BELLONA

MANUFACTURING OUR FUTURE: INDUSTRIES, EUROPEAN REGIONS AND CLIMATE ACTION

Just and achievable industrial decarbonisation

CCS Side-Event
7th November, EU Pavillion, COP22 Marrakech

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ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

"Many models cannot reach about 450 ppm CO2eq concentration by 2100 in the absence of CCS"

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

"CDR technologies such as BECCS are fundamental to many scenarios that achieve low-CO2eq concentrations"

Carbon-Negative | Cement | Steel | Refining & Chemicals | Gas | Coal

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

Credit: thinkstock, moodboard

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

Credit: thinkstock, ondatra-m


Decarbonising industry in Sweden
an assessment of possibilities and policy needs
Max Åhman*
Alexandra Nikoleris
Lars J Nilsson
RICARDO-AEA
sation of heat in industry
search evidence
21
A STEEL ROADMAP FOR A
LOW CARBON EUROPE 2050
INTERGOVERNMENTAL PANEL ON Climate change
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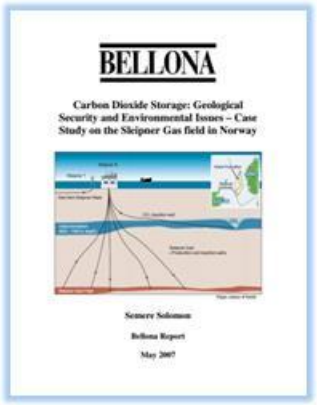
CLIMATE CHANGE 2014
Mitigation of Climate Change
Summary for Policymakers
and Technical Summary
WGIII
WORKING GROUP III CONTRIBUTION TO THE
FIFTH ASSESSMENT REPORT OF THE
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE
WMO
UNEP
This report has been prepared for the
Department of Energy and Climate Change and
the Department for Business, Innovation and Skills
Industrial Decarbonisation &
Energy Efficiency Roadmaps
to 2050
Iron and Steel
MARCH 2015
Energy Technology
Perspectives 2015
Mobilising Innovation to Accelerate Climate Action
WSP | PARSONS BRINCKERHOFF
DNV·GL
pathways to
deep decarbonization
2014 report
ELECTRICITY
INDUSTRY
TRANSPORT
LOWEST COST DECARBONISATION FOR TH
THE CRITICAL
Report to the Secretary of State f
Industrial Strategy from the
on

Bellona & CCS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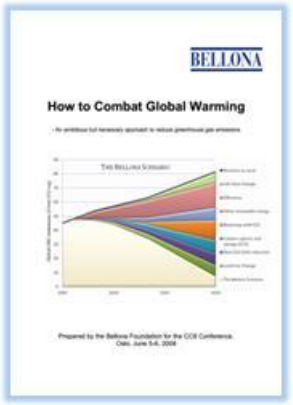
Carbon Dioxide Storage: Geological Security and Environmental Issues – Case Study on the Sleipner Gas field in Norway
Semere Solomon
Bellona Report
May 2007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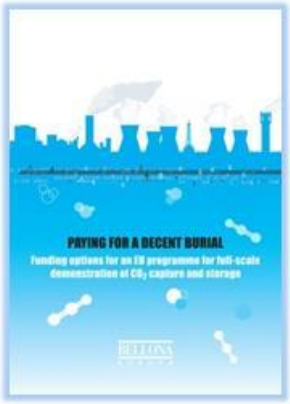
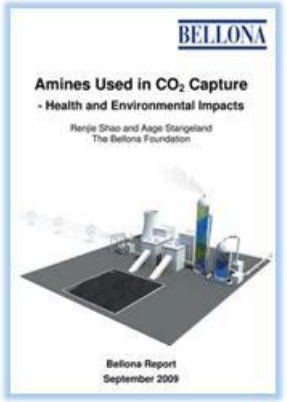
How to Combat Global Warming


PAYING FOR A DECENT BURIAL
Funding options for an EB programme for full-scale demonstration of CO_2 capture and storage


CCS: IMPLEMENTATION OF EU ETS NEW ENTRANT RESERVE FUNDING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Amines Used in CO_2 Capture
- Health and Environmental Impacts
Renjie Shao and Aage Stangeland
The Bellona Foundation
Bellona Report
September 2009


WHY CCS NOW
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EUROPA
Guidelines for public consultation and participation in CCS projects
November 2009


SUNDenergy
CCS in the Nordic countries
in a renewable/climate neutral future (2050)


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A BRIDGE TO A GREENER GREECE


BEST
INSURING ENERGY INDEPENDENCE


ENVIRONMENTAL LAW SERVICE
BEST
CCS READINESS AT SOSTANJ: TICKING BOXES OR PREPARING FOR THE FUTURE?

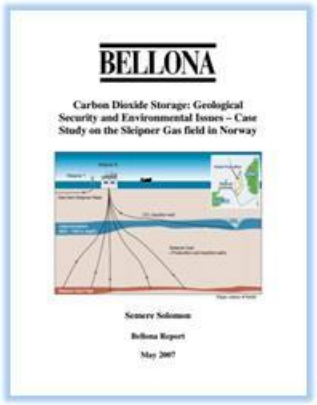

BEST
THE POWER OF CHOICE


BEST
OUR FUTURE IS CARBON NEGATIVE


BEST
KÁRSTØ
& CO_2 EOR
FIRST STEPS TO COMERCALISATION


BELLONA
Working Paper
DRIVING CO_2 CAPTURE AND STORAGE IN THE EU:
NEW POLICIES,
NEW PERSPECTIVES

Bellona & CCS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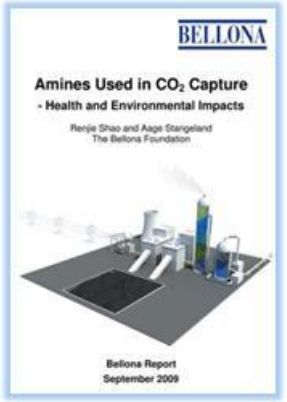
MANUFACTURING OUR FUTURE: INDUSTRIES, EUROPEAN REGIONS AND CLIMATE ACTION
CO_2 Networks for the Ruhr, Rotterdam, Antwerp & the greater Oslo Fjord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A CCS ROADMAP FOR POLAND


