

Intercontinental hydrogen trade: some elements

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**“Renewable hydrogen and cooperation opportunities between
the EU and other world regions”**

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Intercontinental hydrogen trade

- Intercontinental renewable hydrogen trade can help the EU diversify its sources of energy
- Trade can reduce geopolitical dependence on Russia and other fossil fuel exporters
- Renewable hydrogen trade can rely on a larger number of exporting countries
 - Less influence of single producing countries on the market
 - Contribution to a new geopolitical landscape

Intercontinental hydrogen trade

- The development of an intercontinental hydrogen market will require:
 - measures to support investments in hydrogen production projects and H₂-transport infrastructure
 - increase of demand for renewable hydrogen in the EU
 - Reduction of market risks and removal of commercialisation barriers to renewable hydrogen
- Trade of hydrogen derivatives (ammonia, methanol and e-kerosene) may be more suitable in the first phases of market build up

Trade of H2 derivatives

- Trade of hydrogen derivatives may be more suitable in the first phases of market build up
- H2 derivatives such as Ammonia, methanol and e-kerosene may be easier and cheaper to transport than hydrogen
- Ammonia can also be directly used as feedstock and does not necessarily need to be reconverted to hydrogen
- Approx. 10% of global ammonia production is traded today
- Cargoes of liquefied ammonia can be transported by ship

Partnerships between the EU and other regions

- Renewable H2 trade with the EU can facilitate both renewable energy penetration and industrial development in other world regions
- A careful balance should be cast between generation capacity to meet domestic demand and capacity to produce H2
- Cooperation should go beyond hydrogen, including other renewable energy carriers and energy efficiency
- Cooperation that starts with fossil fuels should include RES/EE in the long term
- Cooperation on renewable energy can become a building block for a broader cooperation on trade, security, technology, climate policy

Balance between electricity production for domestic needs and H2 production for exports

- The development of renewable H2 production capacities requires the rapid development of RES electricity potentials
- A careful balance should be cast between generation capacity to meet domestic demand and capacity to produce H2
- Affordable electricity to meet domestic demand is required to ensure sustainable development of the producing country

H2 Production costs need to be low to promote trade

- Additional process steps are needed to transport hydrogen
 - These additional steps increase costs, lead to efficiency losses and higher emissions
- The cost of producing renewable H2 has to be much lower in the exporting region than in the importing region to compensate for transport costs
- Operating costs of renewables are typically low
- Thus, a low cost of capital is key to reduce production costs

Source: „IRENA (2022), Global hydrogen trade to meet the 1.5°C climate goal: Part I – Trade outlook for 2050 and way forward, International Renewable Energy Agency, Abu Dhabi.”

High production costs in the short term

- Renewable hydrogen projects require significant upfront investments
- High costs encourage promoters to locate projects close to abundant, low-cost RES and to customers in order to lower transport costs
- There is competition between project developers to secure the most promising locations and funding
- Higher hydrogen production costs in the near term may narrow margins for hydrogen sales
- First movers may be willing to accept lower profits to secure advantages in the long term

Renewable H2 as feedstock for local industry

- In the long run, countries with high RES potentials may attract green energy intensive industry
- Renewable H2 can be used as a feedstock and fuel by local industry to produce products with higher value-added than raw materials
 - green steel or green fertilizers for domestic consumption or exports to the EU
- This could help EU trade partners to improve their balance of trade with the EU while avoiding some negative impacts of the EU Carbon Border Adjustment Mechanism (CBAM)
- Would hydrogen-dependent EU industry consider relocating to countries with cheaper renewable hydrogen?

Risks for first movers

- Many projects under development are first movers facing a number of risks including:
 - Uncertain demand (e.g. offtake volume, duration, price)
 - Uncertain regulatory frameworks,
 - Fossil fuel price volatility,
 - Lack of infrastructure (e.g. ports. Roads, pipelines),
 - Lack of operational experience,
 - Lack of a skilled workforce
- Investment decisions are being delayed mainly due to regulatory uncertainty and uncertainty in energy prices

Hydrogen bankability

- Renewable hydrogen is currently not economically viable
- Lack of hydrogen financing system
- Project promoters rely on public support
- Renewable hydrogen still has significant bankability issues
- First projects are likely to use a combination of grant funding and concessional debt (blended finance)
- Commercial banks are more conservative
- Initially, mainly projects that have robust long-term offtake arrangements will be able to receive external financing

Guthrie, J., 2022: Financing the green hydrogen revolution – key bankability issues. Linklaters. <https://www.allens.com.au/insights-news/insights/2022/05/Financing-the-green-hydrogen-revolution/>

