European Commission

## ETS Innovation Fund's closed-door knowledge sharing workshop:

# The emerging EU CO2 transport and storage market

*Closed Door Workshop*

**30 March 2023, 09:30h-17:30h**

# Welcome and Information

**The goal:** Joint discussion with EU co-funded CO2 capture operators and CO2 cross-border network developers & prospective CO2 storage operators in the EU & Member States experts

**The Topic:** Timely operational availability of the CO2 storage sites.

**The Modus:** Chatham House rules, i.e. the topics discussed can be referred to in general terms, but one cannot disclose who said what.

**The Results:**

- An anonymised public summary of the meeting discussion will be prepared and published.
- Useful contacts & exchanges of views among front-runners

**Your Comments & Questions:** Post your questions and comments for the open discussion on Slido and vote up the topics that most interest you.

**#IFKSCCS**
passcode
**#IFKSCCS3003**

European Commission

# Overview

- Innovation Fund projects will in total capture around **4.6 Mt CO2 per year** that need to be transported and stored in Europe **by 2028**. With ANRAV (own carbon storage on the Black Sea) the total GHG to be stored in Europe is 5.3 Mt CO2 per year.
- Connecting Europe Facility Projects of Common Interest (PCI) will contribute to the workshop with the most recent developments on planned **cross-border CO2 infrastructures.**
- CO2 storage operators will provide an update on the development stage of their **storage sites** and the capacity they plan to offer to the market until 2030.

# Timeline and volumes of the storage needs

| Project acronym | Location | EU contribution (EUR) | Entry into Operation | GHG emission avoidance per year (Mt CO2) |
|---|---|---|---|---|
| Kairos@C | Belgium | 356,859,000 | Q4 2026 | 1.4 |
| Beccs Stockholm | Sweden | 180,000,000 | Q2 2027 | 0.78 |
| GO4ECOPLANET | Poland | 228,210,004 | Q2 2027 | 1 |
| K6 | France | 153,386,598 | Q1 2028 | 0.8 |
| CalCC | France | 125,198,197 | Q1 2028 | 0.58 |
| ANRAV | Bulgaria | 189,694,949 | Q2 2028 | 0.78 |
| | | 1,233,348,748 | | 5.3 |

European Commission

# Agenda

| | |
|---|---|
| **1. Policy introduction & update by the Commission services** | (9:30 - 10:00h) |
| **2. CO2 storage developments in MS – part 1** | (10:00 - 11:00h) |
| *11:00 – 11:30h Coffee break* | |
| **2. CO2 storage developments in MS – part 2** | (11:30 - 12:30h) |
| **3. Storage support programmes in Europe** | (12:30 - 13:15h) |
| *13:15 – 14:30h Lunch break* | |
| **4. Needs of CO2 capturing projects supported by the Innovation Fund** | (14:30 - 15:15h) |
| **5. Cross-border CO2 network developments supported by TEN-E** | (15:15 - 16:00h) |
| *16:00 – 16:30h Coffee break* | |
| **6. Questions and moderated open discussion** | (16:30 - 17:30h) |
| *17:30h End of the meeting* | |

# INNOVATION FUND

## Deployment of net-zero and innovative technologies

Funded by: **EU Emissions Trading System**

Funding through Grants and Auctions

EUR 40 billion* to invest from 2020-2030 in EU's climate neutral future


Avoid emissions and boost competitiveness

**Supporting manufacturing, production and use in:**

Energy intensive industries

Renewables

Energy storage


Carbon capture, use and storage

Net-zero mobility and buildings

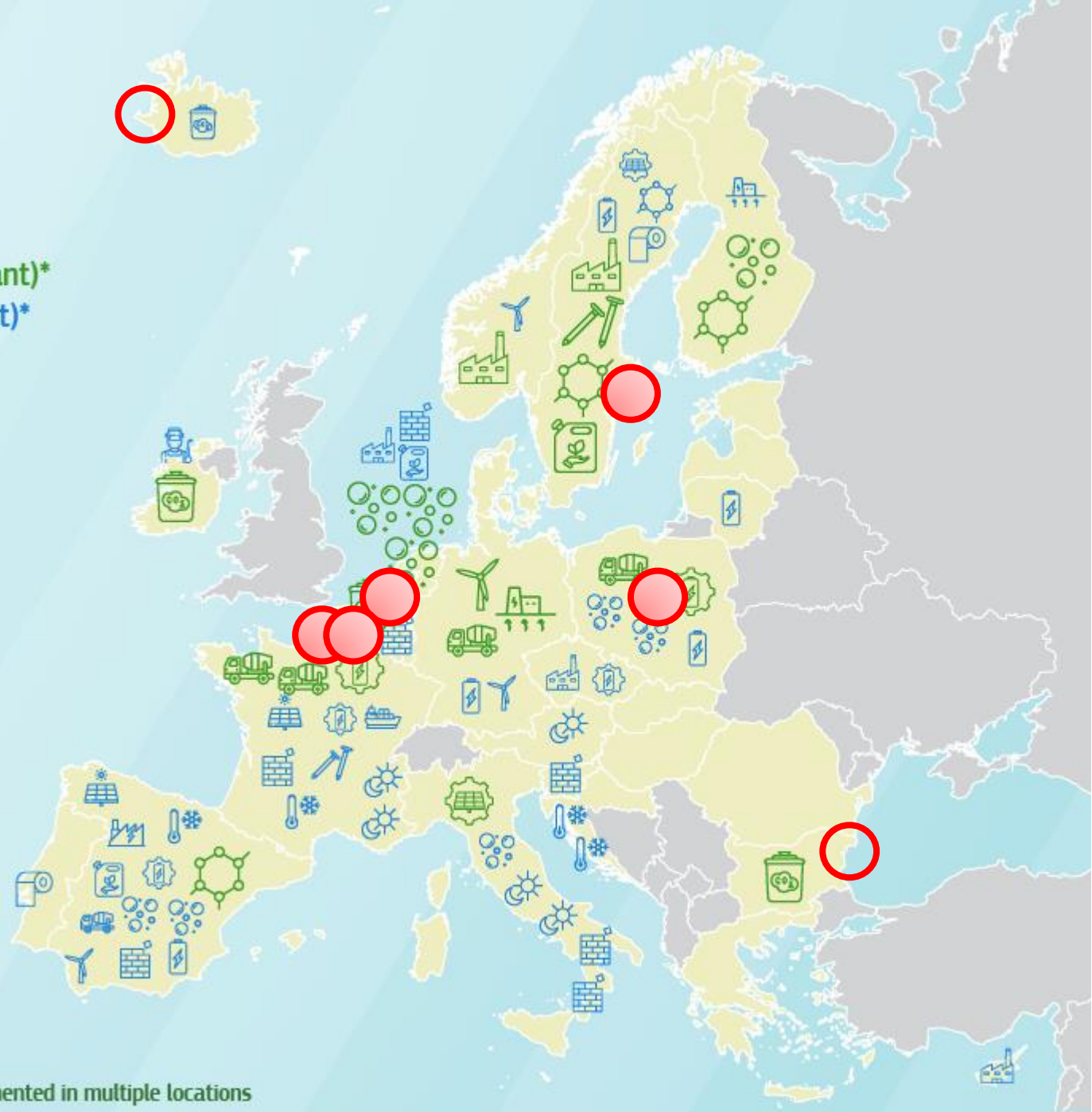
*based on a carbon price of 75 EUR/tonne

