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# The need for cross-border $CO_2$ infrastructure

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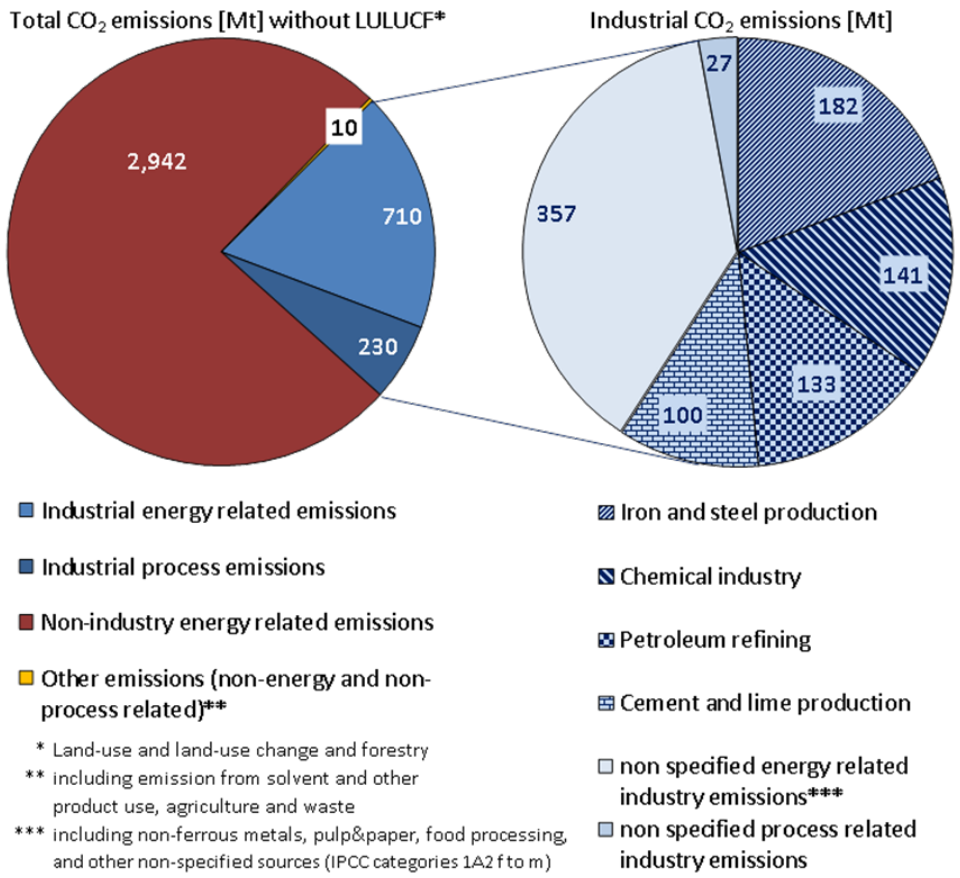
# Bellona

- Independent non-profit organisation
- ° 1986
- Technology and solution-oriented
- Offices in Brussels, Berlin, Oslo, London
- Bellona Europa – specialised in industrial decarbonisation & energy systems thinking

# ZEP 2013 Industry Report: Key Findings/Conclusions #1

- EU 2050 emission cut commitments **will require large-scale mitigation actions in all sectors of the economy.**
- In 2010, direct emissions from industry accounted for **25% of the total EU $CO_2$ emissions.**
- The adoption of **BAT, BPT is not sufficient** to reach the targets set to avoid dangerous climate change.



# Key Findings/Conclusions #2

- **CCS is the only available technology that can deliver the deep emission cuts in several EU energy-intensive industries**

- The deployment of CCS would help ensure a competitive position for existing EU industries in a future carbon-restrained world**, and help reconcile EU climate ambitions with the desire for a re-industrialisation of the EU economy.**

- *Pilot projects have shown that retrofitting $CO_2$ capture into the operation of the conventional processes is possible.* ***Large scale demonstration is now necessary.***

