Kubilius, Marian-Jean Marinescu, Eva Maydell, Angelika Niebler, Aldo Patriciello, Sven Schulze, Maria Szyraki, Riho Terras, Henna Virkkunen, Pernille Weiss</td>
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<td>25</td>
<td>-</td>
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<tr>
<td><strong>ID</strong></td>
<td>Matteo Adinolfi, Paolo Borchia, Markus Buchheit, Elena Lizzi, Thierry Mariani, Joëlle Mélin, Isabella Tovaglieri</td>
</tr>
<tr>
<td><strong>Verts/ALE</strong></td>
<td>Michael Bloss, Damien Carême, Ignazio Corrao, Ciarán Cuffe, Jakop G. Dalunde, Henrike Hahn, Ville Niinistö, Mikuláš Peksa, Marie Toussaint</td>
</tr>
<tr>
<td><strong>ECR</strong></td>
<td>Izabela-Helena Kloc, Zdzislaw Krasnodębski, Robert Roos, Jessica Stegrud, Beata Szydło, Grzegorz Tobiszowski, Evžen Tošenovský</td>
</tr>
<tr>
<td><strong>NI</strong></td>
<td>Andrea Caroppo, Clara Ponsati Obiols</td>
</tr>
<tr>
<td>5</td>
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</tr>
<tr>
<td><strong>RENEW</strong></td>
<td>Martina Dlabajová</td>
</tr>
<tr>
<td><strong>The Left</strong></td>
<td>Manuel Bompard, Cornelia Ernst, Elena Kountoura, Sira Rego</td>
</tr>
</tbody>
</table>

**Key to symbols:**
+ : in favour
- : against
0 : abstention