# Innovation Fund project portfolio

**Green:** Large-scale projects (23 awarded or pre-selected for grant)*
**Blue:** Small-scale projects (47 awarded or pre-selected for grant)*

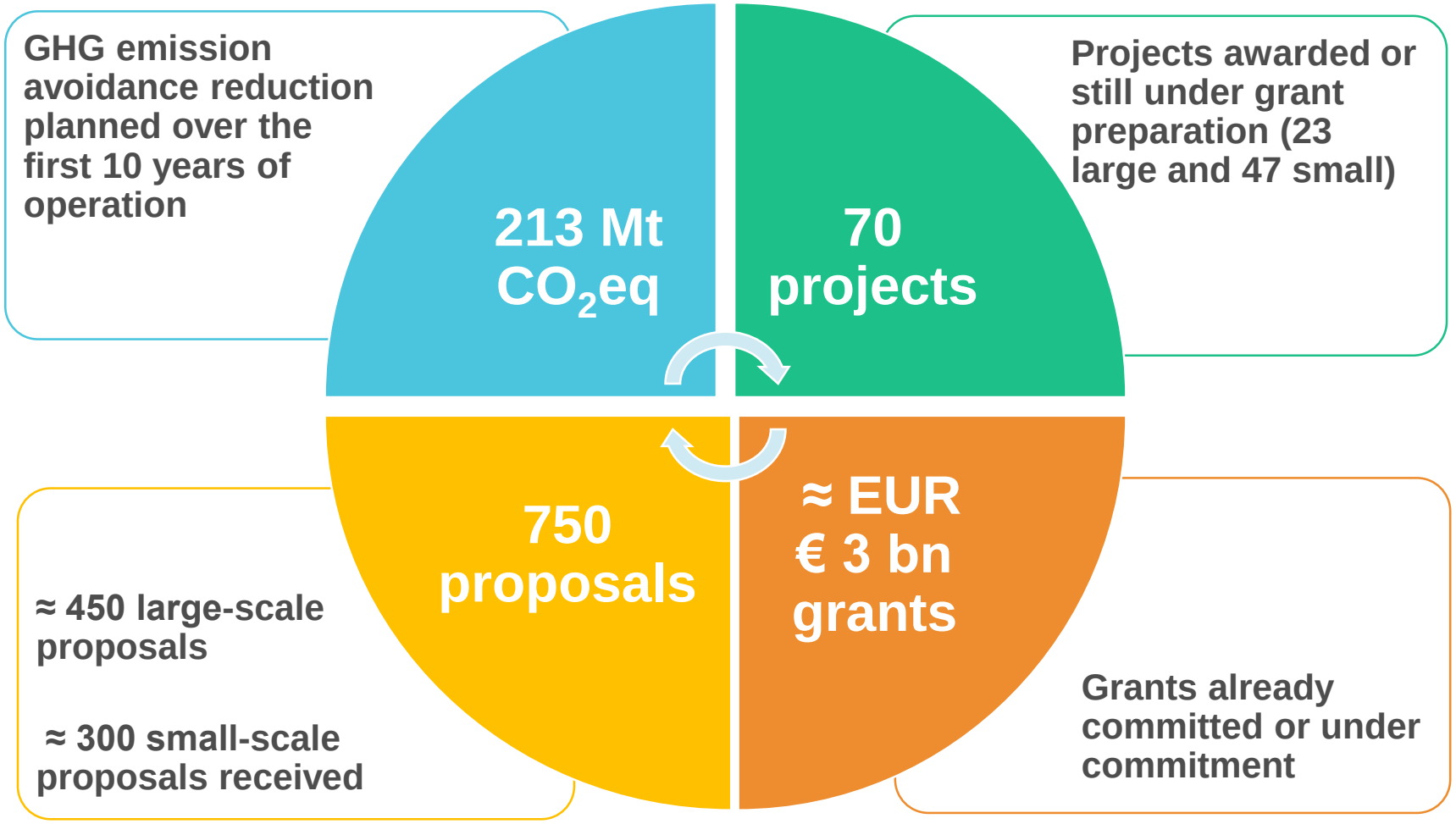
- Biofuels and biorefineries
- Chemicals
- $CO_2$ transpor
- Hydrogen
- Intra-day e
- Iron and st
- Non-ferrous metals
- Glass, ceramics and construction material
- Manufacturing of components for renewable energy
- Manufacturing of components for energy storage
- Other energy storage
- Geothermal energy
- Pulp and paper
- heating/cooling
- gy
- gy
- Cement and lime
- Use of renewable energy outside Annex 1
- Other energy intensive industries

4.6 mt/a $CO_2$ with EU support on offer by 2028!



*The number of symbols is higher than the number of projects, as some projects are implemented in multiple locations