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Working Paper
DRIVING CO_2 CAPTURE AND STORAGE IN THE EU: NEW POLICIES, NEW PERSPECTIVES
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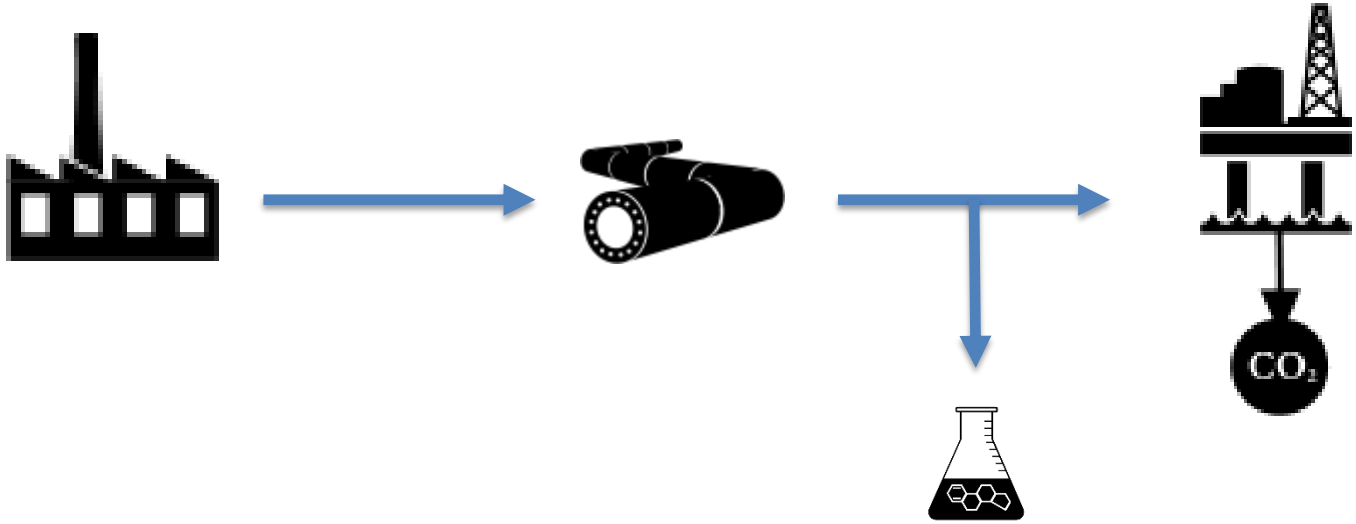
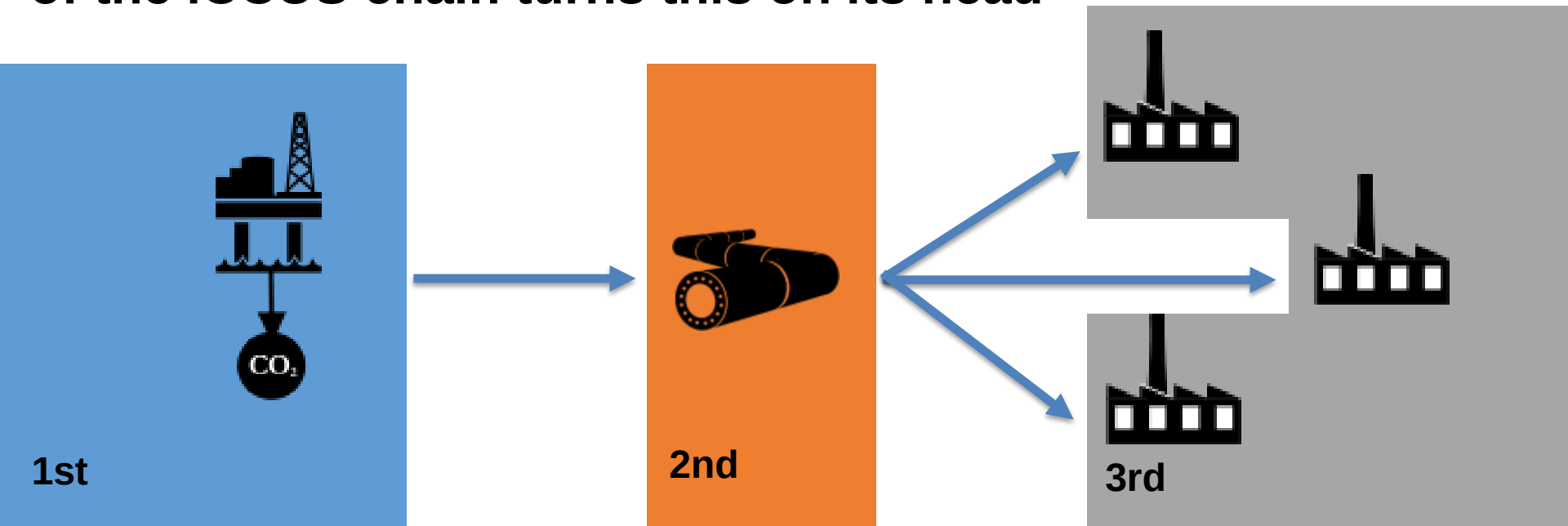
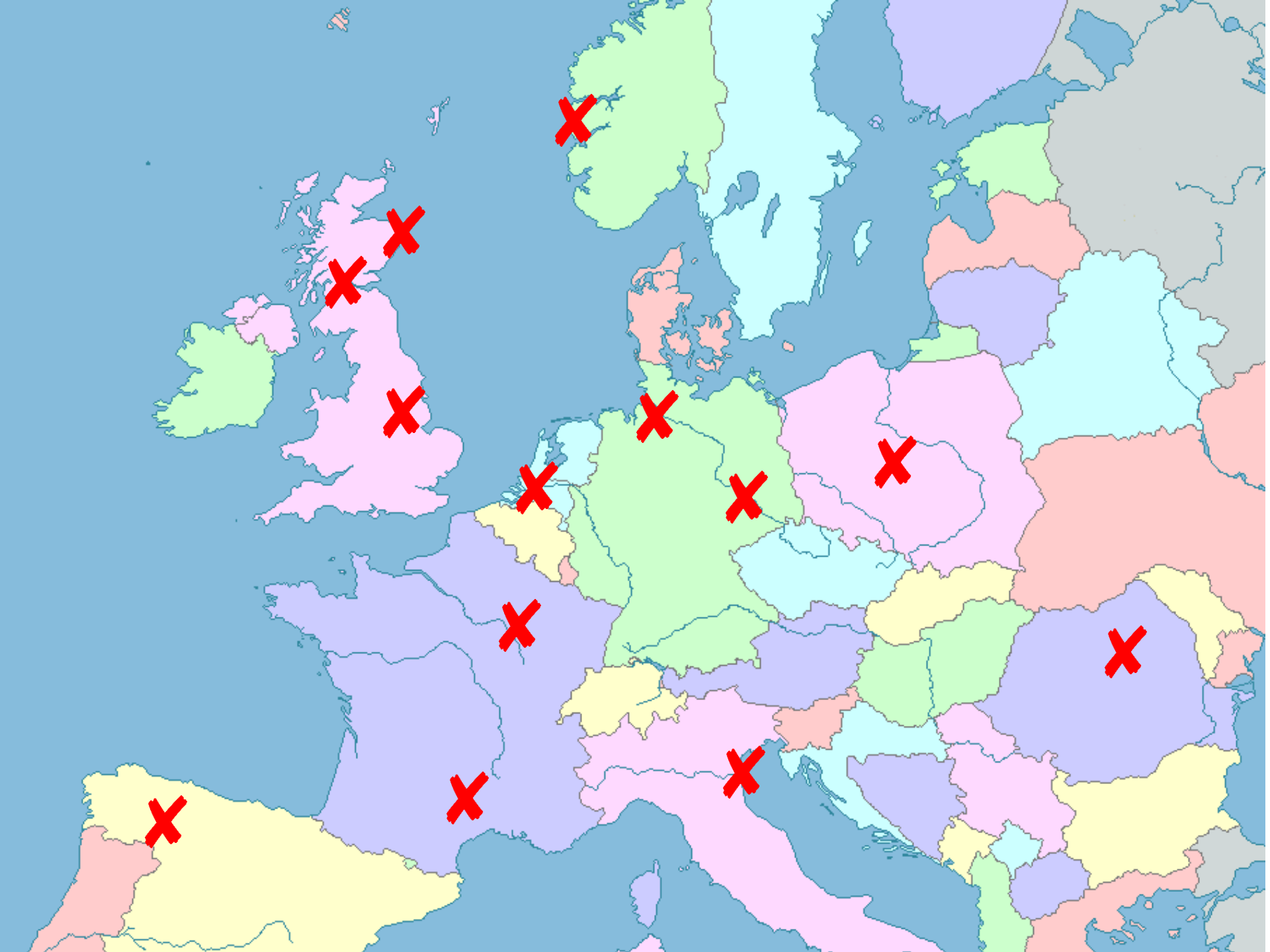
What is Industrial Carbon Capture (Use) & Storage?