# Key Findings/Conclusions #2

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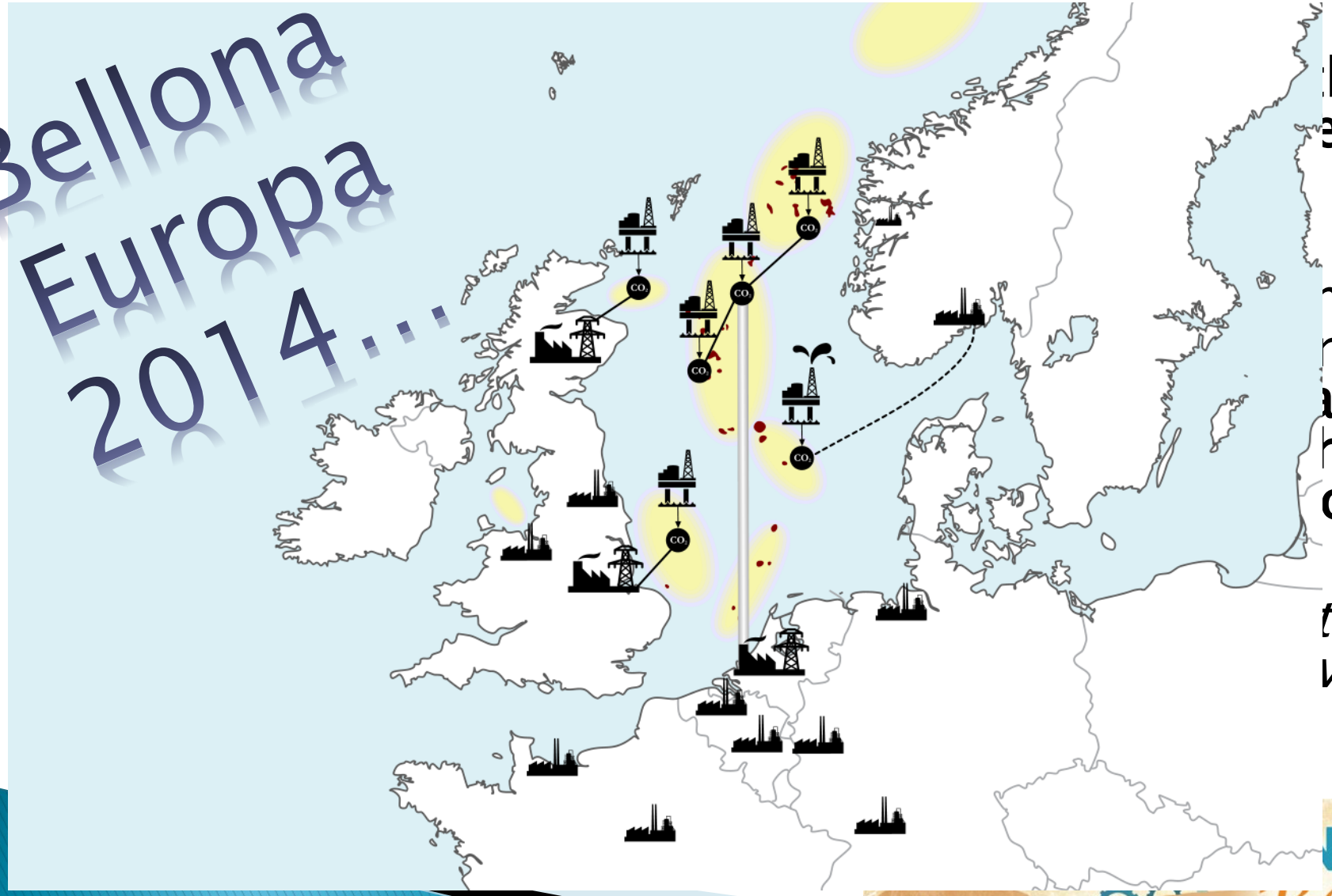
Zero emissions platform

Bellona Europa 2014…



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# Joint call to action for cross-border CO2 infrastructure

I. Cross-border working group
II. Framework conditions for CCS: scope of needs, role of government, participation
III. Legal framework and liability
IV. Funding framework
V. Multi-modal and multi-purpose nature
VI. Connection to industrial clusters further inland

# But what about steel…?
# Case study:
# Tata Steel Ijmuiden

## Direct reduction of iron ore with hydrogen

**Green $H_2$**

- Potential lowest climate impact, no extraction of fossil resources
- Producing 6.62 million tonnes of steel will require 21.2 TWh of renewable electricity. This is more than the total wind production in the Netherlands in 2020.