# Within its first two years, the Innovation Fund has already awarded 70 projects with more than EUR 3bn



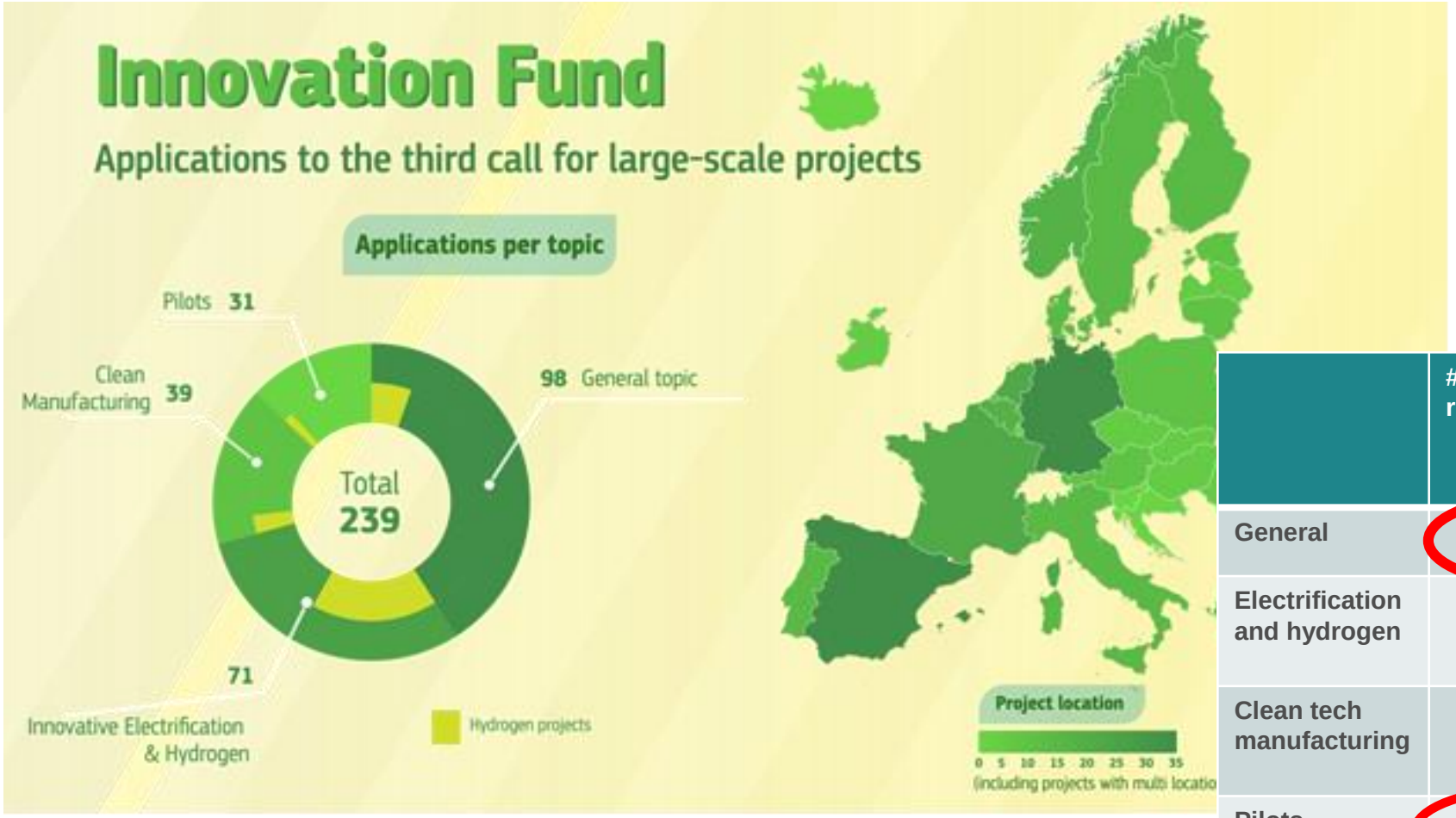

Innovation Fund website, Current Large Scale Call for EUR 3bn, Dashboard, Project fiches

European Commission

# More to come: 3rd LSC with EUR 3 billion

- General Decarbonisation **EUR 1 bn**
- Industry electrification and hydrogen **EUR 1bn**
- Clean tech manufacturing **EUR 700 m**
- Pilots **EUR 300 m**

| | |
|---|---|
| **Launch** | 03 Nov. 2022 |
| **Deadline** | 16 March 2023 |
| **Results** | July 2023 |




| | # proposals received | # proposals that can be funded based on average grant request | Factor of budget oversubscription* |
|---|---|---|---|
| General | 98 | 8 | 12 |
| Electrification and hydrogen | 71 | 9 | 8 |
| Clean tech manufacturing | 39 | 12 | 3 |
| Pilots | 31 | 14 | 2 |
| Total | 239 | 32 | 8 |

** Subject to admissibility and eligibility verifications*

# Towards a **CCUS Strategy for the EU**

**Autumn 2022**

- **Stakeholder inputs** to CCUS Forum plenary meeting
- **Launch of two EC studies** on:

1) JRC: transport and storage infrastructure needs;

2) markets, business cases, regulatory options

**Q1 2023**

- Launch of update CCS Guidance Documents
- CCUS Forum WGs finalise position papers

**Q2-Q3 2023**

- Public consultation launched
- **IF projects find storage services** (**TBC**)
- Regular CCUS Forum WG meetings
- National CCS Directive Implementation reports (04/23)
- GD review stakeholder workshop (07/23)
- **Draft updated National Energy and Climate Plans (NECP)** (06/23)
- **More IF capture projects? (07/23)**

**Q4 2023 +**

- **COM on CCUS strategy for EU**
- Commission Report on Implementation of Directive (10/23)
- **Adoption 6th PCI List *(with storage)* under new TEN-E**
- Revised GDs for CCS Directive

**Ongoing**

- **IF/PCIs projects are « regulatory and market sandboxes »** we continue to work with IF projects to see EU framework working in practice & to remove regulatory barriers.
- **Regular meetings of CCS Dir. Information Exchange Group**: operational knowledge sharing, permit storage forward planning, etc.

