EU GCC CLEAN ENERGY TECHNOLOGY NETWORK

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# Hydrogen without Borders
# Issues and Magic

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The Network is funded by

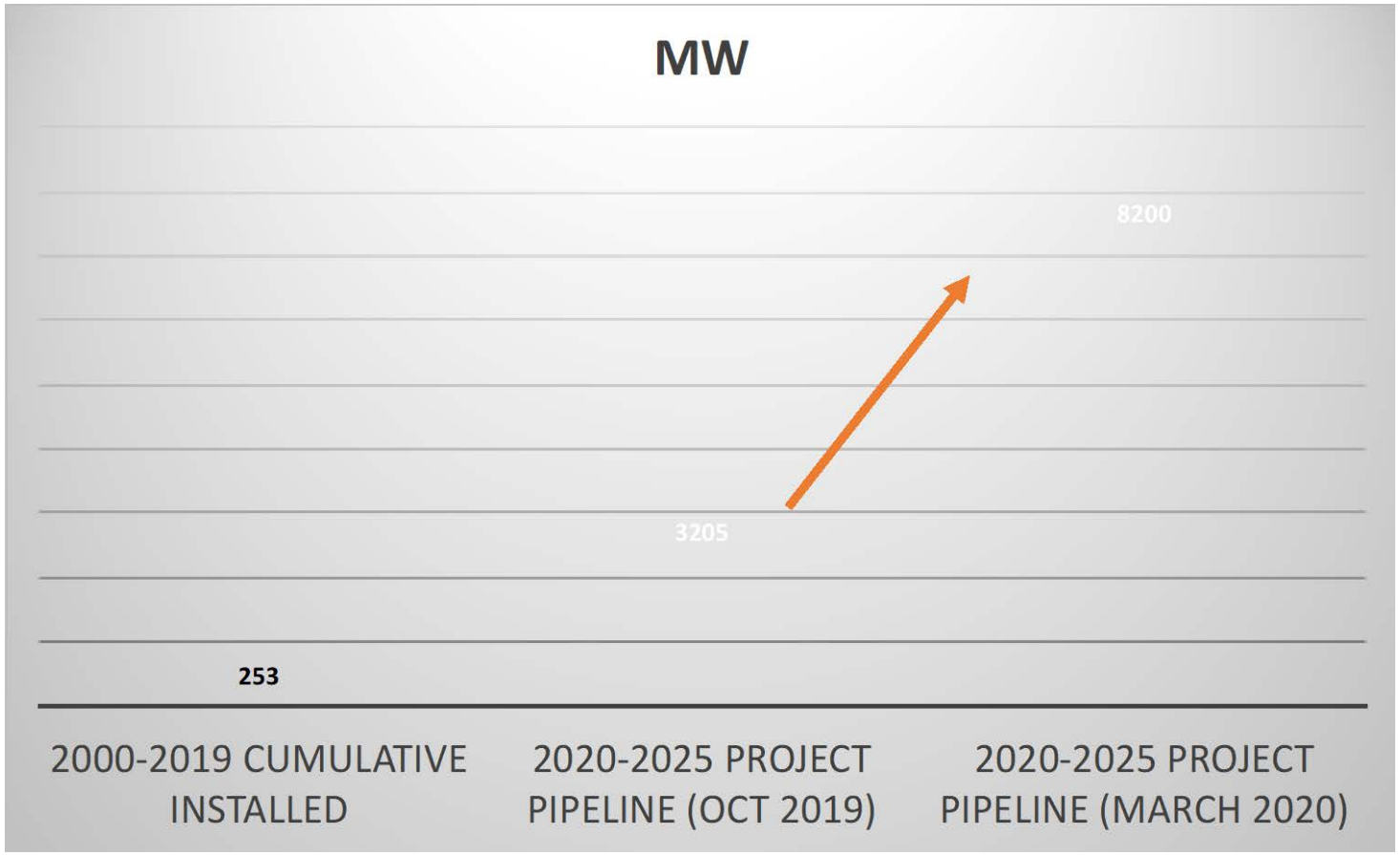
European Commission

# 1

# Recent Developments

# Markets

The pipeline of electrolyzer projects to produce hydrogen from renewable energy has nearly tripled in just five months, of which 57% in Europe




