

# Hafslund Oslo Celsio CCS project

Energy from waste with negative emissions

# Celsio

## Energy sources:



EXCESS  
WASTE HEAT



ELECTRICITY



HEATPUMP/  
SEWER



DATACENTER



WOOD PELLET



BIOFUEL



FOSSIL OIL



LNG



District heating

3344  
Domestic housing

1145  
Apartment building

1244  
Commercial buildings

District heating possible to ships

ENERGY RECOVERY  
FROM 400.000 TONNES  
WASTE/ YEAR

600 km district  
heating network

30 mill liters hot water  
distributed  
throughout Oslo

District cooling

Production approx  
**152 GWh**  
electricity (est. 200)



# World's first full-scale CCS project on Waste-to-Energy

- Part of **Longship** CCS project; permanent geological storage below seabed
- 400 000 tons CO<sub>2</sub>/year, **90% CO<sub>2</sub> capture**
- CCS on Waste-to-Energy provides **50 % CDR**
- Studies completed **2015-2021**
- Demonstrates truck transport of CO<sub>2</sub> to port
- Successful testing on **real flue gas 2018**, new test period with **modified amine Fall 2021**
- Technology supplier **Shell** with **full-scale** experience, EPC contractor **TechnipEnergies**



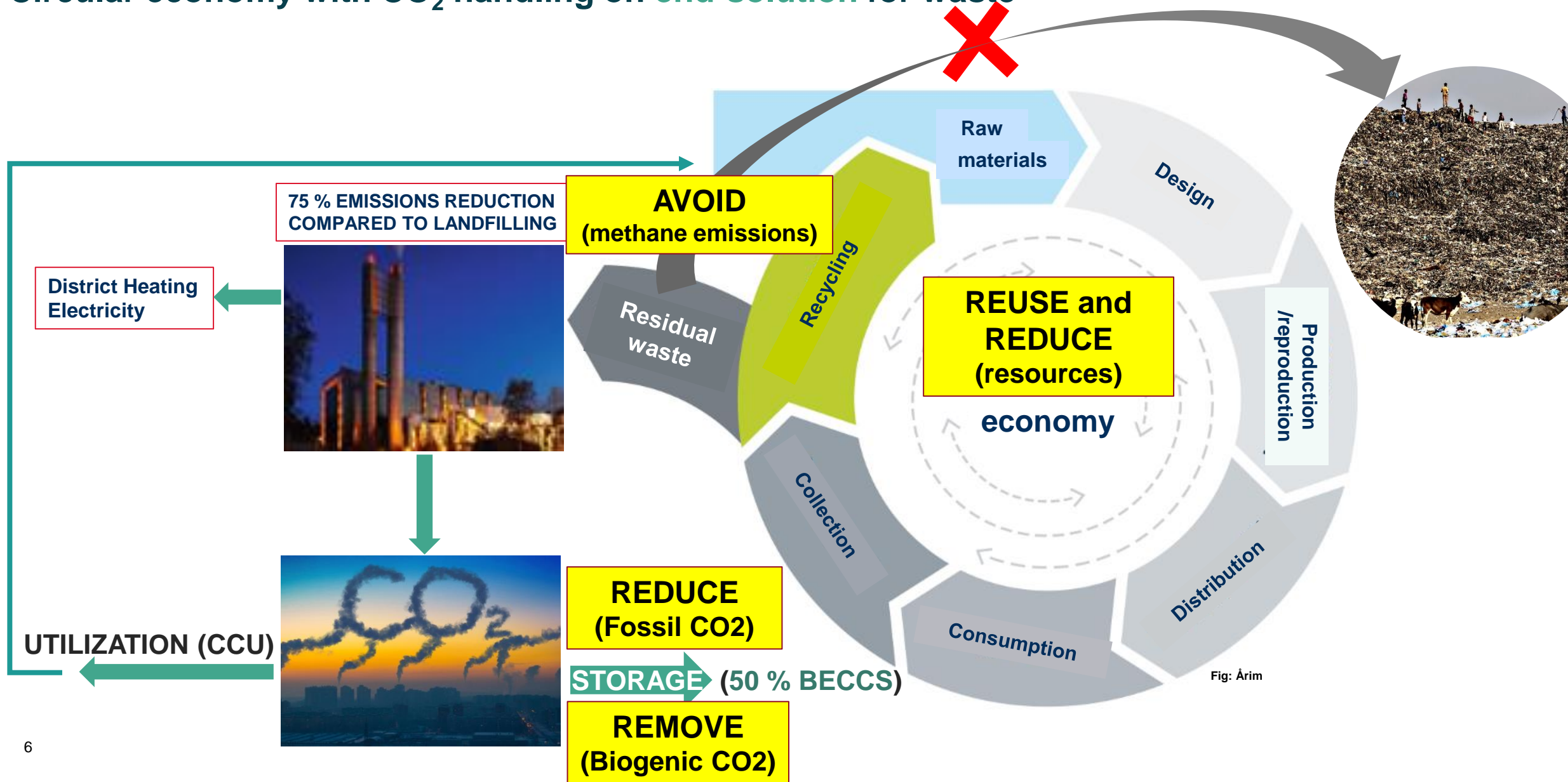
# Waste is one of the world's biggest climate challenges

