



The full scale CCS-project at Norcem Brevik Can it be realised?

Düsseldorf, 7 November 2017

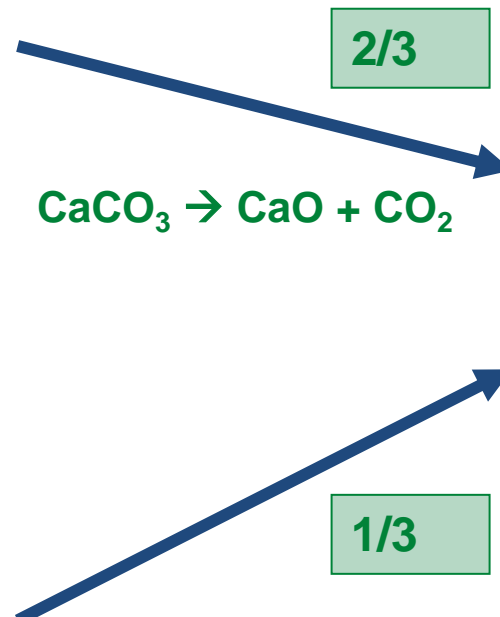
Per Brevik, Director Sustainability and Alternative fuels HC NE

HeidelbergCement in figures

- **63,000 employees.**
- **Core business:**
 - Aggregates.
 - Cement.
 - Downstream activities:
ready-mixed concrete and asphalt.
- **3,030 locations in 60 countries.**
 - 620 production sites for sand, gravel, crushed rock.
 - 161 cement and grinding plants.
 - 1,740 ready-mixed concrete plants.
 - 114 asphalt plants.
- **Aggregates reserves 19 billion tonnes.**
- **Cement capacity 197 million tonnes.**
- **CO₂-emissions 70 million tonnes**



Cement production; two sources for CO₂ emissions



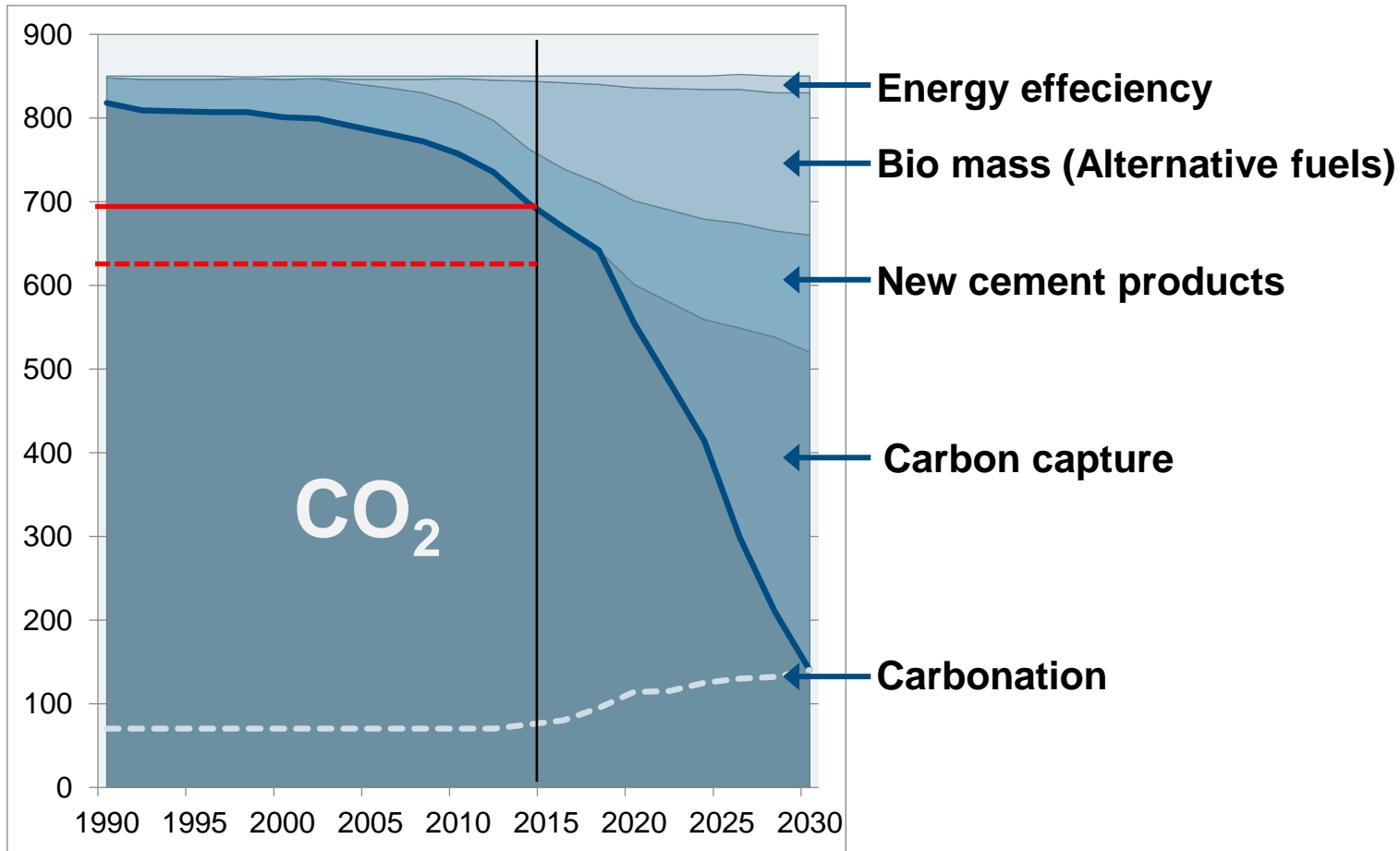
HeidelbergCement Northern Europe's Zero-vision:

