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PATTERNS OF COMMUNICATION ON CLEAR HYDROGEN INNOVATION IN THE TRANSATLANTIC ENVIRONMENT

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Abstract
The potential of clear hydrogen to develop into a valuable resource in the future is becoming a growingly attractive debate topic, in the context of a targeted decarbonized economy. The present article analyses the interest that institutional and corporate actors in the European Union and the United States dedicate to this subject by assessing the comprehensiveness of the official, governmental communication and that of private actors - focusing on gas transmission companies, either producers or transporters - on the exploitation of clear hydrogen. The aim of the research is to investigate where is currently the most visible attention manifesting and whether public institutions or the private sector are more engaged in bringing about change in the near future in the field of green transition.
Keywords: *European Union, United States, clear hydrogen, communication, green transition*

DESIGN OF THE RESEARCH

The research strategy encompasses a qualitative (mainly) and quantitative analysis of the language used in public and private actors' addresses regarding the hydrogen issue. Thus, we have resorted to EU and US

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official governmental documents and a number of press releases. Also, data from reports and studies proved to be useful for statistical purposes.

BRIEF HISTORY OF THE CLEAN HYDROGEN LEGISLATION

Europe is recognized as being a frontrunner on hydrogen innovation initiatives, and other states internationally follow suit, although challenges and uncertainties remain in many cases. Both advantages and disadvantages of hydrogen exploitation are subjects of debate in the energy environment worldwide. Regulators and private actors must cooperate so that the ambitious endeavour of a green future becomes a reality.

Addressing the 21st century climate challenges, in line with its Green Deal initiative, the European Union launched in 2020 its "Hydrogen strategy for a climate-neutral Europe", with a view "towards a hydrogen ecosystem in Europe: a Roadmap to 2050". The strategy underlined policy actions in 5 directions: investment support; support production and demand; creating a hydrogen market and infrastructure; research and cooperation and international cooperation.[1]

In July 2020 the European Clean Hydrogen Alliance – bringing together public and private stakeholders in various formats: roundtables, working groups, and the electrolyser partnership – was created with the mission of deploying innovative green technologies by 2030.[2] The Sixth Hydrogen Forum has taken place on June 27, 2023, with the participation of around 700 attendants approaching topics such as the latest developments on the regulatory framework, the hydrogen economy, connecting public and private investments, the hydrogen bank.[3]

The European Hydrogen Backbone comprising thirty-two energy infrastructure operators from 25 EU member states, as well as Norway,

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[1] European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions- *A hydrogen strategy for a climate-neutral Europe*, 2020 [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0301], September 12, 2023.

[2] European Commission, *European Clean Hydrogen Alliance* [https://single-market-economy.ec.europa.eu/industry/strategy/industrial-alliances/european-clean-hydrogen-alliance_en], September 30, 2023.

[3] European Commission, *6th European Hydrogen Forum report* [6th European Hydrogen Forum report_final.pdf], September 30, 2023.

Switzerland and the United Kingdom was founded also in the summer of 2020. Bound by a shared vision, they have published a first paper for a dedicated hydrogen pipeline infrastructure in July 2020.[4]

2023 saw the adoption of a new plan to establish a European Hydrogen Bank (EHB), responsible for "a full hydrogen value chain in the EU, alongside the Net-Zero Industry Act" as Kadri Simson, EU Commissioner for Energy observed.[5] Investing three billion euros in the future hydrogen market, one of the EHB four pillar is aimed at streamlining current – European and international - financial instruments.[6] A pilot auction supported through the Innovation Fund was to open on November 23, 2023, granting up to €800 million for clean hydrogen projects developed in the European Economic Area (EEA).[7]

Taking a look across the Atlantic, the United States' first – ever National Clean Hydrogen Strategy and Roadmap was released on June 6, 2023, under the Biden – Harris Administration.[8] It was envisioned as "a strategic framework for achieving large-scale production and use of clean hydrogen, examining scenarios for 2030, 2040, and 2050". The Hydrogen Interagency Task

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[4] Amber Grid, Bulgartransgaz, Conexus et al., *European Hydrogen Backbone, European Hydrogen Infrastructure vision covering 28 countries*, 2022 [https://www.ehb.eu/files/downloads/ehb-report-220428-17h00-interactive-1.pdf], October 1, 2023.

[5] European Commission, *Commission outlines European Hydrogen Bank to boost renewable hydrogen* [https://energy.ec.europa.eu/news/commission-outlines-european-hydrogen-bank-boost-renewable-hydrogen-2023-03-16_en], September 30, 2023.

