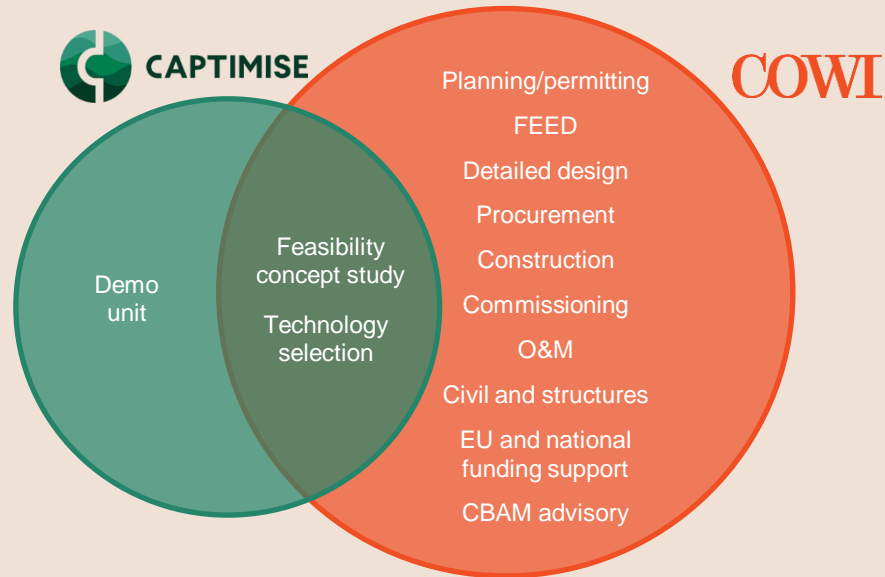

Mastering carbon capture projects

May 15th 2024

Jeppe Grue, Technical Director, COWI

Jonas Rosengren, CFO, Captimise

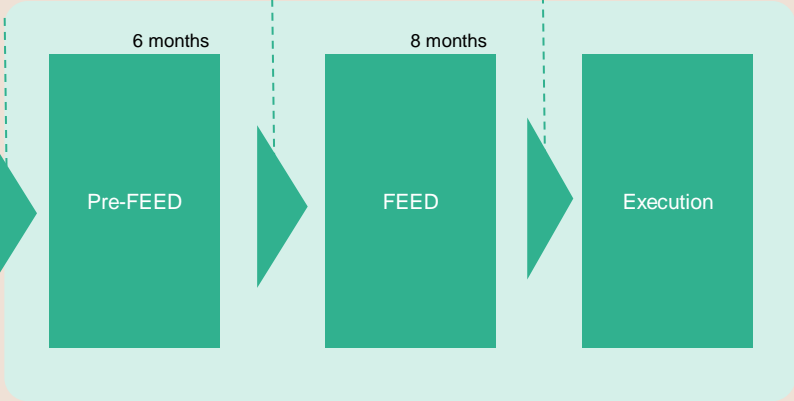
COWI-Captimise – cooperation



Project phases

The Full Workstream Package

 Project Management
 Planning
 Financing and Business Case
 Cost Estimation
 Risk Management
 Stakeholders and Authorities
 Procurement
 Regulatory and Environmental Compliance
 Technical Development / Engineering




