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Betongfokus Region Øst – August 2022

Brevik CCS Prosjektet
Et viktig steg på veien mot klimanøytral betong

Kjell Skjeggerud, HeidelbergCement Norther Europe

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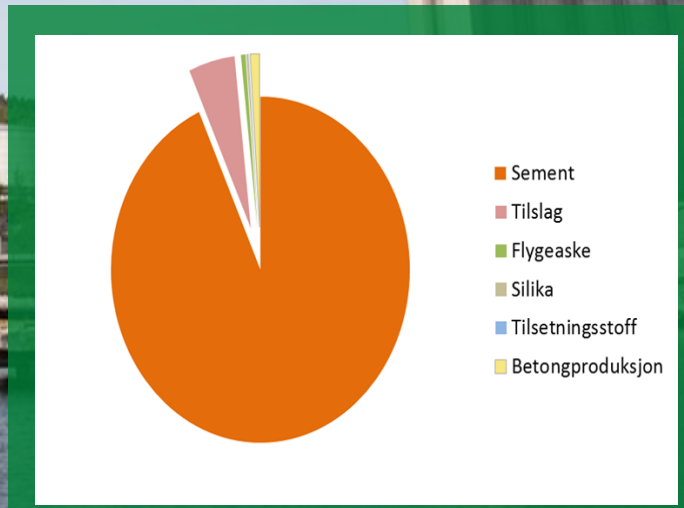
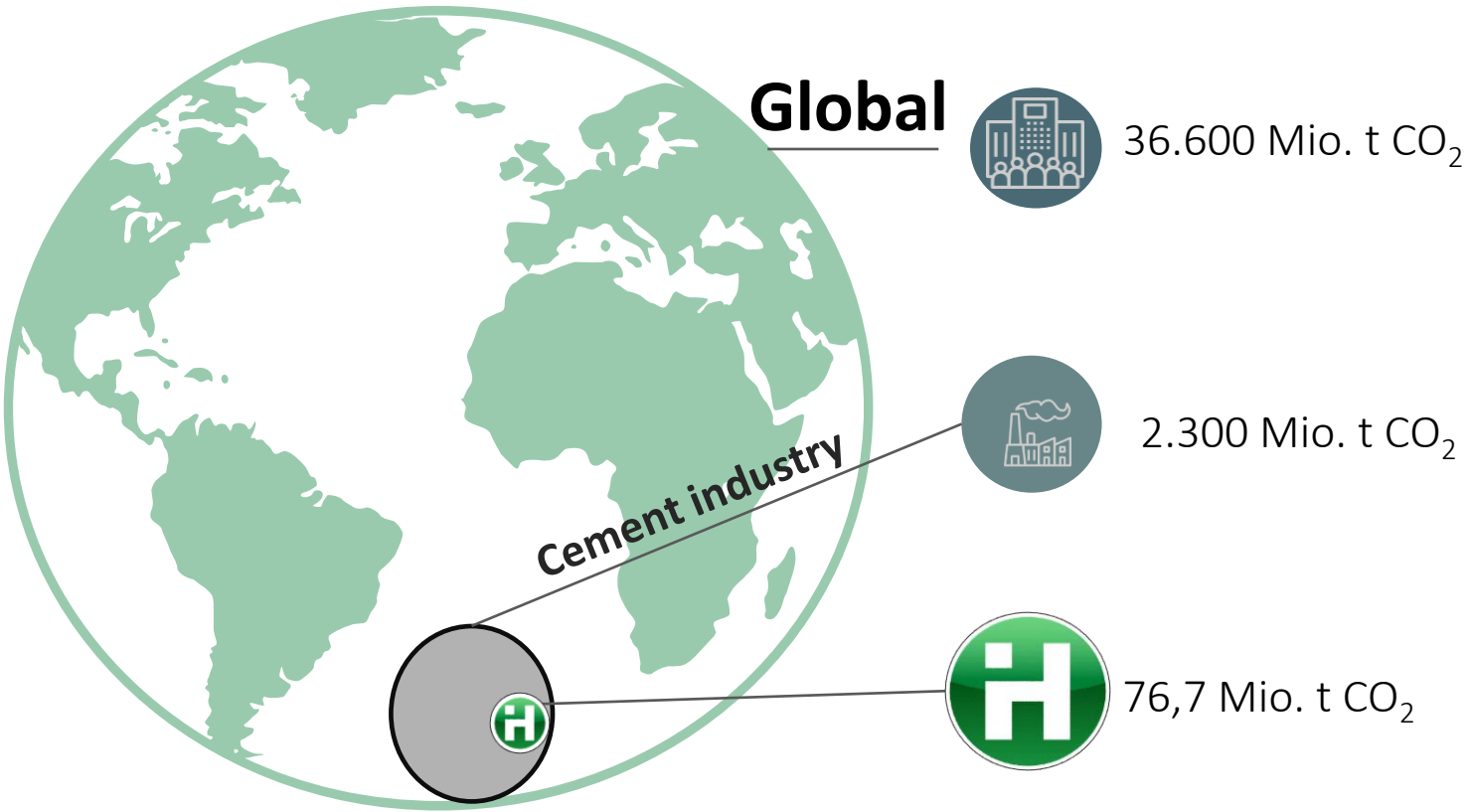
Concrete is the worlds most commonly used building material

