International Association of Oil & Gas Producers

ICEF 2020

Low-carbon hydrogen: Accelerating the emergence of a European hydrogen market.

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€420 bn
in European government revenues[2]

equivalent to around 2.7% of EU GDP

1.1 million jobs

57% of EU Overall Energy Demand

(Oil = 33% , Gas = 24%)

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Hydrogen & the EU's Climate Objectives

Climate Neutrality by 2050

- The European Green Deal includes the first European "Climate Law" which enshrines the 2050 climate neutrality target into law. Europe is the first continent to do so.
- The EU counts on renewable electrification to achieve the lion's share of emissions reductions.
- Question remains around energy-intensive industries: how will they do it?

EU Hydrogen Strategy

- The 2020 EU Hydrogen Strategy aims to increase clean hydrogen production in Europe.
- The overall objective of the strategy is to provide a climate solution as fast as possible (for the sectors which cannot be electrified).
- The Commission's economic recovery plan 'Next Generation EU' highlights hydrogen as an investment priority to boost economic growth, create jobs and consolidate the EU's global leadership.
- The share of hydrogen in Europe's energy mix is projected to grow from the current less than 2% to 13-14% by 2050.

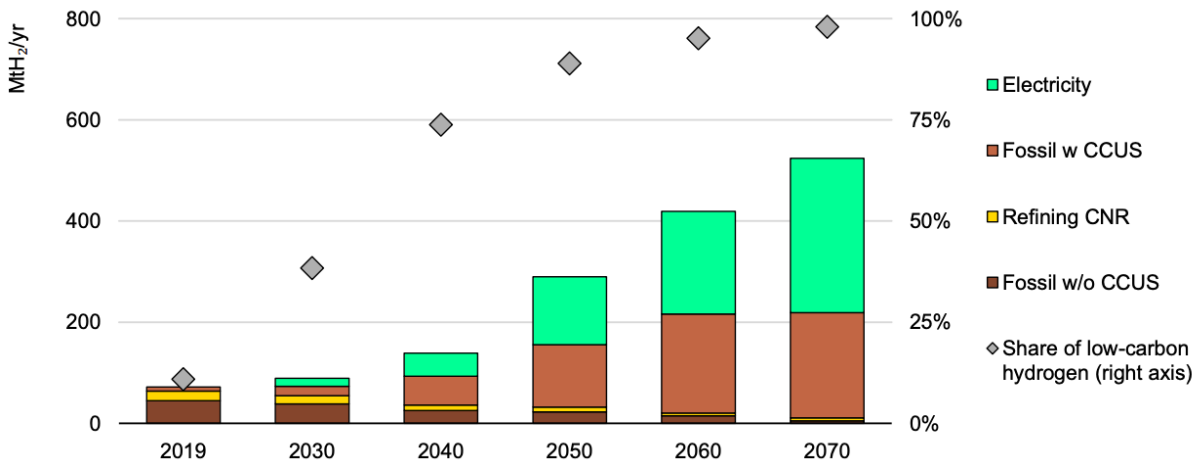
Challenges ahead

- Strong hopes for Hydrogen – but will the Strategy deliver?
- The Commission is counting mainly on electrolysis using renewable electricity. 'Low carbon hydrogen (made from gas reforming + CCS or methane pyrolysis) is only seen as an 'intermediate' solution.
- Questions around cost and scale perspective: European H2 Strategy focuses almost only on renewable H2 which today is microscopic and expensive, whereas the role of low carbon H2 is secondary in the EU Strategy.
- Big uncertainty on 2X40 GW of electrolysers by 2030 (40GW in the EU and 40GW in neighbouring countries?) how much will they be able to produce ?
- High reliance on Guarantees of Origin–H2 produced from electrolysers using grid power will be re-labeled as 'green'
- Monitoring of imported H2 – will it really be clean?