Reviewing the investment and delivery profile of each part of the iCCUS chain turns this on its head





Can European emissions trading (ETS) CO_2 price drive iCC(U)S and the development of CO_2 networks?

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

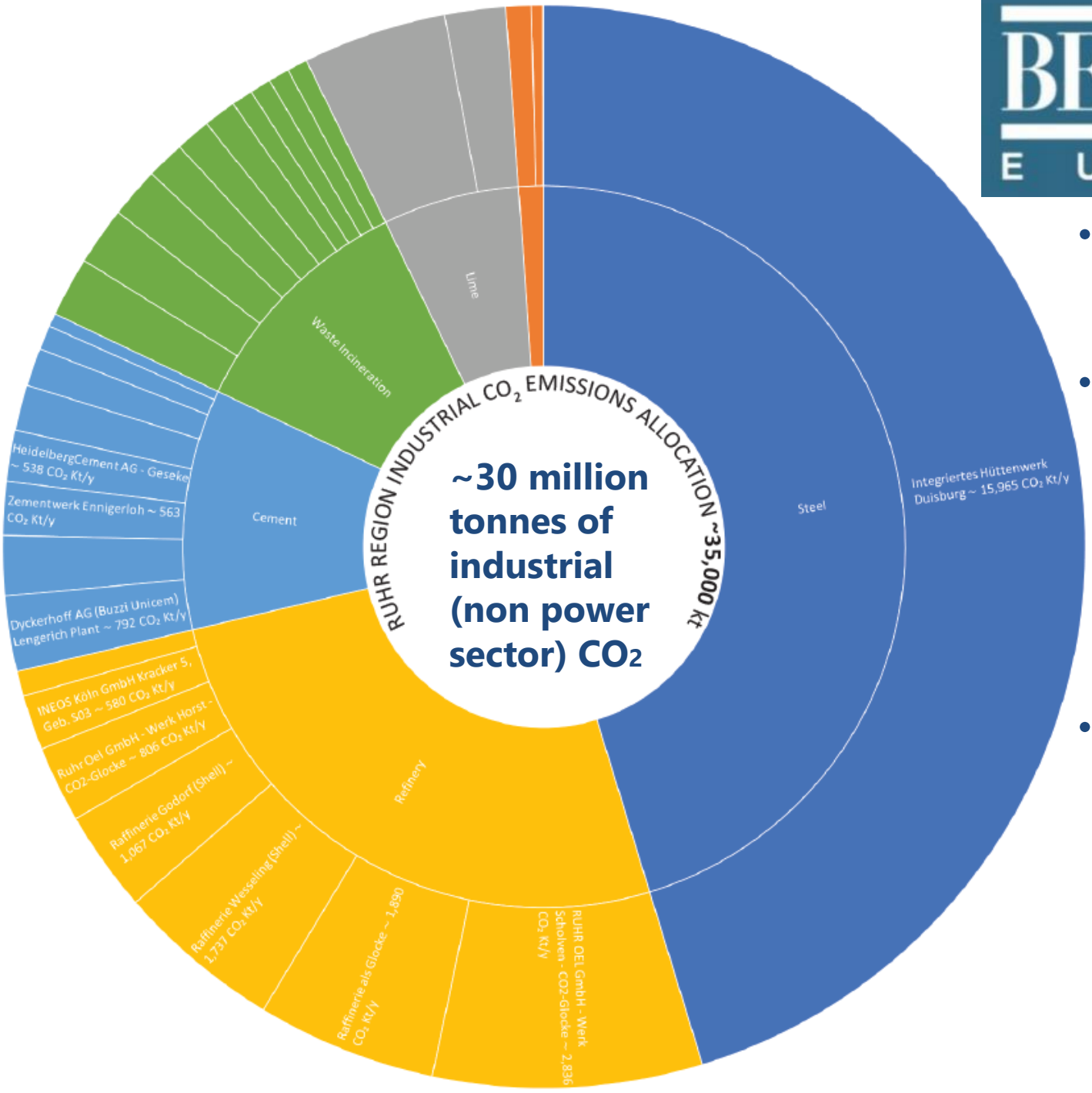
The price signal does not encourage future planned sizing of infrastructure = no sharing and increased cost

