

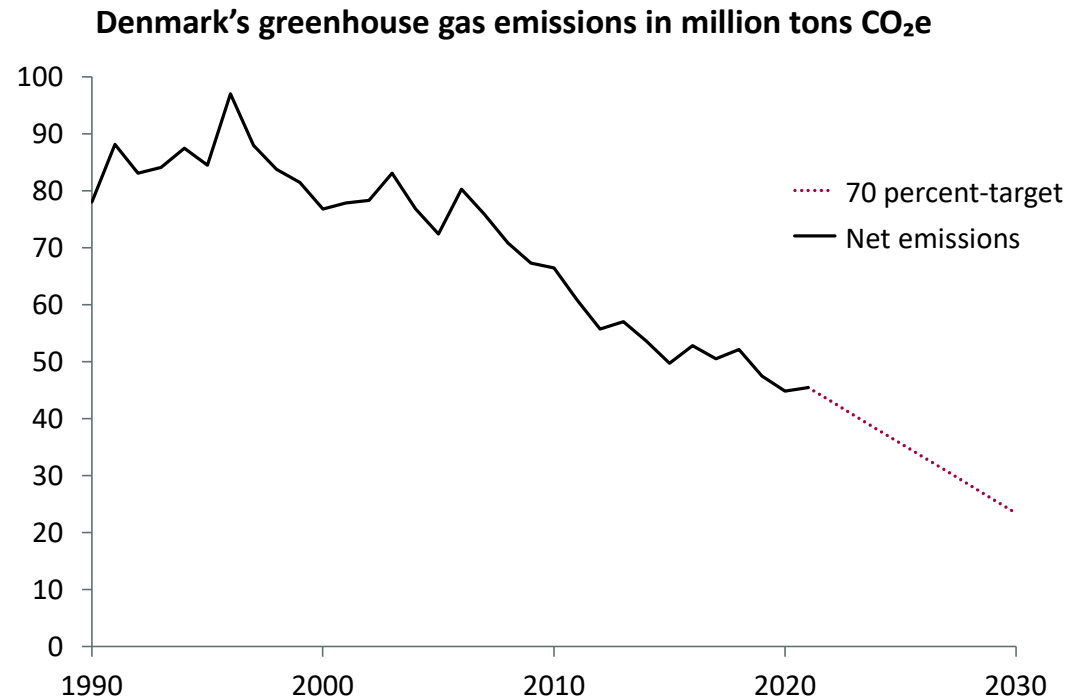


Establishing North Jutland Region, Denmark, as a hub for CO₂ storage and use

Jesper Sand Damtoft

Danish Climate Act of 2019

- Legally binding demand to reduce greenhouse gas emissions with **70 percent by 2030** compared to 1990
- Must reach **climate neutrality by 2045**
- Be **carbon negative by 2050**.



Source: The Danish Energy Agency

Broad political agreement about CCS in Denmark

- Climate agreement of June 22, 2020, **make CCS legal**
- Agreements on **CCS roadmap** of June 30, 2021, and December 14, 2021, enable full scale CO₂ storage in Denmark and **allow for import/export of CO₂**
- **Framework conditions for CO₂ storage** of June 21, 2022, includes 20% state co-ownership of storage permits and enable municipal waste incineration plants and biomass plants to seek financial support for CCS
- Accord on **strengthened framework for CCS** in Denmark of September 20, 2023, consolidate of funds to support establishment of CCS in Denmark include main law for transport of CO₂ in pipelines and opens license rounds for onshore and nearshore CO₂ storages
- International agreements for **cross-border transport of CO₂** signed with Belgium, Netherlands, France, Norway, Sweden

Aftale mellem regeringen (Socialdemokratiet), Venstre, Dansk Folkeparti, Radikale Venstre, Socialistisk Folkeparti, Enhedslisten, Konservative, Alternativet og Liberal Alliance om

