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THE EU'S FIT FOR 55 PACKAGE

THE IMPLICATIONS FOR THE EU HYDROGEN ECONOMY

9 MARCH 2023

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CONTENTS

1. INTRODUCTION
A MODERN HISTORY OF HYDROGEN

1520 – 1st recorded observation of hydrogen by Paracelsus

1789 – first demonstration of water electrolysis by two Dutch merchants, J.R. Deiman and A.P. van Troostwijk

1873 – publication of *The Mysterious Island* by Jules Vernes

1900 – the first flight by airship by Count Ferdinand von Zeppelin

1937 – Hindenburg disaster

1939 – discovery of hydrogen metabolism in green algae opens the door to future hydrogen production

1966 – the first hydrogen car presented by General Motors

2008 – Fuel Cells and Hydrogen Joint Undertaking launched by EU Commission

2014 – FCH JU extended to 2030 with more than EUR 1.3 billion funding

2020 – EU Hydrogen Strategy

July 2021 – Fit-for-55-Package (incl. Hydrogen and decarbonised gas market package)

May 2022 – REPowerEU plan

August 2022 – President Biden signs Inflation Reduction Act

February 2023 – EU Commission publishes Delegated Act on Additionality

1. INTRODUCTION

THE CLEAN H2 "MARKET"

Today – a nascent "structured" market		2030(?) and beyond – Clean H2 a commodity in a Clean H2 Ecosystem
Usually driven by "early adopter" offtakers and suppliers	**Virtually linked over wider value chains**	Hydrogen as a commodity, with multiple sellers and buyers transacting at a market price
Physically linked in "clusters" or "valleys"		Liquid and deep markets, mirroring current markets in the hydrocarbon world
Smaller-scale projects supplying to single (or small number of) offtakers, with bilateral contracts	**Proper regulation of clean H2 production, transport, storage, including definition of clean H2**	Hydrogen grids, analogous to gas grids
Scale up as supply capacity and demand increase		Buyers and sellers connected to a midstream offering transport and storage and trading
Investors/lenders evaluating specific offtaker credit and bankability	**Ocean transport solution emerges among ammonia, LOHC and liquid H2**	New suppliers – bankability of a seller depends on its project economics compared to the strength and depth of the market, independent of individualised offtake
Bespoke hydrogen delivery infrastructure per project		Corporate style "evergreen" gearing levels maintained by hydrogen suppliers, operating as going concerns
Structured investment and financing (project finance) for individual projects	**Dedicated H2 transport and storage**	

1. INTRODUCTION
GLOBAL TRENDS

2. OVERVIEW OF KEY EU LEGISLATIVE PACKAGES
IMPACTING HYDROGEN PROJECTS

"Fit for 55" package. It includes a wide range of reforms, covering the key EU climate policies, and various related laws on transport, energy and taxation (e.g. RED III, ETS, CBAM)

Hydrogen and Gas Market Decarbonisation Package (Commission proposal published on 15 December 2021). It will enable a market for renewable and low carbon hydrogen facilitating their injection, transmission, distribution and trading in the gas grids

REPowerEU Plan – Setting a target of 10 million tonnes of domestic renewable hydrogen production and 10 million tonnes of imports by 2030

European Hydrogen Bank will guarantee the purchase of hydrogen, notably by using resources from the Innovation Fund, through an investment of €3 billion to help build the future hydrogen market

Two Delegated Acts on the definition and production of renewable hydrogen (published on 10 February 2023), supplementing the Renewable Energy Directive

Trans European Networks – TEN-E Regulation (entered into force in June 2022). It governs the selection and implementation of Projects of Common Interest (PCIs – key energy infrastructure projects) selected by the Commission every two years. Natural Gas to be replaced by H2 projects

Revised Climate, Energy and Environmental Aid Guidelines. Entered into force on 1 January 2022 extending scope to new areas (e.g. clean mobility, hydrogen) and introducing new aid instruments (e.g. contracts for difference)

