



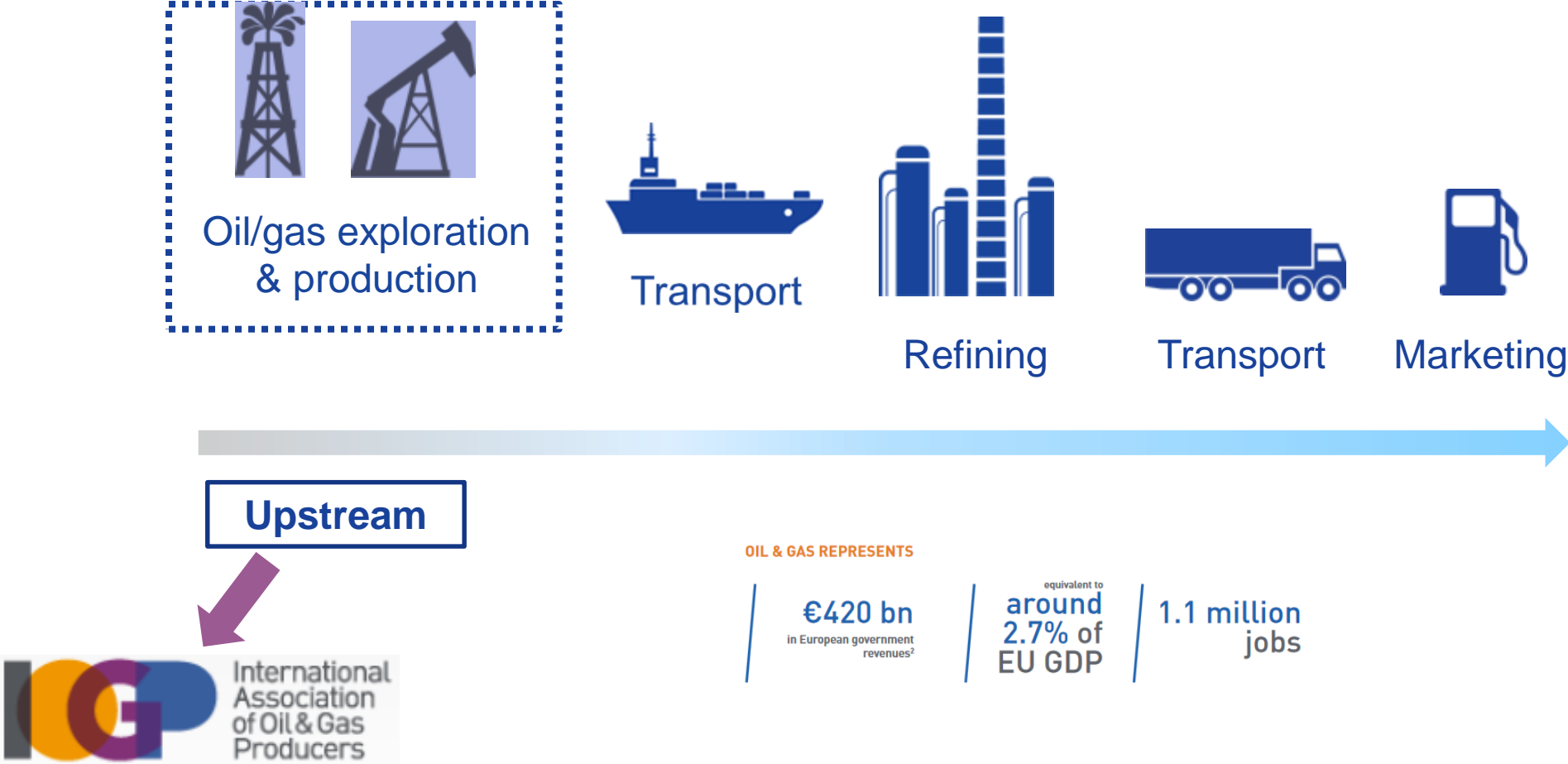
International
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Producers