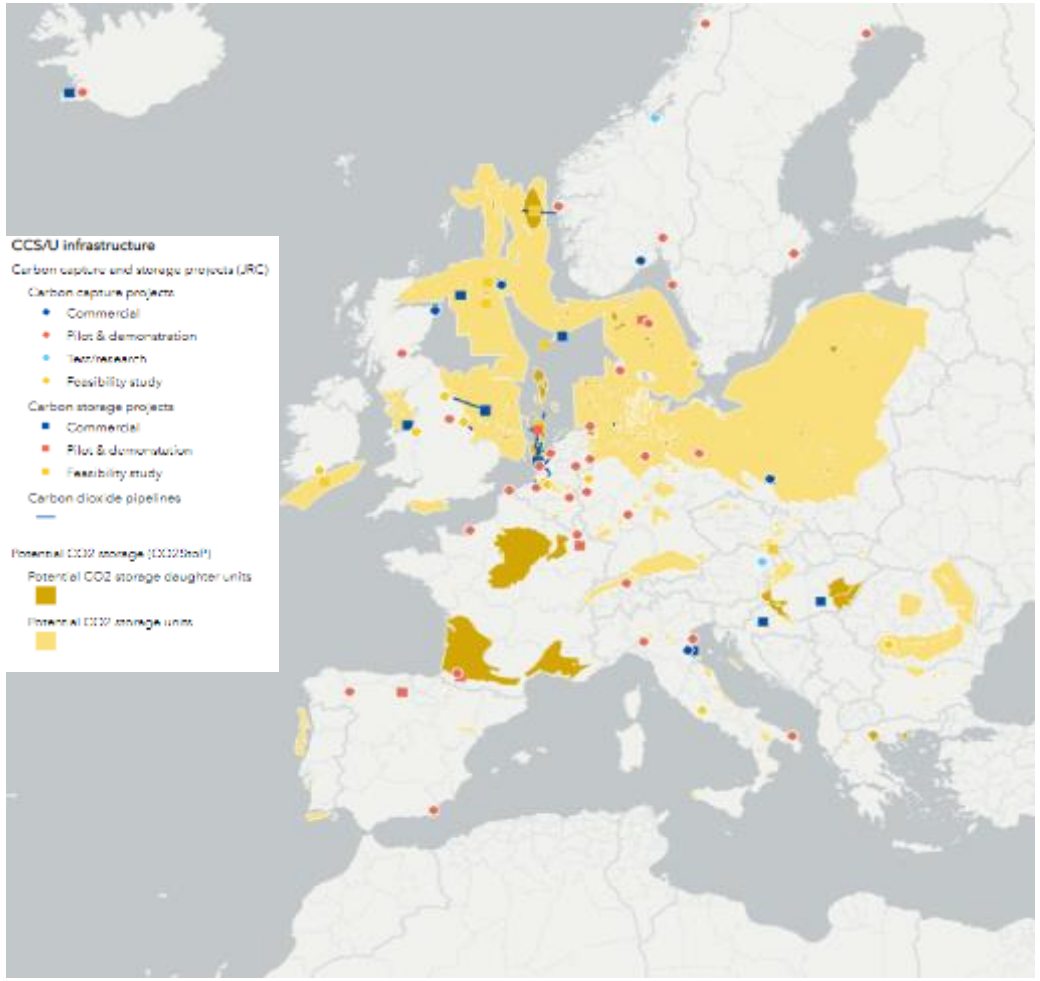
# Studying the evolution of a trans-European $CO_2$ transport network

**WHO**
The Joint Research Centre with a mandate from DG ENERGY

**WHAT**
Cost optimal match of $CO_2$ sources with $CO_2$ sinks

**WHEN**
Time horizon 2050

**HOW**
Energy and Industry Geography Lab + optimization software and tools

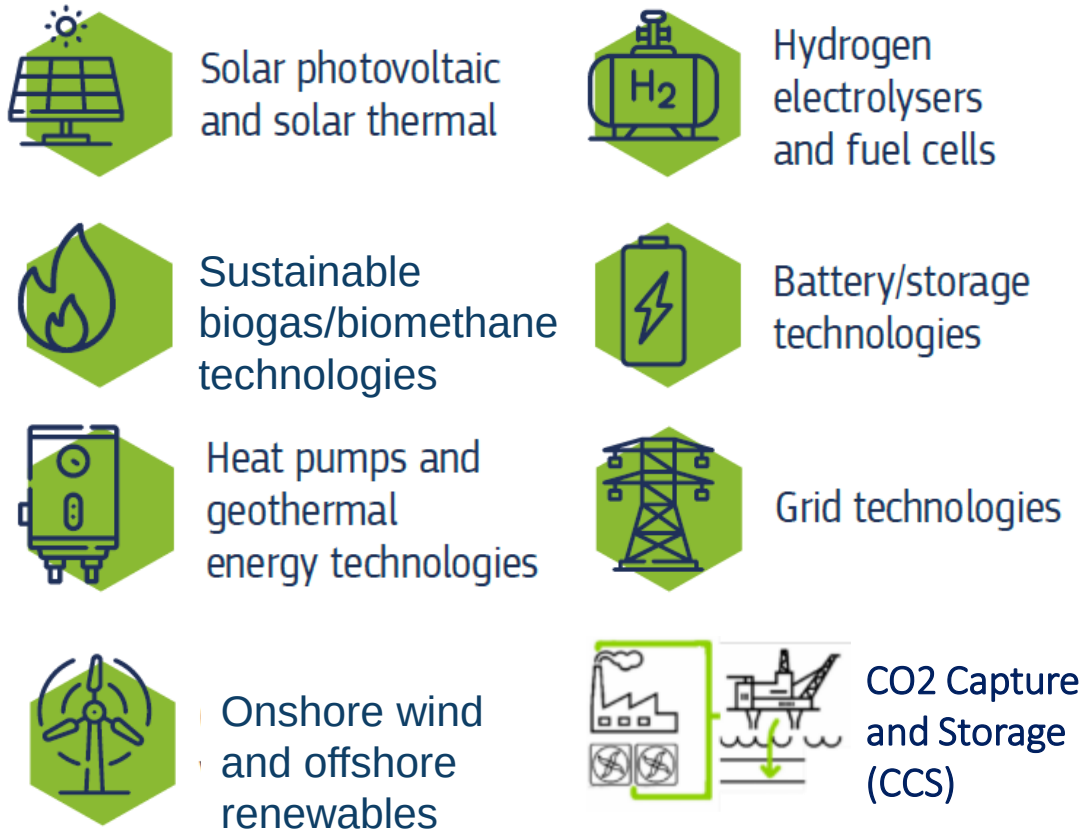



Source: https://energy-industry-geolab.jrc.ec.europa.eu/

European Commission

# Net-Zero Industry Act

- **Wide definition for net-zero technologies**, with nevertheless a focus on 8 specific areas
- Ambition: scale up net-zero technology manufacturing in the EU to provide at least 40% of the EU's annual deployment needs by 2030
- **Target: CO2 storage capacity 2030**



# Net-Zero Industry Act: Chapters

## Permitting

- Streamlined permitting deadlines and procedures
- One-stop shops
- Information sharing

## Investment

- Crowding-in private investments in net-zero strategic projects by Commission and MS
- Net-Zero Industry Europe Platform to advise on financing of projects

## Markets

- Sustainability & resilience criteria in auctions
- Sustainability & resilience criteria in public procurement
- Sustainability & resilience criteria in public support measures

## Skills

- Skills for quality jobs through Net-Zero Industry Academies
- Credentials for skills transparency, transferability & cross-border mobility



## Innovation

- Regulatory Sandboxes to promote innovation and to test innovative net-zero technologies in a controlled environment for a limited amount of time


## Governance

- Net-Zero Europe Platform as a reference body for the Commission to coordinate actions jointly with Member States including international partnerships