State Aid for Important Projects of Common European Interest (IPCEIs). Revised State aid rules in line with new climate targets and accelerate EU decarbonisation strategy

2. OVERVIEW OF KEY EU LEGISLATIVE PACKAGES

HYDROGEN IMPORTANT PROJECTS OF COMMON EUROPEAN INTEREST (IPCEI)

15 July 2022 - The "IPCEI Hy2Tech" project

- **Scope**: covers a wide part of the hydrogen technology value chain, including (i) the generation of hydrogen, (ii) fuel cells, (iii) storage, transportation and distribution of hydrogen, and (iv) **end-users applications**, in particular in the **mobility sector.**
- **Fifteen participating Member States**: Austria, **Belgium**, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Italy, Netherlands, Poland, Portugal, Slovakia and Spain.
- **Funding**: up to €5.4 billion in public funding, which is expected to unlock additional €8.8 billion in private investments.
- **Beneficiaries** include John Cockerill and Cummins (hydrogen generation technology)

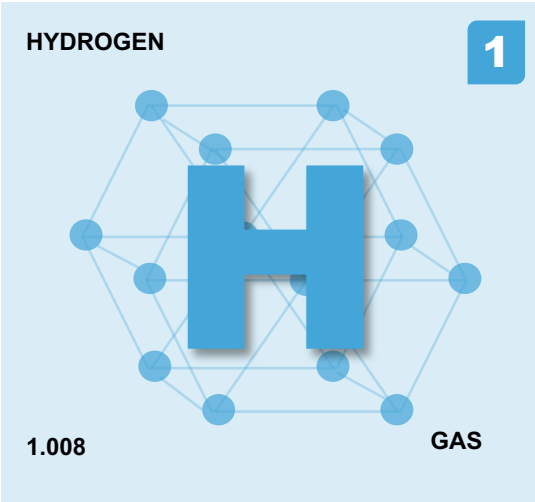
21 September 2022 - The "IPCEI Hy2Use" project

- **Scope:** covers a wide part of the hydrogen value chain by supporting (i) the construction of hydrogen-related infrastructure, notably large-scale electrolysers and transport **infrastructure**, for the production, storage and transport of renewable and low-carbon hydrogen; and (ii) the development of innovative and more sustainable technologies for the integration of hydrogen into the **industrial processes** of multiple sectors, especially those that are more challenging to decarbonise, such as steel, cement and glass.
- **Thirteen participating Member States**: Austria, **Belgium**, Denmark, Finland, France, Greece, Italy, Netherlands, Poland, Portugal, Slovakia, Spain and Sweden.
- **Funding:** up to €5.2 billion in public funding, which is expected to unlock additional €7 billion in private investments.
- **Beneficiaries** include *H2 Backbone* (Fluxys) and *Columbus (*ENGIE and Charmeuse)

3. ‘FIT FOR 55’ PACKAGE
OVERVIEW

Key proposals having a substantial impact on the future deployment of a hydrogen economy in the EU

- Proposal for a third revision of the renewable energy directive (**Renewable Energy Directive III)**
- **Delegated Acts on the definition and production of renewable hydrogen**
- The alternative fuels infrastructure regulation (**Alternative Fuel Infrastructure Regulation**)
- The proposal for a regulation on the use of renewable and low-carbon fuels in maritime transport (**FuelEU Maritime initiative**)
- The revision proposal of the EU-ETS directive (**EU Emissions Trading System**)
- The Carbon Border Adjustment Mechanism (**CBAM**)
- The revision proposal of the energy taxation directive (**Energy Taxation Directive**)



3. 'FIT FOR 55' PACKAGE
FOCUS ON THE PROPOSALS

Renewable Energy Directive III (RED III): *revised renewable energy targets*

- **Scope**
  - The definition of 'Renewable Fuels of Non-Biological Origin' ("RFNBOs") has been extended beyond the transport sector, specifying that energy from RFNBOs shall be counted towards Member States' shares of renewable energy and the targets set in the Directive.
  - According to proposed art. 1 (a) 'renewable fuels of non-biological origin' means "*liquid and gaseous fuels whose energy content is derived from renewable sources other than biomass*".