Main challenge is the cement clinker production

- 2 Gt CO_2 annually
- 6% of world wide GHG emissions



CO_2 reduction in Cement industry is a significant part of the solution



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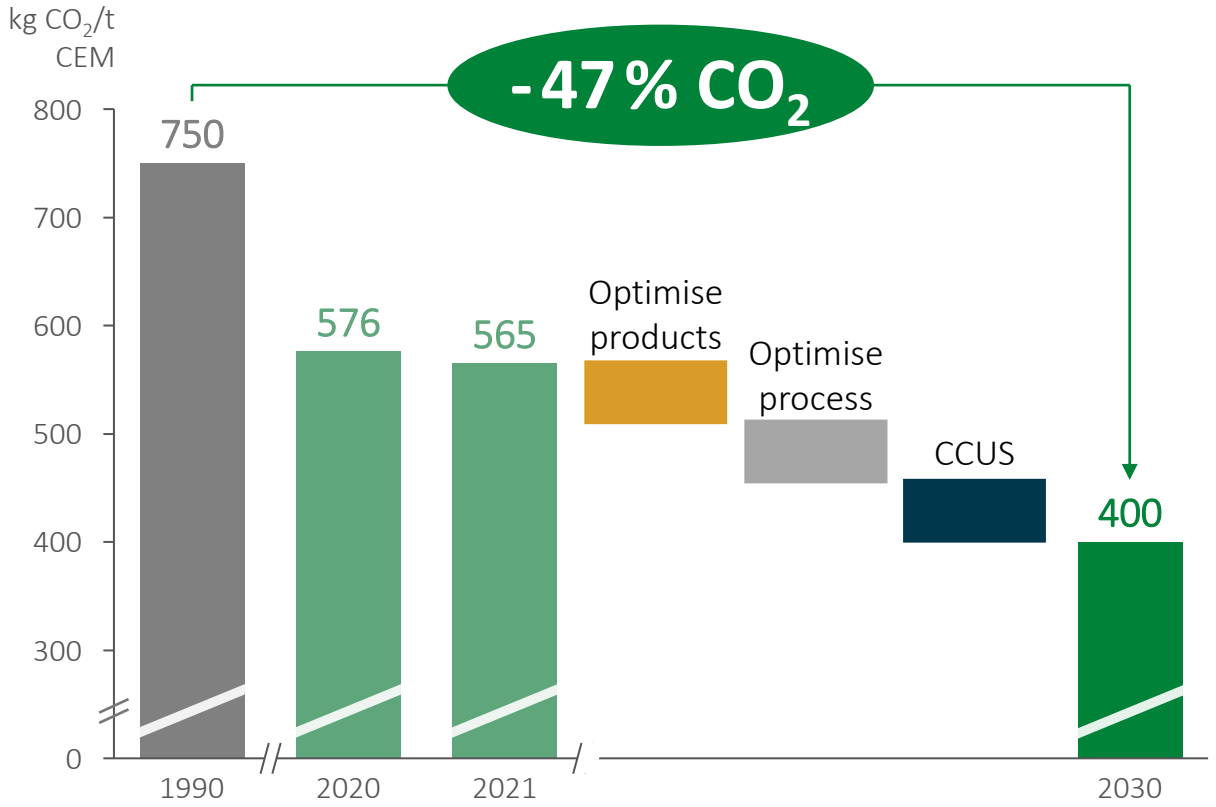
“We accelerate deep decarbonisation to reach 400 kg CO_2/t cementitious material by 2030.”