**CO₂-neutral concrete products
over the product's life cycle (LCA)
by 2030**

Where are we, what's done and what's ahead?

Reduced emissions from cement production

kg CO₂/tonne cement



TestCenter Brevik



- **CLIMIT-project 2013–2017**
- **Testing 4 capture technologies on real flue gas**
- **Further steps towards a full-scale carbon capture project**
 - Possible integration into the cement plant (2014)
 - Pre-feasibility study (2015)
 - Feasibility study (2016)
 - Concept study (2017)

4 post-combustion capture technologies

Aker Solutions amine technology – TRL 9



Air Products/ NTNU membrane technology – TRL 5



Alstom Power Calcium Looping – TRL 3



RTI solid sorbent technology – TRL 4



CLIMIT project / Conclusions

- Technologies for capture are available, but on different stages regarding development/maturity
- **CCS is technically feasible, but without economic support; realisation within 10–15 years will be difficult!**
- **In a 2020-perspective:**
 - The amine technology is proven/documentated at site, and a possible full scale solution.
 - Based on energy from excess heat; 400.000 tonnes of CO₂ can be captured.



2050

- Cap: 2°C innen 2050
- Carbon negative by 2100

Global

- Population: 9 billion
- Higher consumption
- Higher demand for energy
 - Scarce resources
- Technological breakthroughs

National

- Access to renewable energy
- Stable economic and political framework conditions
 - Norway an attractive host nation
- Authorities support industries' efforts to develop new technology and new products

The Roadmap

Norsk Industri

VEIKART FOR PROSESSINDUSTRIEN
BKT VERDSCAPINGS MED HULLTILTSP1 2020

NG

...sammenheng med lavere karbonavtrykk, ...for produksjon av metallprodukter ...

...for betong og betongens karbonavtrykk

...20 prosent innblending av flyaske ...