- **Targets**

Overall renewable energy target (by 2030)	RED	Fit for 55	REPowerEU	Outcome
	32%	**40%**	**45%**	*Ongoing trilogue*

RFNBO target industry (by 2030)	Commission Proposal	Outcome
	50% by 2030, with an increase to **75%** by 2035	**42%** by 2030, with an increase to **60**% by 2035 (*provisional agreement between the 3 institutions*)

RFNBO target transport (by 2030)	Commission Proposal	
	5.7%	*Ongoing trilogue*

- **Current status/next steps** – The proposed revision of the directive is still under negotiation amongst the three European Institutions.

3. ‘FIT FOR 55’ PACKAGE
FOCUS ON THE PROPOSALS

Delegated Act on Additionality (published on 10 February 2023)

- **Purpose** – Delegated Act on Additionality defines under which conditions hydrogen, hydrogen-based fuels or other energy carriers can be considered as ‘renewable liquid and gaseous fuels of non-biological origin’ (“RFNBOs”) for the purpose of article 27(3) of the Renewable Energy Directive

- **Option 1: direct connection** to an installation generating renewable electricity as fully renewable (article 3):
  - **Direct line OR** production of renewable electricity and RFNBO within **same installation**;
  - Renewable electricity production installation came into operation not earlier than **36 months** before RFNBO production installation; and
  - **No grid connection OR** grid connection with **smart metering system** showing that no electricity has been taken from the grid for RFNBO production.

- **Option 2: electricity taken from the grid** as fully renewable (article 4): **either:**
  - RFNBO production facility located in **bidding zone** where the average proportion of **renewable electricity** exceeded **90%** in the previous calendar year and the production of renewable liquid and gaseous transport fuel of non-biological origin does not exceed a maximum number of hours set in relation to the proportion of renewable electricity in the bidding zone;
  - RFNBO located in a **bidding zone where the emission intensity of electricity is lower than 18 gCO2eq/MJ** (subject to further criteria being met);
  - Electricity from the grid consumed during an **imbalance settlement period** (subject to further criteria being met); or
  - Electricity from the grid which complies with the conditions on **additionality, temporal correlation and geographic correlation** (*see next slide*).

3. ‘FIT FOR 55’ PACKAGE
FOCUS ON THE PROPOSALS

Delegated Act on Additionality

- **Additionality** (article 5): the installation generating renewable electricity:
  - came into operation not earlier than **36 months** before the installation producing the renewable liquid and gaseous transport fuel of non-biological origin; and
  - has **not received support** in the form of operating aid or investment aid (but subject to exceptions).

- **Temporal correlation** (article 6): RFNBO must in principle be produced within:
  - until 31 December 2029: the **same calendar month**; or
  - from 1 January 2030: the **same one-hour period**,

  as the renewable electricity produced under the renewables power purchase agreement.

- **Geographical correlation** (article 7) location of the electrolyser is either:
  - the **same bidding zone** as the renewable electricity generating installation;
  - an **interconnected bidding zone** (incl. in another Member State), and electricity prices in the relevant time period on the day-ahead market are equal or higher than bidding zone RFNO production; or
  - an **offshore bidding zone** that is interconnected with the bidding zone where the electrolyser is located.