[6] European Commission, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the European Hydrogen Bank*, 2023 [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023DC0156&qid=1689756932873], September 30, 2023.

[7] European Commission, *Upcoming EU Hydrogen Bank pilot auction: European Commission publishes Terms & Conditions*, 2023 [https://climate.ec.europa.eu/news-your-voice/news/upcoming-eu-hydrogen-bank-pilot-auction-european-commission-publishes-terms-conditions-2023-08-30_en], September 30, 2023.

[8] US Department of Energy, *Biden-Harris Administration releases first-ever National Clean Hydrogen Strategy and Roadmap to build a clean energy future, accelerate American manufacturing boom*, 2023 [https://www.energy.gov/articles/biden-harris-administration-releases-first-ever-national-clean-hydrogen-strategy-and], September 30, 2023.

Force was conceived in order to facilitate a comprehensive governmental approach to the implementation of the US hydrogen strategy.[9]

Nevertheless, the potential of the most abundant chemical element in the universe had been tackled even before. In 2020, the US Department of Energy publicised the Hydrogen Program Plan – an extensive document unveiling a strategic perspective on hydrogen research, development, and demonstration (RD&D).[10]

The Infrastructure Investment and Jobs Act (or Bipartisan Infrastructure Law, 2021, in line with the objective of the so-called "Hydrogen Shot", designed to reduce the cost of clean hydrogen to $1 per 1 kilogram in 1 decade[11]) supported progress by allocating USD 9.5 billion for clean hydrogen electrolysis, manufacturing and recycling initiatives and especially for Regional Clean Hydrogen Hubs.[12] The 2022 Inflation Reduction Act (IRA) has further incentivized America's development on the path towards clean energy.

The figure below displays the level of public spending on research, development and demonstration (2018 – 2022) in different world regions including Europe and the Americas.

The Hydrogen Map created by Pillsbury Law follows the evolution of more than 200 blue and green projects around the world (some of them already operational). Western Europe and Asia Pacific were identified as drivers of the global low-carbon economy, whereas the US initiatives followed an ascendant trend.[13]

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[9] US Department of Energy, *U.S. National Clean Hydrogen Strategy and Roadmap* [https://www.hydrogen.energy.gov/library/roadmaps-vision/clean-hydrogen-strategy-roadmap], October 1, 2023.

[10] US Department of Energy, *Energy Department releases its Hydrogen Program Plan,* 2020 [https://www.energy.gov/articles/energy-department-releases-its-hydrogen-program-plan], October 1, 2023.

[11] Hydrogen and Fuel Cell Technologies Office, *DOE launches the Hydrogen Shot Fellowship*, 2021 [https://www.energy.gov/eere/fuelcells/articles/doe-launches-hydrogen-shot-fellowship], October 1, 2023.

[12] US Department of Energy, *DOE establishes Bipartisan Infrastructure Law's $9.5 billion Clean Hydrogen Initiatives*, 2022 [https://www.energy.gov/articles/doe-establishes-bipartisan-infrastructure-laws-95-billion-clean-hydrogen-initiatives], October 1, 2023.

[13] Dominic Ellis, *Hydrogen Map shows 57 projects are operational globally*, 2021 [https://energydigital.com/oil-and-gas/hydrogen-map-shows-57-projects-are-operational-globally], October 1, 2023.

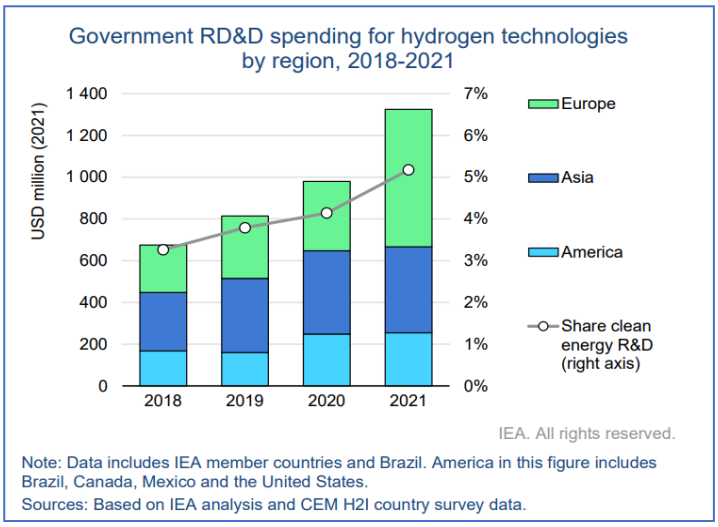

Figure 1. Government RD&D spending for hydrogen technologies by region, 2018 – 2022
Source: International Energy Agency, *Global Hydrogen Review 2022*, https://iea.blob.core.windows.net/assets/c5bc75b1-9e4d-460d-9056-6e8e626a11c4/GlobalHydrogenReview2022.pdf