## $CO_2$ storage

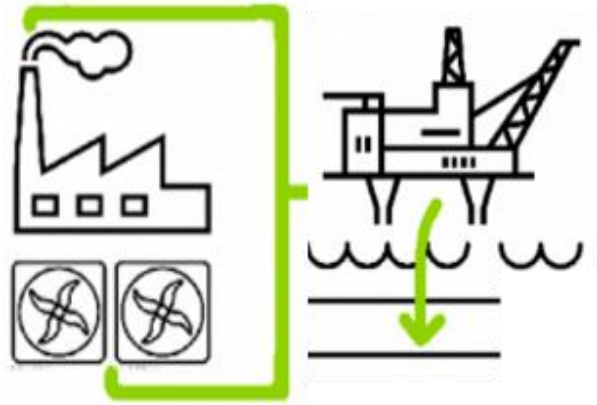
- Sets objective and obligations aimed at removing one of the main barriers to CCS

European Commission

| | Benefits |
|---|---|
| **Net-Zero Technologies (All)** | • Simplification: One-stop shop, online access to info, faster permitting (12-18 months)<br>• Innovation: Regulatory Sandboxes<br>• Competences and skills |
| **Net-Zero Strategic Technologies (Annex)** | • Facilitated access to markets through benefitting from sustainability and resilience criteria in auctions (15-30% weight of award criteria), public procurement and other public schemes<br>• Benchmark for manufacturing capacity of strategic net-zero technologies to reach at least 40% of EU's annual deployment needs by 2030<br>• Possibility to become a Strategic Net-Zero Technology Project |
| **Strategic Net-Zero Technology projects** | • Priority status and obligations for Member States to process the permitting process faster via shorter time-limits.<br>• Shorter permitting deadlines (9-12 months)<br>• Overriding public interest<br>• MS and COM to support through crowd-in private investments in net-zero strategic projects to accelerate their implementation<br>• Benefit from finance coordination by the Net-Zero Europe Platform |

# A CO2 storage objectives for the EU

- **EU-wide objective to achieve an annual $CO_2$ storage capacity of 50 million tonnes by 2030**, to reassure industry investors that their captured emissions can be stored in the EU (storage in combination with enhanced hydrocarbon recovery excluded)
- **Obligation to publish all geological data relating to oil and gas production sites** when decommissioning
- **Net-Zero Strategic Projects** are supported if:
  - ✓ Operational $CO_2$ injection capacity by 2030 or earlier, and
  - ✓ Applied for a $CO_2$ storage permit $CO_2$, in accordance with Directive 2009/31/EU



# Oil and Gas transition to net-zero

- **Contribution:** Oil and gas producers have to provide an individual contribution for reaching the Union-wide CO2 injection target.
- Individual companies needs to **contribute in accordance with their share in overall EU oil and gas production**
- Flexibility: Oil and gas producers can **use their own assets, cooperate with each other or third parties** to provide new $CO_2$ storage and injection capacity commissioned by 2030.
- Monitoring based **storage needs in Member States (NECP)** with bi-annual **progress reports from industry**

# CCS Workshop – State aid

## ETS Innovation Fund's knowledge sharing workshop

30 March 2023

*The views expressed in this document are those of the author and may not in any circumstances be regarded as stating an official position of DG Competition or of the European Commission.*

*Nadine Müller*
*COMP.H2 – Deputy Head of Unit*
*IPCEI, Environment & Innovation I*

Competition

# Policy introduction & update by the Commission services

European Commission | COMPETITION

# Revision of State aid rules and context

**November 2019:**
European Green Deal Communication

**October 2020:**
Evaluation of EEAG and related GBER articles
(results published)

**January 2022**: Adoption of the Climate, Environmental protection and energy aid guidelines ('**CEEAG**') replacing the 'EEAG'

**March 2023:**
Endorsement of **'Green Deal' GBER revision** (targeted to the green and digital transition)

**Spring 2023**: Adoption of **'Green Deal' GBER revision**

**Main objectives of revision of the CEEAG and GBER:**

- ✓ Facilitate support for Green Deal-relevant projects ➔ Enlarging the scope to cover new areas and technologies
- ✓ Limiting the possibility for Member States to grant aid that locks in fossil-based technologies and processes
- ✓ Ensuring alignment and coherence with relevant EU legislation and policies in the environmental and energy fields (Green Deal, Fit for 55 initiatives, etc.)
- ✓ While ensuring competition distortions are kept to the minimum

# Aid for CCUS projects (dedicated infrastructure)

| | Article 36 GBER | Section 4.1 CEEAG |
|---|---|---|
| **Eligible projects** | Investments reducing direct emissions + dedicated infrastructure<br><br>Incl. investments in **$CO_2$ capture and transport** (+ buffer storage) which:<br>• Are integrated into a complete CCS and/or CCU chain<br>• Have negative NPV throughout the project's lifetime<br><br>Excludes: permanent storage | All technologies that contribute to the reduction of greenhouse gas emissions<br><br>Incl. investments in CCS/CCU technologies (dedicated) |
| **Treatment of fossil fuels** | May not increase the demand of fossil fuels or expand production capacity of the beneficiary | May not stimulate or prolong the consumption of fossil-based fuels and energy |
| **Aid amount calculation** | Alternative options:<br>• 30% of extra investment costs + SME/'assisted areas' bonuses<br>• Competitive bidding (up to 100% invest. costs)<br>• Investment costs minus operating profit + clawback<br>Maximum **EUR 25 million** per undertaking per project | • In principle: **competitive bidding process**<br>• Exception e.g. for cases of limited expected supply/competition: **funding gap + claw back** |
| **Form of aid** | Only investment aid | Investment aid or operating aid |
| **Cumulation with EU funds** | Allowed if total amount of public funding for same eligible costs ≤ most favourable funding rate | Allowed if total amount of public funding does not lead to overcompensation |

# Aid for energy infrastructure

| | Article 48 GBER | Section 4.9 CEEAG |
|---|---|---|
| **Eligible projects** | Construction or upgrade of energy infrastructure <u>subject to full third-party access and tariff regulation</u><br><br>Including CO2 infrastructure:<br>• **Pipelines**<br>• Facilities for **liquefaction and buffer storage** of CO2<br>• **Essential equipment for operating the system** (e.g. monitoring and control systems).<br><br>Excludes:<br>- Dedicated infrastructure for a small group of users<br>- Capturing equipment<br>- Permanent storage | Same as GBER<br>+ **permanent storage**<br>+ **energy infrastructure that is fully or partially exempted from regulation** (but significant or total exemption makes proportionality more difficult to establish)<br><br>Excludes:<br>- Dedicated infrastructure for a small group of users<br>- Capturing equipment |
| **Aid amount calculation** | • Aid may reach up to 100 % of funding gap (but max. 100% of investment costs)<br><br>Maximum aid amount: **EUR 70 million** per undertaking per project | • Aid may reach up to 100% of the funding gap<br>• Claw-back mechanism may be needed to limit windfall profits |
| **Form of aid** | Investment aid | • Investment aid<br>• Operating aid under specific conditions |
| **Cumulation with EU funds** | Allowed if total amount of public funding for same eligible costs ≤ most favourable funding rate | Allowed if total amount of public funding does not lead to overcompensation |