The Potential for CCS in Europe

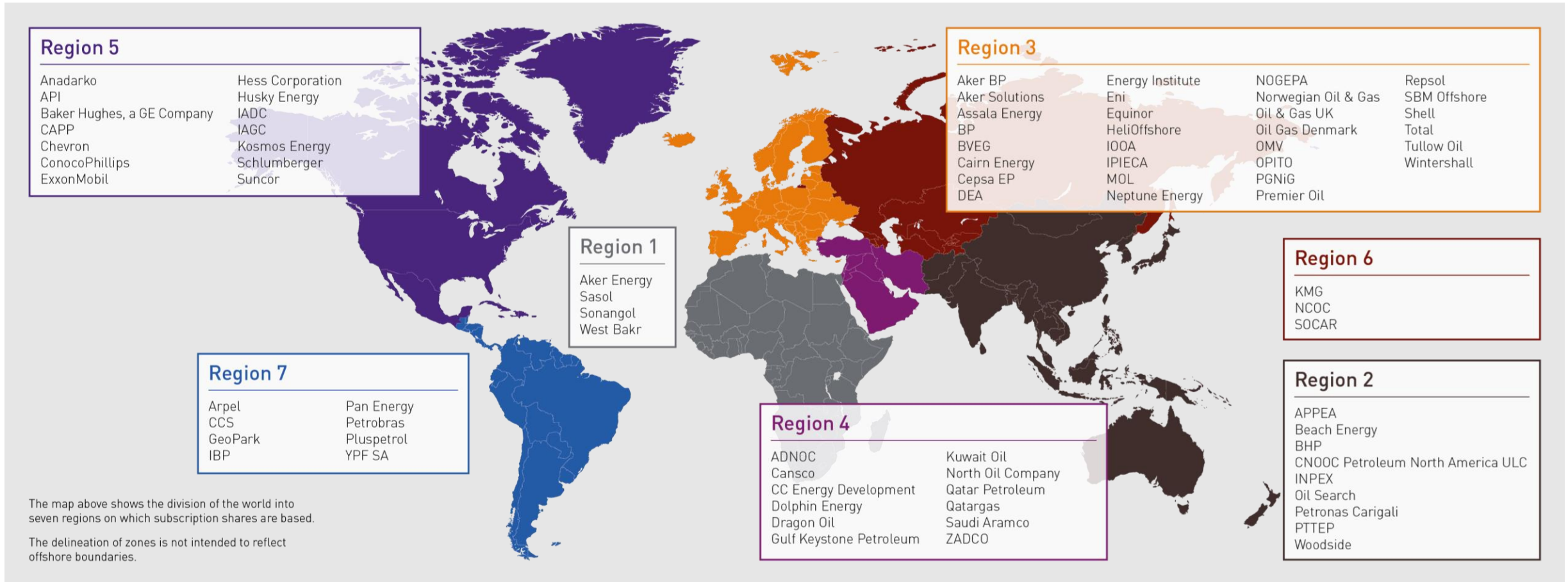
14th October 2019



International Association of Oil & Gas Producers - IOGP



Global Membership

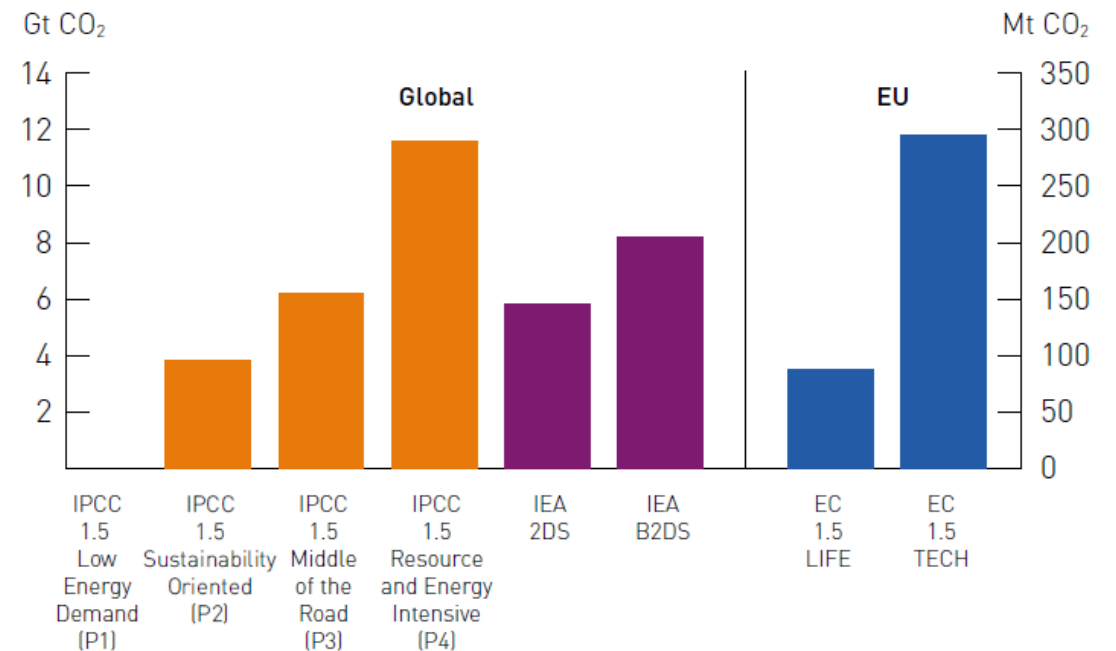


Map shows locations of Member Head Offices. Many operate globally

The role of CCS

- The IPCC, IEA and European Commission foresee an important role for CCS in meeting the Paris Agreement targets.
- Today, there are two large-scale CCS facilities operating in Europe, capturing a total of 1.55 Mtpa CO₂ for storage.
- To be on track for 1.5°C, one CCS facility capturing 1.5 Mt CO₂ would need to be added every week from now until 2050.

The role of CCS in global and EU 2°C and 1.5°C scenarios CO₂ stored in 2050



Source: data from IPCC (2018), IEA (2017), GCCSI (2018).