Now it is time to take off: We sharply accelerate decarbonisation



Levers to reach our 2030 targets

Products	Clinker incorporation **< 68 %** and drive circularity
Process	**45%** Alternative fuels rate **20%** Biomass fuels rate
CCUS	**10 mt CO_2** captured (cumulative)

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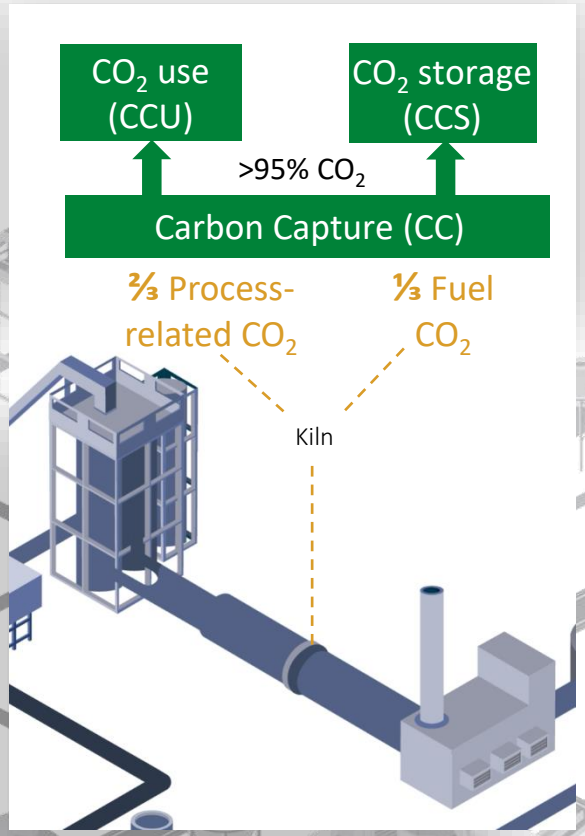
The unavoidable process emissions of our clinker manufacturing require CCUS

Captured and utilised (CCU) or stored (CCS)

Raw meal



Mill

Reduced through waste-derived fuels and more efficient energy use

⅔ of CO_2
emissions from limestone

⅓ of CO_2
emissions from fuels

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>7500 hours testing with Aker Carbon Capture «Mobile Test Unit»

3000 hours pilot testing of Waste Heat Recovery Unit

2005 Full scale desk study

2011 Pre-engineering

2013 Kick off TCB (2013-17)

2014-15 Technology testing

2016 Feasibility study

2016-17 Concept study

2018-19 FEED Study 29/8-18 — 31/10-19

- ✓ 450 reports
- ✓ 500 drawings
- ✓ 3D model

2019-20 Decision process Government

- ✓ Press conference by government 21/9-20
- ✓ State budget release 7/10-20
- ✓ Decision in Parliament 20/12-20

2021-2024 Realization

- ✓ Start performance testing 1/7-24
- ✓ Regular operation 31/8-24

✓ Development- and negotiation of contracts

Public attention

CEMENT Group

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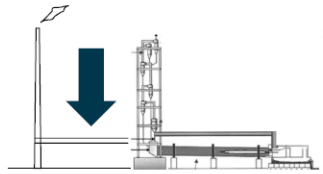
Full scale demonstration facility