 Integration into existing plant

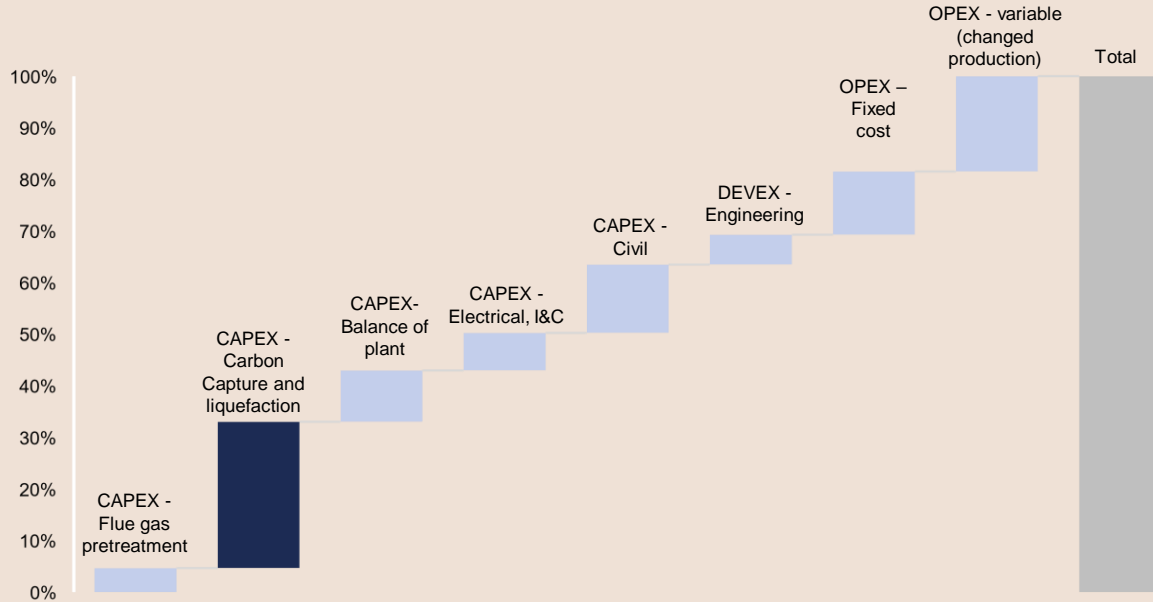
 Technology selection

 HSE

 Handling of end-products

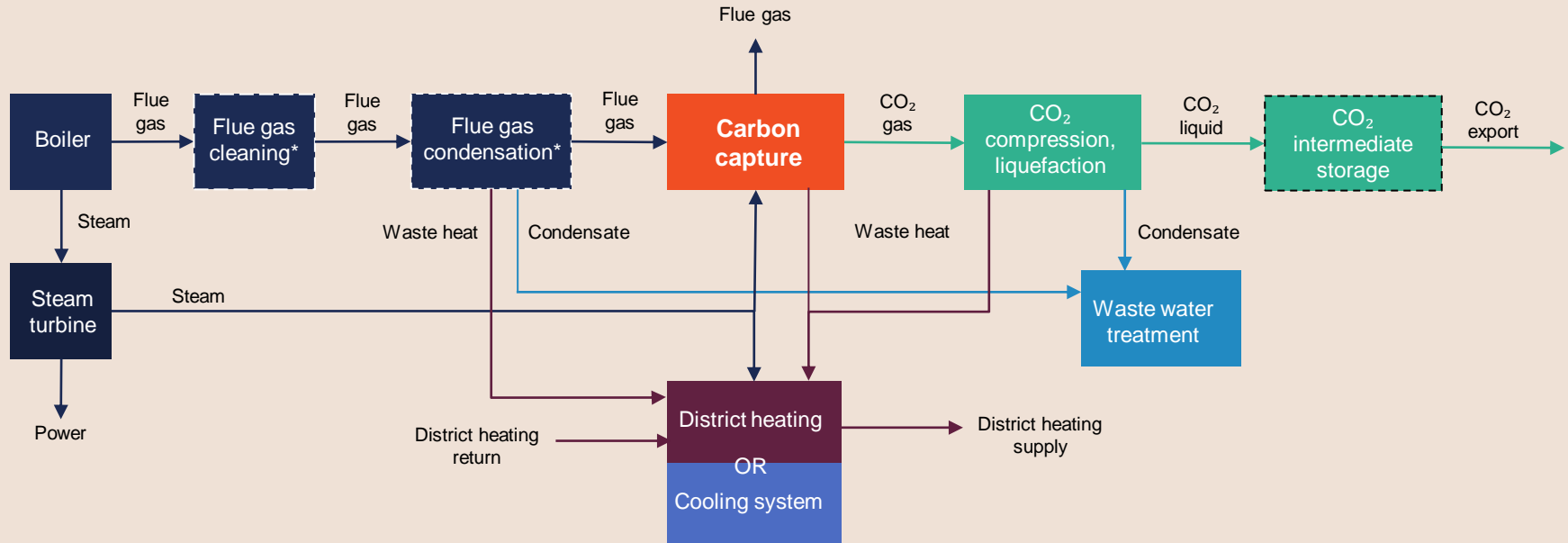
 Permitting

Levelized cost for CO₂



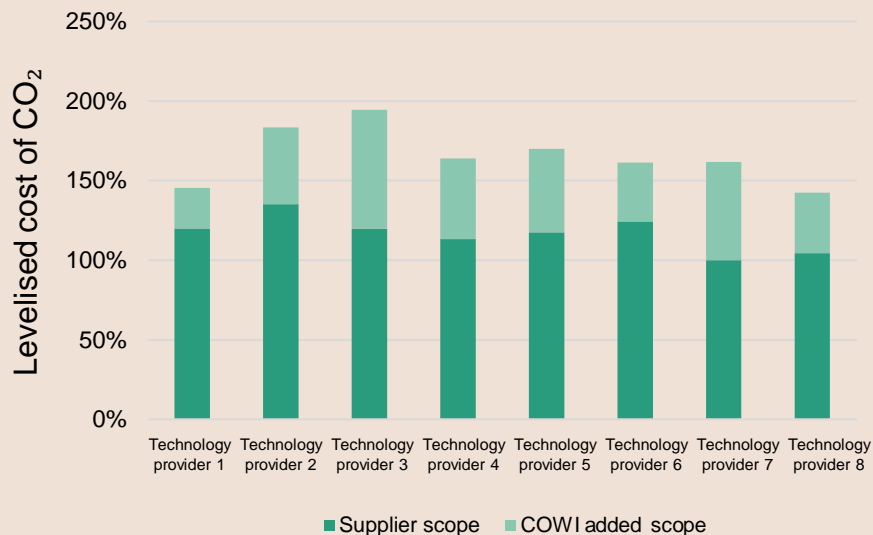
CO₂ capture plant represents 25-30% of the total LCOCO₂ and the total cost includes a lot more than just the CC unit. It is important to consider the entire value chain of CO₂ production.

Overall process flow diagram



*Flue gas cleaning and condensation may need refurbishment, new equipment or is sometimes already existing.

Scope alignment



Scope correction includes

- Flue gas treatment
- Civil
- Waste water treatment and waste handling
- Balance of plant
- Auxiliary power consumption
- Opportunities for heat integration and impact on plant cycle



Supplier technologies include

- Absorption based technologies
- Pressure swing absorption
- Novel technologies

How COWI creates value

- CC experience
- Market knowledge
- Heat integration and integration of auxiliary systems

- Permitting
- Waste stream handling
- Procurement strategy
- Coordination

COWI's references:

- Waste-to-energy plants
- Biomass fired power plants
- Cement plants
- Ore smelters

Case – Ørsted AVV57



Main components:

- Flue gas condensation incl wastewater treatment
- 2 Modules of Aker CC Just Catch 100
- New steam turbine 25 MW
- Heat pumps for heat integration
- CO₂ compression and liquification
- Intermediate CO₂ storage
- Transport by trucks to Asnæsværket for shipping



Timeline:

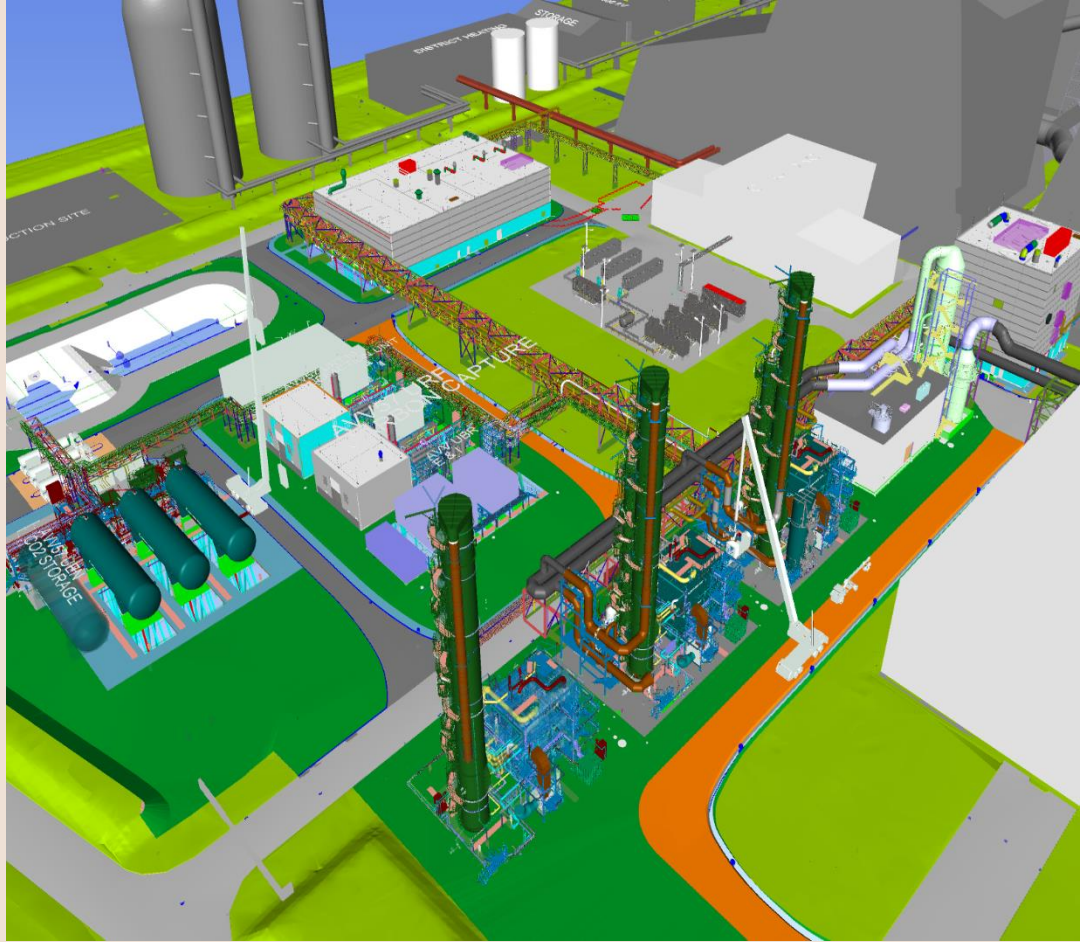
- Construction start: December 2023
- Commercial operation: End of 2025



**150 000 tonnes of CO₂
captured yearly**

Ørsted AVV 57 COWI's services

- Feasibility study
- Pre-Feed
- Basic design
- Permitting
- Detailed design of civil – 3D model
- Detailed design of piping and balance of plant
- Technical tender specifications for process lots
- Technical support to contract negotiations
- Follow up on suppliers





COWI delivers value through our comprehensive understanding of the full value chain