The role of CCS and CCU

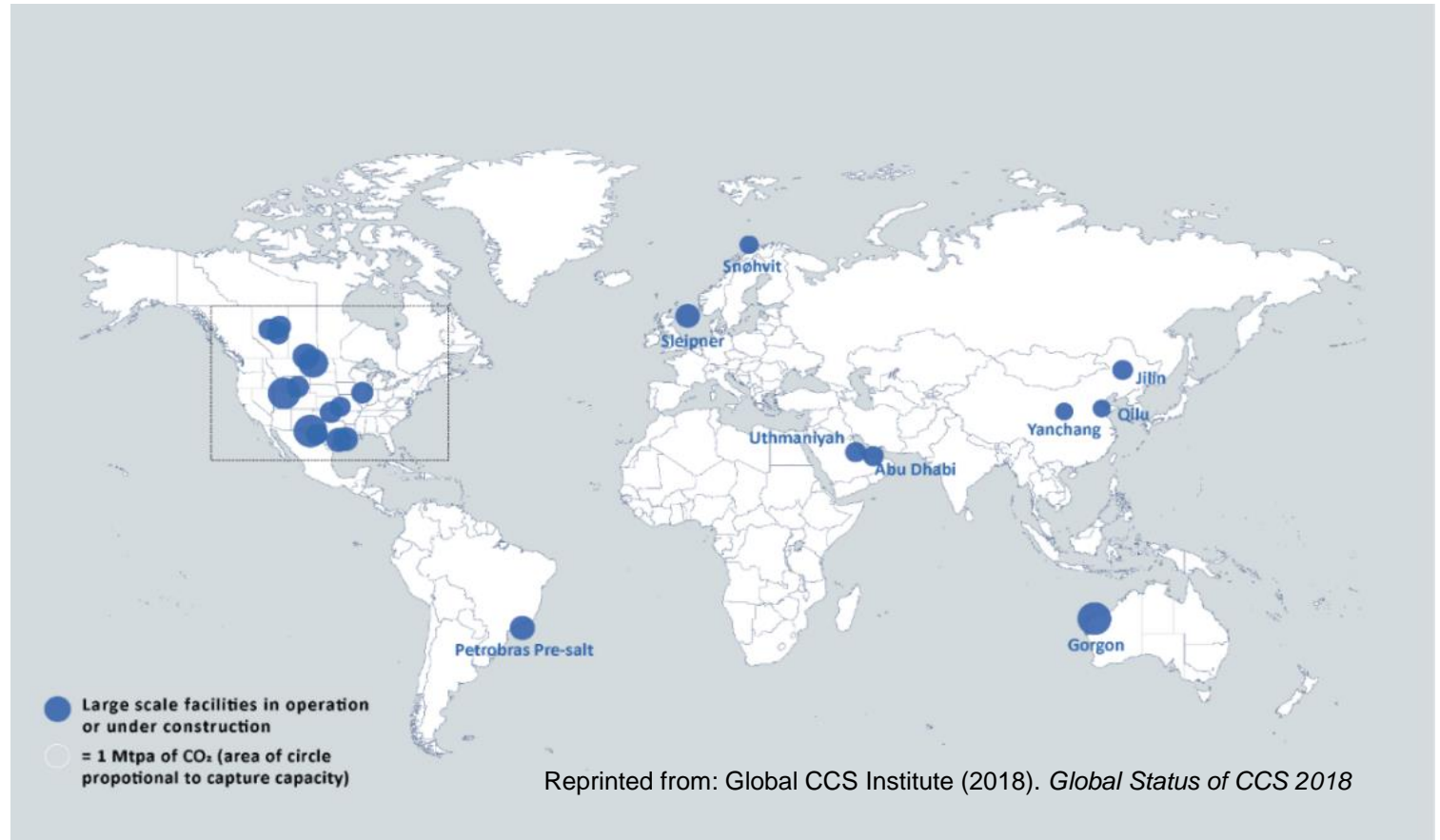
CCS is a key way of achieving emissions reduction, enabling:

- Industry to decarbonise with post-combustion and process emissions CCS
- Decarbonised hydrogen from natural gas with CCS