Amine post combustion

Capture rate 55 ton CO_2/hour

Total 400.000 ton CO_2 /year
Capture rate 50%

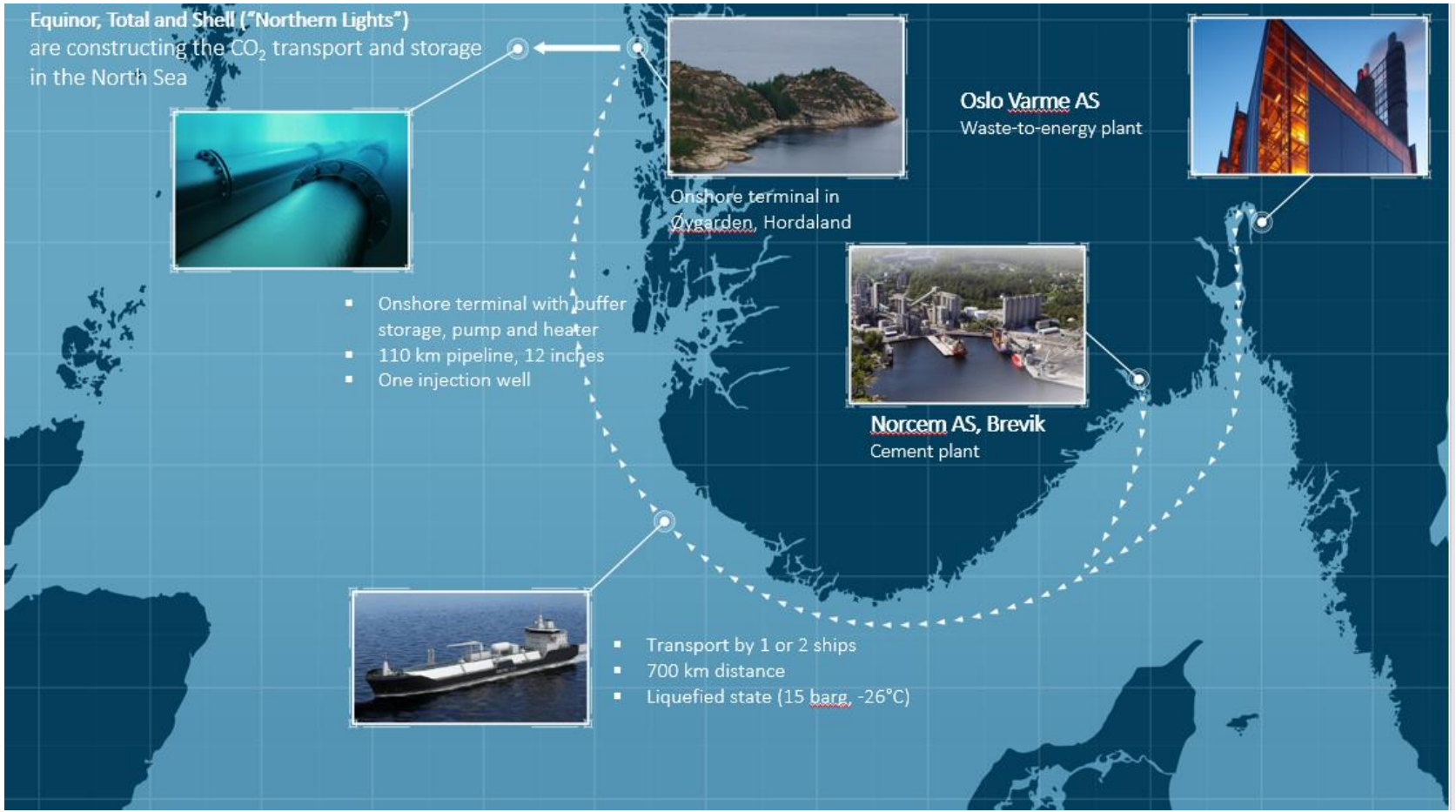
Designed to fully utilize
available waste heat
Installed WHR 46 MW