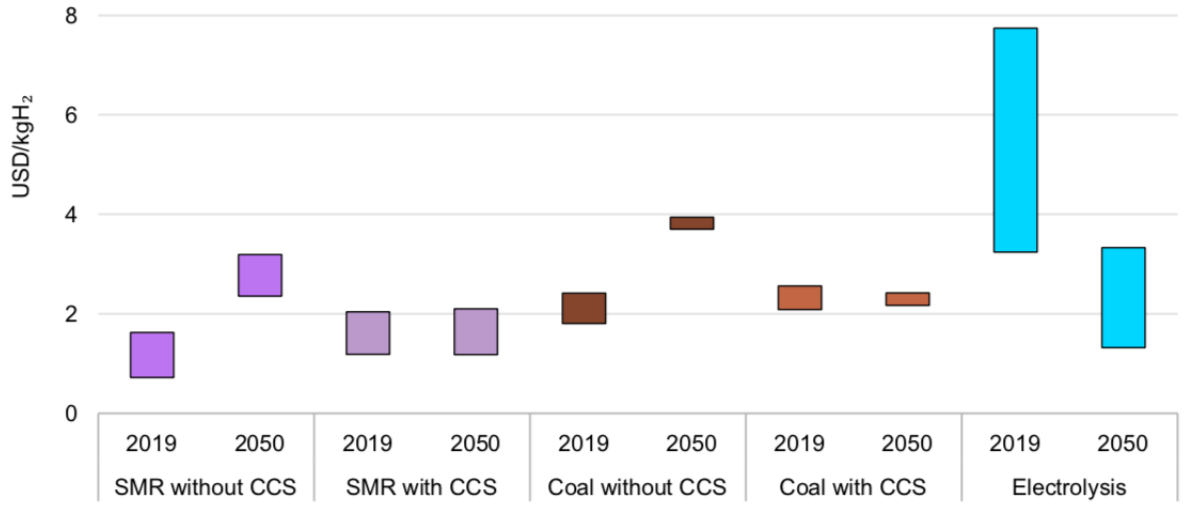
➢ **'Low-carbon H2 can accelerate the uptake of a H2 value chain in Europe, and facilitate the integration of renewable H2.**
➢ **But it remains ignored today by policymakers**

Hydrogen production costs

IEA (2020): Global hydrogen production by technology in the Sustainable Development Scenario, 2019-70



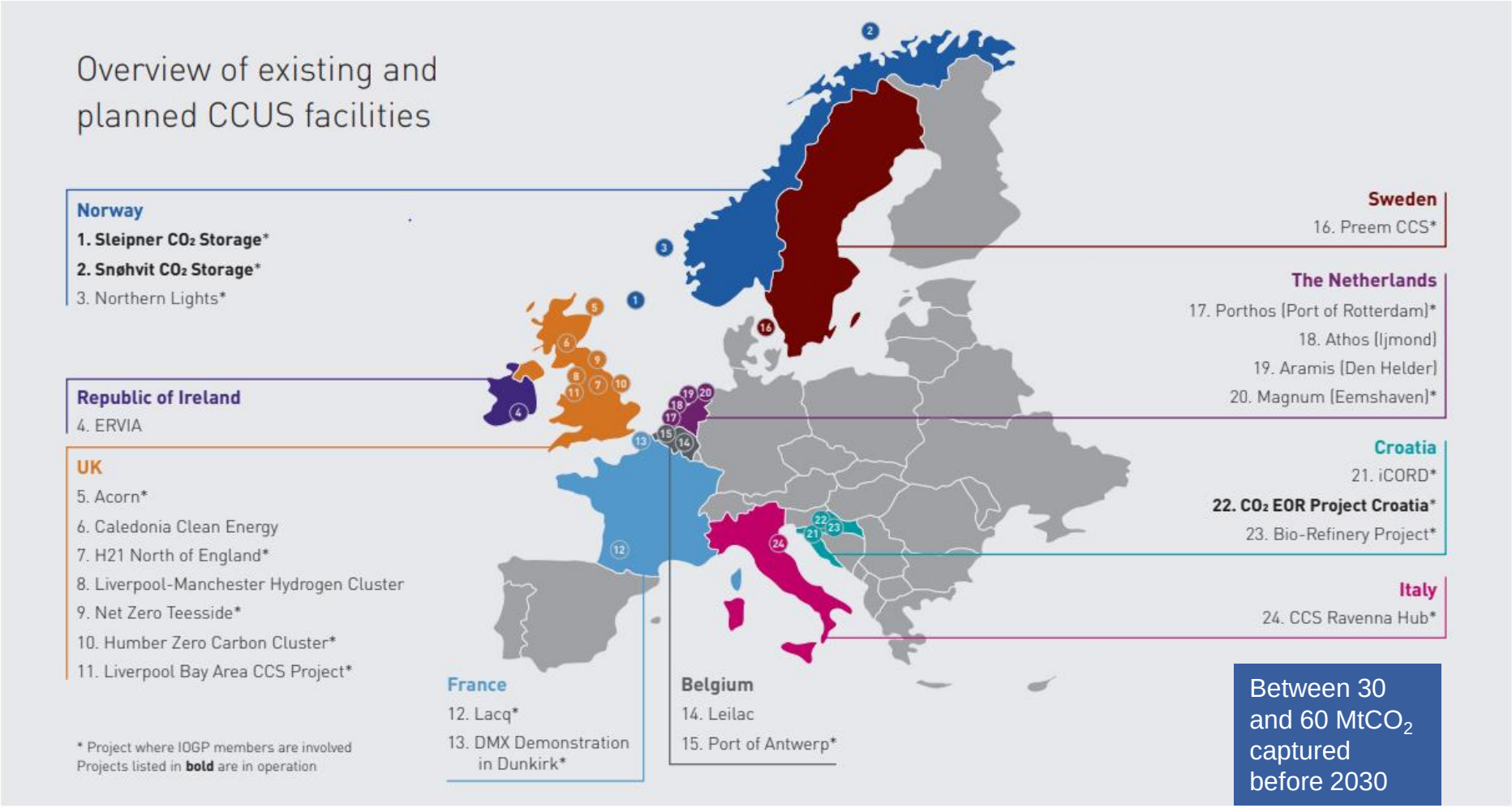
IEA (2020): Hydrogen production costs by production source