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_2 price drive iCC(U)S and the development of CO_2 networks?

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

In the interim industries will be paying the ETS, lacking options to deeply reduce emissions



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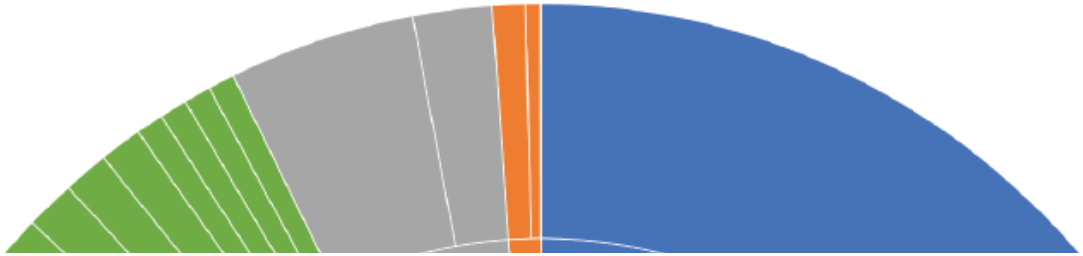
- **Ruhr Area**, Germany
- German industrial emissions make up ~¼ of Germany's CO_2 emissions
- What about the reform of the EU ETS...?



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Bloomberg ▼ | Germany Vows Help for Battered Steelmakers Ahead of Carbon Bill

Germany Vows Help for Battered Steelmakers Ahead of Carbon Bill

by Brian Parkin
bparkx

April 29, 2016 – 4:12 PM CEST

- Germany seeks exemptions for steel industry in ETS reform
- German steelers face EU1 billion bill p.a. for CO2 permits

Germany's ruling coalition is backing calls from steel producers like Thyssenkrupp AG and Salzgitter AG to shield them from financial risks from the European Union's

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EU ETS...?

With the EU economic crisis, Industrial output and related CO_2 emissions fell, and the ETS EUA (CO_2) price plunged

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Market purists say Great, that was the idea: Europe will exceed its 2020 emissions target!

…but is job loss a climate solution? What about our consumption?

Picture source: The Economist

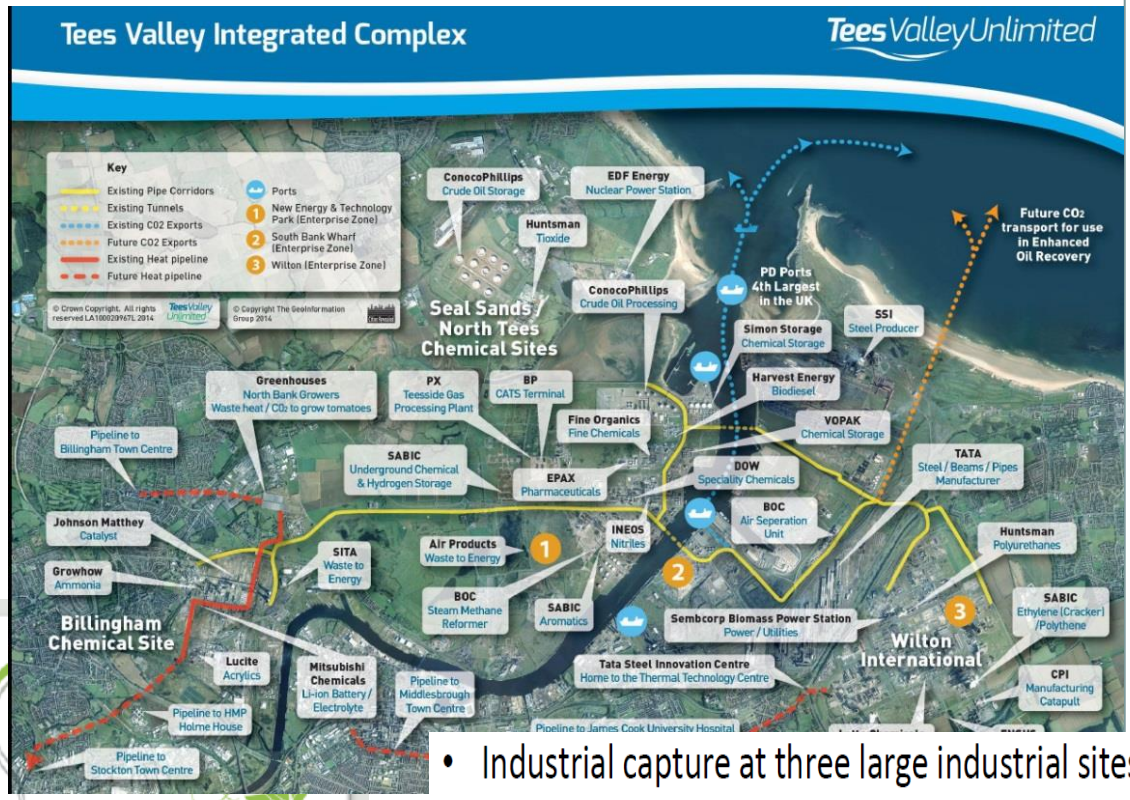
We do need disruptive industry.