# Thank you

**#IFKSCCS**
passcode
**#IFKSCCS3003**

**Post comments or questions via Slido**



European Commission | COMPETITION

# Agenda

| | |
|---|---|
| **1. Policy introduction & update by the Commission services** | (9:30 - 10:00h) |
| **2. CO2 storage developments in MS – part 1** | (10:00 - 11:00h) |
| *11:00 – 11:30h Coffee break* | |
| **2. CO2 storage developments in MS – part 2** | (11:30 - 12:30h) |
| **3. Storage support programmes in Europe** | (12:30 - 13:15h) |
| *13:15 – 14:30h Lunch break* | |
| **4. Needs of CO2 capturing projects supported by the Innovation Fund** | (14:30 - 15:15h) |
| **5. Cross-border CO2 network developments supported by TEN-E** | (15:15 - 16:00h) |
| *16:00 – 16:30h Coffee break* | |
| **6. Questions and moderated open discussion** | (16:30 - 17:30h) |
| *17:30h End of the meeting* | |

# $CO_2$ reduction through storage under the North Sea

Alexander Vink, Commercial manager
30 March 2023

Co-financed by the Connecting Europe Facility of the European Union

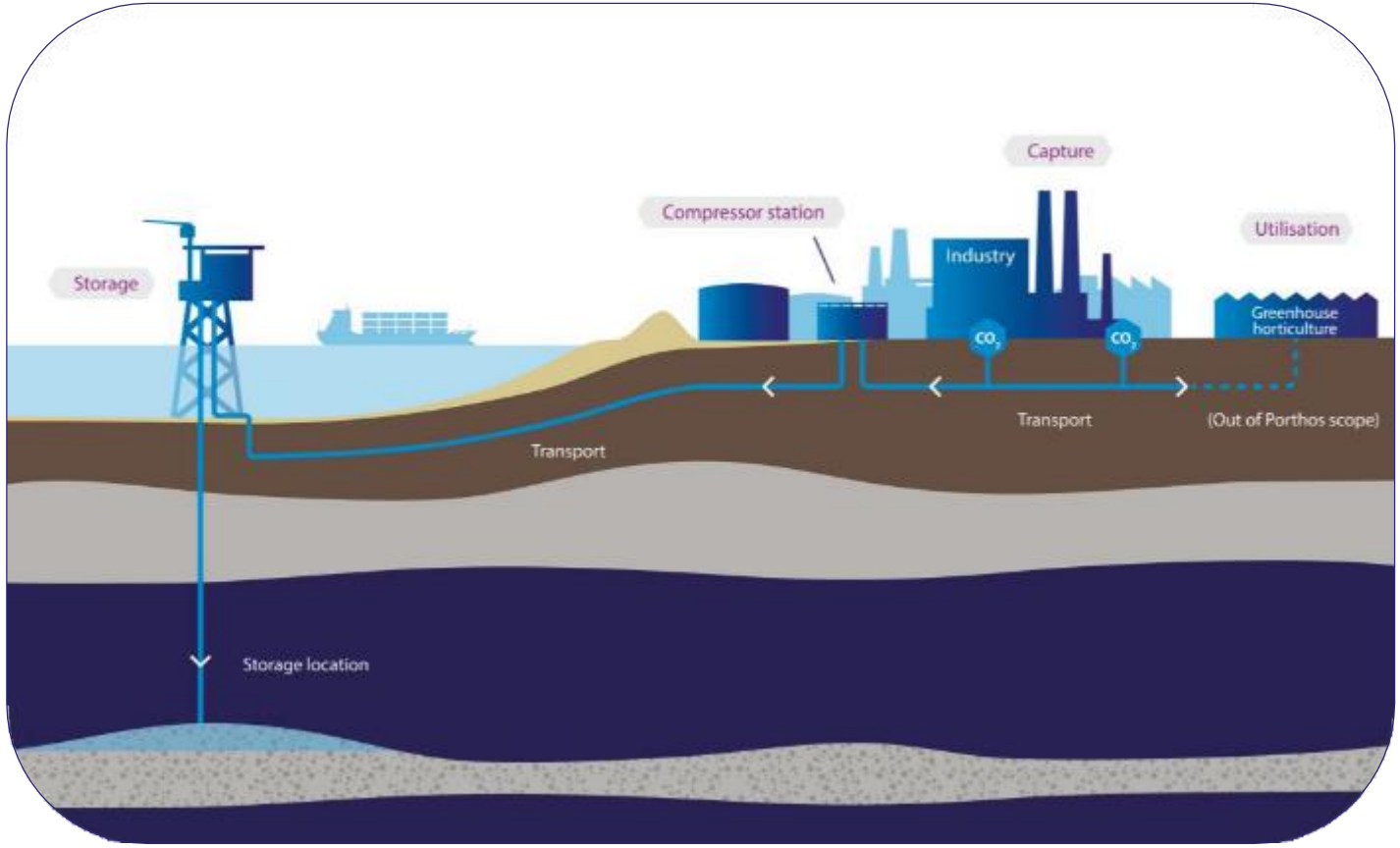
Porthos
$CO_2$ TRANSPORT & STORAGE

# Porthos project

*Port of Rotterdam, the Netherlands*

- $CO_2$ capture by customers

- $CO_2$ transport and storage by Porthos:
- Collection pipeline (~ 30 km)
- Compressor station
- Offshore pipeline (~ 22 km)
- Storage in empty gas fields, more than 3 km under the North Sea



