IEA support to reduce EU dependence on Russian fossil fuels

Workshop Summary: **Rolling out cross-border hydrogen trade for the European Union**

30 June 2022

International Energy Agency

1. Introduction and background

On 30 June 2022, the IEA convened a virtual workshop under **Output 3: Roll-out of renewable and fossil-free hydrogen** as part of the project **IEA support to reduce EU dependence on Russian fossil fuels** initiated by the Directorate-General for Structural Reform Support (DG REFORM) together with the Directorate-General for Energy (DG ENER).

The workshop convened **79 government representatives from 22 countries** to discuss the practical aspects of scaling up hydrogen trade in support of European Commission ambitions, as set out in the REPowerEU Communication published on 18 May 2022.

The workshop convened international experts to answer governments' questions on four critical questions with near-term importance for policy:

1. In what sectors can hydrogen displace large amounts natural gas and other fossil fuels in a hurry?
2. How quickly can significant quantities of hydrogen and hydrogen-based fuels be imported, and in what configurations?
3. What policies are still needed to enable investments in low-emissions hydrogen supply for export within or to the EU?
4. How will the necessary EU infrastructure for trading hydrogen get built and on what terms?

The workshop was designed to cover the strategic and practical aspects of these policy questions, and also direct decision-makers to further technical resources.[1] The guiding principle was to find authoritative expert speakers on each question – from government, industry and the research community – who could clarify the state-of-the-art and provide a unique forum for the audience to ask airising policy questions.

Section 2 of this summary presents the context for the proposed acceleration of the EU's hydrogen sector. Sections 3-7 highlight notable messages from speakers to policymakers during these four workshop sessions. Across the sessions, several themes were particularly salient:

A. Moving from almost no demand for low-emissions hydrogen in the EU today to 20 million tonnes per year (Mt H_2/yr) is a huge challenge, but it is the right ambition for member states in the current context. In some key sectors – refining, fertilisers, shipping, steel – companies are ready to move to the next scale of projects above 0.015 Mt H_2/yr. The introduction of new instruments, such as IPCEI, was praised, but

[1] Certain technical topics that are well covered elsewhere were not included within the workshop scope, including: technologies for producing and trans-forming hydrogen; the methodologies for certifying hydrogen's environmental credentials; economics of hydrogen production from local renewables; and onshore hydrogen pipeline network requirements.

project developers are impatient for more clarity on regulation and support instruments before investing.

B. Hydrogen imports to the EU will not happen in time for winter 2022, but there are many projects that are well-developed and aiming for operation soon after 2025. To secure supplies to the EU, strong partnerships and contracts will need to be developed quickly, between governments and along the value chain.
C. To bring enough large projects online by 2030, major investment decisions must happen by 2025. It is important for all member states to explore how existing EU funding and financial instruments can help achieve this goal, especially for infrastructure. If everyone waits for costs to fall instead of cooperating to build the first wave of large projects, then the second wave of cheaper projects may never arrive.
D. Offtake (contracts for guaranteed purchases of low-emissions hydrogen) must be nurtured at the same scale and pace as projects for hydrogen production, especially for cross-border trade. Ensuring interoperability of standards for the environmental impacts of hydrogen so that cargoes can secure ten years or more of offtake in the EU is a key near-term task for governments. Some speakers expressed an opinion that if stringent EU criteria for hydrogen to be produced only from "additional" renewables capacity were applied to imports then this would slow the pace of scale up to 2030.

In advance of the workshop, the IEA produced a background paper and held a consultation call to hear from EU member states about the areas in which they seek information and guidance. All invited countries were offered the chance to submit questions for the workshop speakers in advance by email or via the workshop registration page. Several registrants took the opportunity to send questions, which were shared with speakers to ensure that the answers would be as useful as possible. This note summarises the workshop proceedings and conclusions.

The workshop was opened by Tim Gould (IEA Chief Energy Economist) and Kaspar Richter (Head of Unit for Sustainable Growth and Business Environment in the European Commission's Directorate-General for Structural Reform Support). Tim Gould placed the workshop within the context of the pressing energy policy decisions facing EU member states before winter and how they are supported by this series of IEA practical workshops under a Technical Support Instrument for Member States on REPowerEU. Kaspar Richter provided a clear reminder of the background to the workhop from the European Commission perspective: the critical priority of phasing out EU dependence on Russian gas, oil and coal, and the need for cross-border hydrogen trade to reach that goal this decade.