CCU is a key way to recycle CO₂ to make e-fuels and synthetic gases

- Tool for sector coupling

- **18 CCS commercial projects** globally (2 in Europe)
- Over **200 Mt of CO₂** has been stored globally, with no evidence of leakage



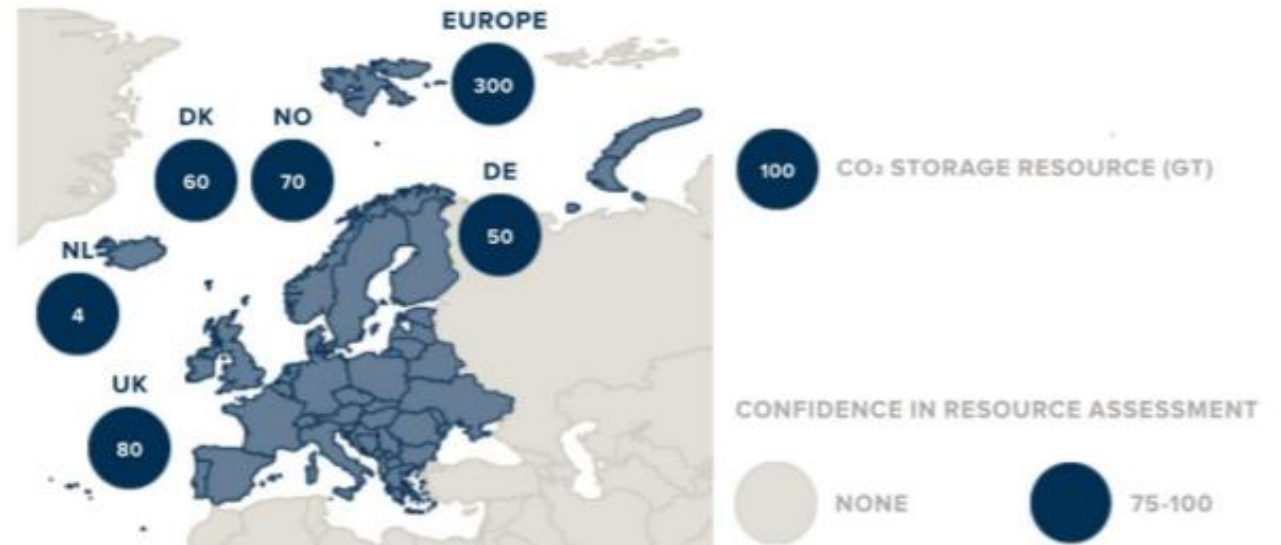
CO2 geological storage capacity in Europe