A McKinsey Study entitled "Road Map to a US Hydrogen Economy' Promotes Scale-Up Activities in the Growing Hydrogen Economy" underlined that "the US is uniquely positioned to grow and lead the green hydrogen economy due to the abundant, low cost renewable energy sources needed to produce green hydrogen, including wind, solar, hydropower and nuclear."[14] However, the same company in collaboration with the Hydrogen Council, in the Hydrogen Insights 2023 remarked that over 1000 dedicated initiatives (the majority of them to be fully or partially deployed by 2030) have already been announced worldwide, most of them located in Europe.[15]

[14] Plug Power, Inc., *McKinsey study 'Road Map to a US hydrogen economy' promotes scale-up activities in the growing hydrogen economy*, 2020 [https://www.globenewswire.com/news-release/2020/10/05/2103399/0/en/McKinsey-Study-Road-Map-to-a-US-Hydrogen-Economy-Promotes-Scale-Up-Activities-in-the-Growing-Hydrogen-Economy.html], October 1, 2023.

[15] Hydrogen Council, *Hydrogen Insights 2023 An update on the state of the global hydrogen economy, with a deep dive into North America*, 2023 [https://hydrogencouncil.com/wp-content/uploads/2023/05/Hydrogen-Insights-2023.pdf], October 1, 2023.

PATTERNS OF COMMUNICATION – EUROPEAN AND AMERICAN DISCOURSE ON THE FUTURE OF HYDROGEN

The official EU discourse on hydrogen underlines the comprehensive agenda on this field and the very pragmatic strategies and punctual actions but nevertheless it states clearly the community's ambitions to take the lead in this provokative transformation and transition process. Delivering her speech at the inauguration of the European Hydrogen Week, EU Commission President said in 2021:

"Clean hydrogen will have a central place in the climate-neutral economy of the future and I am proud of Europe's role as the world's clean hydrogen trailblazer. At the beginning of this year, more than 200 new hydrogen projects have been announced globally. 55% of them are in Europe… We have to scale up clean hydrogen production, expand its applications, and create a virtuous circle where demand and supply feed each other and bring the prices down. That is the principle. This is without any doubt a global endeavour, but I want Europe to be leading the race."[16]

Discussing punctual interventions to achieve this strategic goal, von der Leyen's address approached a four-point structure; it was the case of the Hydrogen Council event on January 2021:

"Today I would like to tell you what the European Union is doing in concrete. Let me focus on four practical actions. First, we have set clear targets for cutting our emissions, and made them legally binding. We want to cut our emissions by at least 55% by 2030, on the way to climate neutrality by 2050. (…) Second, we are investing in clean hydrogen like never before. Our recovery plan, called NextGenerationEU, is worth 750 billion euros. (…) Third, we are changing the rules of the game to facilitate the deployment of clean hydrogen. (…) For instance, last month we proposed a revised regulation for the Trans-European Networks for Energy. (…) And fourth, we have created a new alliance with the private sector. Our success will depend entirely on cooperation with companies like yours. This is why we have launched the European Clean Hydrogen Alliance. And I am glad that over one thousand companies have already joined it."[17]

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[16] EU Commission Press, *President von der Leyen opens the European Hydrogen Week* [https://www.pubaffairsbruxelles.eu/eu-institution-news/president-von-der-leyen-opens-the-european-hydrogen-week-eu-commission-press/], August 11, 2023.

[17] European Commission, *Speech by President von der Leyen to the Hydrogen Council*, 2021 [https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_21_158], August 11, 2023.

We must retain powerful expressions like "leading the race", "changing the rules of the game", that keeps us aware of the EU's ambition to set the norm when it comes to green energy based on hydrogen use.