The workshop was conducted under Chatham House rules. Statements in this summary are therefore not attributed to individual external speakers.

2. The context for faster roll out of hydrogen trade

The REPowerEU Communication from the European Commission envisages a rapid scale up of the role of hydrogen to 2030, in particular as a substitute for imported natural gas and oil. The stated plan is to enter the 2030s with 250 bcm less natural gas demand in the EU compared with 2020; a 60% reduction. On 30 May 2022, the European Council agreed to ban seaborne imports of crude and oil products from Russia by early 2023. The proposed level of ambition for hydrogen to meet these goals goes beyond the 10 Mt H_2/yr from renewable electricity that was included in the Fit for 55 package in 2021, doubling it to 20 Mt H_2/yr consumed within the EU by 2030. Of this, 10 Mt H_2/yr are foreseen to be imported from third countries.

When hydrogen is produced without using natural gas and is used in applications that would otherwise have used natural gas, overall natural gas demand is reduced. Today, most of the 7 Mt H_2/yr of hydrogen demand in the EU is met by reforming of natural gas and this produces significant CO_2 emissions. The main form of hydrogen production that would be compatible with EU climate goals and avoids natural gas inputs involves electrolysing water with renewable or nuclear electricity. Low-emissions electrolysis hydrogen can contribute to reducing natural gas demand and enhancing EU energy

security.[2,3] If it is used in the transport sector or the European steel sector, it can also displace oil and coal demand, respectively.

Various factors will determine the extent to which low-emissions electrolysis hydrogen can soften the impacts of high energy prices in the near-term, or bolster EU energy security while reducing greenhouse gas emissions in the period to 2030.

Given that global hydrogen production from low emissions electricity currently stands below 0.025 Mt H_2/y, the pace of scale-up to meet the targets is very ambitious. More than previous policy documents, REPowerEU puts the focus on *projects* rather than *potential* or *net-zero requirements*. Factors including supply chain readiness, technological performance, permitting, skills, insurance and market conditions will strongly influence the speed with which investment flows to projects and projects begin construction and enter operation.

For example, it will require a coordinated sequence of major infrastructure projects, each of which might consist of a value chain including renewable electricity generation (with individual plants of 1 GW or more), new equipment for accommodating hydrogen in end-uses (thousands of tonnes per year at a time), hydrogen production, hydrogen transport and hydrogen storage. To bring that full value chain online by 2030 will likely require all the conditions to be in place for the first investment decisions by 2026 at the latest. For many projects, a pathway that minimises risk might involve stepwise expansion to 1 GW, starting with around 100 MW (approximately 0.015 Mt H_2/yr). If so, the first stages may need to start construction within two years from now. For that to happen, a swathe of administrative relationships will need to be finalised in a way that does not put projects at risk from future updates and improvements, including safety regulations, certification systems, insurance products, contracts for operational support, offtake contracts, permits and technical guarantees.

Another implication of the REPowerEU targets for hydrogen is that all member states will need to take critical decisions in the coming year or two. The targets are out of the reach of a small number of leading EU member states acting alone. Reaching 20 Mt H_2/yr would require almost all EU member states to make significant investments within their borders, and also create the conditions for investments in hydrogen supply from outside.

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[2] Some useful definitions of terms can be found in the workshop background paper.

[3] Interactions with the electricity grid, whether direct or indirect, can affect the total amount of natural gas demand displaced by low-emissions electrolysis hydrogen. For example, if the renewable electricity comes from plants that could otherwise have fed into the grid to directly displace gas-fired power plants, the impact will be lower. Likewise, if power is taken from the grid at peak times it could lead to additional dispatch of gas-fired generators. The EU Renewable Energy Directive under discussion suggests ways of mitigating these issues.