IEA's Sustainable Development Scenario sees global H2 production of 513 Mt in 2070. Over 50% comes from electrolysis, which will require the electricity equivalent to ca. half of today's total generation. Ca. 40% comes from fossil fuels with CCUS, resulting in the capture of 1900 Mt CO_2. The cost-competitiveness of H2 will mainly depend on the costs of gas and renewable electricity.

- **Hydrogen from natural gas with CCUS can already be produced cost-effectively and at scale.**
- **It should be considered an integral part of the EU's hydrogen strategy.**

CCUS – More than a concept, a reality



https://www.oilandgaseurope.org/wp-content/uploads/2020/06/Map-of-EU-CCS-Projects.pdf

Obstacles to CCS deployment

- Persistent skepticism towards CCS
  → It's considered as costly, facing public acceptance issues, and an intermediary measure which is not a good signal for investment.
- Despite IEA and IPCC made it clear that we need to accelerate the development of CCS infrastructure to meet climate targets, the EU is still very shy
  → In comparison with the US, UK and Norway, the EU is late to the game.
- The technology works, it's safe and reliable but political support and incentives are still insufficient
  → Incentives are needed to reduce costs for CCS, overcome public acceptance and scale up projects.

➢ **CCS value chain needs support from all stakeholders, policy makers and political players**

‘Hydrogen for Europe’ study – partners and exploitable results

Steering Committee

	Consortium	Funding Partners
Research	IFP Energies nouvelles, SINTEF	bp, ConocoPhillips, Concawe, eni, equinor, ERVIA, GASSCO, ExxonMobil, Hydrogen Europe, International Association of Oil & Gas Producers, Norsk olje&gass, OMV, Shell, snam, TOTAL, wintershall dea, Zukunft ERDGAS e.V. Gemeinsam. Für nachhaltige Energie.
Project management	Deloitte.	

A comprehensive analysis with an ambitious scope

- **Exhaustive geographical and temporal coverage:** up to 2050 for every EU country
- Holistic representation of the energy **sectors** (gas, electricity), **end uses** (transport, building, industry) and **their interfaces**
- **Cost-optimal decarbonization pathways** for each country considering endogenous features on a dynamic framework
- **Fostering complementarities** between gas and electricity through low-carbon hydrogen
- **Optimal investment/divestment pathways** for every technology and infrastructure
- Meaningful policy and regulatory recommendations to unfold value and stick on path dependencies

Combining two detailed energy system models

SINTEF’s ***eTranport*** model to explore the full dynamics of the transition in the EU28

The model is a cutting-edge tool that combines different optimisation techniques to capture path dependencies and cumulative effects (endogenous learning, cost of stranded assets, etc.). It will be used to finding cost-efficient and feasible pathways of the energy transition.

IFPEN’s *TIMES-Miret EU* model to assess pathways at the country level

The model provides a robust and proven methodology with extremely high level of detail on every current and potential use of low-carbon hydrogen for every EU country. It will encompass the dynamic considerations and path dependencies’ findings from the *eTransport* model to offer higher geographical detail.

Contributing to the debate with data

Hydrogen for Europe is a first-of-a-kind study that comprehensively looks at the EU energy system, quantifies the economic and environmental benefits of hydrogen in the energy transition.

The study develops a silo-breaking approach to the energy transition in order to objectively demonstrate:

1. Hydrogen's strategic role in the energy transition and the potential it brings in terms of economic efficiency
2. What is needed to establish low-carbon hydrogen as a pillar? What are the optimal pathways and actions?
3. What is required from policy-makers and regulators? What are the current gaps that need to be filled?

Our policy recommendations

- Technology neutral approach for all sources of low carbon/renewable Hydrogen sources in the Hydrogen Strategy's initiatives
- Recognition of the long-term, cross-sectoral role of gas and CCS and its significant scale-up potential
- Comprehensive terminology and certification system to cover all energy sources based on full life-cycle GHG emission savings
- A European CCUS Forum alongside the Clean Hydrogen Alliance, bringing together industry, civil society and policymakers to work together on scaling up these key technologies and retain industry and jobs in Europe.

- **Low-carbon hydrogen can produce large volumes and create European supply hydrogen value chains**
- **This will in turn facilitate and accelerate the integration of renewable power based hydrogen into the internal energy market.**

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