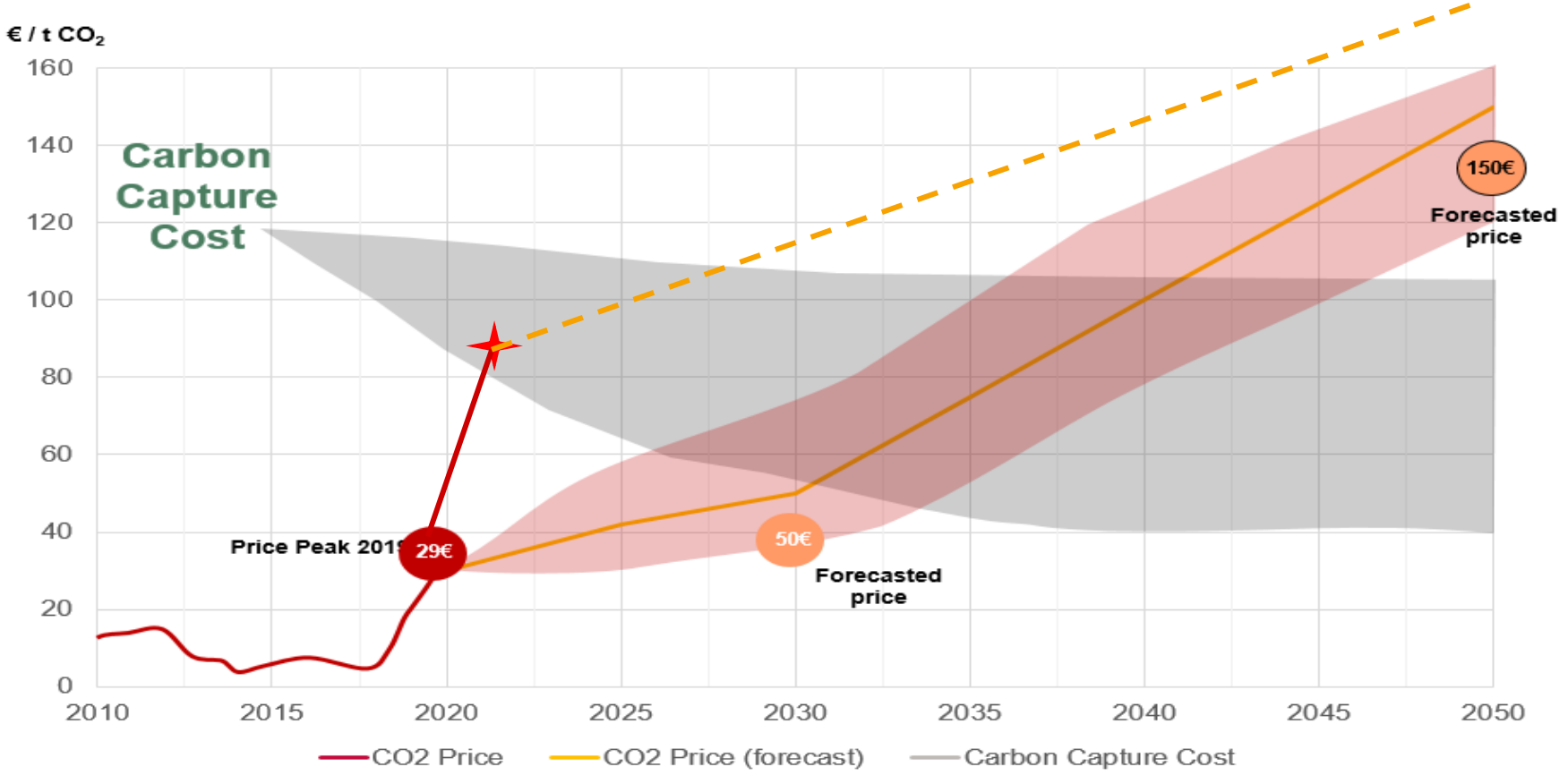
Amine technology
(Post combustion capture)

Maturity	
Energy use	
Cost efficiency	

Longship-program



Cost of capturing vs cost of emitting?



