



TEXTS ADOPTED

P9_TA(2021)0241

A European Strategy for Hydrogen

European Parliament resolution of 19 May 2021 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

¹ OJ C 324, 1.10.2020, p. 41.

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 report of 14 October 2020 entitled ‘2020 report on the State of the Energy Union pursuant to Regulation (EU) 2018/1999 on Governance of the Energy Union and Climate Action’ (COM(2020)0950),
- having regard to the Commission communication of 17 September 2020 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 on a new industrial strategy for Europe (COM(2020)0102),
- having regard to Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources¹ (the ‘Renewable Energy Directive’),
- having regard to Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council²,
- having regard to Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure³ (the ‘Alternative Fuels Infrastructure Directive’),
- having regard to Council Regulation (EU) No 559/2014 of 6 May 2014 establishing the Fuel Cells and Hydrogen 2 Joint Undertaking⁴,
- having regard to Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009⁵ (the TEN-E Regulation),
- having regard to Regulation (EU) No 1316/2013 of the European Parliament and of the Council of 11 December 2013 establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC)

¹ OJ L 328, 21.12.2018, p. 82.

² OJ L 328, 21.12.2018, p. 1.

³ OJ L 307, 28.10.2014, p. 1.

⁴ OJ L 169, 7.6.2014, p. 108.

⁵ OJ L 115, 25.4.2013, p. 39.

No 67/2010¹, which is currently being revised,

- having regard to Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC² (the ‘ETS Directive’),
 - having regard to its resolution of 10 July 2020 on a comprehensive European approach to energy storage³,
 - having regard to its resolution of 10 July 2020 on the revision of the guidelines for trans-European energy infrastructure⁴,
 - having regard to its resolution of 15 January 2020 on the European Green Deal⁵,
 - having regard to its resolution of 28 November 2019 on the climate and environment emergency⁶,
 - 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’⁷,
 - having regard to its resolution of 25 October 2018 entitled ‘Deployment of infrastructure for alternative fuels in the European Union: time to act!’⁸,
 - having regard to its resolution of 6 February 2018 on accelerating clean energy innovation⁹,
 - 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 (A9-0116/2021),
- 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

¹ OJ L 348, 20.12.2013, p. 129.

² OJ L 275, 25.10.2003, p. 32.

³ Texts adopted, P9_TA(2020)0198.

⁴ Texts adopted, P9_TA(2020)0199.

⁵ Texts adopted, P9_TA(2020)0005.

⁶ Texts adopted, P9_TA(2019)0078.

⁷ OJ C 23, 21.1.2021, p. 116.

⁸ OJ C 345, 16.10.2020, p. 80.

⁹ OJ C 463, 21.12.2018, p. 10.

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 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 CO₂ 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 electrolyzers 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 EUR 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 hydrogen¹ 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

¹ 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.

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-, resource- 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 protection and restoration of biodiversity and ecosystems;

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 clear¹; 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 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

¹ 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 Directive¹ 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 electrolyzers and renewable hydrogen production; calls on the Commission to develop a roadmap for the deployment and upscaling of electrolyzers 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

¹ Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity (OJ L 283, 31.10.2003, p. 51).

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, focussing 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; notes that a number of fossil-based hydrogen production sites are located in the just transition territories and highlights that effective support measures should be directed at the decarbonisation of existing fossil-based hydrogen production; urges that measures aimed at the development of the European hydrogen economy should not lead to the closure of these production sites, but to their modernisation and further development, thus benefiting the regions by ensuring a locally produced sustainable energy carrier, facilitating GHG emissions reduction, and contributing to the reskilling and further employability of the local workforce;
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, electrolyzers 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 Directive (EU) 2019/944¹ and requests that they benefit from the same

¹ Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019

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) Regulation¹ 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

¹ Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU (OJ L 348, 20.12.2013, p. 1).

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 electrolyzers 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 electrolyzers 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.