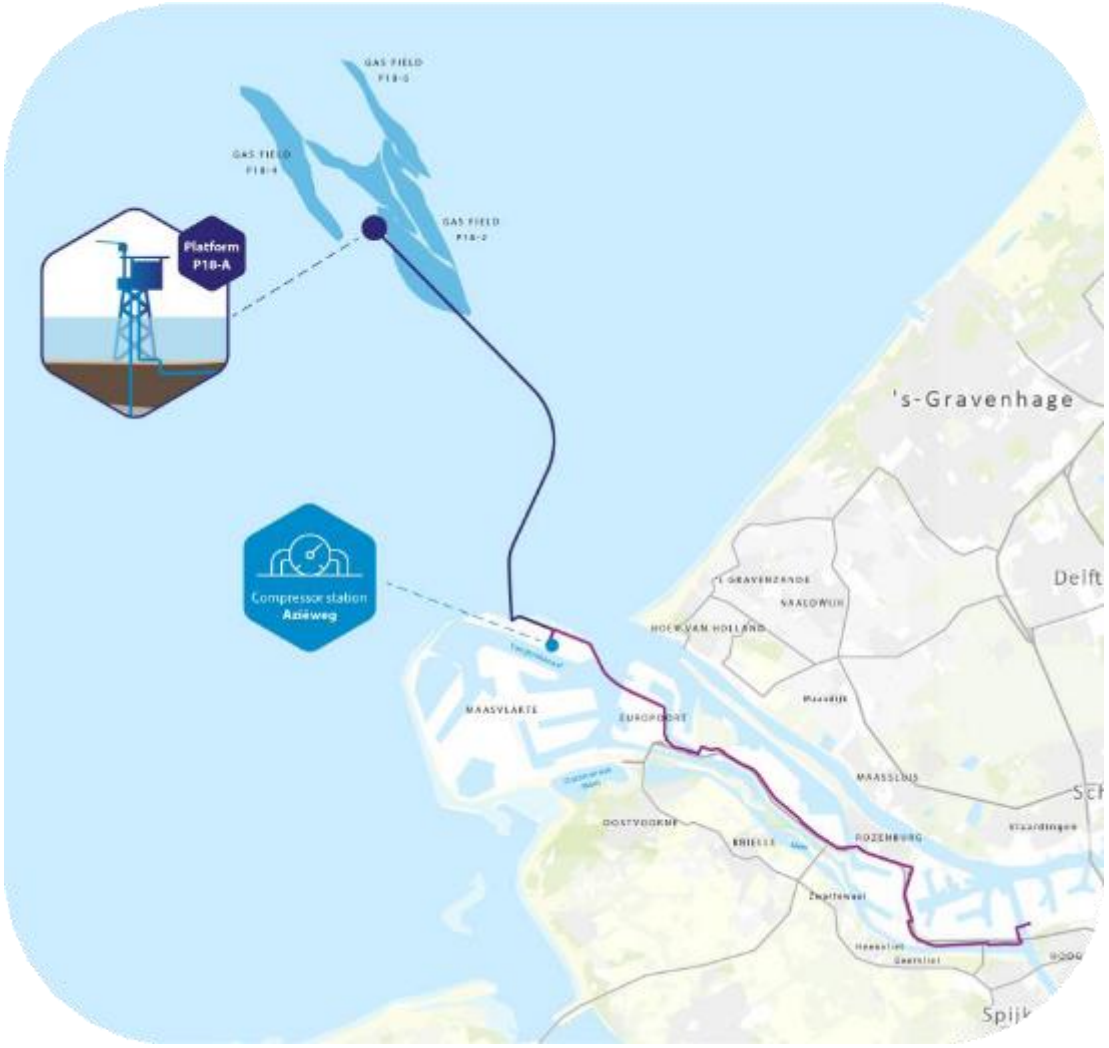
# Porthos project

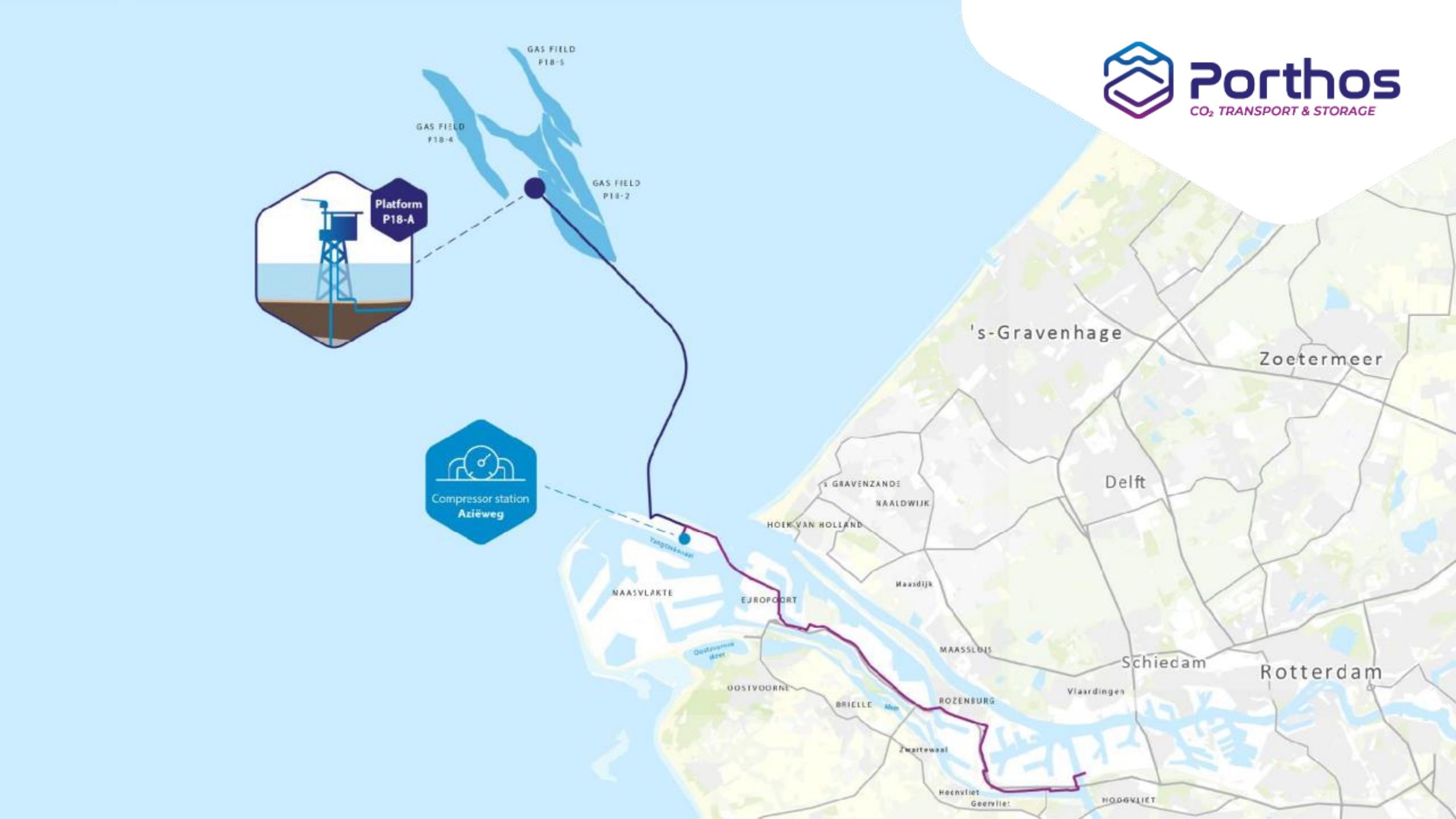
*Port of Rotterdam, the Netherlands*

- EBN, Gasunie, Port of Rotterdam Authority
- Air Liquide, Air Products, ExxonMobil, Shell