Rapid deployment of this scale means creating the conditions for trade: between EU countries, between sectors, and from overseas to the EU. Trade allows regions with the best resources, the most advantageous economics or a head-start in policy development to take a lead in stimluting hydrogen supply, while other market participants focus on creating demand. Reaching millions of tonnes of low-emissions hydrogen per year cannot be achieved only with projects that have integrated value chains, nor is it likely to be achievable without importing hydrogen or hydrogen-based fuels from regions with plentiful renewable resources and which can share the task of ramping up infrastructure investment. Key outstanding questions for all countries, and for the European Commission, relate to the necessary elements of policy package that can unlock investment in new hydrogen supply and distribuition infrastructure in the EU and overseas.

The 2021 *"Fit for 55" package* already sets out proposals for reaching roughly 5.6 Mt H_2 use in EU industry (displacing gas) and 5 Mt H_2 use in transport (displacing oil), including a target for 50% renewable-sourced hydrogen in industry's hydrogen consumption and 2.6% in transport fuel demand by 2030. It also includes 0.7% synthetic aviation fuels in aviation fuel demand by 2030, 6% lower GHG emissions for ships at EU ports, a zero minimum tax rate for sustainable fuels and a proposal for a carbon border adjustment mechanism (CBAM).

3. In what sectors can hydrogen displace large amounts natural gas and other fossil fuels in a hurry?

The session focused on existing projects and corporate decisions that are at the forefront of building out hydrogen value chains in Europe. Speakers from the oil refining, fertiliser, shipping and steel sectors described the strategic reasons for their investments in electrolyser projects and the challenges they have had to overcome.

Each speaker made a strong case for why their sector could provide the demand to absorb several Mt H_2/yr of low-emissions hydrogen supply this decade. They each described their project plans and their strategies as going further than what is currently supported by policy and regulation. In each sector, companies active at the forefront of hydrogen development are making decisions in the absence of clear regulatory guidance and in many cases, policy is having to catch up with their ambition.

A key issue for companies is the need to bring costs down if hydrogen supply is to be a profitable future business. To bring down costs, "you just need to start building stuff, preferably starting small and gradually increasing the size" to gigawatt scale. The technology is mature enough to get started, but if everyone waits for costs to fall instead of cooperating to build the

first-mover projects, then the second wave of cheaper projects may never arrive. Companies and governments will quickly need to negotiate win-win options for economic support that reduces early phase risks for first-movers by enough to trigger investments.

The messages for policy makers were:

- Creating certain demand is key. Stimulate demand from sectors that can absorb new hydrogen supplies into existing facilities. Focus on uncomplicated value chains. Sectoral emissions reduction targets could be helpful to give certainty to frontrunner companies with corporate emissions targets that want to invest.
- Look for associated benefits of moving from natural gas to hydrogen. For example, the oxygen that is co-produced with hydrogen by electrolysers can replace the need to buy oxygen to reach high temperatures for industrial heat. In addition, an onsite electrolyser with hydrogen storage for heating industrial processes can typically be operated flexibly to benefit power grids and can be integrated into district heating systems.
- The shipping sector can relatively easily absorb ammonia or methanol fuel made from hydrogen as it turns over its fleet, but large container ships only need to refuel once for each long round-trip and so Europe will compete with other regions that could bunker hydrogen more cheaply. The steel sector can use hydrogen in blast furnaces, but this replaces coal, which is less of a priority than replacing natural gas; shifting from blast furnaces to “direct reduced iron” could increase natural gas demand in the near-term and lead to the loss of primary steel production in the longer-term to regions with low-cost hydrogen.
- At the vanguard, industry is ready to move to the next scale of projects above 100 MW and investment decisions must happen soon if they are to operate by 2025 or soon after. Whereas today’s projects are not in line with companies’ normal economic investment criteria, going up in scale means having a more favourable policy environment. Key proposed elements like IPCEI or carbon-contracts-for-difference (CCfD) will delay investments if they are not formalised soon. For meeting the 2030 target, a policy and regulatory environment that supports major investment decisions must be in place in all EU countries by 2025.
- Don’t’ forget to account for the costs of ensuring smooth hydrogen supply when integrating into a process that traditionally has round-the-clock operation. This can be done by maintaining some existing fossil-based hydrogen supply or investing in storage onsite.
- For the scale of expansion envisaged for 2030, permitting of renewables and infrastructure (including pipelines and storage) could become a challenge and governments could anticipate that now.
- For ammonia use for shipping, regulations around safety remain unaddressed. However, as ammonia-fired ships are only likely to be commercially available towards the end of the decade, they should not be a major bottleneck.