Rammevilkår for CO₂-lagring i Danmark
Opfølgning på Danmarks CCS-strategi

21. juni 2022

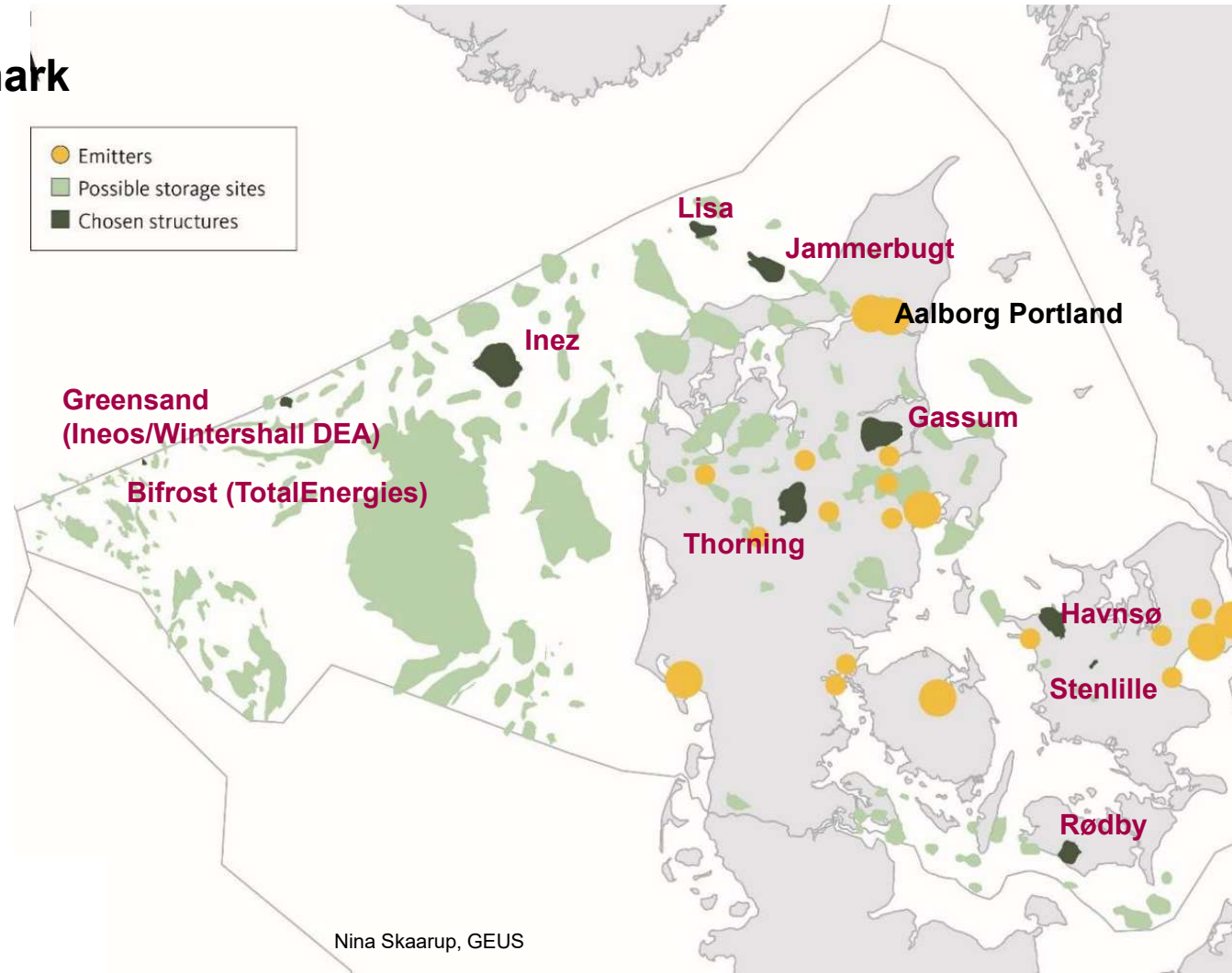
Aftale om styrkede rammevilkår for
CCS i Danmark
Klimahandling - Vejen til fuld fangst og lagring af CO₂ i
2030

20. september 2023

Aftale mellem
Regeringen (Socialdemokratiet, Venstre og Moderaterne), Socialistisk Folkeparti, Liberal Alliance, Det Konservative Folkeparti, Enhedslisten, Radikale Venstre, Dansk Folkeparti og Alternativet

CO₂ storage potential in Denmark

- Denmark's underground may store more than **22 billion tons CO₂**
- Three exploration licenses has been awarded **offshore**
- License round for **onshore** storages started in December 2023
- 9 companies or consortia have submitted tenders
- Exploration licenses will be awarded in **May-June 2024**



Support schemes for CCS

- 27 MEUR to the **Geological Survey of Denmark and Greenland** for investigations of CO₂ storage potential
- >24 MEUR from **EU Regional and Social Funds**, including the **Just Transition Fund**
- Funding from **Innovation Fund Denmark** for R&D in CCUS and green fuels
- **Danish CCS Funds**. 5 BEUR to establish CCS of 3.2 million tons CO₂ per year before 2030



Innovation Fund Denmark



Danish Ministry of Climate,
Energy and Utilities

Point sources in North Jutland in 2045

CO₂VISION

- Region North Jutland
- Aalborg Portland
- Biogas
- Biogas, new
- Industry
- Waste incineration