**Blue $H_2$**

- Needs less electricity input
- GHG emissions are very low dependent on high capture rate, permanent storage, and low methane leakage

- https://www.frompollutiontosolution.org/

> **Running Tata Steel on green hydrogen requires more electricity than the total 2020 Dutch wind production…**

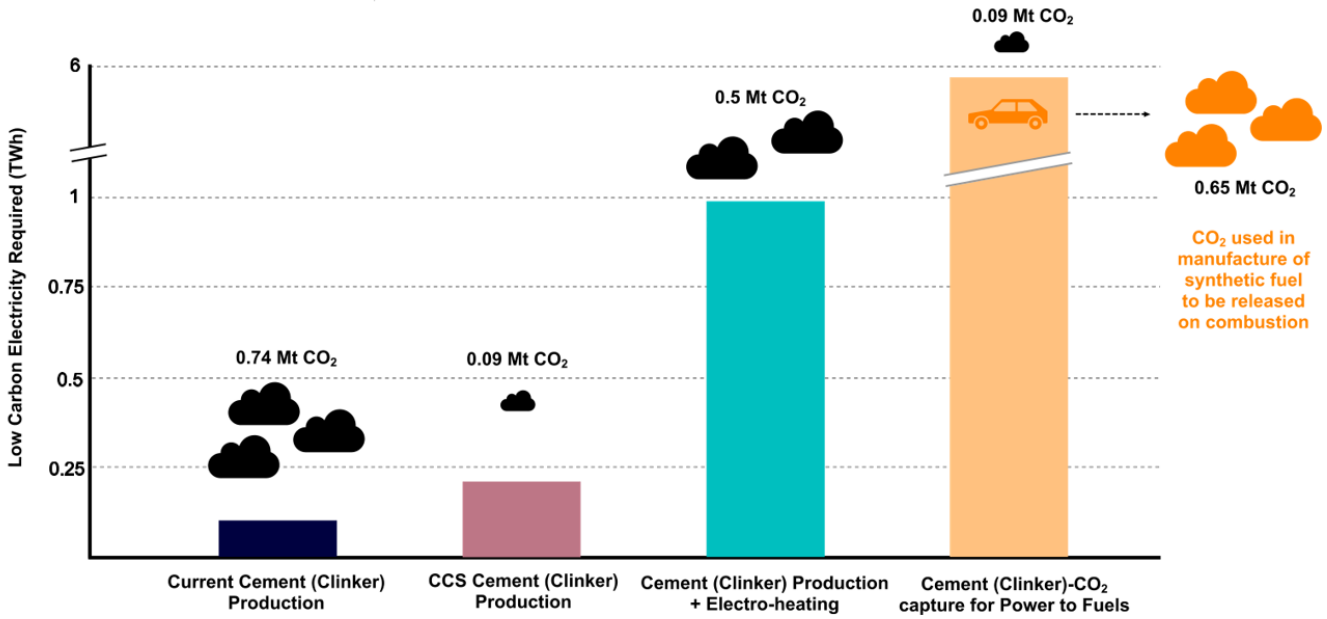
# RESOURCE REQUIREMENTS OF INDUSTRIAL DEEP EMISSIONS CUTS

**Decarbonisation & Electricity requirement**

Electrification in the cement sector provides limited $CO_2$ reductions – ***process emission remain.***

Electrification of New Steel production via Steel Direct Reduction of Iron (DRI) via Hydrogen requires significant renewable energy. ***A single steel production site would consume as much electricity as 9 million European households.***

Decarbonisation of Europe's chemical production – via electrification & hydrogen would require ***more than twice*** (+140%) ***the EU's current electricity generation.***