- **Waste amounts increasing**
- **Cities are growing**
- **Methane from landfills ~20% of global warming**
- **40 Mill tons missing capacity for treatment of residual waste**



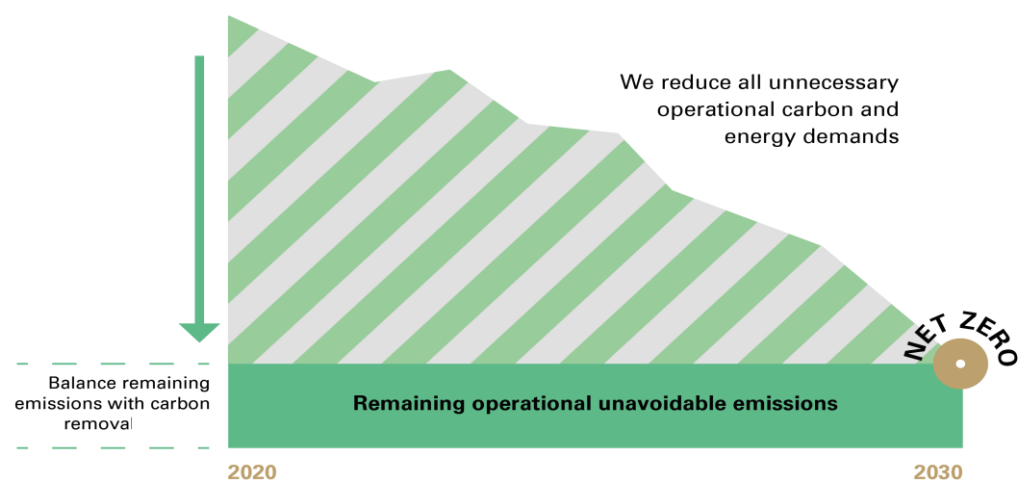
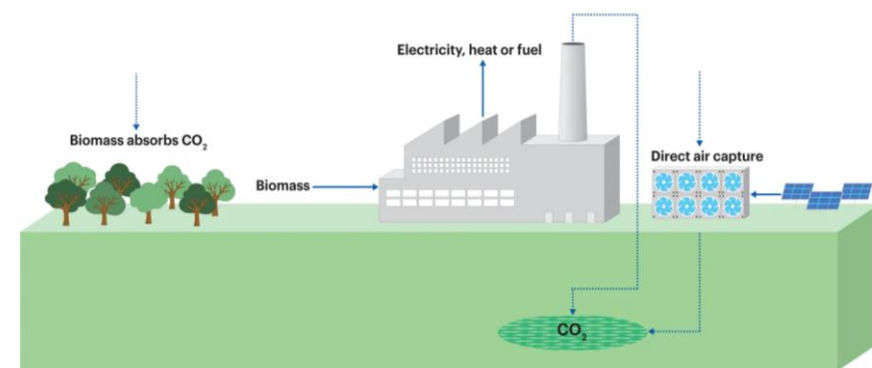
# Avoid, reduce, reuse, recycle - and remove!