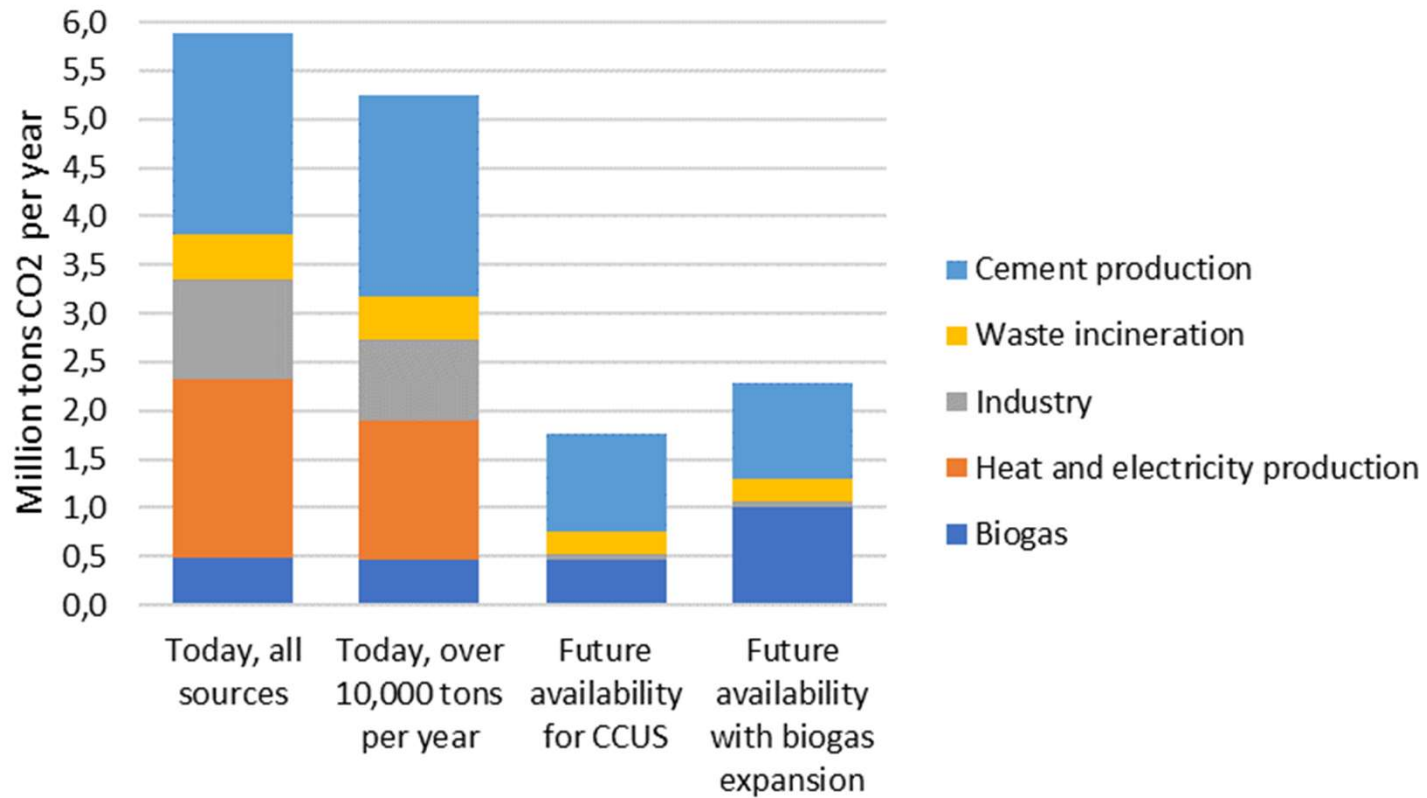
THE EUROPEAN UNION
The European Social Fund