- Geological storage potential for CO2 in Europe is around **134 GtCO2** (taking into account storage restrictions in some Member States).



- This is equivalent to **446 years' worth of CO2 storage** at the rate suggested necessary in 2050 by the European Commission in 2050.

Estimated CO2 storage capacity in Europe



Adapted from: Global CCS Institute (2018). *Global Status of CCS 2018*

- Storage capacity in fields and saline formations in Europe is ample. Deep saline aquifers offshore provide the largest capacity and scale-ability

Madrid Forum Report on CCS/CCU coordinated by IOGP

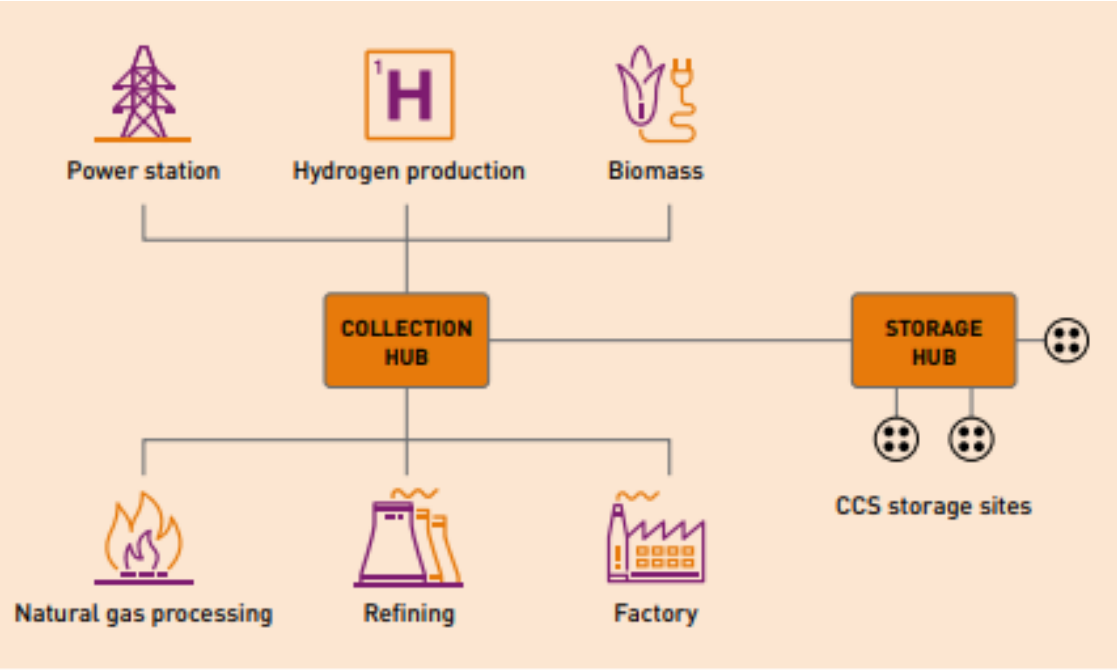
Taskforce was established involving all interested stakeholders