- Not all quick-win opportunities are large-scale projects: high-temperature industrial heat (e.g., for steel finishing) can be made a low-risk investment at many sites.

4. How quickly can significant quantities of hydrogen and hydrogen-based fuels be imported, and in what configurations?

The session heard about how quickly corss-border hydrogen trade could realistically scale up from speakers with direct experience of developing hydrogen import and export strategies. All speakers stressed the need to find synergies between renewable resources and existing infrastructure to keep costs down.

The messages for policy makers were:

- Imports will not happen overnight, and so this option should be considered within the context of the 2025-2030 target rather than the 2022 winter. However. there are many projects that are well-developed and looking for the right financing conditions to invest.
- Some of these projects on the supply side are not fixed to a specific export route. Whether they partner with European users or Asian user will be influenced by the regulatory requirements and availability of long-term contracts.
- Financing will play a role in determining how many projects go ahead, and governments could think about soft loans and concessional finance, including export credit finance that recognises that much of the equipment for overseas projects could come from Europe.
- Offtake (guaranteed customer contracts) must be nurtured at the same scale and pace as supplies of low-emissions hydrogen for export. Currently exports are receiving more attention than users. Another area where there is a potential mismatch is in the manufacturing capacity for key pieces of equipment and the ambitions of major export project developers for 2030.
- The option that has the lowest potential costs is blending hydrogen into natural gas pipelines from Northern Africa, taking advantage of the short distance, high solar reseource and existing infrastructure and commercial relations. 5% hydrogen (by volume) can be transported without any challenge and member states can already introduce the secondary legislation to allow blending, including modalities for guarantees of origin that are compatible with the EU ETS. However, for imports, the infrastruture for producing renewable electricity and hydrogen on the African side will take some years and may need financial and political support.
- To import significant amounts by pipeline, the approach would be to convert individual pipelines one-by-one to 100% hydrogen, as the current import corridors for natural gas

are composed of up to five parallel lines. For the corridor connecting southern Italy to Algeria through Tunisia, 2 Mt H_2/yr of hydrogen may be feasible to transport in 2030.

- Significant investments in port infrastructure will be necessary, but Europe already has major import terminals for energy that provide a world-class physical foundation. The thing that gives port investors more concern is the lack of harmonised certification for hydrogen products so that exporters and importers can have comfort that there will be long-term demand for the cargoes.
- Unlocking a small number of large import corridors and ports may require cross-border cooperation within the EU to faciltate distribution of the imported products to users in adjacent countries. This is expected to be important to aggregate demand for imports (as well as local production) across Germany, the Netherlands and Belgium.
- International cooperation will be key. This is a core finding from Japan's work since 2014 to build up international hydrogen supply chains. Japan has learned a tremendous amount about the barriers to be addressed by working with countries on projects over the last eight years.
- The larger project developers who are looking to export 0.5 Mt H2/yr or more of hydrogen by 2030 are mostly focusing on ammonia as the transport molecule of choice. They calculate that ammonia shipped from the best locations can be competitive with fossil fuels in Europe this decade. Ammonia is well understood technology, handling and transport can be easily managed with existing experience and there are well over 100 ports with ammonia terminals today. There is also large-scale demand for ammonia in applications where it does not need to be turned back into hydrogen first (fertiliser, shipping fuel or power plants) and which do not have other clear options for full decarbonisation. Finally, today's natural gas prices have made ammonia a much more expensive commodity, which narrows the financing gap significantly for low-emissions hydrogen routes.

5. How will the necessary EU infrastructure for trading hydrogen get built and on what terms?

This session focused on the critical elements that would need to be in place for investors to make available the billions of euros that will be needed for key supply chain infrastructure such as port equipment, electrolyser factories and pipelines.

The messages from the speakers for policy makers were:

- Investing in the hydrogen supply chain will not be qualitatively different from that of natural gas, but there are more contracting parties who will need to invest, and each will be looking for contracts that will be in place for around 20 years. Up to seven such contracts may need to be signed to get one value chain off the ground, from renewable

electricity capacity to final hydrogen user. Finding ways to minimise this number in the early days will be key.