THE EUROPEAN UNION
The European Regional Development Fund

Funded as part of the Union's response to the COVID-19 pandemic

Investing in your future

Availability of CO₂ in North Jutland – import needed for economy of scale



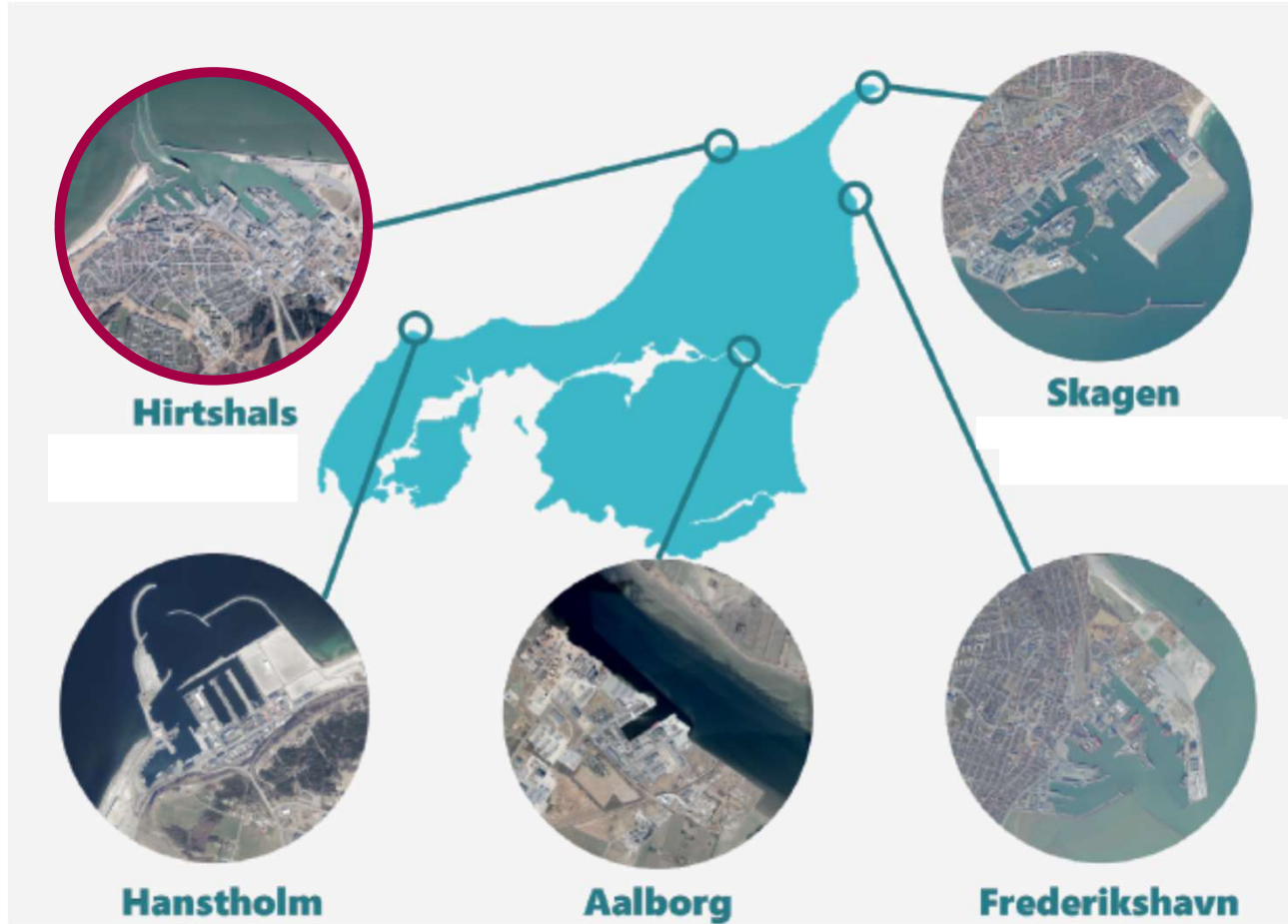
Future scenario: 2045

Aalborg Portland’s Road Map stipulated 0.4 million tons CO₂ captured per year by 2030



Harbour analysis

CO₂VISION



THE EUROPEAN UNION
The European Social Fund

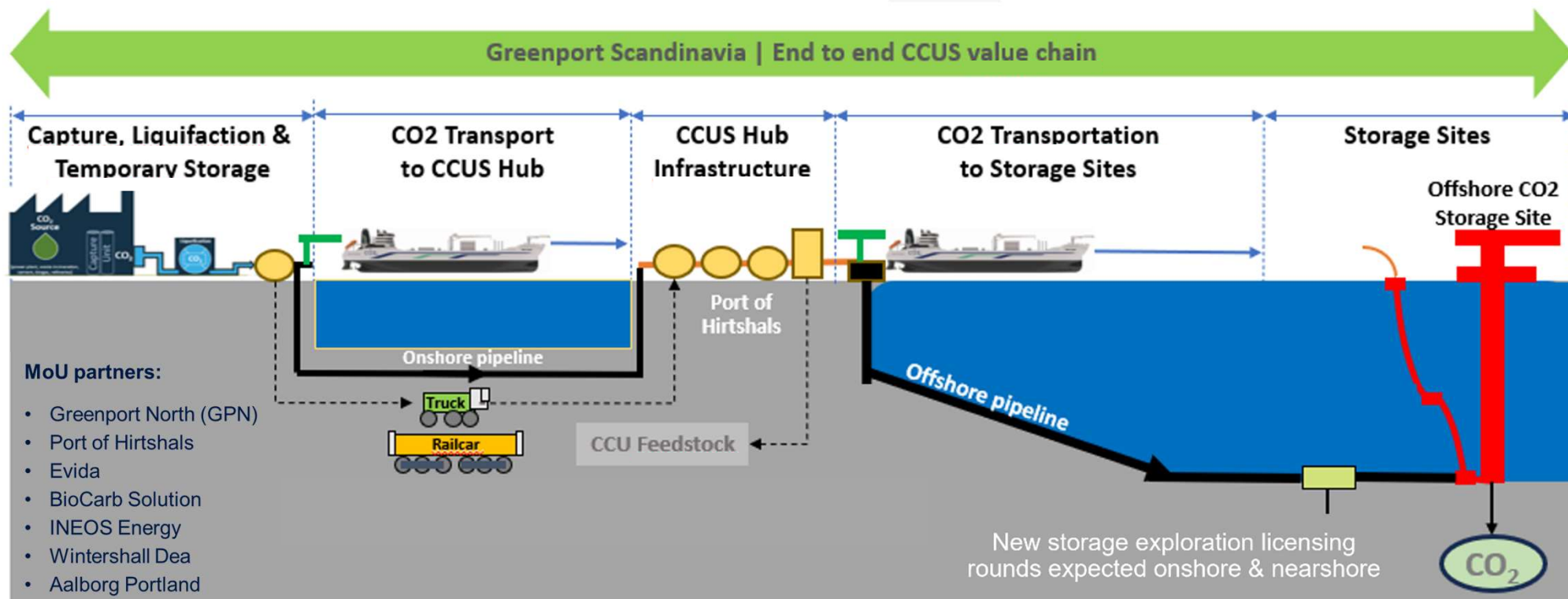
THE EUROPEAN UNION
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Investing in your future