Source: Wood McKenzie

# EU Hydrogen Strategy – leaked 18 June …..

EUROPEAN
COMMISSION

Brussels, XXX
[…](2020) XXX draft

**SENSITIVE***

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS**

**Building a hydrogen economy for a climate-neutral Europe. A strategic roadmap.**

# EU Hydrogen Strategy – leaked…..

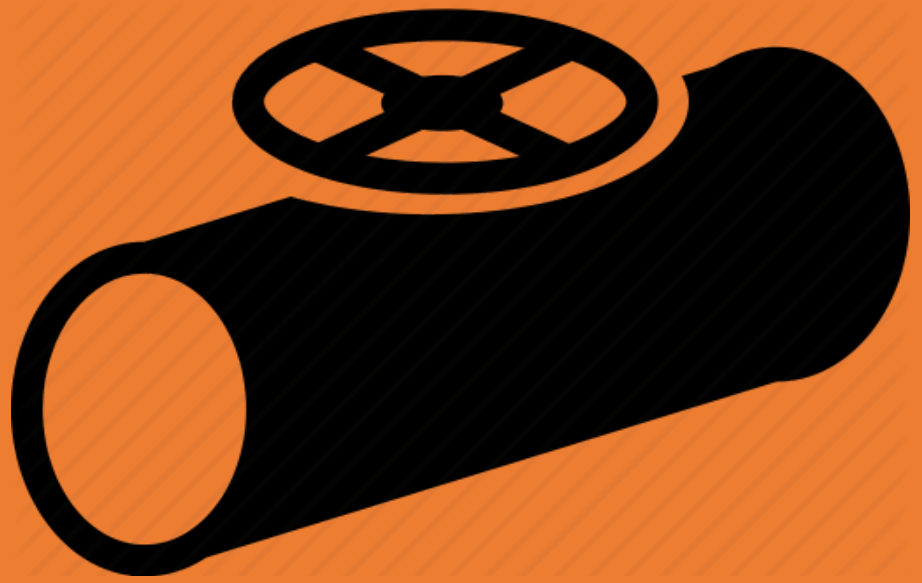
- Priority focus on green hydrogen
- At least 4 GW of electrolysers by 2024
  at least **40 GW** installed by 2030.
- Role for **import** from neighboring regions
- By 2030, the Commission estimates that €13-15bn could be invested in electrolysers across the EU, in addition to €50-150bn for a dedicated wind and solar capacity of 50-75GW.

# And the money

- The **EU Recovery Plan consists of two instruments** which add up to this first response: the **Next Generation EU fund** and a **revised EU budget**. Worth a total €750 billion and €1.100 billion respectively, both will compose the next Multiannual Financial Framework (MFF), or EU budget, for the period 2021-2027. This brings the total sum to €1.85 trillion, and €2.4 trillion if adding the short-term 'safety nets'.
- **Hydrogen is featured as a key sector that should receive support under the recovery plans especially due to its ability to bolster the longer-term objectives of the European Union**, such as the EU Green Deal's targets, climate-neutrality, and the EU's strategic autonomy. Hydrogen and the hydrogen sector are explicitly mentioned multiple times across the Commission's set of Communications. Under the current plans put forward, it is set to feature prominently in several of the various schemes.