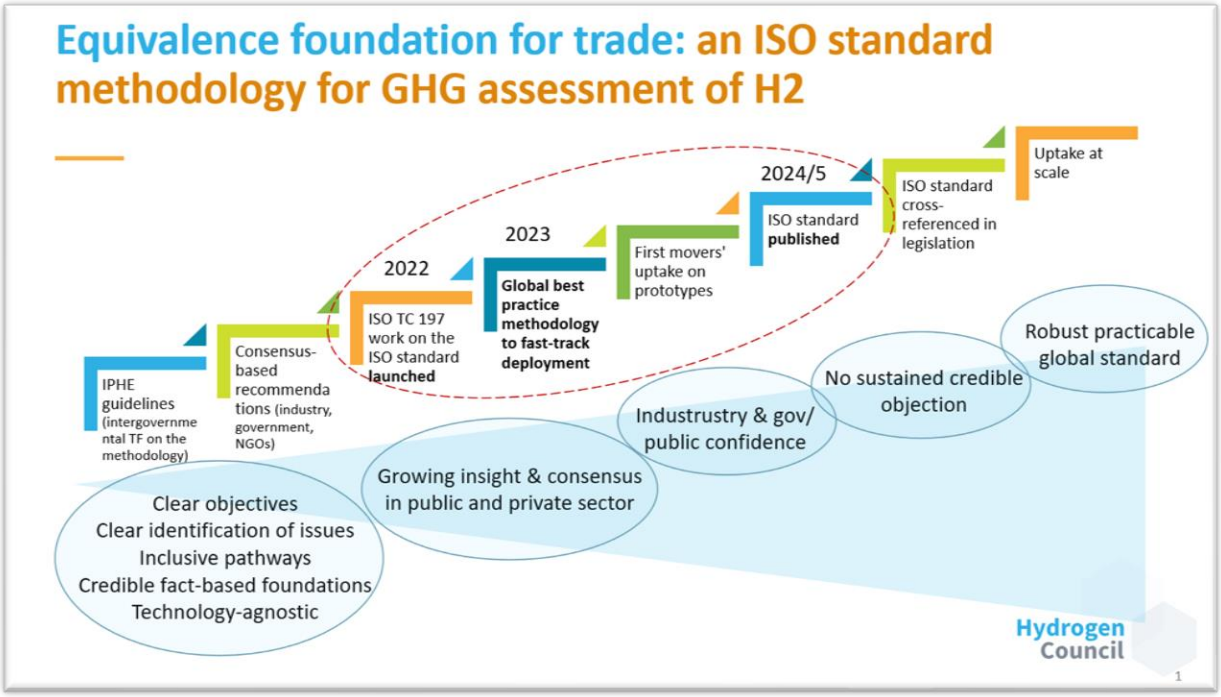
- In addition, whereas LNG commanded a small price premium over oil and pipeline gas that was tolerable due to its favourable qualities, hydrogen may suffer from a high premium for a technically less attractive product.
- In the early days of LNG contracting the good credit ratings of the offtakers (usually state-owned utilities) were very important. Compared to these utilities, potential industrial offtakers of hydrogen do not have such excellent credit ratings or certainty about their long-term business prospects.
- Quotas for low-emissions hydrogen in end-use sectors that rise into the future may be more useful for underpinning investment in long-lived infrastructure than economically sophisticated instruments like CCfDs. This is because the CCfDs may not have long enough durations unless they run for 15-20 years.
- Tackling the current situation may require projects that are not necessary the cheapest on paper but are the easiest to deliver and reduce natural gas demand this decade. For example, the promoters will push to bring the planned ammonia import terminal in Germany online by 2026, with cargoes further distributed by rail, even if that does not represent the most competitive long-term vision.
- Governments should seek to understand how price formation will emerge for hydrogen and whether it will be based on the fixed capital costs (which would be reliable and attractive) or indexed to inflation and the opportunity costs of selling the electricity for other uses.
- For complex projects, governments could act as market makers, signing early contracts between suppliers and users of hydrogen in different jurisdictions. This has the potential to significantly reduce the risks for investors in project developers on both sides of the trade, thereby facilitating faster scale up and purely commercial contracting thereafter. H2Global, launched by Germany is currently working on such a model, and it is open to hydrogen trade projects in all EU member states and overseas.
- EU funding and financial instruments of which member states should be aware include:
  - Connecting Europe Facility (grants for studies and works of cross-border importance), the scope of which has been extended to include electrolysers
  - Innovation Fund (grants for capex and opex for commercial demonstration, especially in in industry)