- **Industry players (associations and their members):** ENTSOG, CO2 Value Europe, EFET, GIE & Eurogas, OGCI, IPIECA, Gassnova, IOGP, ZEP,
- **CCS Projects Managers:** Northern Lights, PORTHOS, Ervia Cork CCS, Preem CCS
- **Energy Intensive Industries:** Fertilizers Europe, CEFIC, IFIEC
- **International & regional organisations, regulators:** CEER, IEA, the European Commission, CEN, Global CCS Institute
- **Academia/research institutes:** Prof. Alberto Abanades of Universidad Politécnica de Madrid, SINTEF, IFPEN
- **NGOs:** Bellona, European Climate Foundation

Report on the potential for CCS & CCU in Europe: https://ec.europa.eu/info/sites/info/files/iogp_-_report_-_ccs_ccu.pdf

CO₂ capture opportunities in industrial clusters

- 2/3 of EU CO₂ emissions come from power and heat plants, industrial sites and waste management installations

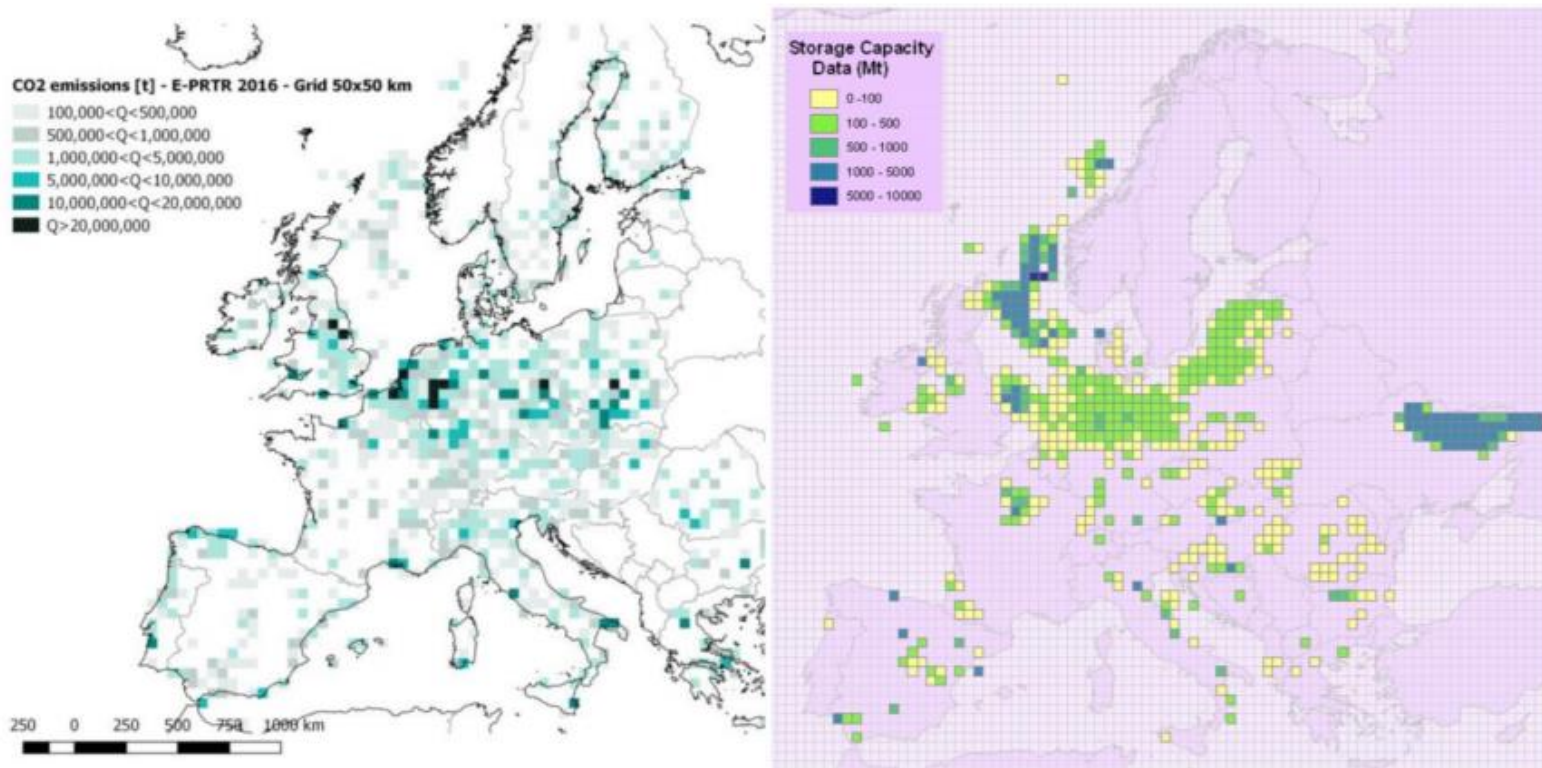


Industrial cluster	CO ₂ emitted (Mtpa)
Yorkshire	60
Marseille	35.5
Teesside	26
Antwerpen	18
Rotterdam	17.5
Le Havre	14.5
Skagerrak/Kattegat	14
Firth of Forth	7.6
Ruhr region	No data available

- As larger installations tend to be located in clusters, CO₂ can be efficiently gathered and transported to the site of the storage.

CO₂ capture opportunities in industrial clusters

Comparison of CO₂ emission clusters and CO₂ storage capacity in Europe



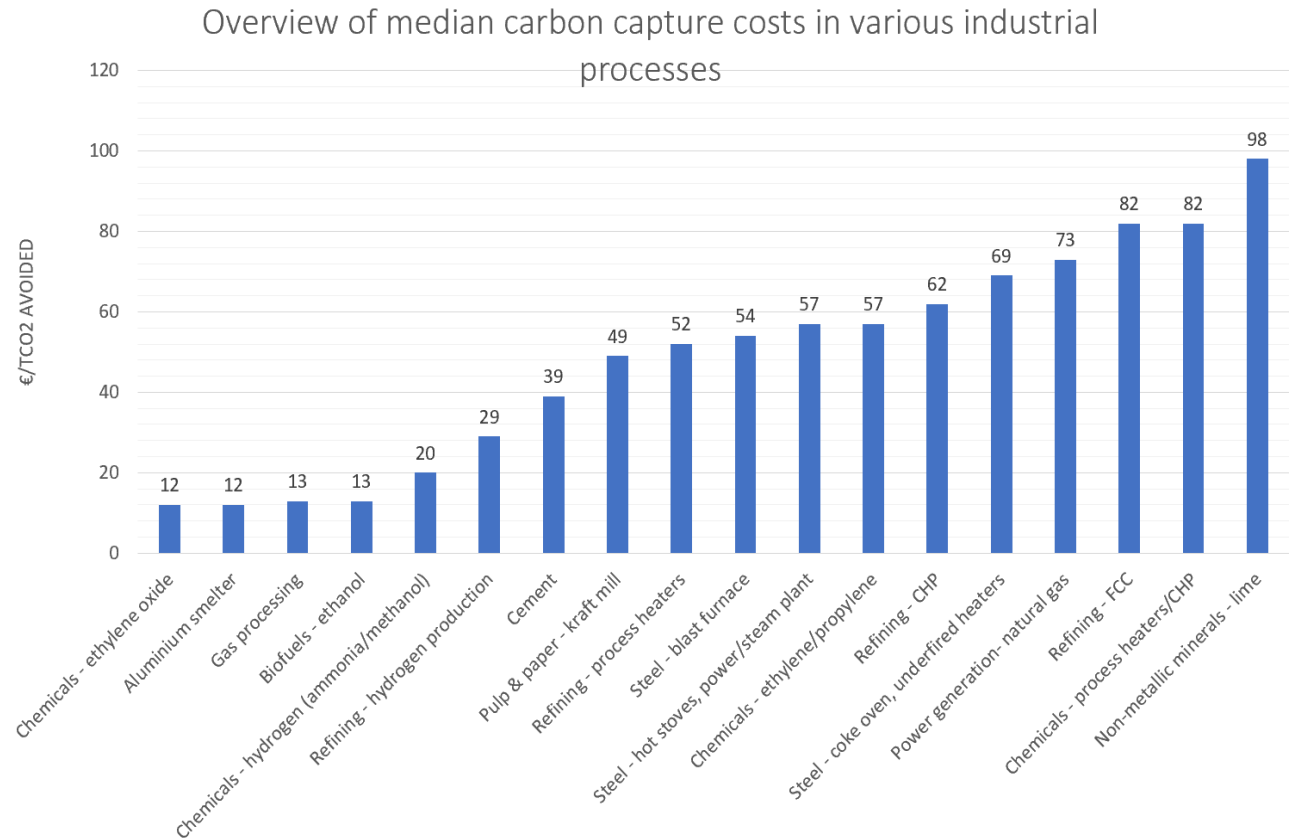
Adapted from: Endrava (2018). *Potential for CCS in Europe: Report for the Norwegian Oil and Gas Association* and DG ENER/ARUP (2010). *Feasibility study for Europe wide CO₂ infrastructure*