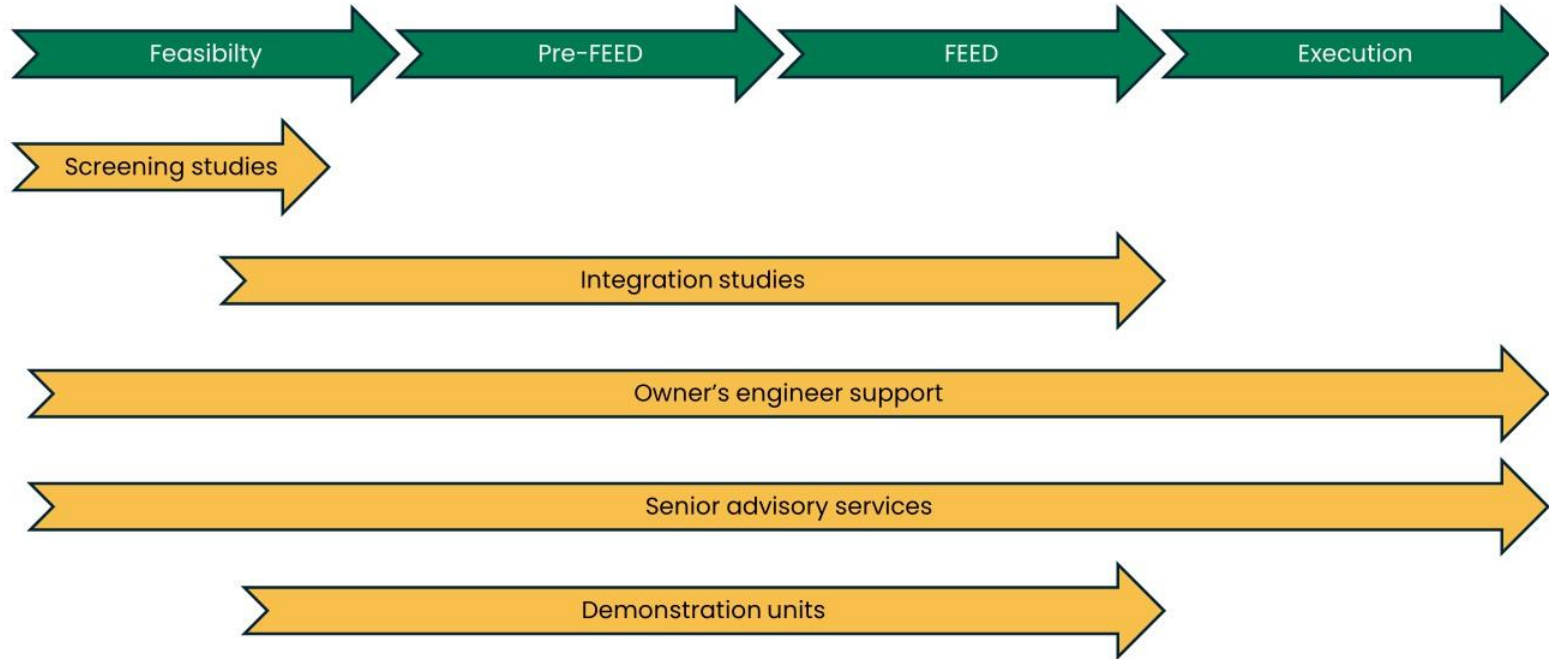
Carbon Capture by Captimise

2024-05-15



CAPTIMISE

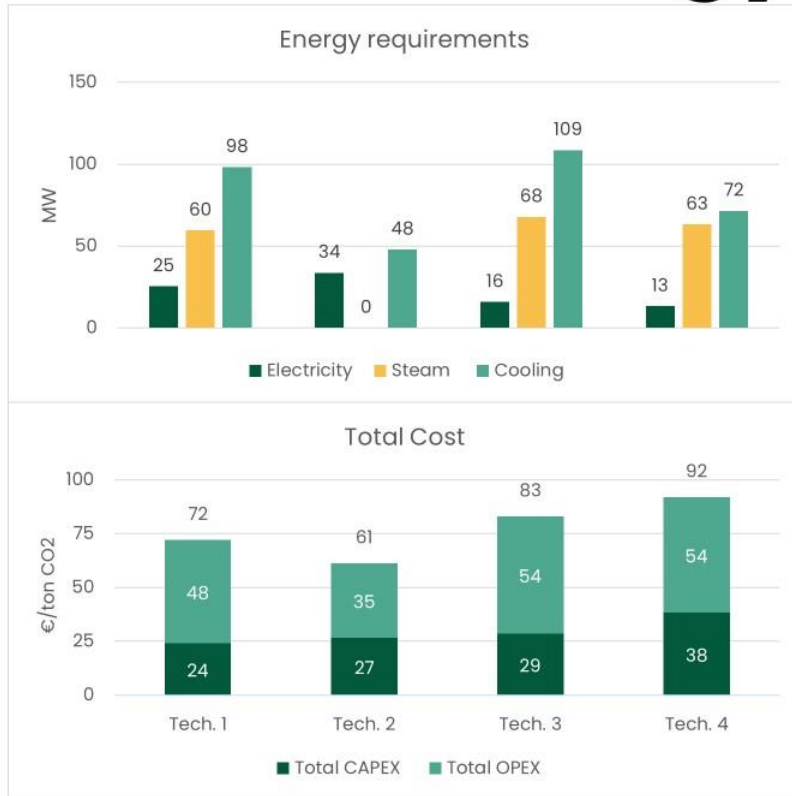
How do can we support your CCS project?