6. What policies are still needed to enable investments in low-emissions hydrogen supply for export within or to the EU?

This sesssion raised a number of final considerations about remaining needs for regulation, standardisation and policy support.

The messages from the speakers for policy makers were:

- Safety standards for hydrogen in industrial applications are well developed, and the recent work has been around how to transfer this to the energy sector. For the mobility sector the standards are now well aligned and mature. This still needs to be replicated for other end-users such as the power sector, light industry or buildings.
- Different jurisdictions globally are developing standards for labelling the greenhouse gas emissions impacts of hydrogen supply. These standards appear to be incompatible, which project developers say is putting a brake on investment. Among these standards, those proposed by the European Commission are the most well aligned with the 2050 needs for net-zero, but also the most restrictive for first-movers this decade. Some industry representatives would prefer technology agnostic standards based on emissions only.
- Even if there were consensus, the process of publishing a standard takes time. For the standard on greenhouse gas emissions accounting that has been in development for the past year, it will likely only become an ISO standard in 2025 and see wide adoption after that.
- Delays in publishing regulation and standards will result in delays to investment decisions. The first-mover project developers are seeking certainty for their projects, but understand that regulations will need to evolve for future projects based on experience. Project developers are particularly keen for uncertainties in current drafts of legislation to be addressed in ways that do not add risk, including additionality requirements for renewable power and calculations of effective subsidies for existing power plants that could exclude them from some renewable hydrogen accreditations.
- The SDE++ system in the Netherlands has already built-up significant experience with CCfD-type models and the Dutch government would welcome enquiries from other EU member states so they can share their knowledge. Over time, SDE++ system has evolved in terms of eligibility and contract terms to adapt to the realities of project developers.



7. Conclusions

Among the many insights shared during the 4.5 hour event, there was a notable sense of optimism from some companies that have invested in Europe's biggest electrolyser projects so far. These projects, at 10-20 MW, are in sectors with existing demand for hydrogen, secure demand for their final products this decade and an ability to integrate electrolytic hydrogen by varying hydrogen supplies from fossil fuel sources. Sectors such as fertiliser manufacture, refining, shipping and steel production (including steel finishing) are each targeting expansion to 1 Mt H_2/yr or more of hydrogen demand in Europe by 2030. However, speakers also conveyed a perception that some of these company plans are running ahead of the policy process, which still needs to iron out details. The most important policy work highlighted by participants is likely to be on certification of hydrogen's environmental credentials and creation of demand for low-emissions hydrogen. Sectors that currently use hydrogen in the EU have only very limited economic incentives to switch to a hydrogen source that they expect to be more expensive in the medium term, and in total this existing demand represents less that one third of the REPowerEU target.

Throughout the event, speakers shared the state of the art and latest thinking on how to unlock investment decisions for large projects of 1 GW or more by mid-decade. A role for policy was identified in coordinating the multiple contracts that will need to be aligned and standardised through the value chain if projects for hydrogen supply, transport, storage

and use are to go ahead in parallel. There are some opportunities to re-use existing infrastructure, but new pipelines, storage facilities and port terminals will certainly be needed. Aside from the most straightforward value chains in which a captive electrolyser can be installed at a European industrial site, these considerations apply to nearly all configurations of projects. When thinking about international trade into the EU, even the use of pipelines, which is perhaps the most straightforward route to achieve one hundred thousand tonnes of hydrogen, faces technical and investment hurdles. In addition, there were strong reminders that the challenge is international: Australia, Japan, the Middle East and South America all have projects with international consortia that are looking for the most secure opportunities to conclude trade deals.