But in the foreseeable future, we also need loads of steel, cement etc..

Massive industrial job loss will turn society against climate action

Let's together build a societal case for industrial decarbonisation - then we can secure public support!

The voice of 60 million workers in Europe



Tees Valley Unlimited

iccsi
PROCESS INDUSTRY CARBON CAPTURE & STORAGE INITIATIVE

- Industrial capture at three large industrial sites
  - Ammonia, Steam Methane Reformer, Blast Furnace
- Additional, smaller, and future sources of CO_2

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-efficient pathway for most CO_2-intensive industries to deeply decarbonise

There is a role for Regional, National Governments and EU to enable timely development of enabling CO_2 networks

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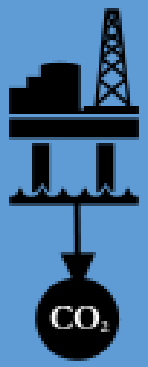
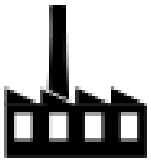
Shared networks for wider and lower cost decarbonisation

Certainty of decarbonisation pathway

Lower the effective ETS price to decarbonise



We propose using state-owned and/or -funded CO_2 Market Makers to break the current inertia. Regional CO_2 transport and storage infrastructure development organisations



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

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

Capture operators need to have a **guaranteed CO_2 storage solution**, at a known price, before they can gain finance

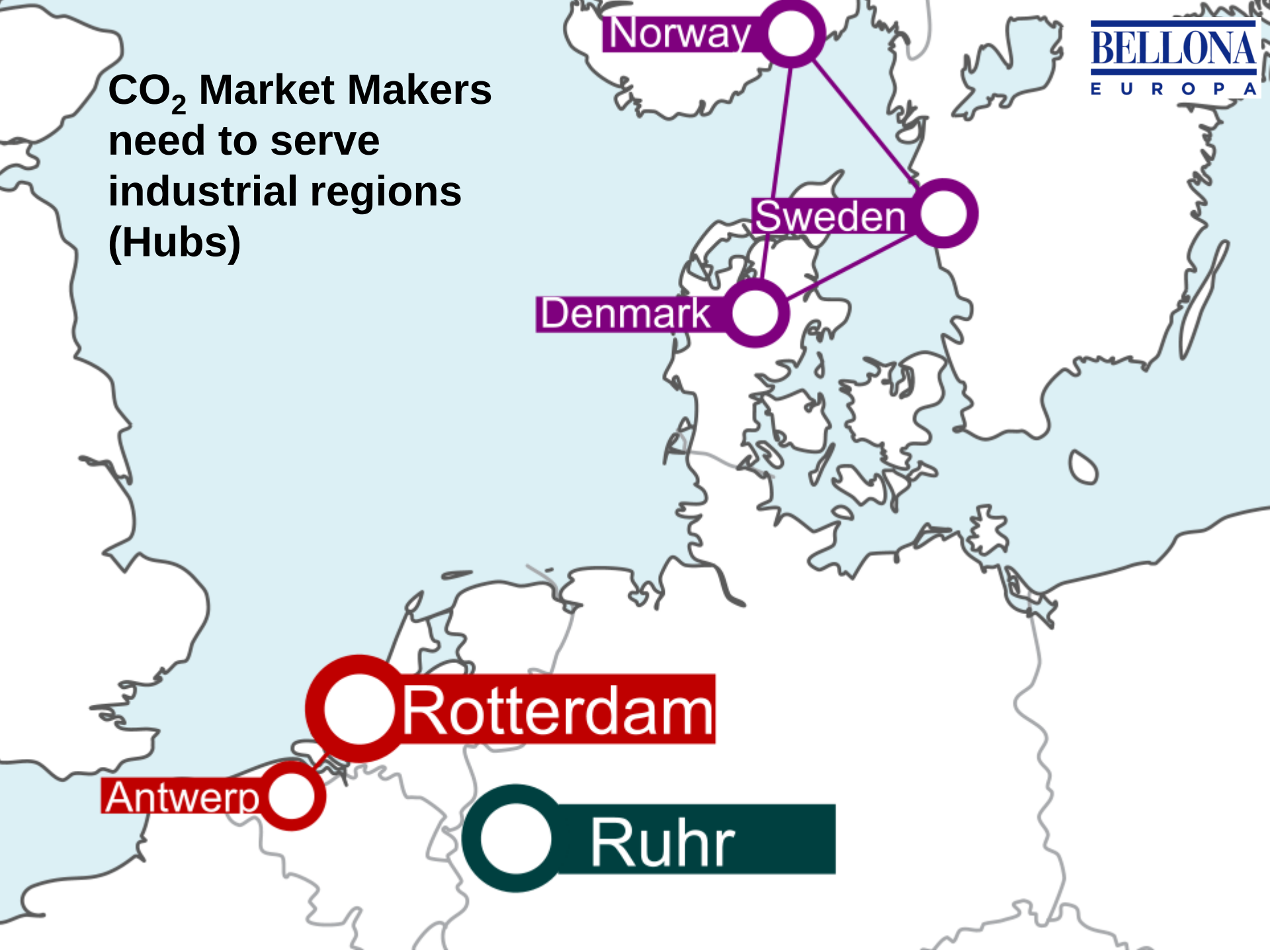
Counterparty risk flows from each segment of the value chain to the other, making timely investment risky and more costly if they do occur

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 CO_2 and ensure corresponding storage is available.

The Market Maker is ideal for developing required storage volumes during the pre-commercial phase.