...for betong og betongens karbonavtrykk

...for betong og betongens karbonavtrykk

METALLPRODUKSJON METAL PRODUCTION

...for betong og betongens karbonavtrykk

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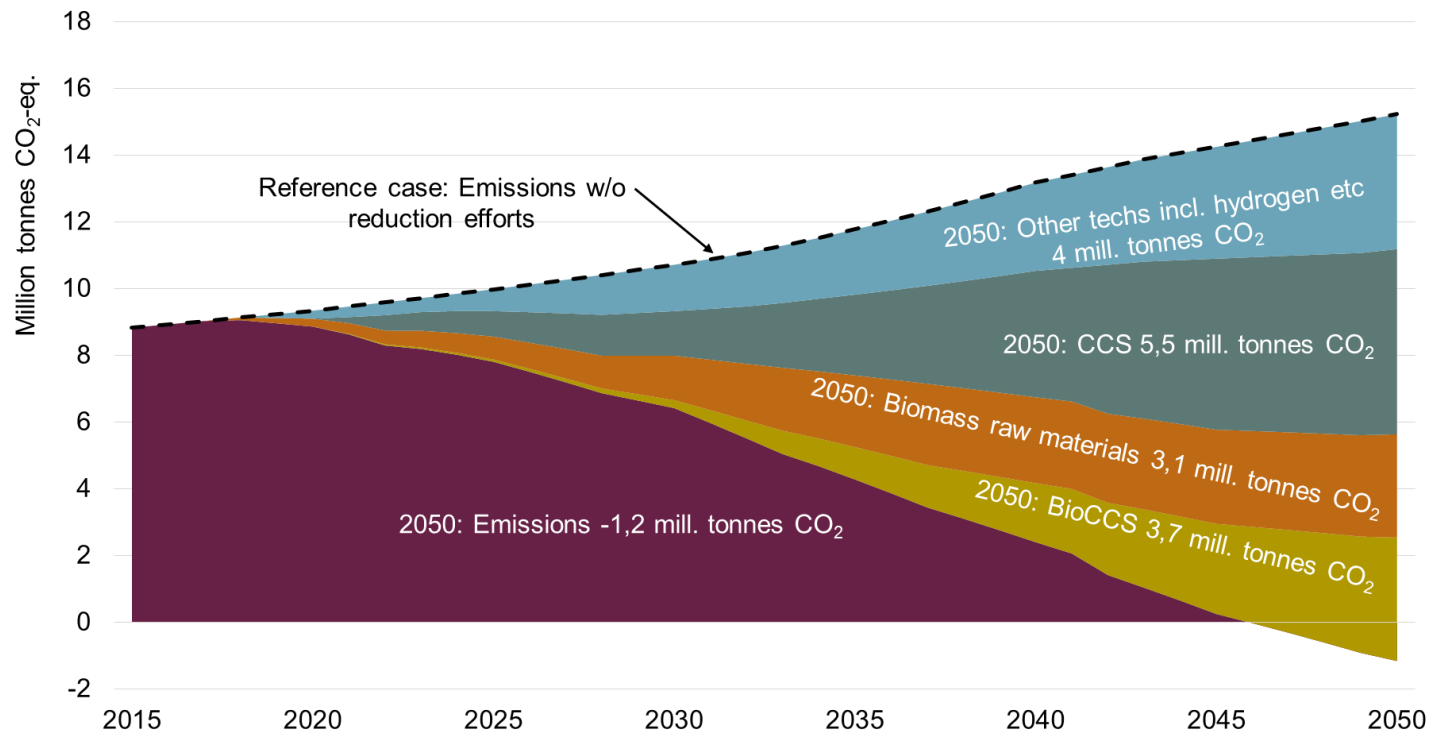
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Emissions and emission reductions by technology



Norway / Full scale CCS project

CO₂-STORAGE

- Planning by Statoil and partners
- Intermediate storage on shore
- Offshore storage in the North Sea
- Huge capacity