# 2

## Infrastructure



# Infrastructure

- Issue:
  - Can we use the existing gas grid for hydrogen?
- Considerations:
  - Certain materials can become brittle, fitness of compressors, flow meters, etc.
- Magic:
  - Research in France[1], Germany and the Netherlands[2] has shown that the bulk of pipelines can accommodate hydrogen
  - Build pure hydrogen infrastructure immediately, develop a conversion plan for 2030 - 2050
  - Transition to pure hydrogen only by 2050

1. www.grtgaz.com/fileadmin/plaquettes/en/2019/Technical-economic-conditions-for-injecting-hydrogen-into-natural-gas-networks-report2019.pdf
2. DNVGL. (2017). Verkenning waterstofinfrastructuur (in Dutch). Report for Ministery of Economic Affairs.

# 3

Blending

# Blending

- Issue:
  - Shall we blend hydrogen in the gas grid or convert to pure hydrogen?
- Considerations:
  - Blending can be done up to 6% percent[1] with minor investments. Up to 20% is possible. Transmission grid only.
  - Bulk of the demand is for pure hydrogen[2]
  - How to tackle varying input of hydrogen?
- Magic:
  - Allow development of blending projects until 2030, limited to transmission system
  - Build pure hydrogen infrastructure (backbone) immediately
  - Transition to 100% pure hydrogen only by 2050

1. www.grtgaz.com/fileadmin/plaquettes/en/2019/Technical-economic-conditions-for-injecting-hydrogen-into-natural-gas-networks-report2019.pdf
2. www.fch.europa.eu/sites/default/files/Hydrogen%20Roadmap%20Europe_Report.pdf

# 4

50 shades of hydrogen

# 50 Shades of Hydrogen

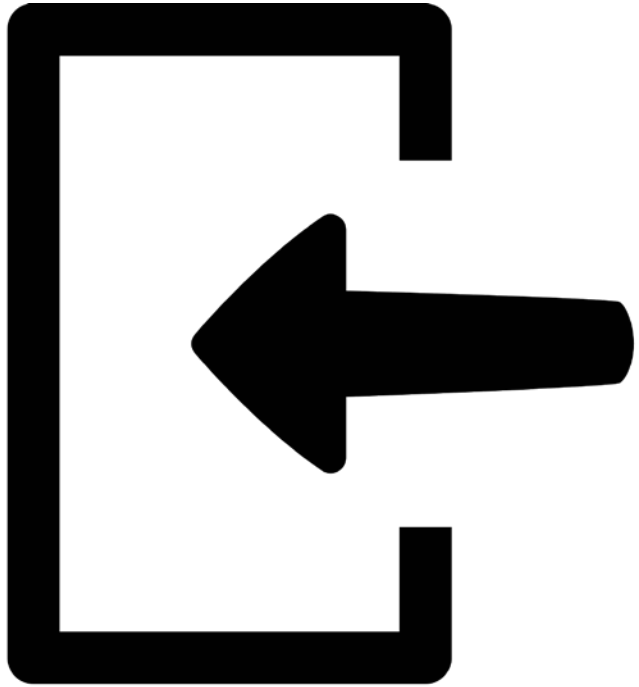
- Issue:
  - There is black, grey, brown, green, blue hydrogen, but what does it mean?
- Considerations:
  - Each colour has a different carbon foorprint, sometimes even within a colour
- Magic:
  - Main currency should be carbon content
  - Develop a unified system of life cycle carbon accounting that is internationally workable
  - Based on Guarantees of Origin and additional sustainability criteria (biomass)
  - Starting point: https://www.certifhy.eu/

# 5

Import

# Import of hydrogen

- Issue:
  - Why doesn’t produce Europe its own hydrogen instead of importing from North Africa and Ukraine?
- Considerations:
  - To get to 50% electricity by 2050, Europe needs 2000GW of solar and 650GW of wind. To also cover hydrogen, that would need to be doubled
- Magic:
  - North African countries have the potential to produce hydrogen competitively[1]. Gas pipelines are very cost-effective
  - A domestic hydrogen industry in the Southern Mediterranean area offers the potential for economic development, lower emissions, good jobs and revenue from export