3. ‘FIT FOR 55’ PACKAGE
FOCUS ON THE PROPOSALS

Delegated Act on Additionality

- **Transitional phase:**
  - Transitional phase of the requirements on “additionality” until 1 January 2038 for hydrogen projects that will start operating before 1 January 2028
  - Hydrogen producers will be able to match their hydrogen production with their contracted renewables on a monthly (instead of hourly) basis until 1 January 2030. However, Member States will have the option of introducing stricter rules on temporal correlation as of 1 July 2027 (*see previous slide*)

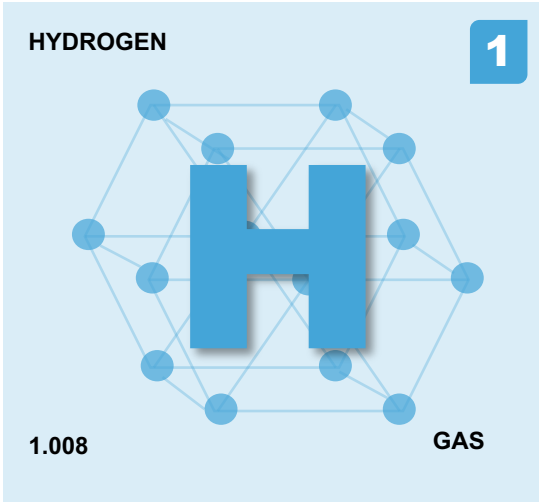
- **Extra-territorial application**:
  - Requirements will apply to both domestic producers and producers from third countries exporting to the EU
  - reliance on national certification schemes and international voluntary certification schemes recognised by the European Commission

- Complemented by a **second delegated act** providing a **methodology** for calculating life-cycle **greenhouse gas emissions** for **RFNBOs** (also published on 10 February 2023)
  - provides that the greenhouse gas emissions savings from the use of recycled carbon fuels shall be at least 70%
  - methodology takes into account greenhouse gas emissions across the full lifecycle of the fuels, including upstream emissions, emissions associated with taking electricity from the grid, from processing, and those associated with transporting these fuels to the end-consumer

3. 'FIT FOR 55' PACKAGE
FOCUS ON THE PROPOSALS

Alternative Fuel Infrastructure Regulation (AFIR): *specific targets for hydrogen refueling stations*

- **Scope** – Article 2 defines 'alternative fuels' as *"fuels or power sources which serve, at least partly, as a substitute for fossil oil sources in the energy supply to transport and which have the potential to contribute to its decarbonisation and enhance the environmental performance of the transport sector, including hydrogen"*. No distinction between low-carbon hydrogen and renewable hydrogen



- **Core provisions**
  - *Initial proposal EC:* Roll-out of hydrogen refuelling stations with a maximum distance of 150 km in-between with the geographical scope extended along the TEN-T core network and urban nodes.
  - *Latest amendment proposed by the EP*: Hydrogen refuelling stations on every 100km by 2028. Each station will have a daily capacity of 2 tonnes and with at least one 700bar dispenser. The minimum number of stations are to be installed by the end of 2027. Liquid hydrogen shall be made available at publicly accessible refuelling stations.

- **Current status/next steps** – ongoing trialogue. Final round foreseen for 27 March 2023

	Existing petrol stations (2020)	Commission Impact Assessment	Industry minimum needs	European Parliament	Council
EU-27	110.364	798	1915	1491	224

Figure 1: comparison of current positions on AFIR hydrogen refuelling stations target (source: Hydrogen Europe)

3. ‘FIT FOR 55’ PACKAGE
FOCUS ON THE PROPOSALS

EU Emissions Trading System (ETS):

- **Scope** – ETS extended to the maritime sector, road transport and buildings. The EU ETS proposal will include the production of hydrogen with electrolysers under the EU emissions trading scheme, making renewable and low-carbon facilities eligible for free allowances (= extension to all hydrogen production technologies).