The most recent State of the Union (SOTEU) address dating from September 13, 2023 accounted for another occasion when the European Commission prompted, in a competitive paradigm, the Union's imperative of being the trend setter: "From wind to steel, from batteries to electric vehicles, our ambition is crystal clear: The future of our clean tech industry has to be made in Europe"; (…) "In the last five years, the number of clean steel factories in the EU has grown from zero to 38. We are now attracting more investment in clean hydrogen than the US and China combined."[18]

Back in 2020, First Vice President of the European Commission, Frans Timmermans, former European Commissioner for Climate Action, also remarked that "in developing and deploying a clean hydrogen value chain, Europe will become a global frontrunner and retain its leadership in clean tech".[19]

On the same note, in a vivid competitional spirit, the American official discourse also pointed out the US' objective of taking the lead in the newly emerging hydrogen industry: "Ensuring America is the global leader in the next generation of clean energy technologies requires all of us — government and industry — coming together to confront shared challenges, particularly lack of market certainty for clean hydrogen that too often delays progress. That's why DOE is setting up a new initiative to help our private sector partners address bottlenecks and other project impediments — helping industry unlock the full potential of this incredibly versatile energy resource and supporting the long-term success of the H2hubs"[20], to quote the U.S. Secretary of Energy Jennifer M. Granholm.

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[18] European Commission, *2023 State of the Union address by President von der Leyen*, 2023 [https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_23_4426], September 14, 2023.

[19] European Commission, *Powering a climate-neutral economy: Commission sets out plans for the energy system of the future and clean hydrogen*, Brussels, 2020 [https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1259], October 1, 2023.

[20] US Department of Energy, *Biden-Harris Administration to jumpstart clean hydrogen economy with new initiative to provide market certainty and unlock private investment*, 2023 [https://www.energy.gov/articles/biden-harris-administration-jumpstart-clean-hydrogen-economy-new-initiative-provide-market], September 29, 2023.

Pointing to the Inflation Reduction Act of 2022 signed by incumbent US President Joe Biden, in an interview for Albuquerque Journal Alex Greenberg, director of the state Economic Development Department's Science and Technology Office, argued: "Up to now, Europe has had more of a head start in pursuing the transition to hydrogen. But with the IRA, the U.S. has real potential to become the global leader."[21]

While research is still ongoing and national hydrogen strategies started to take shape in various EU countries, thematic presentations of different energy operators in Europe (reunited under the umbrella of the European Hydrogen Backbone[22]) underlined the significant, competitive potential of green hydrogen exploitation and the possible emergence of so-called "hydrogen valleys": "(…) hydrogen and power-to-X production has significant potential in Finland" (Gasgrid, Finland), "Hydrogen is considered alongside electricity as a prerequisite for Europe's ability to act and compete in the 21st century." (Ontras, Germany), "Connecting the Baltic region with Central Europe with an onshore or offshore pipeline would enable Europe to increase its energy self-sufficiency and energy security" (Elering, Estonia), "To connect future markets with production centers, EUSTREAM plans to dedicate one or more of its main transit pipelines only for transport of 100% hydrogen." (EUSTREAM, Slovakia), "Spain's long-term ambition is to be one of the main hydrogen suppliers in Europe" (Enagas, Spain), "To ensure that hydrogen is developed to its full potential, there must be a defined perspective towards the development of a well-interconnected European hydrogen market over time (…) In Western Romania, the interconnection with Serbia is also envisaged for 100% hydrogen use." (Transgaz, Romania), "(the Transitgas pipeline) it is therefore an ideal partner to ensure the necessary imports from outside Europe and more specifically from North Africa"(FluxSwiss, Switzerland).

Paul Epstein, a partner for Shearman and Sterling (a multinational law firm headquartered in New York City) noted that "both public officials and

[21] Kevin Robinson-Avila, "Federal incentives accelerate New Mexico's hydrogen economy", *Albuquerque Journal* [https://www.abqjournal.com/news/local/federal-incentives-accelerate-new-mexicos-hydrogen-economy/article_95be467b-cb05-5c66-82db-108cf3dd9333.html], September 29, 2023.