Reference cement production facility of 1 million tonnes per annum. Comparing the electricity requirements and CO2 reduction of carbon capture and storage, electric heating, CO2 conversion via power to fuels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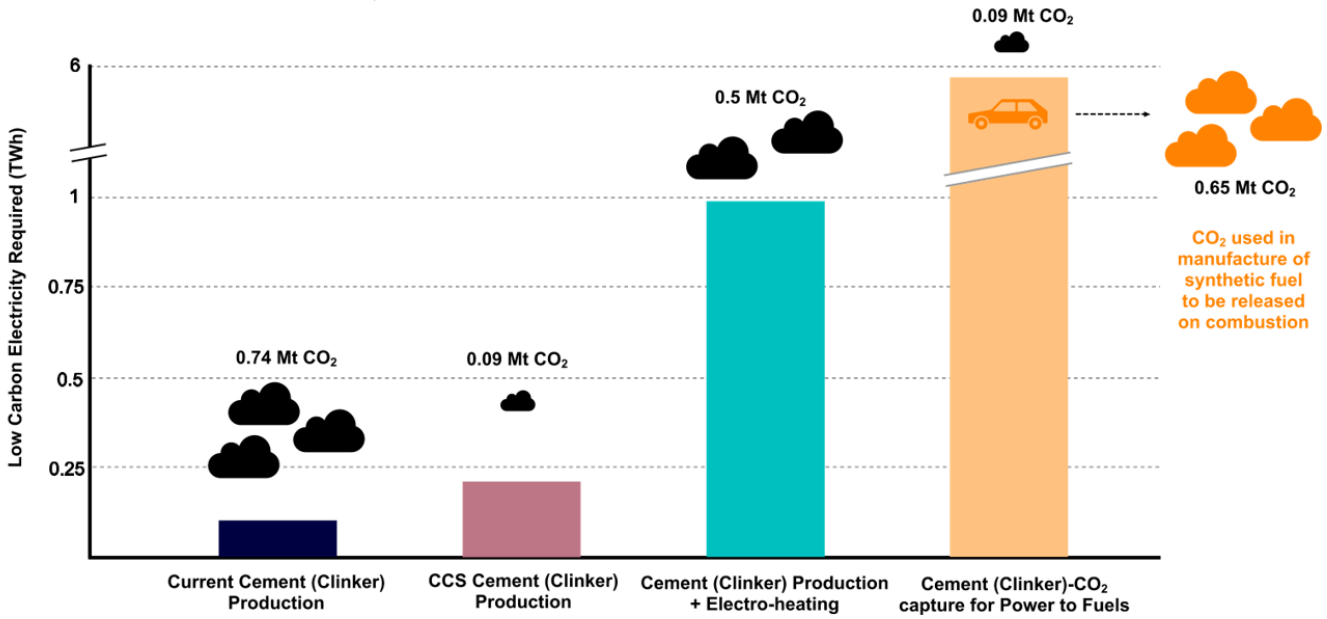
# OF INDUSTRIAL DEEP EMISSIONS CUTS




Reference cement production facility of 1 million tonnes per annum. Comparing the electricity requirements and CO2 reduction of carbon capture and storage, electric heating, CO2 conversion via power to fuels

# Carbon Dioxide Removal

## The four required principles to assess it

1. Carbon dioxide is **physically removed from the atmosphere**.

2. The removed carbon dioxide is **stored** out of the atmosphere **in a manner intended to be permanent.**

3. **Upstream and downstream GHG**, associated with the removal and storage process, are comprehensively estimated and **included in the emission balance**.

4. The total quantity of atmospheric **carbon dioxide removed and permanently stored is greater than** the total quantity of **carbon dioxide emitted** to the atmosphere.