CO₂-TRANSPORT

- Gassco
- By ship



Norcem
HeidelbergCement
Cement production



Yara Porsgrunn
Ammonia production



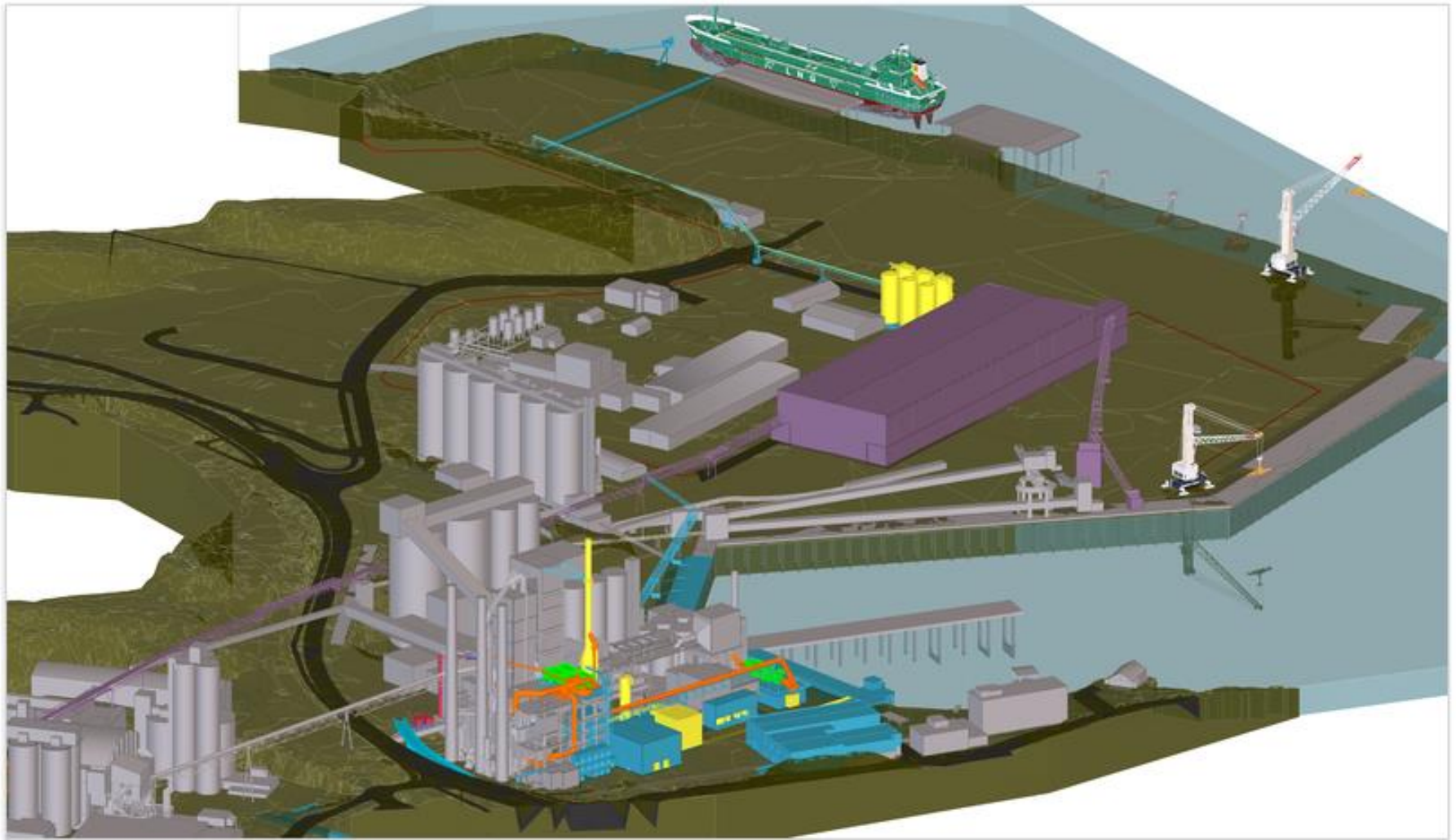
Fortum Oslo Varme AS
Waste-to-energy plant