- EU emission clusters and storage locations are proximate, creating relative ease of access for EU energy intensives to CO₂ storage
- In order to facilitate a cluster-based approach to CCS and CCU, it is necessary to map the emission sources in the region and develop a joint approach between Member States and industry to deploying common-user infrastructure.

What can the EU do?

CO₂ Capture

- Tradeable tax credits for capture facilities, e.g. 45Q
- Markets for decarbonised products, e.g. Guarantees of Origin
- Governments guarantees to the capture facility
- Recognise and reward CO₂ transport by ship/rail/truck, in a similar way to pipelines, in the MMR



Source Adapted from: Navigant (2019). *Gas for Climate. The optimal role for gas in a net-zero emissions energy system*, Appendix E.

What can the EU do?

CO₂ Transport

- Enable gas infrastructure or other companies to transport CO₂, including in an offshore environment towards the storage, overseen by gas regulators with appropriate mandates.
- Encourage studies which appraise offshore transport infrastructure to identify infrastructure suitable for re-use.

CO₂ Storage

- Clarify the liabilities of CO₂ storage facility operators
- Governments can provide guarantees to the capture facility
- Encourage Member States to develop CO₂ storage atlases, as well as promote relevant geological and infrastructure information sharing

Building a regional CO2 system



- Cross-border CO2 networks and cooperation will be needed to move CO2 clusters to offshore storage
- New business models can be created
- Opportunity for regional cooperation in other parts of the EU

Source: Equinor, Norwegian full-scale CCS project

Conclusions

- **Separation of CCS and CCU value chain** allows different business cases to develop, with economies of scale across the value chain.
 - **Capture clusters** → shared CO₂ transport and storage infrastructure
 - **Ringfencing of risk** allows targeted policy and support measures
 - Governments may take on early **cross-value chain risk**
- **Public financial support** is necessary until **economies of scale** are achieved
- Europe is well placed to take advantage of the benefits of CCS, given the EU's ample **CO₂ storage capacity**, existing subsea infrastructure, and wide range of European industries that could decarbonise by capturing, using and storing their CO₂
- New and scale-able volumes of **low-carbon hydrogen with CCS** will also enhance the efficiency, sustainability and cost effectiveness of the future European gas market
- **Future EU gas market regulation** can support further deployment of CCS, CCU and low-carbon hydrogen, allowing the EU to benefit from these technologies



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For more information please contact:

François-Régis Mouton, Director EU Affairs, frm@iogp.org

Christian Schwarck, Deputy Director EU Affairs, cs@iogp.org

www.iogp.org

Registered Office

City Tower
Level 14
40 Basinghall Street
London EC2V 5DE
United Kingdom
T +44 (0)20 3763 9700

Brussels Office

Avenue de Tervuren 188A
B-1150 Brussels
Belgium
T +32 (0)2 790 7762

Houston Office

19219 Katy Freeway
Suite 175
Houston, TX 77094
United States
T +1 (713) 261 0411

eu-reception@iogp.org