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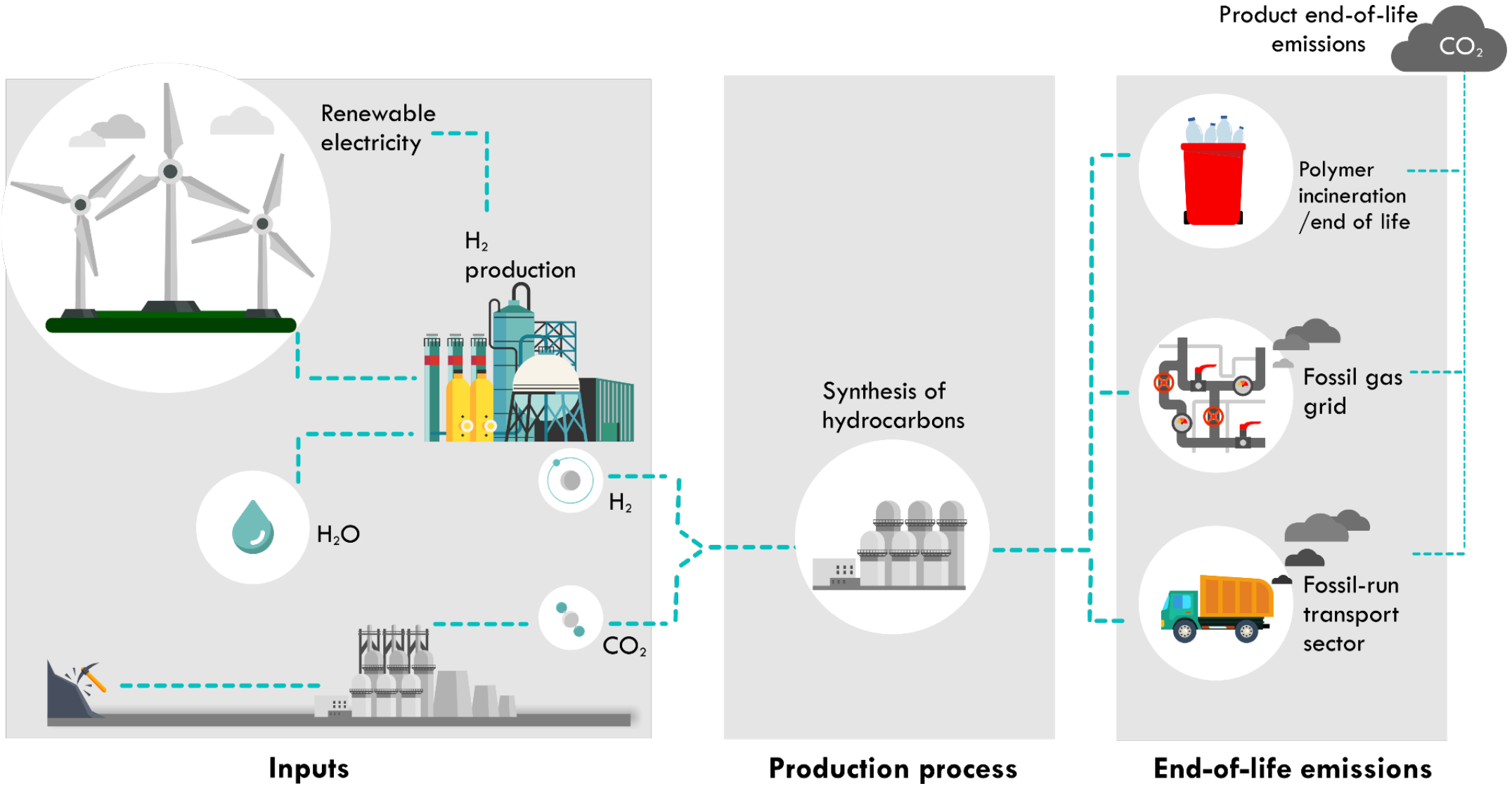
# WHAT OF CO2 UTILISATION? - NOT ALL CCU IS CLIMATE ACTION!