[22] Amber Grid, Bulgartransgaz, Conexus et al., *European Hydrogen Backbone, loc. cit.*

industry recognize the important role hydrogen could play in the decarbonization of the U.S. economy."[23]

American oil and gas companies convinced of the potential that hydrogen can have in the future, also addressed the topic, including from an international perspective, and we have selected several examples in this regard: "Renewable hydrogen will play a pivotal role in the energy system of the future and this project (i.e. Holland Hydrogen I, Europe's largest renewable hydrogen plant to come operational in 2025) is an important step in helping hydrogen fulfil that potential." (Anna Mascolo, Executive Vice President, Emerging Energy Solutions at Shell[24]); "Chevron believes in the value of delivering large-scale hydrogen solutions that support a lower carbon world. We aim to deliver lower carbon energy to a growing world by creating a profitable, large-scale, lower carbon hydrogen business that builds on our existing assets, capabilities, and customers."[25] (Chevron, California); "By helping to activate new markets for hydrogen and carbon capture and storage, this project (i.e. a hydrogen production plant and one of the world's largest carbon capture and storage projects, developed at Baytown, Texas), can play an important part in achieving America's lower-emissions aspirations."[26] (Joe Blommaert, president of ExxonMobil Low Carbon Solutions).

We remarked that the language in the companies' presentations appeals to contextualization, examples, epithets, assessments (of the status quo) and predictions (including timeframes) such as in the following syntagma: "it is expected that", "would also be possible", "a possible scenario assumes that", "a vital role is foreseen".

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[23] Paul Epstein, *Hydrogen's present and future in the US energy sector*, 2021 [https://www.shearman.com/perspectives/2021/10/hydrogens-present-and-future-in-the-us-energy-sector], October 1, 2023.

[24] *Shell to start building Europe's largest renewable hydrogen plant*, 2022 [https://www.shell.com/media/news-and-media-releases/2022/shell-to-start-building-europes-largest-renewable-hydrogen-plant.html], October 1, 2023.

[25] Chevron new energies, *Accelerating lower carbon solutions* [https://www.chevron.com/operations/new-energies], October 1, 2023.

[26] *ExxonMobil planning hydrogen production, carbon capture and storage at Baytown complex*, 2022 [https://corporate.exxonmobil.com/news/news-releases/2022/0301_exxonmobil-planning-hydrogen-production-carbon-capture-and-storage-at-baytown-complex], October 1, 2023.

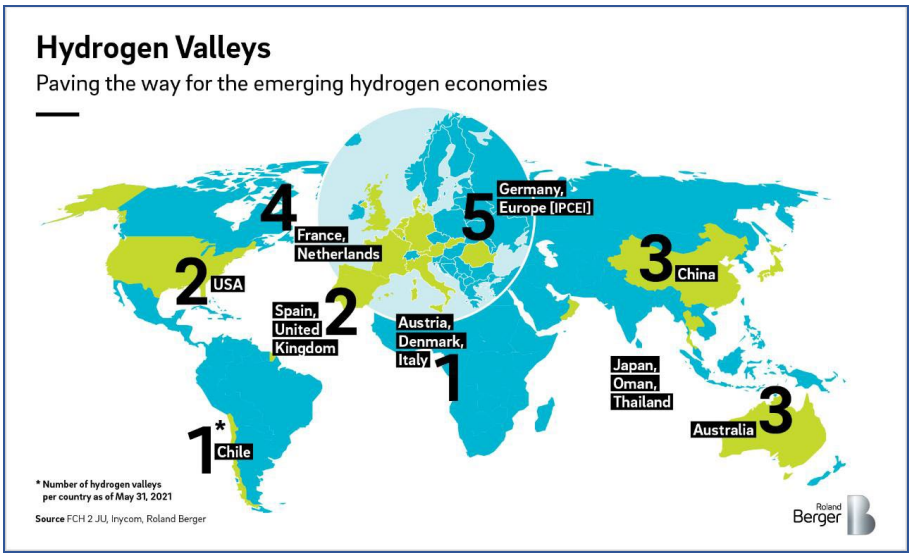

Figure 2. Hydrogen valleys
Source: Uwe Weichenhain, *Hydrogen Valleys: first elements of the new hydrogen economy* https://www.rolandberger.com/en/Insights/Publications/Hydrogen-Valleys-first-elements-of-the-new-hydrogen-economy.html

A QUANTITATIVE APPROACH TO LANGUAGE

The hydrogen strategy for a climate-neutral Europe (24 pages, 9632 words exclusive of footnotes), launched in 2020, makes use of words and phrases like: "hydrogen" – 322 times, "strategic" – 17, ("strategic vision", "strategic roadmap", "strategic objective", "strategic element", "Strategic Forum", "strategic interest", "strategic investments"), "potential" – 14, "public" – 9, "private" – 8, "global" – 8, "long term" – 5, "priority" – 5, "leadership" – 4.[27]

Also, for statistical purposes, we have resorted to a WordCounter application and the results showed that the most frequently used words in the Strategy are: hydrogen (322 times), renewable (91), EU (80), production (77), energy (73), gas (49), support (44); among the most common trigams (i.e. three-word phrases) in the document we found: "renewable and low-carbon" (16 times), "research and innovation" (14), "the Commission will" (14), "greenhouse gas emissions" (13), "clean hydrogen alliance" (8).