CO_2 Market Makers need to serve industrial regions (Hubs)
Norway
Sweden
Denmark
Rotterdam
Antwerp
Ruhr
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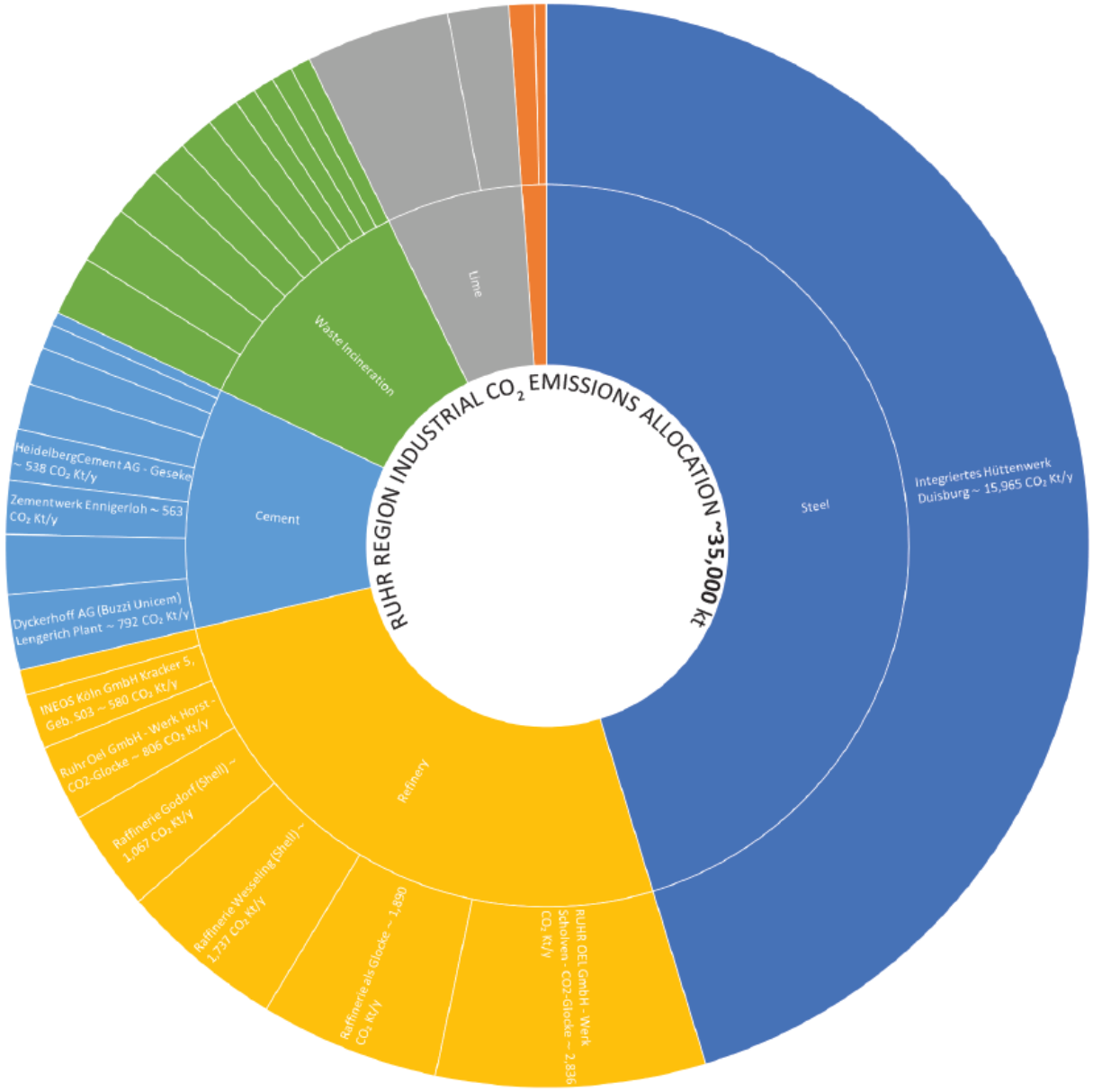
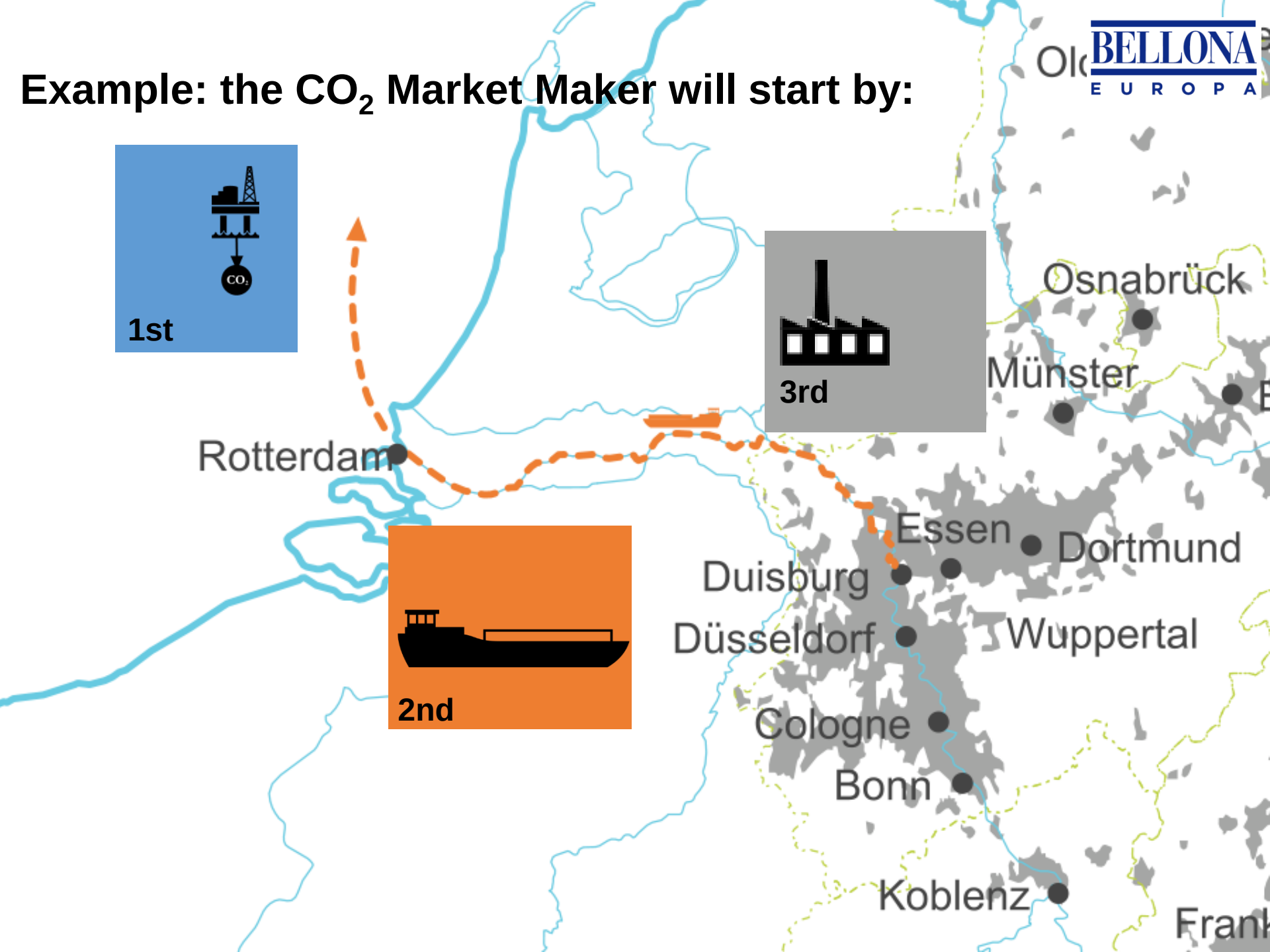
The case of the Ruhr Germany