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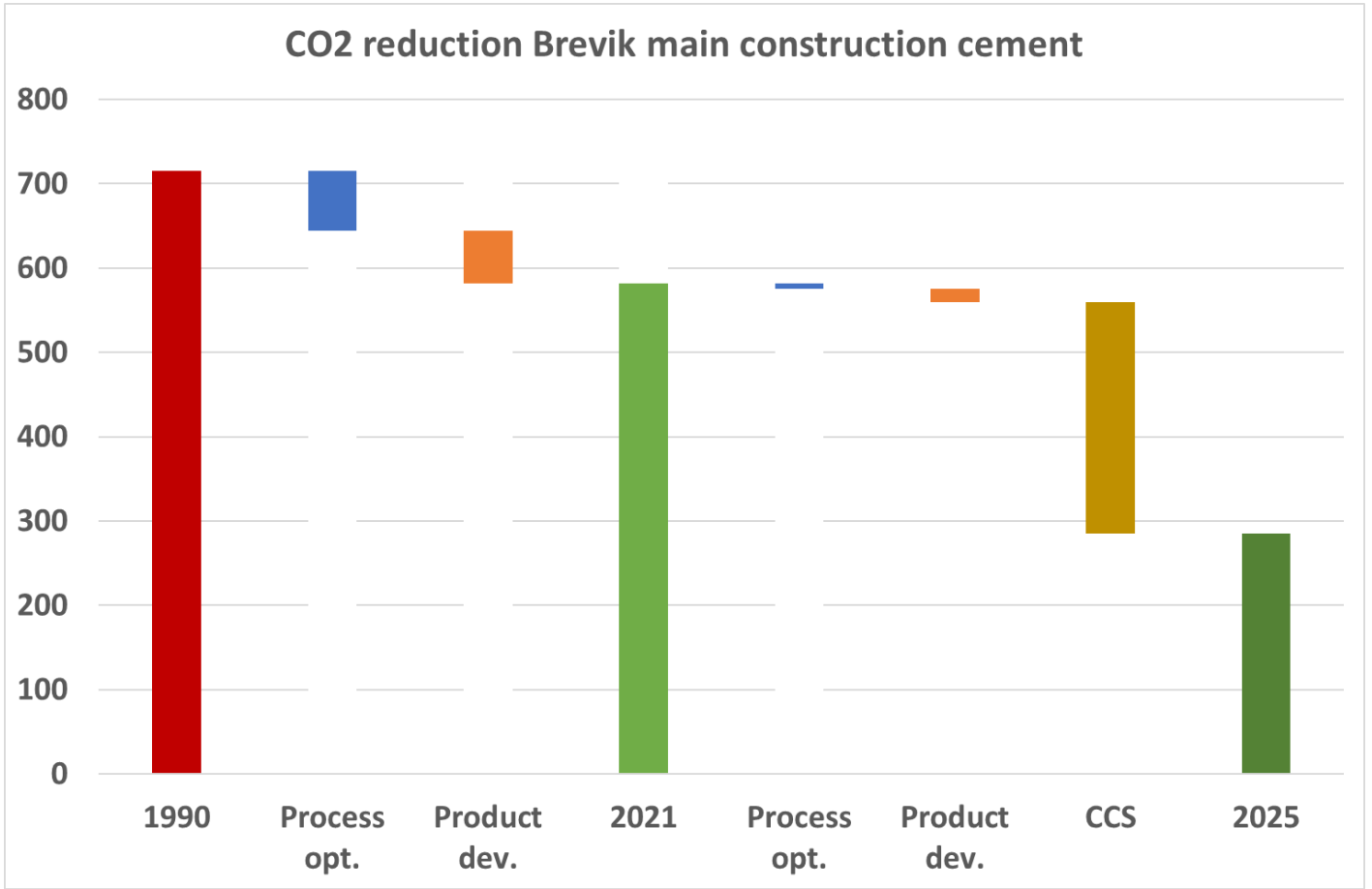
Effect of CCS on environmental footprint of cement



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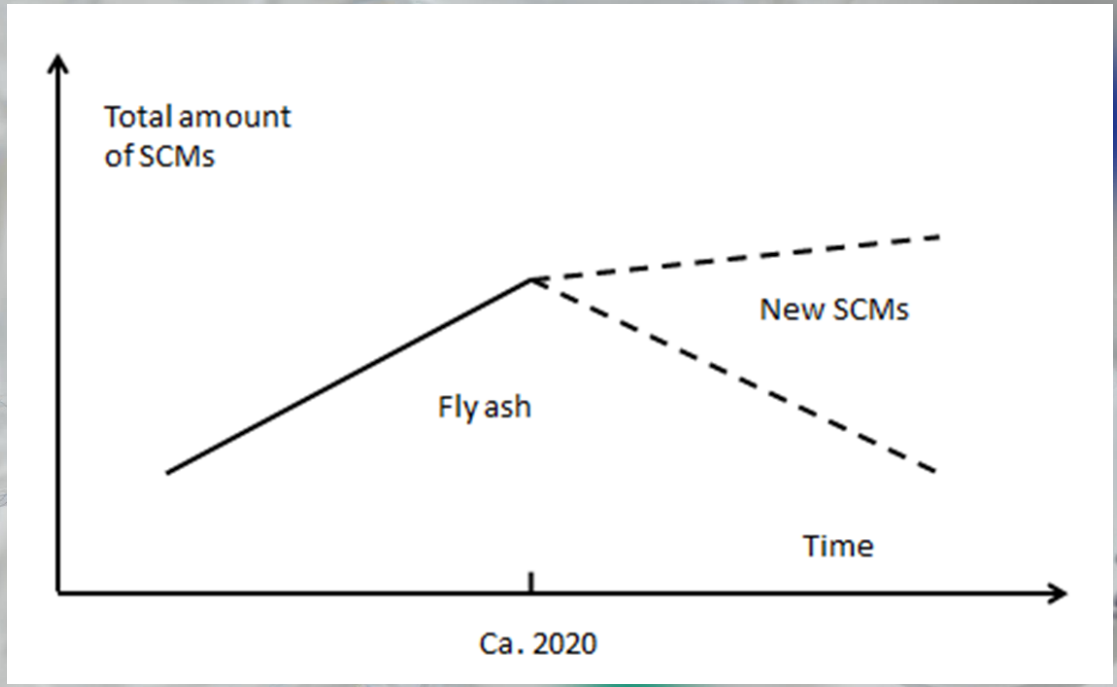
We advance the formulation of cement all the way to carbon-free.