WHAT WE DO

**We provide independent
technology comparisons
for carbon capture**

CC Technology Screening



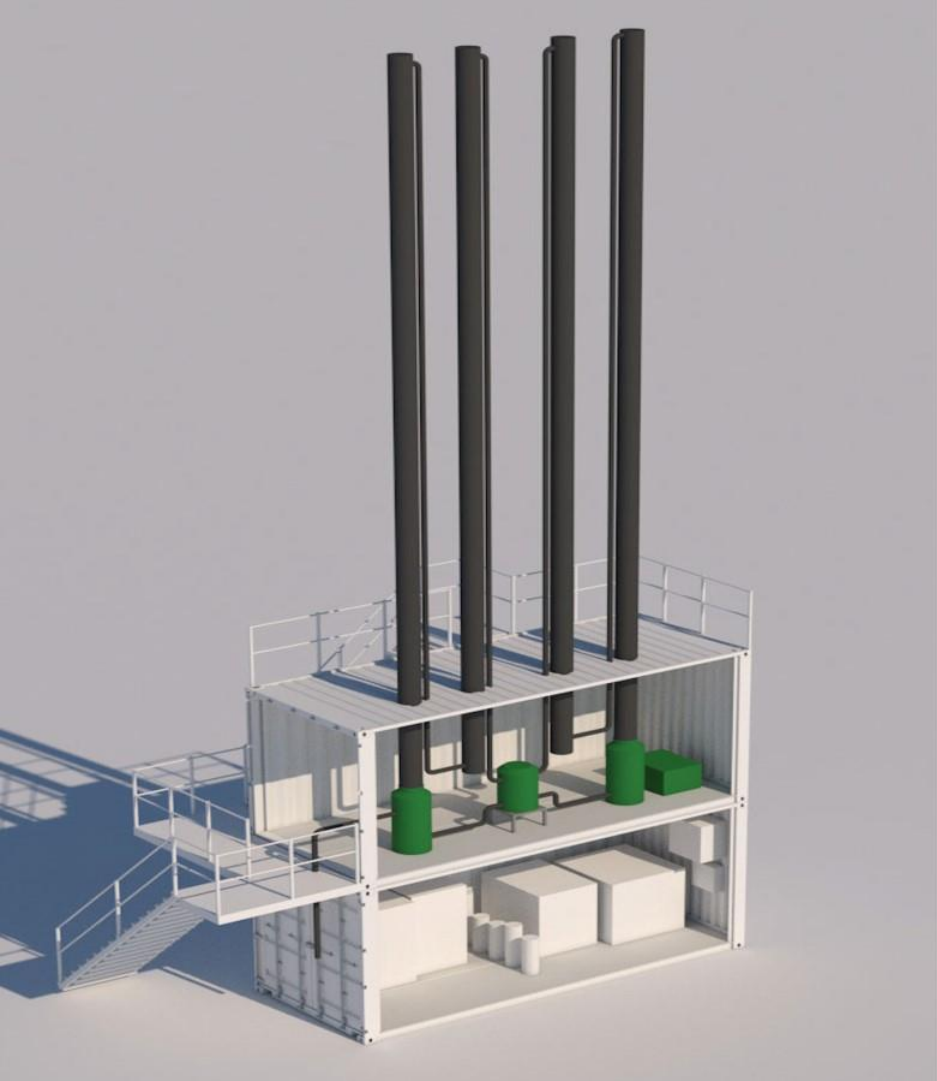
- Capture technologies (TRL 7-9)
 - Amines
 - Hot Potassium Carbonate (HPC)
 - Chilled Ammonia Process (CAP)
- Energy requirements
 - Electricity
 - Steam
 - Cooling
- CAPEX and OPEX estimates
- Footprint requirements
- Total cost of capture per tonne carbon dioxide

30 CCS Project Studies



WHAT WE DO

**The Captimiser helps to
prove the analysis before
final investment decision**



The Captimiser

An independent demonstration unit for;
Amines, Potassium Carbonate and Chilled Ammonia

Demonstrate

- Proof of capture technology
- Reactions between solvent and flue gases
- Understanding of process and educating staff
- Capture rate performance
- Optimisation of solvent and catalysts
- Degradation products
- PR – Proof of your intention