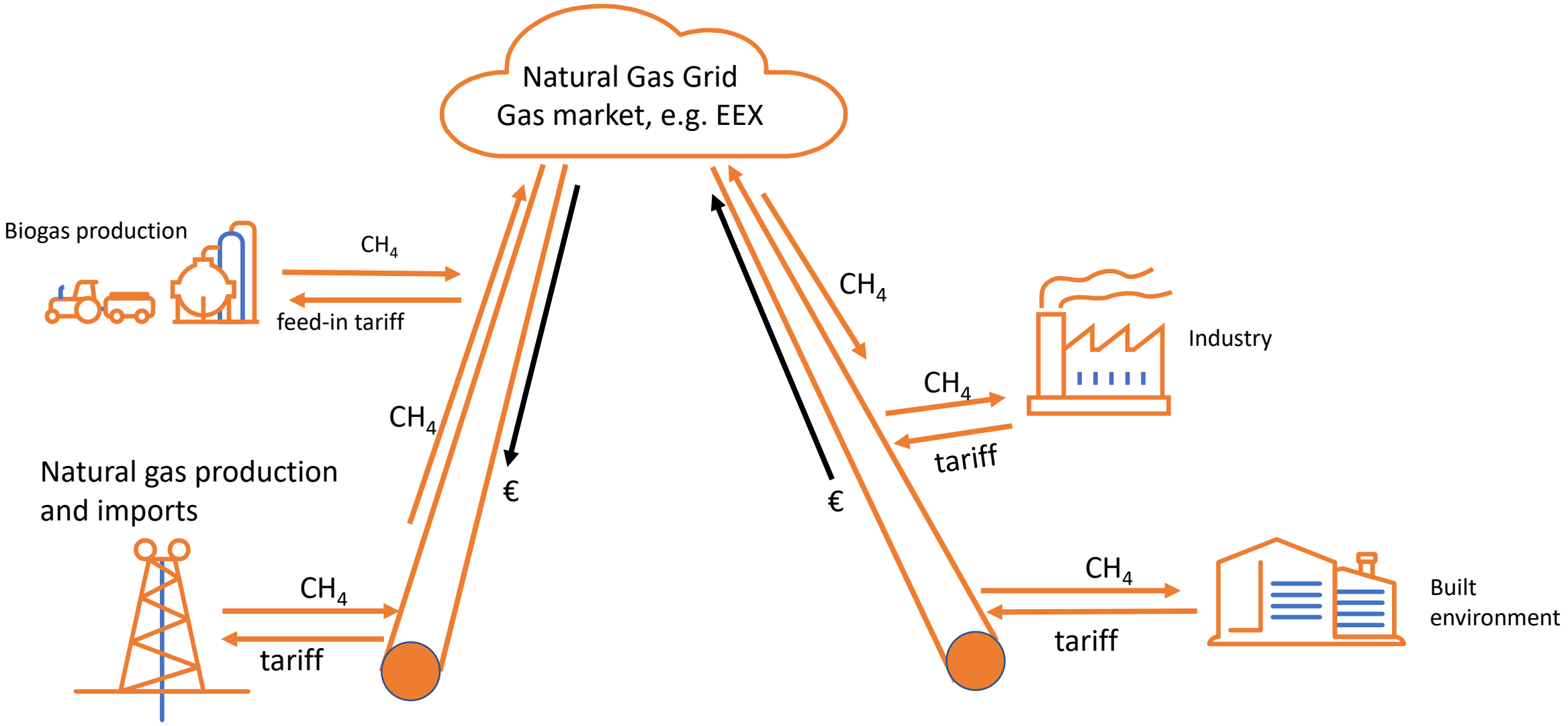


1. dii-desertenergy.org/wp-content/uploads/2019/12/Dii-hydrogen-study-November-2019.pdf