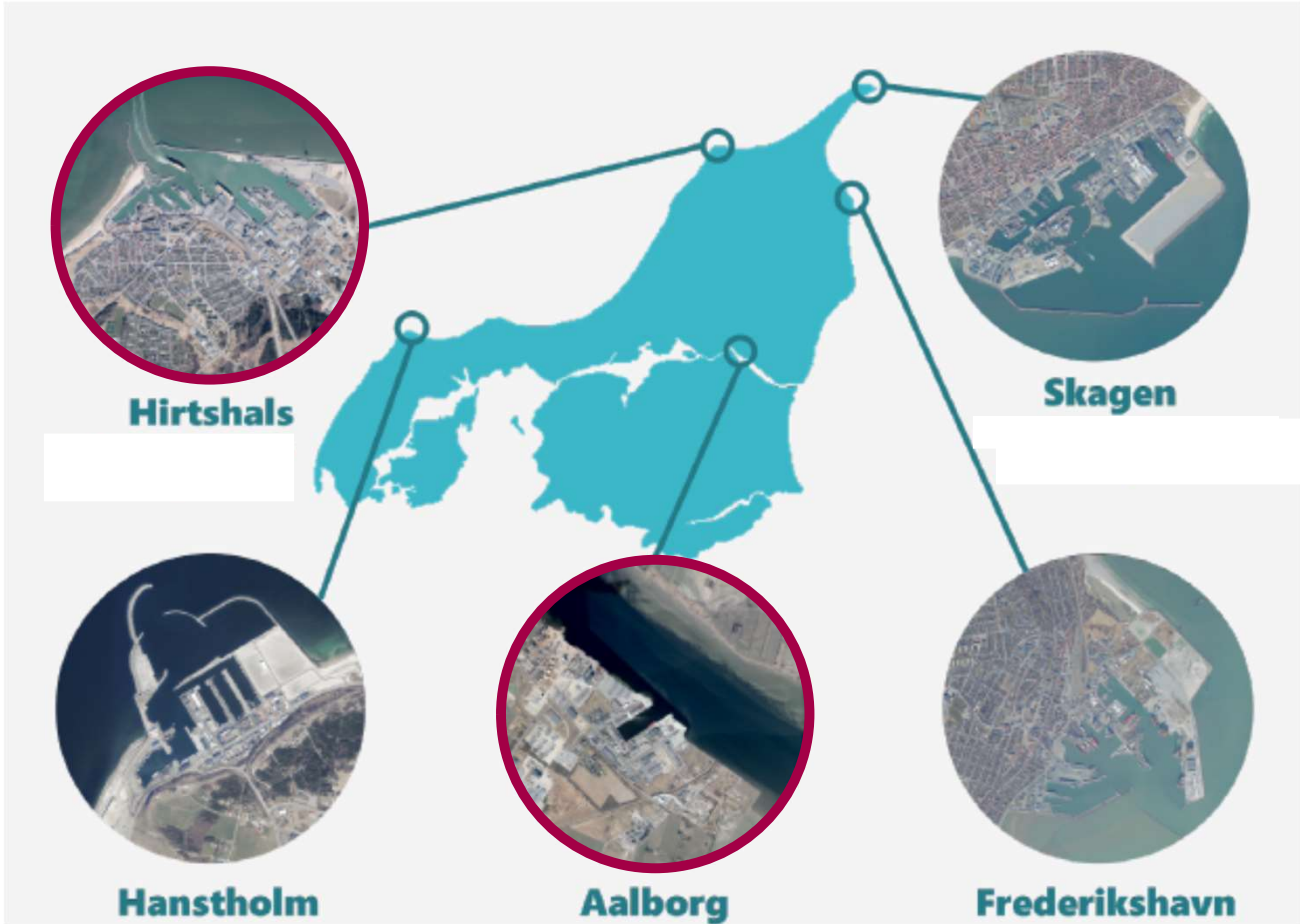
The Greenport Scandinavia Multi (GPS) CCUS Value Chain