a) Very large industrial CO_2 cluster, including Europe's largest steel complex.
b) Inland shipping already extensive for industrial products, inland shipping of CO_2 on barges is a scalable and affordable connection to CO_2 storage in North Sea through Rotterdam.
c) CO_2 storage onshore in Germany currently not permitted!



Example: the CO_2 Market Maker will start by:



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

EUROPEAN INSTRUMENTS CAN AID STRATEGIC DEVELOPMENT OF CO_2 CAPTURE, TRANSPORT AND STORAGE

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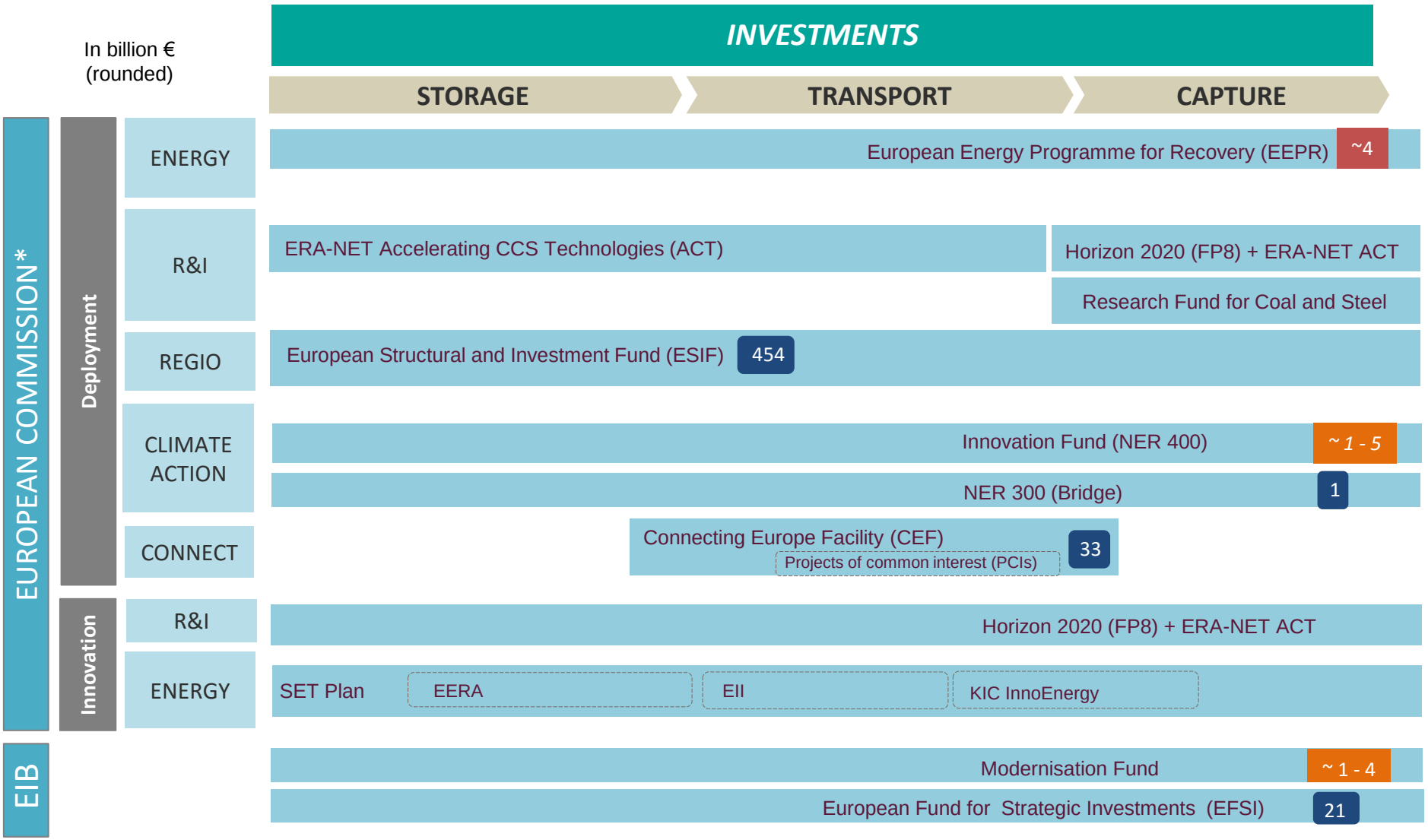
In billion €
(rounded)