# REVIEWING THE CCU ($P_2X$) LOBBY NUMBERS…

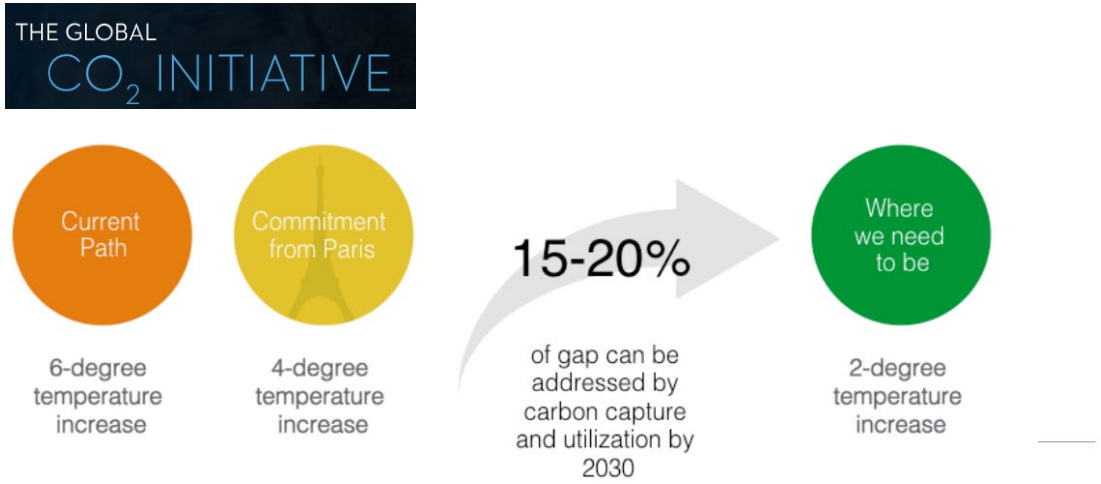
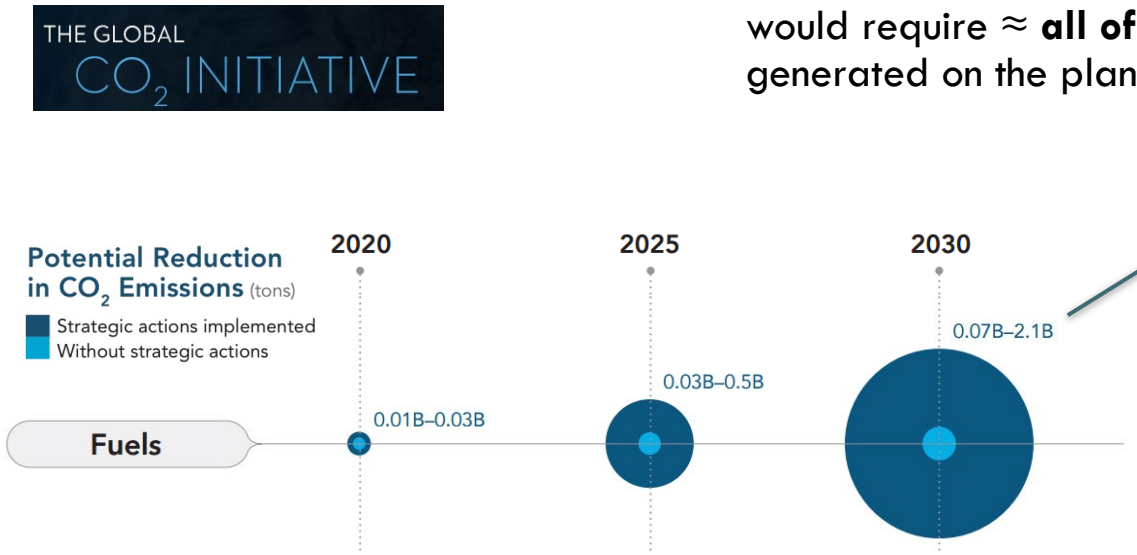


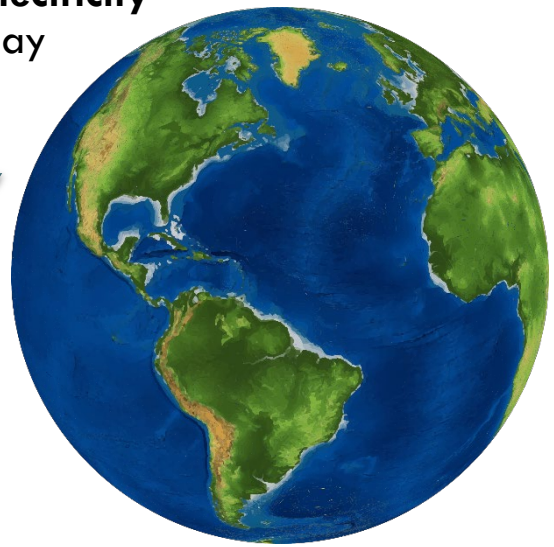

***Figure 4: CBPI can play a significant role in addressing gap to achieve a $2^0$ future***

Source: Issam Dairanieh, $CO_2$ Sciences, "*Market potential and environmental impact of CO2 conversion technologies*"

# REVIEWING THE CCU ($P_2X$) LOBBY NUMBERS…

Putting 2.1 billion tonnes of $CO_2$ into fuels would require ≈ **all of the electricity** generated on the planet today



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# REVIEWING THE C

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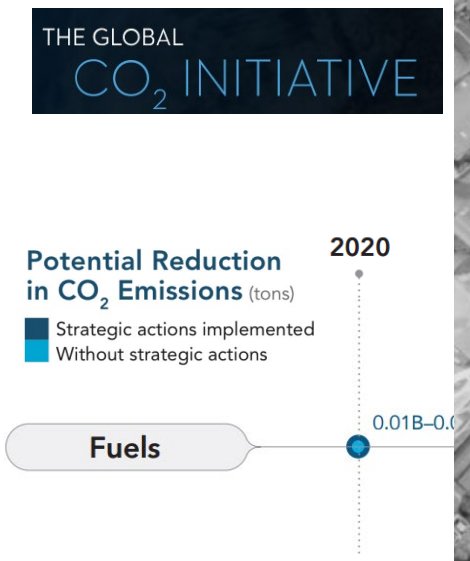