- **Core provisions**
  - Lowered coverage threshold for producing hydrogen and synthetic gases from 25 tonnes per day (tpd) to 5. Raises 2030 CO2 reduction target to 62% on 2005 levels.
  - Free allowances will be fully phased out by 2034 and almost cut in half by 2030 in some sectors. They will be gradually replaced by a new carbon tariff at the EU’s border. 4% of all ETS allowances will be placed in a market stability reserve (MSR).
  - A separate new ETS II for fuel for road transport and buildings that will put a price on emissions from these sectors will be established by 2027 (but could be postponed until 2028).

- **Current status/next steps** – Political agreement reached.

Carbon Border Adjustment Mechanism (CBAM):

- **Scope** – CBAM covers only one H2 carrier i.e. ammonia.

- **Core provisions** – Importers will have to declare the emissions directly linked to the production process, and if these exceed the EU standard, acquire an “emission certificate” at the price of CO2 in the EU.

- **Current status/next steps**
  - Provisional agreement between EP and Council reached on 13 December 2022.
  - CBAM is expected to take effect from 1 October 2023. Importers of cement, iron, steel, aluminium, fertilisers, ammonia and power will have to report on volumes of imports and corresponding emissions from that date, with payment obligations coming into effect in 2026.

- **Effect on hydrogen market?**
  - Exclusion of H2 carriers other than ammonia (e.g. methanol) may distort import strategies and negatively affect the direct import of hydrogen via pipelines.
  - CBAM does not cover strategically important downstream products like electrolysers and fuel cells, which may put EU manufacturers at a disadvantage compared to their international competitors.

4. INTERRELATION WITH MIDSTREAM REGULATION (EU)

The missing link

Grid regulation as a critical element to establish a midstream H2 backbone connection supply and demand

Ongoing EU reform process

Establishment of a dedicated regulatory framework

EU Hydrogen and Gas Market Decarbonisation Package

1. Proposal for a recast Directive on gas markets and hydrogen (*COM(2021)803 final*)
2. Proposal for a recast Regulation on gas markets and hydrogen (*COM(2021)804 final*)

4. INTERRELATION WITH MIDSTREAM REGULATION (BELGIUM)

KEY ELEMENTS OF THE BELGIAN FEDERAL H2 TRANSPORT REGULATION adopted on 27 February 2023

Designation of a single Hydrogen Network Operator (HNO)

- Responsible for the operation of hydrogen transport infrastructure in Belgium, the network development plans and the commercial relations with network users
- Designated by the federal minister for energy
- **Legal monopoly** to operate the Belgian hydrogen transportation network
- **Non-discriminatory and open access** to the hydrogen transport network
- Strict **ownership unbundling requirements**
- Preparation of a **Network Development Plan** every two years under the CREG's supervision

Transitional measures for existing hydrogen networks

- Hydrogen pipelines already in use when the regulation would enter into force are subject to transitional measures to enable existing operators to (i) respect their commitments under existing supply and offtake agreements; (ii) ensure that they could be interconnected and integrated with the HNO's network; (iii) facilitate the development of the HNO's activities
- These transitional measures will be applicable until **31 December 2030**.
- By 31 December 2030, all existing hydrogen transport networks would have to be managed by the HNO, unless they qualify as a "geographically confined hydrogen network"

Exemption of HNO monopoly for geographically confined hydrogen networks

- Specific exemption for so called "**geographically confined hydrogen networks**"
- This exemption would cover hydrogen transport networks which (i) are interconnected and intended for transporting or distributing hydrogen; (ii) are owned and operated by a company other than the HNO; and (iii) connect one injection point to a limited number of offtake points within geographically limited commercial or industrial areas
- Such networks could still be operated by other entities (also **after 31 December 2030**), provided they have been granted a **permit** by the minister of energy

Transportation permit for hydrogen networks

- Will enter into force as soon as the **Ministerial Decree** designating the HNO is published
- Operators of existing hydrogen networks can apply for an **extension** of their existing transportation permit under the existing Federal Gas Law up to 31 December 2030
- Operators of existing hydrogen networks can also apply for the **expansion** of an existing hydrogen network until 31 December 2030

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