Creating a CC(U)S hub to Harvest the Economies of Scale throughout the Value Chain



Harbour analysis

CO₂VISION



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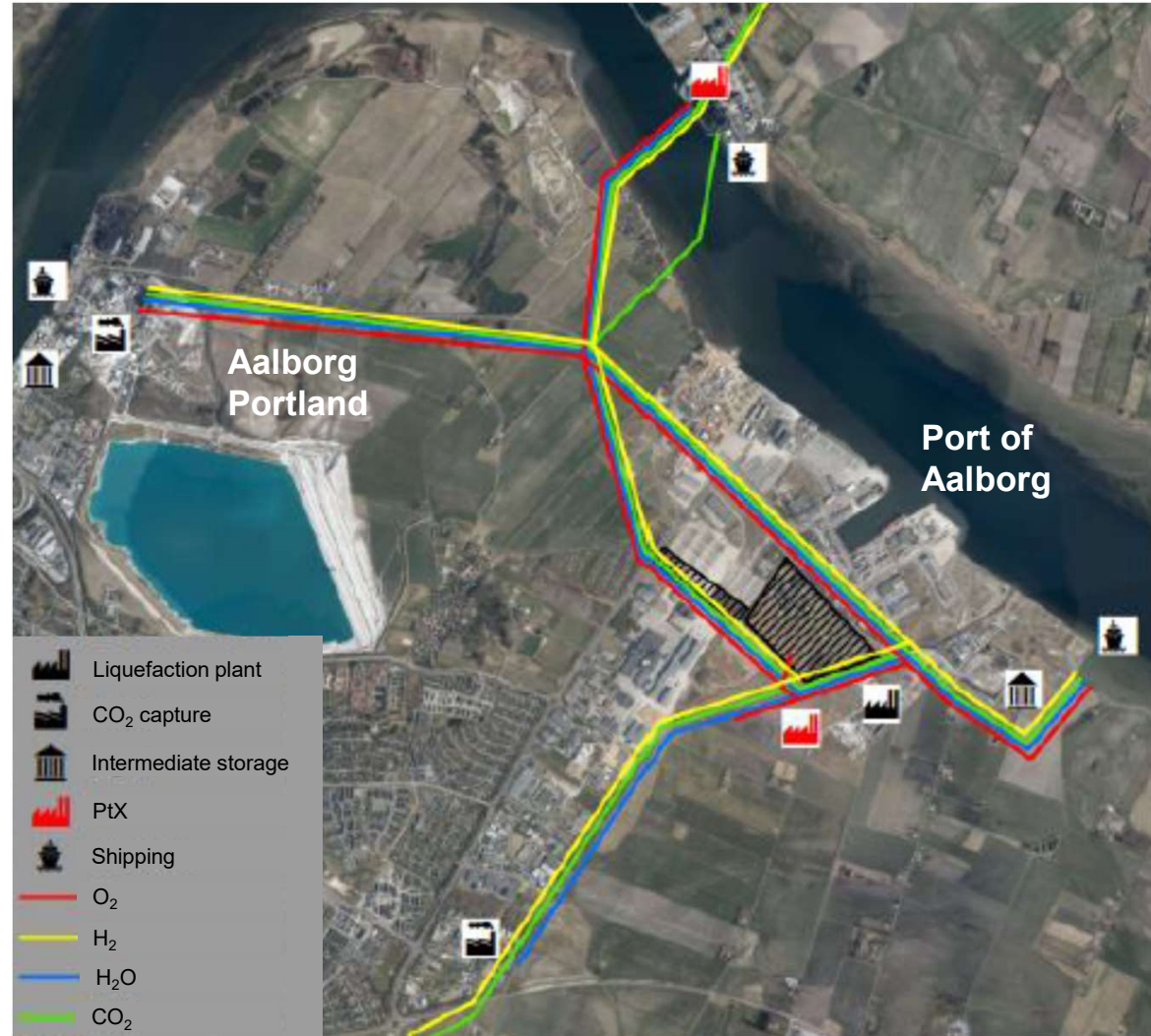
Funded as part of the Union's response to the COVID-19 pandemic

Investing in your future



System integration

- **Synergies** between CO₂ capture, import, storage and utilization
- **Local infrastructure** for hydrogen, oxygen, water and CO₂
- Takes advantage of existing **district heating** grid in Aalborg