Full scale CO2-capture / Norcem

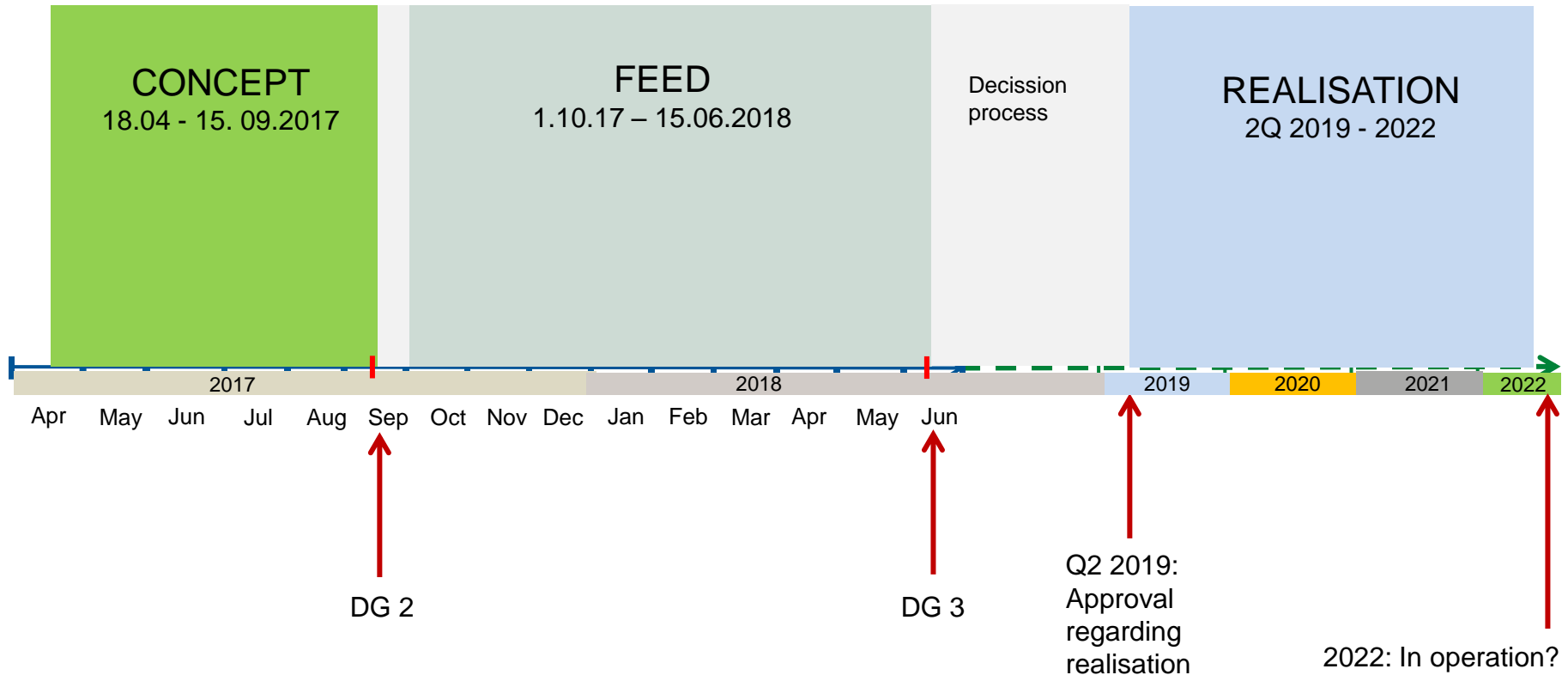
Technology	Aminosolvent
Technology provider	Aker Solutions
Capture capacity	400 000 t/ år
Excess heat	46 MW
Intermediate storage CO2	5 300 t
Cost estimates (CAPEX/ OPEX)	± 30 %



Concept study / Layout



«Original» schedule towards realisation



National budget 2018 / Project realisation?

- Reduced funding for FEED studies
- Projects put on HOLD; awaiting the political process
- Project evaluation in parliament Feb/March 2018
- Some challenges, but it's still possible to build the industry's first full scale CC-plant in Brevik
- Further delay; we are now talking about 2023!

■ Thank you for your attention!