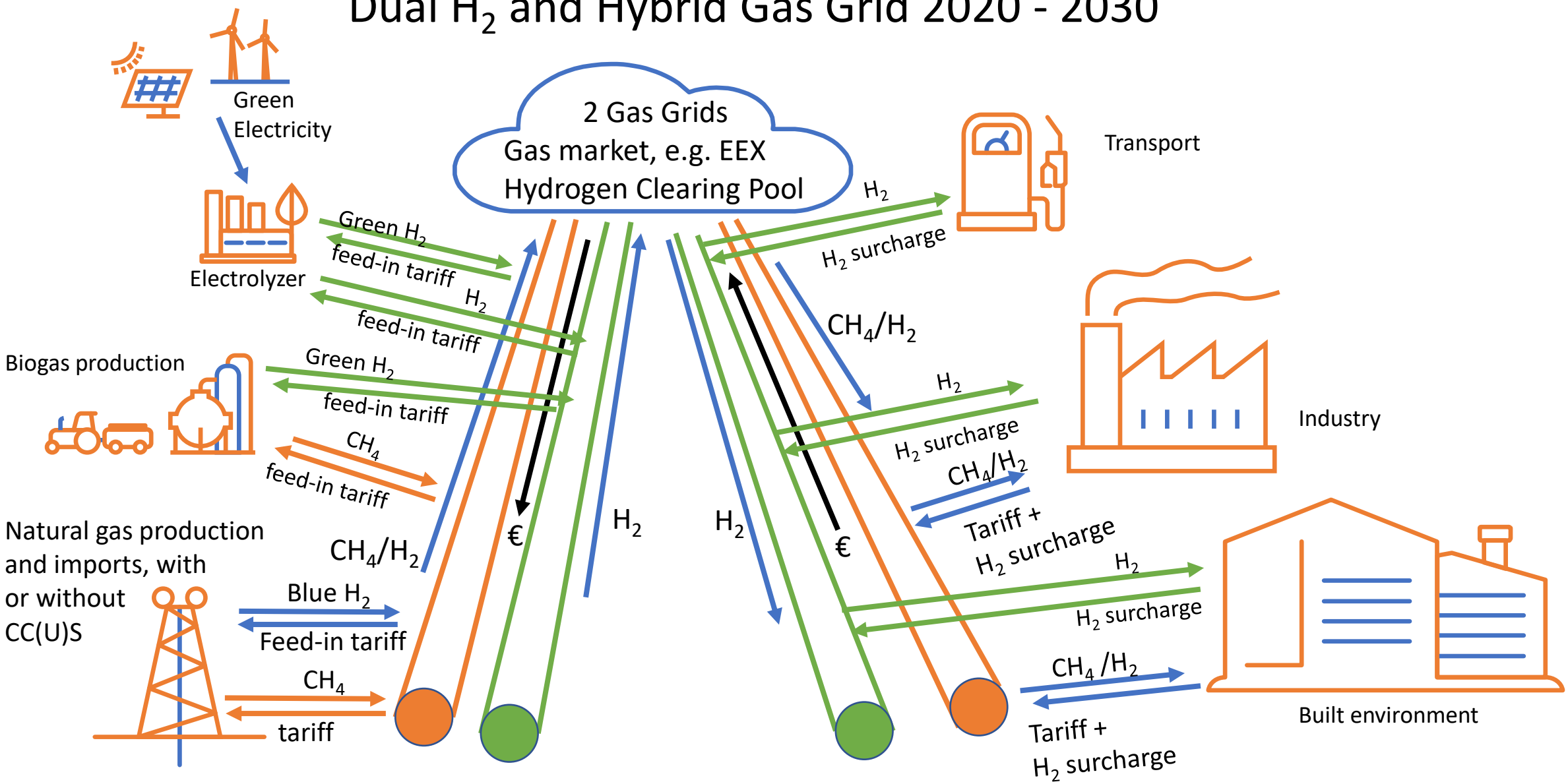
# 6

# Market Design

# Gas grid 2020



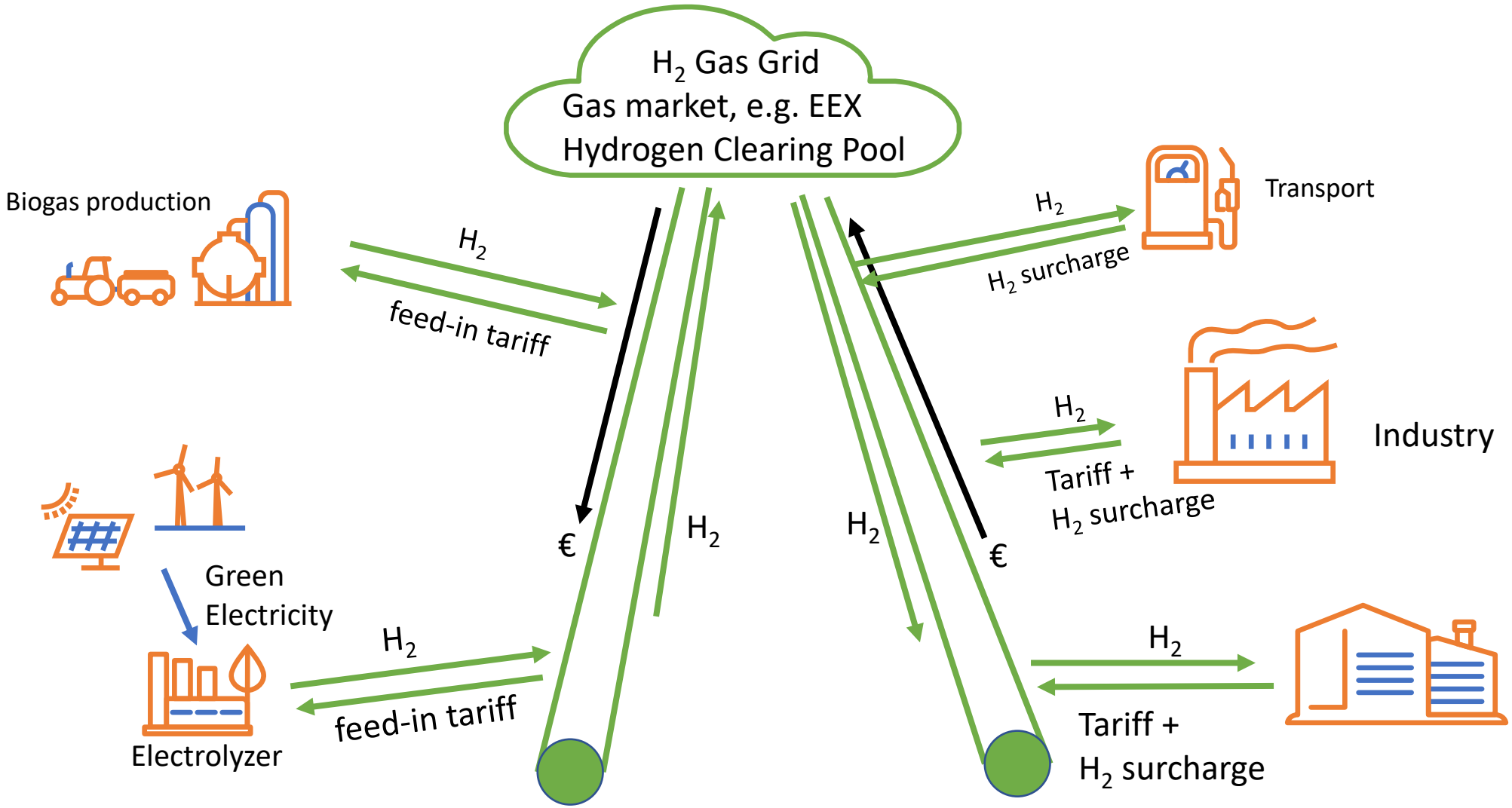
# Dual $H_2$ and Hybrid Gas Grid 2020 - 2030




Production of natural gas and hydrogen

Consumption of natural gas blended with hydrogen
As well as pure hydrogen

# $H_2$ Gas Grid 2050

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