CCS and the cement industry

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GES (Global Environmental Sustainability)
HeidelbergCement

COP24, December 6th, 2018
HeidelbergCement has committed to reduce its carbon footprint

2030 Sustainability Commitments

- We are committed to fulfilling our share of the global responsibility to keep temperature rise below 2°C

R&D budget

- 80% of R&D budget is related to CO₂-reduction research
The cement industry Roadmap 2050: we share responsibilities

- Concrete is the world 2nd most used commodity
- Cement production is responsible for 5-7% of manmade CO₂-emissions
- CO₂-roadmaps are defined at worldwide and on EU-level
- HeidelbergCement is co-founder and frontrunner in all these initiatives

Direct CO₂ emissions from global cement production (Mt/yr)

- CCS/CCU (share of generated CO₂ captured in 2050)
  - 25% in IEA Roadmap
  - 46% in European Roadmap

Source: IEA/CSI Technology Roadmap, 2019
Proud to be frontrunners in CCUS

- **Post combustion CC** in HeidelbergCement Norway tested in 2016; in preparation for full scale 300 m€
- **Oxyfuel** reduces the cost of CC; demo for 80 m€
- **LEILAC**: innovative calciner to separate CO₂ without energy-penalty: EU-funded 12 m€
- **CCU**: using CO₂ to grow algae for sustainable protein for animal nutrition (own investment 2 m€)
The Norwegian full scale demonstration CCS project

- First full-chain industrial CCS project in Europe
- Project 75% funded by Norwegian government
- Co-funded with 3 m€ by Norcem-HC
- After successful tests (2014-2016), project is now set for real scale
- Investment decision for full-chain demonstration in 2020/2021 (0.4 mio ton/year CO₂). Costs: 300m€
- In operation late 2023 (or 2024)

**CO₂-STORAGE**
- Planning by Equinor and partners (Shell and Total)
- Intermediate storage on shore
- Offshore storage in the North Sea
- Huge capacity

**CO₂-TRANSPORT**
- By ship
- Responsibility Equinor
- Equinor develops transport and storage

Intermediate storage for CO₂ on shore: «Naturgassparken» in Øygarden

Norcem
HeidelbergCement
Cement production

Yara Porsgrunn
Ammonia production

Fortum Oslo Varme AS
Waste-to-energy plant

- By ship
- Responsibility Equinor
- Equinor develops transport and storage
Carbon Capture: the challenges

Significant increase in production costs:

- Currently, the legal and economic conditions of these technologies would impair the competitiveness of cement production
- CO₂ storage or reuse strategy and infrastructure
- Oxyfuel still requires R&D
- Post-combustion requires further development of high-performance capture materials to reduce energy demand
Looking beyond cement plants

Storage potential North Sea
> 1,500 Mton

Offshore pipeline
25 km

Storage field
(2.5 Mton)

Existing pipeline (CCAP)
Shell – Ato – Westland for CCU

Aim: a backbone running through the port area for transport and storage of CO₂ in (depleted) offshore oil & gas fields.

CC(U)S value chain

CO₂ capture / sourcing
CO₂ transport
CO₂ storage / use

Industrial sector

- Cement
- Steel
- Bulk Chemicals
- Carbon black
- Lime
- Aluminum
- Paper
- Coke
- Hydrogen
- Ethylene
- Ammonia
- Comb. of fuels

Port of Rotterdam

HeidelbergCement
And beyond emissions: recarbonation (CO₂-uptake)

- Ambient CO₂ reacts with Ca(OH) in concrete to CaCO₃
- Alkalinity drops (PH < 10): rebar’s surface passivation dissolves
- Corrosion reinforcing steel accelerates

- Curing of pre-cast concrete with CO₂
- CO₂ sequestration during lifetime of construction
- Recycled concrete fines recarbonate with CO₂
Concluding remarks

- HC commits to fulfill its share in the Paris 2° target

- HC is engaging pro-actively with politics and society to find most effective way in decarbonizing the industry, while maintaining a competitive position

- In its operations worldwide HC is testing and developing Carbon Capture and when possible the (commercial) Use of CO$_2$ from stacks applying various technologies

- HC estimates maximum 10-20% of CO$_2$ emissions can be used by CCU, thus CCS is unavoidable
Thank you

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