MANUFACTURING OUR FUTURE: INDUSTRIES, EUROPEAN REGIONS AND CLIMATE ACTION

Just and achievable industrial decarbonisation

@Bellona_EU
A typical wind turbine is 89% steel

The high renewable scenario of the EU energy 2050 roadmap anticipates 1,000 GW of wind power to be installed. This will require 100 million tonnes of steel.

Deeply decarbonising steel requires CO$_2$ transport and storage infrastructure.
Energy efficient and passives buildings use materials like cement to increase thermal mass, heating the building in winter and cooling it in summer.

Deeply decarbonising cement requires CO$_2$ transport and storage infrastructure.
Nitrogen fertilisers are responsible for 1% of global CO$_2$ emissions.

Using less will improve the climate and the environment.

To deeply decarbonise what remains requires CO$_2$ transport and storage infrastructure.

Credit: thinkstock, David De Lossy
What is Industrial Carbon Capture Use and Storage?

Reviewing the investment and delivery profile of each part of the iCCUS chain turns this on its head.
How is CCS development going in Europe?

Two CO\textsubscript{2} storage projects – one dating form 1996 and both oil and gas related

No commercial scale transport of CO\textsubscript{2}

No CO\textsubscript{2} capture at industrial facilities
Can European emissions trading (ETS) CO$_2$ price drive iCCUS and the development of CO$_2$ networks?

The price signal comes late after storage and transport should be developed = delay

The price signal does not encourage future planned sizing of infrastructure = no sharing and increased cost

CO$_2$ storage and infrastructure is around and in use for a long time. Much longer than most industries plan commercial investment = reluctance to invest
Can European emissions trading (ETS) CO\textsubscript{2} price drive iCCUS and the development of CO\textsubscript{2} networks?

Result: Less decarbonisation, later, and at a higher cost

In the interim industries will be paying the ETS with little options to deeply reduce emissions
What are Europe's goals for industrial development and policy tools for decarbonisation?

**EU industrial policies and targets (20% increase in industrial output by 2020)**

**EU goals: reduction CO\_2**
40% - 2030, 80-95% - 2050

There is tension between these two goals

Global competitiveness & Employment
What are the outcomes if a feasible decarbonisation pathway does not materialise?

- **Bad for industry** – added uncertainty, disincentive to investment
- **Bad for climate** - less action and at higher cost
- **Bad for industrial regions and employment** – Reduced investment, added uncertainty
What are the outcomes if a feasible decarbonisation pathway does not materialise?

The core reason for the tension is there is currently no accessible cost effective pathway for most CO\textsubscript{2} intensive industries to deeply decarbonise.
There is a role for Regional, National Governments and EU to enable timely development of enabling CO₂ networks.

- Shared networks for wider and lower cost decarbonisation
- Certainty of decarbonisation pathway
- Lower the effective ETS price to decarbonise

We propose using state-owned and/or -funded CO₂ Market Makers to break the current inertia. Regional CO₂ transport and storage infrastructure development organisations
Capture operators need to have a guaranteed \( \text{CO}_2 \) storage solution, at a known price, before they can gain finance.

Transport operators need to have confidence in income in order to perform feasibility and routing studies, including public engagement.

Storage operators need a guarantee of income before they can invest in exploration, appraisal and feasibility work.

**Counterparty risk** flows from each segment of the value chain to the other, making timely investment risky and more costly if they do occur.

**Solution:** Remove counterparty risk with regional *coordination* bodies to deliver each segment of the CCUS value chain in a timely and *strategic* manner.

The **Market Maker** is a regional CCUS coordination body:

a) Manages the development of primary infrastructure on behalf of the state (trunk pipelines, shipping terminals + back-up storage site)

b) Has a duty to take all contracted captured \( \text{CO}_2 \) and ensure corresponding storage is available.

*The Market Maker is ideal for developing required storage volumes during the pre-commercial phase.*
Network effect: Larger CO\textsubscript{2} networks provided better societal value, lower risk and greater participation for CO\textsubscript{2} emitters and CO\textsubscript{2} stores. Commercial risk is reduced though greater participation, market size and commercial maturity.

The Market Maker will require a mandate and capitalisation to place the foundations for a mature CO\textsubscript{2} network at an industrial emissions cluster.

The Market Maker will:

a) Tender for the development of CO\textsubscript{2} storage
b) Tender for the development of strategic CO\textsubscript{2} transport infrastructure
c) Tender for the initial supply of CO\textsubscript{2} to the CO\textsubscript{2} network. Using this CO\textsubscript{2} to develop CO\textsubscript{2} stores
d) Build out the CO\textsubscript{2} storage and transport network to CO\textsubscript{2} sources in a planned stepwise way

Lower societal cost of decarbonisation and increased decarbonisation

The Market Maker will advance planned CO\textsubscript{2} transport and storage to enable timely and lowest cost decarbonisation of industrial clusters
CO₂ Market Makers need to serve industrial regions (Hubs)
a) Very large industrial CO₂ cluster, including Europe’s largest steel complex.

b) Inland shipping already extensive for industrial products, inland shipping of CO₂ on barges is a scalable and affordable connection to CO₂ storage in North Sea through Rotterdam.

c) CO₂ storage onshore in Germany currently not permitted!
Example: the CO₂ Market Maker will start by:

1st
- Capture CO₂ at industrial source

2nd
- Transport CO₂ by ship to Rotterdam

3rd
- Store CO₂ underground or near industry location
How can a regional CO2 Market Maker be capitalised?

EU funding schemes eligible for CCS projects and that could possibly be accessed to capitalise/fund CO$_2$ Market Makers exist, yet they are highly fragmented.

As the main benefactors, it is imperative that Europe’s strategic industrial regions take ownership in prioritising the delivery of CO$_2$ networks.
### Investments

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### Deployment

- **EUROPEAN COMMISSION**
- **EIB**
- **ENERGY**
- **R&I**
- **REGIO**
- **CLIMATE ACTION**
- **CONNECT**

### Financing

- **From ~2020**
- **Between 2014-2020**
- **Since 2009**
These three industrial facilities alone produce 5% of Norway's CO₂ pollution. We need to Deeply Decarbonise Society to reach 1.5°C. A plan to capture, transport and store the CO₂ will solve that.
This is **EGE**
It is responsible for **20%** of CO₂ from the city of Oslo

**Oslo** plans to become carbon neutral

**EGE** will capture and store 300 thousand tonnes of CO₂ every year

Deeply Decarbonise Society to reach 1.5°C
This is **Norcem**
It produces cement for building energy efficient cities in **Norway**. It also produces CO$_2$, warming our world

**Norcem** will capture and store 800 thousand tonnes of CO$_2$ every year

Deeply Decarbonise Society to reach 1.5°C
This is **Yara Porsgrunn**

It produces fertiliser helping to increase crop yields. It also produces CO$_2$, increasing global warming.

**Yara Porsgrunn** will capture and store 300 thousand tonnes of CO$_2$ every year. Let's produce food and not CO$_2$.

Deeply Decarbonise Society to reach 1.5°C.