For comparison, the 2023 US Clean Hydrogen Strategy and Roadmap (99 pages, 24.343 words, exclusive of figures, tables and bibliography) unveils the preference for the aforementioned words as follows: "hydrogen" – 1258,

[27] European Commission, *A hydrogen strategy for a climate-neutral Europe*, *loc. cit.*

"potential" – 93, "long term" – 37, "global" – 35, "public" – 25, "strategic" – 20 times, "private" – 19, "priority" – 7, "leadership" – 5.[28]

A simple percentual calculation revealed that, in some cases, the selected words appear in a larger percentage in the US Strategy compared to the EU document, sometimes approaching to double. Additionally, we observed that "hydrogen" and "potential" represent the two most used words in both strategies, whereas at the other side of the spectrum there are to be found the concepts of "priority" and "leadership", considering our limited words' selection. Nevertheless, this is not a counterargument for the EU's assertiveness in securing a leading position onto the future of green hydrogen.

THE CASE OF ROMANIA

The potential of hydrogen is actively debated in Romania, too. A recent example refers to the 2023 edition of the Central European Natural Gas Congress, organized by Transgaz in Sibiu, on 27-29 September. The event was attended by both public and private entities from Central and South-East Europe and addressed topics of high actuality among which the diversification of natural gas supply sources and transmission routes in Central, South Eastern Europe and the Balkans, medium and long-term usage of natural gas as part of the European energy mix, financial support for the development of gas infrastructure in the aforementioned regions, new digital technologies in the energy industry, hydrogen as a long-term and large-scale energy carrier.[29] The first edition of the Congress took place in 2022 in Slovakia.

The Romanian national gas transmission company Transgaz is one of the actors currently involved in a pilot project (ROHYD) of studying the injection of hydrogen into natural gas pipelines. Efforts are based on the company's collaboration with third parties, such as Romanian research institutes and energy universities. On the international side, Transgaz has initiated and signed in April 2022 a MoU with TSOs from Slovakia (EUSTREAM), Hungary

[28] US Department of Energy, *US National Clean Hydrogen Strategy and Roadmap* [https://www.hydrogen.energy.gov/clean-hydrogen-strategy-roadmap.html], September 14, 2023.

[29] Transgaz Communication Department, *Transgaz organized in Sibiu the 2023 edition of the Central European Natural Gas Congress in Central, South-East Europe and the Balkans*, 2023 [https://www.transgaz.ro/sites/default/files/Release%2029.09.2023_0.pdf], October 1, 2023.

(FGSZ) and Poland (GAZ SYSTEM) aimed at sharing expertise on the issue of blending hydrogen with natural gas.[30]

Romania has adopted a Law on hydrogen on June 20, 2023 and its national strategy on hydrogen was subjected to debate, as announced by former Energy minister, Virgil Popescu.[31]

CONCLUSIONS

Analysing speeches of different institutional and corporate entities on the subject of future hydrogen usage as well as the EU's and the US' dedicated strategies we can conclude that both the public and the private sector are interested in exploring the industrial potential of hydrogen with a view to achieve ambitious, strategic environmental goals by the next decades.

Especially the institutional discourse unveiled a competitive paradigm of exposing results or prospects for the future, the leading position in the clean tech innovation being disputed between the Europe and America, though the former is still rejoicing an advantage in terms of number of proposed projects and financial investments. A number of key expressions in public addresses characterize the competitional spirit.

Hydrogen will continue to attract the attention of a variety of stakeholders as research on its potential goes on but there are still questions to be answered while advantages and disadvantages are being calculated and calibrated.

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[30] Transgaz, *Company presentation* [https://www.transgaz.ro/en/about-us/company-presentation/company-presentation], October 1, 2023.

[31] Afrodita Cicovschi, *Legea privind Hidrogenul a fost adoptată: Producția va fi de 288,8 mii tone,* 2023 [https://adevarul.ro/economie/strategia-nationala-pentru-hidrogen-a-fost-2277167.html], October 1, 2023.

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