Circular economy with CO<sub>2</sub> handling on end-solution for waste



# The potential of Carbon removal

- We will not reach global climate goals without carbon removal
- Negative emissions can make up for unavoidable fossil emissions; very expensive or very hard to abate
- Countries, cities and public companies committing to **net zero** by 2050
- Private initiatives and voluntary marketplaces for verified CO<sub>2</sub> removals emerging
- Need for common framework of technology-based removals (BECCS, DACS)
- EU legislation/framework for certifying carbon removal methods expected in 2022. A.O anticipated to address
  - Permanence
  - Sustainability
  - Single counting of removal

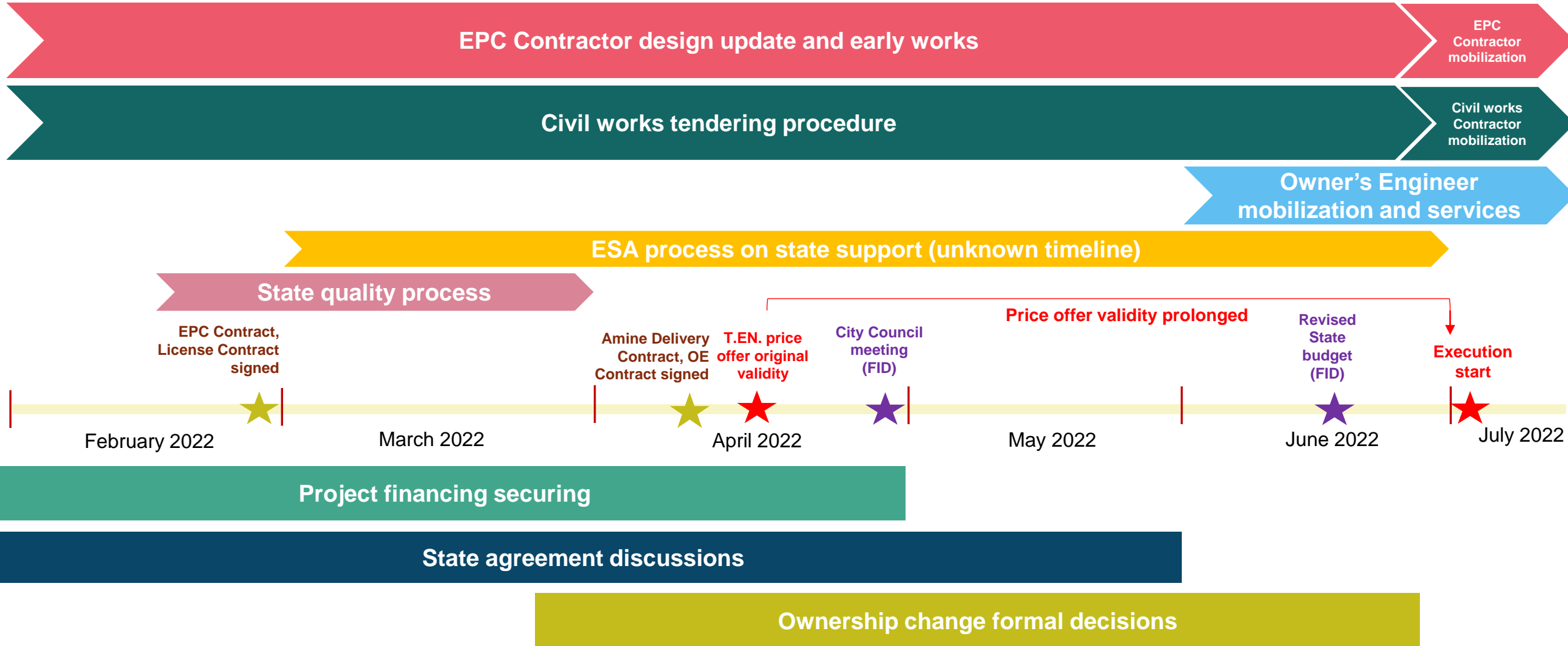


# CCS project financing

- **Total Project cost 910 Mill EUR**
  - CAPEX 550 Mill EUR
  - OPEX 350 Mill EUR for 10 years operation
- **State support 330 Mill EUR**
  - 10 year support period for operations
  - 10 years transport and storage service
- **Payment per ton CO2 delivered at port (= ETS price)**
- **City of Oslo direct investment in pref. shares of 210 Mill EUR.**
- **Remaining funding 390 Mill EUR by Celsio**



# Start of execution in summer 2022





# Thank you

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