Looking at the projects seeking investment it is clear that no single molecule will attract all the capital. While ammonia is currently the most favoured for seaborne trade, potential exporters see a range of possibilities for moving up the value chain to fertilisers, sponge iron or even electricity. However, efforts are well underway to establish partnerships between regions, with the Port of Rotterdam setting an example and seeking to import over 4 Mt H_2/yr of hydrogen equivalents by 2030. Regardless of the main hydrogen production and reception locations for the EU, the workshop revealed a number of areas in which low-emissions hydrogen value chains could offer investment opportunities in all members states, including electrolyser manufacturing and high temperature industrial heat. It concluded with a perception that the sector is moving now from studies to investments, but policy action is needed quickly to enable the scale of projects that can significantly reduce natural gas and oil demand this decade.

8. Useful resources

- Workshop background paper
- REPowerEU Communication
- REPowerEU staff working document: hydrogen accelerator
- EU Fit for 55 package
- Important Projects of Common European Interest (IPCEI): hydrogen
- Innovation Fund
- Connecting Europe Facility
- IEA The Future of Hydrogen
- IEA Global Hydrogen Review 2022
- H2Global
- Holland Hydrogen 1 project: refining
- Puertollano project: fertiliser
- Japan: hydrogen value chain project

9. Workshop Agenda

Morning session	
09h30	**Welcome** • Tim GOULD, IEA Chief Energy Economist • Kaspar RICHTER, European Commission Directorate-General for Structural Reform Support
09h45	**In what sectors can hydrogen displace large amounts natural gas and other fossil fuels by 2030?** **Moderator:** Simon BENNETT, IEA • Refining (Ruben VAN GRINSVEN, General Manager for Integrated Hydrogen Projects, Shell) • Fertiliser manufacture (David HERRERO FUENTES, Chief Operating Officer, Fertiberia) • Synthetic transport fuels (Jacob STERLING, Senior Director, Head of Ocean Decarbonisation and Innovation, A.P. Moller - Maersk) • Iron and steel (Göran NYSTRÖM, Senio Advisor, Ovako AB; Hans-Jörn WEDDIGE, Chair of the Environment and Energy Committee of Business at OECD) Questions to the experts from government stakeholders
10h45	**How quickly can significant quantities of hydrogen and hydrogen-based fuels be imported, and in what configurations?** **Moderator:** Abdullah AL-ABRI, IEA • How much hydrogen can come via international pipelines? (Giulia BRANZI, Head of Climate Policies, Snam) • What seaborne trade routes could make sense for Europe (Anne GEURTS, Programme manager External Affairs, Energy transition and Hydrogen, Port of Rotterdam) • What has Japan learned from extensive programmes in recent years? (Eiji OHIRA, Director, New Energy and Industrial Technology Development Organization) • What types of projects are potential exporters most serious about? (Andrew DICKSON, Development Director, CWP) Questions to the experts from government stakeholders
12h00	**End of morning session**

Afternoon session	
14h30	**Welcome and introductions**
14h40	**How will the necessary EU infrastructure for trading hydrogen get built and on what terms?** **Moderator:** Barbara JINKS, Programme Manager Green Gas Delivery and Use, IRENA • What is needed to get a new port terminal built? (Sebastian VOGEL, Head of Hydrogen Strategy, RWE) • What do we know about possible contractual models? (Graham WEALE, Professor, Ruhr-Universität Bochum) • What will determine where the value chain for electrolysers is located? (Andrei ZSCHOCKE, Head of Green Hydrogen Strategy, ThyssenKrupp Nucera) • Possible EU funding instruments (Zita CSOKA, European Commission DG Energy) Questions to the experts from government stakeholders
15h35	**What policies are still needed to enable investments in low-emissions hydrogen supply for export within or to the EU?**
	Moderator: Rebecca SCHULZ, IEA • Investing in the interim period before global certificates and standards (Andrei TCHOUVELEV, Director Safety / Regulatory and Daria NOCHEVNIK, Director for Policy and Partnerships at Hydrogen Council) • How can auction models be used to create a market for hydrogen? (Kirsten WESTPHAL, H2Global) • How can tools like carbon contracts-for-difference help create markets? (Jan Bouke AGTERHUIS, Senior Advisor, Netherlands Enterprise Agency, RVO) Questions to the experts from government stakeholders
16h30	**Closing remarks**

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