Hydrogen bankability

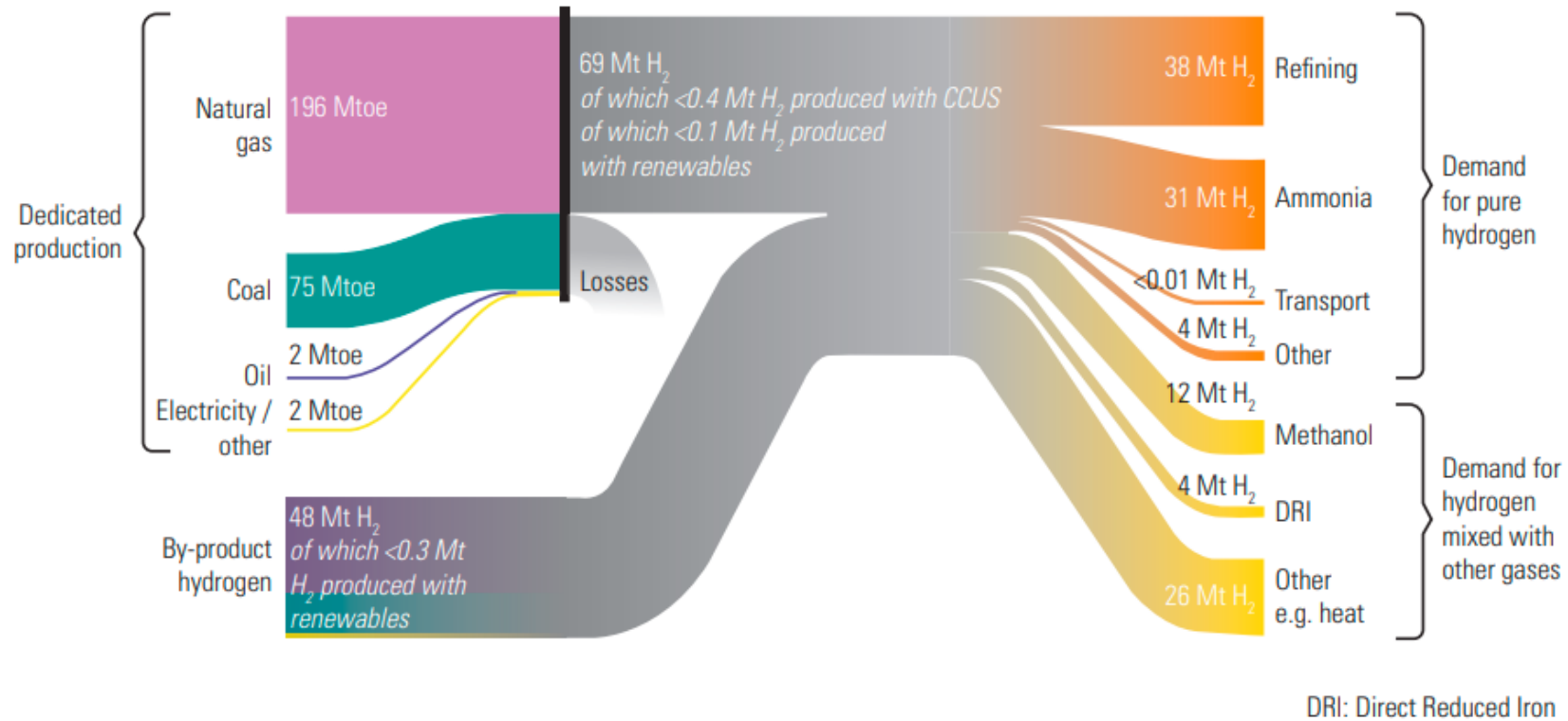
- To be financeable, a hydrogen project must have a bankable offtake scheme
- Replacing existing use cases for gray hydrogen may be easier to finance
 - E.g. Ammonia and refineries
 - Banks are more familiar with these cases and risks easier to assess
- Long-term contractual agreements enable the commercial de-risking of investments (Hydrogen Purchase Agreements, HPAs)
- Long-term, fixed-price offtake contract with a utility or other public or quasi-public purchaser offers more security to the banks

Norton Rose Fullbright, 2021: Financing hydrogen projects brings unique challenges.
<https://www.nortonrosefulbright.com/en/knowledge/publications/cd725de6/financing-hydrogen-projects-brings-unique-challenges>

Thank You!

Hydrogen Value Chains in 2018 (IEA, 2019)

Figure 6. Worldwide Hydrogen Value Chains



Source: IEA, 2019: The Future of Hydrogen. Report prepared by the IEA for the G20, Japan. Seizing today's opportunities
https://iea.blob.core.windows.net/assets/9e3a3493-b9a6-4b7d-b499-7ca48e357561/The_Future_of_Hydrogen.pdf

Opportunities

- Use of revenues from renewable hydrogen trade to advance economic development and energy access (e.g. in Africa)
- Broadening of the Partnership between the EU and other regions towards energy, trade, technology, security and climate policy issues
- Training of a skilled workforce
- Cooperation on R&D with universities and other research institutions
- Cooperation between European and companies in other regions
- Development of ports, maritime trade and other infrastructure
- Renewable hydrogen use for domestic industry. Green products such as green steel, green fertilizer and green ammonia could be used for domestic purposes or exported to the EU
- Contribution to the security of energy supply of the EU

Challenges

Ownership of the renewable hydrogen agenda

Lack of technological capacity

Undeveloped infrastructure (ports, pipelines, roads)

Insufficient value chain development: production, transport, storage, end use

High costs of renewable hydrogen

Lack of skilled workforce

Low access rates to electricity in Africa

Water availability (desalination may be required) and competing land uses

Technical challenges to transport hydrogen or hydrogen derivatives (e.g. ammonia, methanol, Liquefied Organic Hydrogen Carriers)

Safety risks

Political instability

Lack of policy and investment frameworks

Local value chains

- It is important to strengthen local value chains for renewable energy and energy efficiency technologies
 - Are components produced and assembled locally?
 - Are local companies capable of installing, maintaining, repairing and decommissioning the technology?
 - Are local companies active as importers, product suppliers, distributors, sales agents or service suppliers?
- Access to finance, technology, skills and knowledge influence the market penetration
- Local companies in developing countries often lack access to knowledge, skilled workers and capital

Green industry in Africa?

- Raw materials currently account for about 49% of exports from Africa to the EU
- Africa can embark on a path to sustainable industrialisation -> leapfrogging
- Green industrialisation would help Africa diversify away from commodity exports
- Renewable potentials would enable low-carbon industry
- The expansion of renewable energy capacities in Africa can also open up opportunities for exports to Europe