Source: Issam Dairanieh, CO
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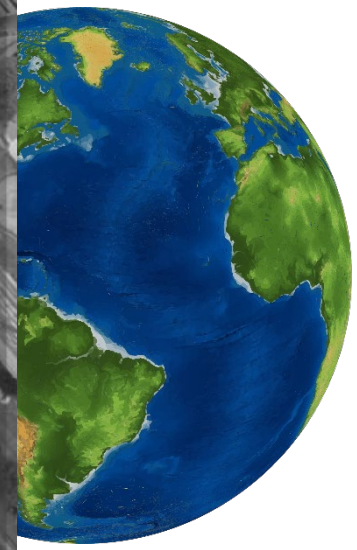
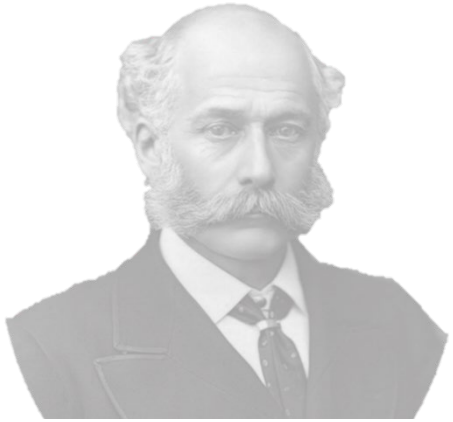


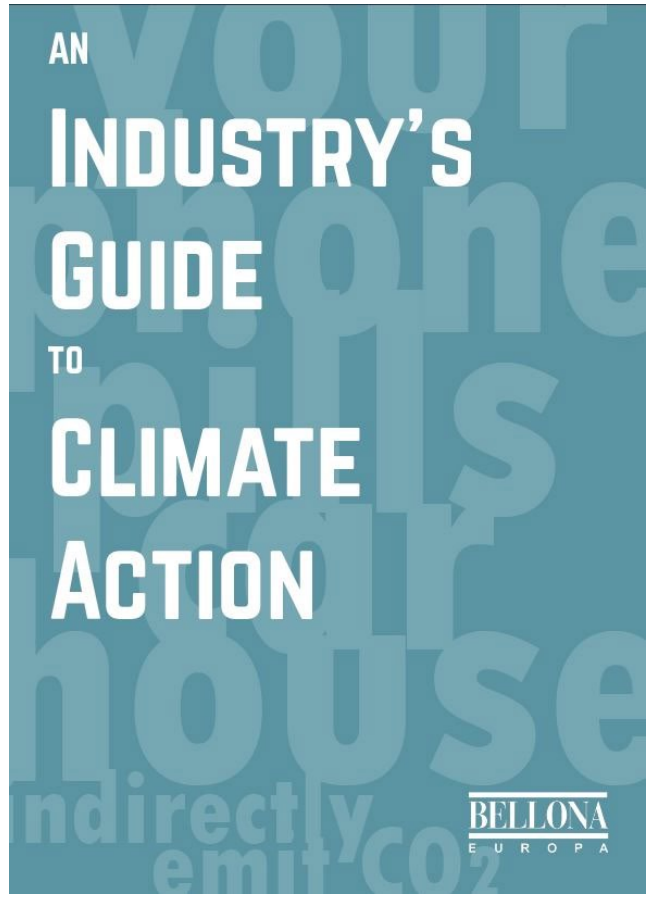
# $CO_2$ NETWORK AS A PUBLIC GOOD

*In the early 19th century, London planned to expand its sewage system, yet faced widespread public opposition. Particularly wealthier people, living uphill, did not see why a general sewage system was needed and hence did not want to pay to improve the property of private individuals 'downhill'. In fact,* ***sewage was not seen as a public good****, and so the government initially considered it improper to use public money.* ***It took several cholera epidemics, thousands of deaths, and the 'Great Stink' of 1858 for London to finally modernize and upgrade its sewage system****, at last stopping the unchecked dumping of human waste into the city and the river Thames.*



***"[The principle] was of diverting the cause of the mischief to a locality where it can do no mischief."***

Sir Joseph Bazalgette, Civil Engineer



# Thanks for your attention!
# Get in touch ☺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