Caption

X From ~2020

X Between 2014-2020

X Since 2009

Press Release: Norway breaks vicious cycle of inaction on CCS deployment with concrete plans for industry

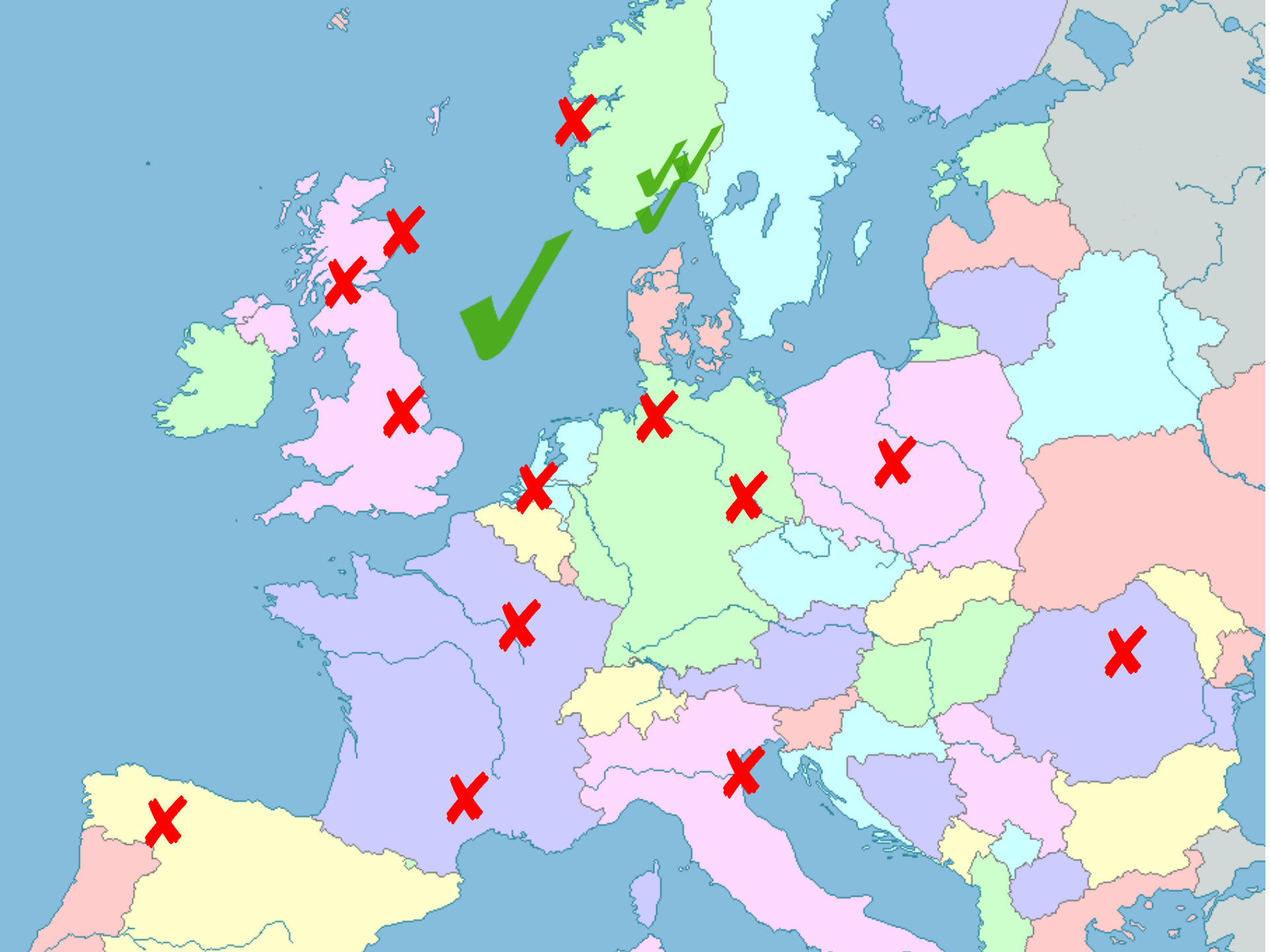
Today marks a historic milestone for the deployment of Carbon Capture and Storage (CCS) technology in the EU. Thanks to Bellona's consistent efforts the Norwegian Ministry for Petroleum and Energy today, 30 September 2016, confirmed the Norwegian government's decision to move forward with the country's three CO2 capture projects from the feasibility study.

Published on September 30, 2016 by **Bellona Europa**

The capture projects represent three different industries: Yara, the world's largest ammonia production company, Norcem, Norway's sole cement producer, and Oslo's waste management and energy recovery CCS project Klemetsrud. This will thus add immense value for the development of CO_2 capture technologies in Norway and throughout the EU.

Related posts

- Why deeply decarbonising cement needs CCS
- Why deeply decarbonising fertiliser manufacture needs CCS
- Why tackling waste incineration emissions needs CCS
- Press Release: Norway breaks vicious cycle of inaction on CCS deployment with concrete plans for industry



Lord Oxburghs report (UK) 12th September 2016

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Recommendations

1. Establish a CCS Delivery Company ("CCSDC") (paras 195 –252)

A newly formed and initially state-owned company tasked with delivering full-chain CCS for power at strategic hubs around the UK at or below £85/MWh on a baseload CfD equivalent basis. Formed of two linked but separately regulated companies: "PowerCo" to deliver the power stations and "T&SCo" to deliver the transport and storage infrastructure, the CCSDC will need c.£200-300m of funding over the coming 4-5 years.

2. Establish a system of economic regulation for CCS in the UK (paras 253-290)

The government will establish a system of economic regulation for CCS in the UK which is based on a regulated return approach. This will draw heavily on existing regulatory structures in the energy system and hence include: a CCS Power Contract based on the existing CfD or capacity contract to incentivise CCS for power; the regulation of T&SCo as

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