CO₂ VISION

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Investing in your future

Research in CCUS: Examples of projects

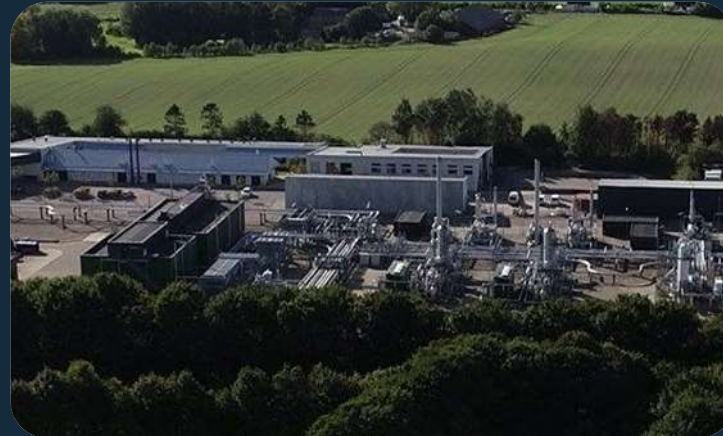
Pilot plant at
Aalborg Portland

*Reducing energy
consumption through
CO₂ capture*



Biochar testing on
Copenhagen University
test fields

*The climate potential of
biochar in a Danish
context*



Monitoring and
safety of CO₂ storage at
the Stenlille structure

*Monitoring
technologies and
leakage risks*

INNO-CCUS at Aalborg Portland

**CORT
2022-2023**



**CASPER
2024-2026**



Project period: **August 2022 - July 2025**

Total budget: 2.6 MEUR. **Grant of 1.8 MEUR**

Objective: Investigate advanced amine solvents for carbon capture and new heat integration methods

Project participants: Pentair, Aalborg Portland, DTU, Ørsted, Aalborg University, Force

The pilot plant captures **1 ton/day**. Tested in Aalborg in the period October 2022 - October 2023

Project period: **October 2023 - September 2026**

Total budget: 2.0 MEUR. Grant of **1.4 MEUR**

Objective: Investigate pipeline transport, storage or use

Project participants: Pentair, Aalborg Portland, DTU, DTI, Evida, DGC, Gas Storage Denmark

Amine plant fitted with **liquefaction unit** and **intermediate CO₂ storage**. Will operate September 2024 - February 2025

ConsenCUS

CarbOn Neutral cluSters by Electricity-based iNnovations in Capture, Utilisation and Storage

Aalborg Portland



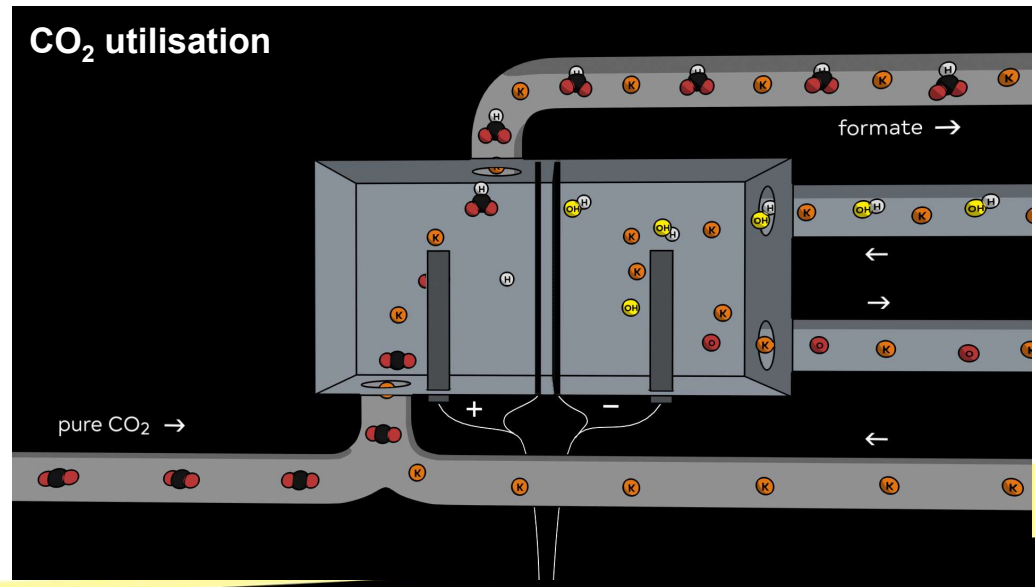
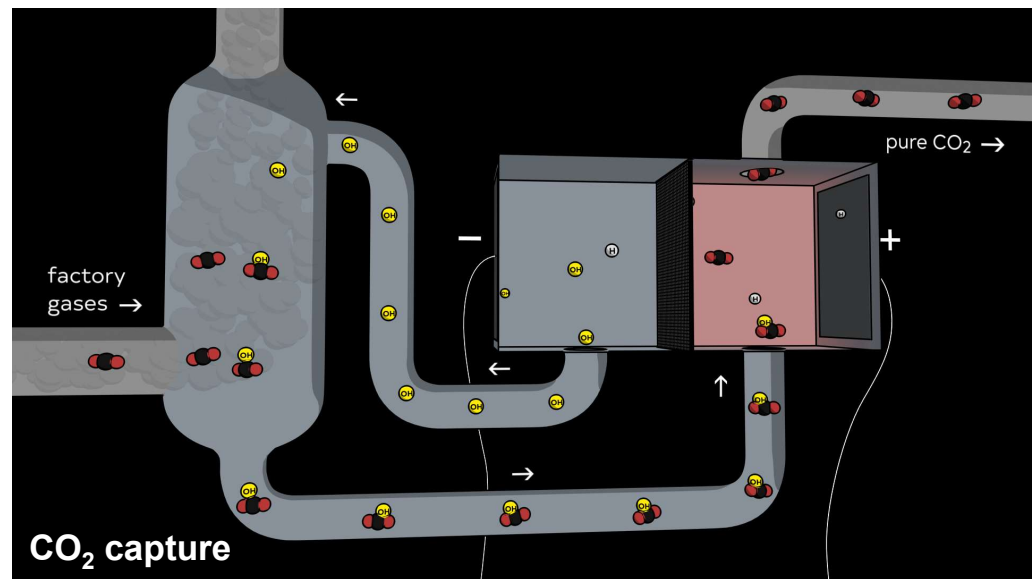
OMV Petrom