R&D Project Newscem

NEWSCEM – NEW Supplementary cementitious materials in CEMent production



Clinker replacements is key to reduce CO_2 footprint of cement

Important considerations for supplementary cementitious material (SCM)

- Locally available materials
- Pozzolanic or hydraulic properties
- Sufficient reserves
- Cost efficient logistics

Products

< 68 %

clinker incorporation and drive circularity

Opportunities in waste streams from steel and other industries

Future steel and metal slags

Prospects
– Steel industry also in transformational process

Opportunities
– Enable use of future waste streams from metal production

Timing
– Several projects underway with industry partners

Local clay recourses – An opportunity for clinker replacement

Calcined clay

Prospects
- Systematically screening potential clay sources worldwide

Opportunities
- Up to 50% clinker replacement when combining calcined clay and limestone

Timing
- Successful clay calcination trial in Kunda, Estonia
- HeidelbergCement recently announced JV in Ghana will build the world´s largest flash calciner for clay calcination

Volcanic pozzolan – our most interesting opportunity – short term

Natural pozzolan in Iceland

Prospects

- Bringing the historical use to a new industrial dimension

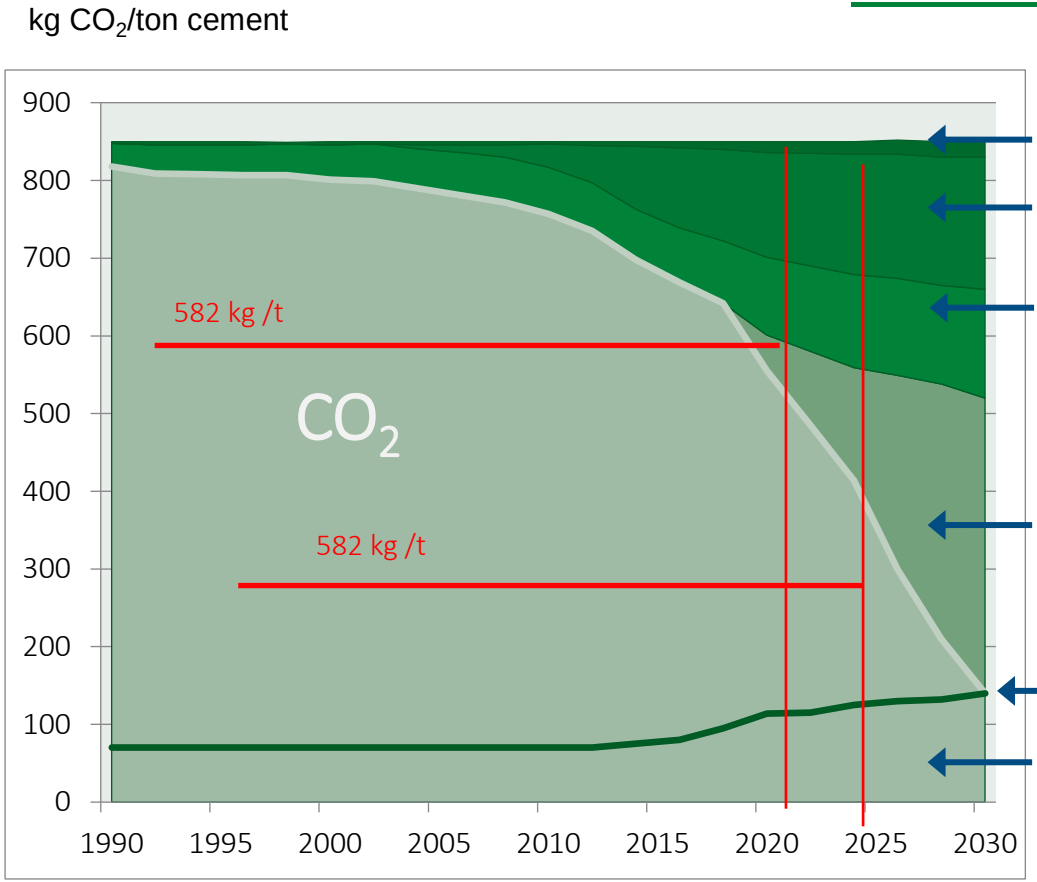
Opportunities

- **Superior quality** due to fast cooling (glacier):
  - High reactivity
  - Denser structure
  - Low water demand

Timing

- Secured access to sufficient reserve of pozzolan
- Plant capacity of 1 mt p.a. (planned 2025/26)

HeidelbergCement Northern Europe – 2030 - ZERO Vision



Process development - Energy

Process development – Alternative fuels

Product development - SCM

Carbon Capture and Storage

Net Zero as of 2030

Carbonation
(Reversed calcination, $CaO + CO_2 \rightarrow CaCO_3$)

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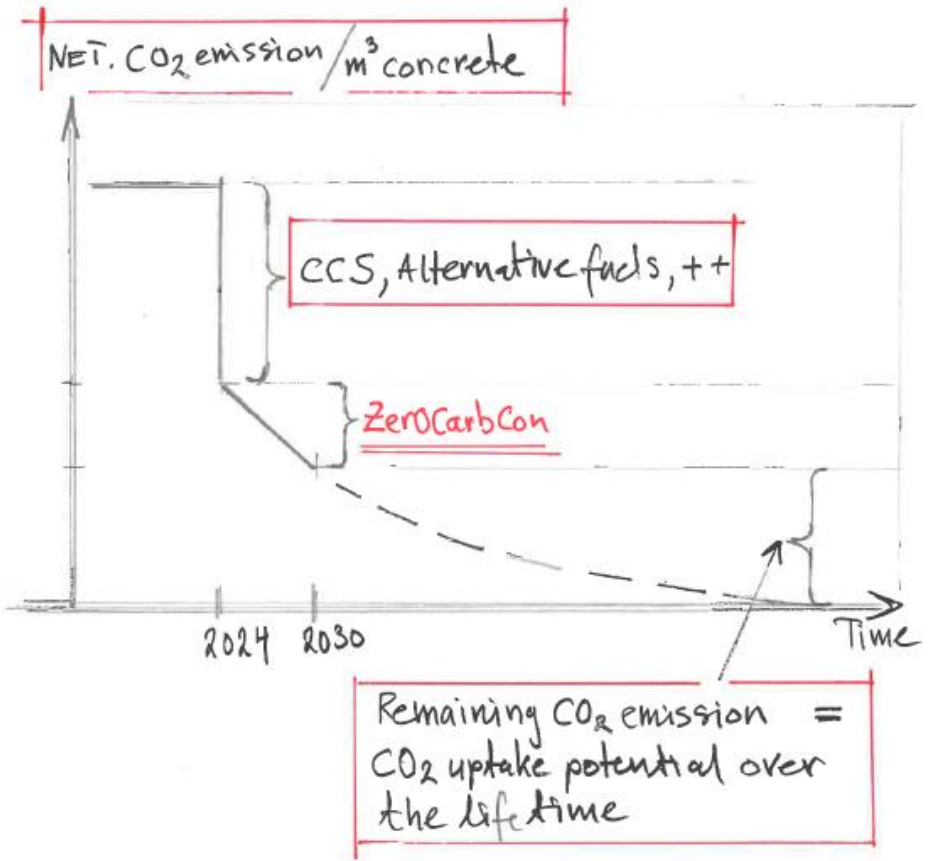
ZeroCarbCon – Zero emission Carbon Concrete (ZCC)



22/08/2022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Carbon Capture and Storage will secure our position as the most environmentally friendly building material