Grecian Magnesite

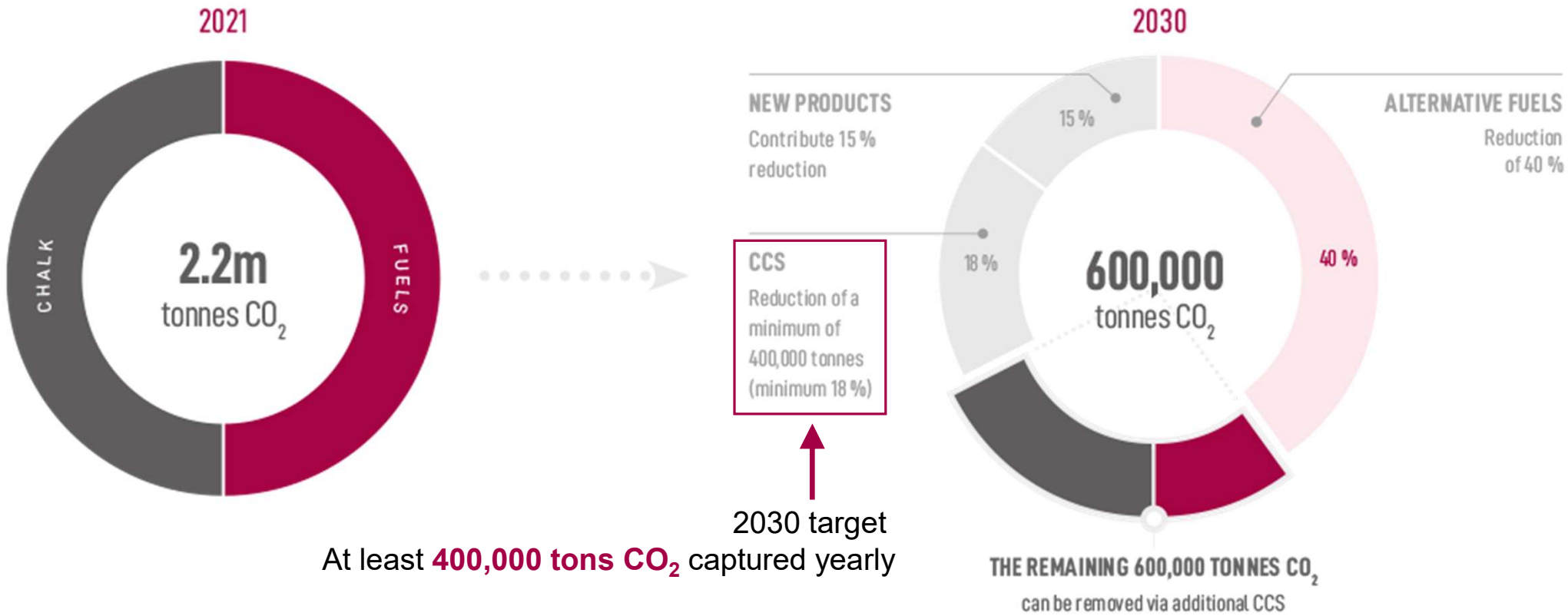


DGC Danish Gas Technology Centre
wetsus
aalborgportland
RGU
COVAL Energy
GRECIAN MAGNESITE ΕΛΛΗΝΙΚΟΙ ΛΕΥΚΟΛΙΘΟΙ
UNIVERSITY OF CALGARY
New Energy Coalition
DTU
EPG ENERGY POLICY GROUP
OMV Petrom
GEUS
HERIOT WATT UNIVERSITY
BGS British Geological Survey
rijksuniversiteit groningen
CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS
The Oil & Gas Technology Centre
ZHEJIANG UNIVERSITY





Aalborg Portland plan to reduce CO₂ emissions from 2.2 million to 600,000 tons



Planned carbon capture site





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