- ~ 37 Mton
- ~ 2.5 Mton per year for 15 years (Sold Out)

- CAPEX ~ € 450-500 million
- Final investment decision in 2023, operational in 2026




Porthos
CO₂ TRANSPORT & STORAGE
GAS FIELD P18-5
GAS FIELD P18-4
GAS FIELD P18-2
Platform P18-A
Compressor station Aziëweg
's-Gravenhage
Zoetermeer
Delft
's GRAVENZANDE
NAALDWIJK
HOEK VAN HOLLAND
Maasdijk
NAASVLAKTE
EJROPOORT
MAASSLUIS
Schiedam
Rotterdam
OOSTVOORNE
BRIELLE
ROZENBURG
Vlaardingen
Zwartewaal
Heenvliet
Geervliet
HOOGVLIET

# Thank you for your attention!

For more information, please visit:
**www.porthosCO2.nl**

*The contents of this presentation are the sole responsibility of Porthos and do not necessarily reflect the opinion of the European Union.*

Co-financed by the Connecting Europe Facility of the European Union

Porthos
$CO_2$ TRANSPORT & STORAGE


# EMERGING ENERGY SOLUTIONS

## Cleaner Energy Together

Shell $CO_2$ Storage Projects in Europe

Alistair Tucker, General Manager CCS Europe

# Shell CO2 Storage Projects in Europe

### Norway – Storage Projects

- Shell is partner in Northern Lights
- In construction, on stream 2025
- Customers connected via Shipping

### UK Northern North Sea – Storage Projects

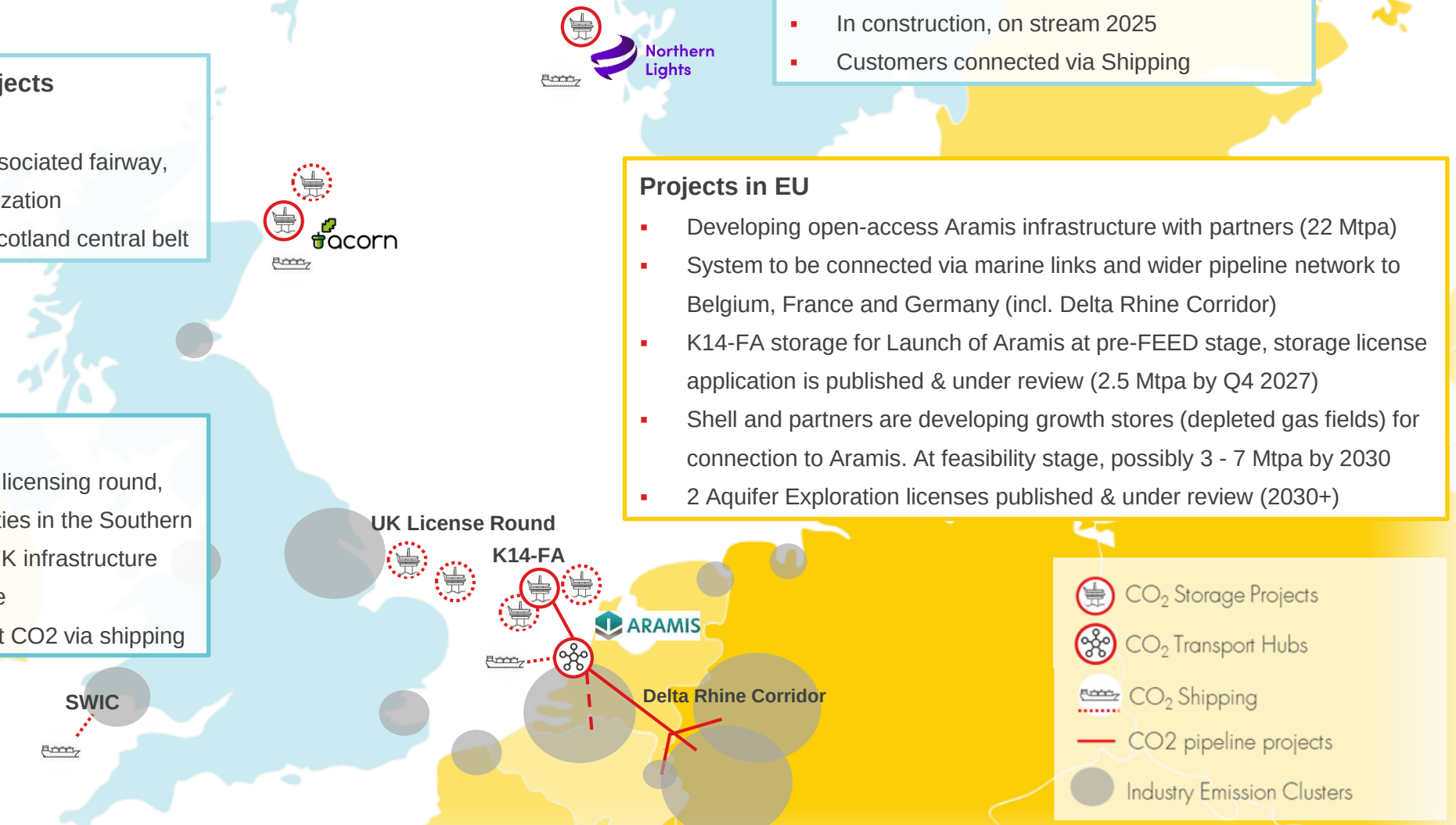
- Shell is partner in Acorn in UK
- Developing the GoldenEye field and associated fairway, part of wider Scottish Cluster decarbonization
- Shipping and pipeline connections to Scotland central belt

### Projects in EU

- Developing open-access Aramis infrastructure with partners (22 Mtpa)
- System to be connected via marine links and wider pipeline network to Belgium, France and Germany (incl. Delta Rhine Corridor)
- K14-FA storage for Launch of Aramis at pre-FEED stage, storage license application is published & under review (2.5 Mtpa by Q4 2027)
- Shell and partners are developing growth stores (depleted gas fields) for connection to Aramis. At feasibility stage, possibly 3 - 7 Mtpa by 2030
- 2 Aquifer Exploration licenses published & under review (2030+)

### Projects in Southern UK

- Participating in the UK Carbon Storage licensing round, including large-scale storage opportunities in the Southern North Sea that could be connected to UK infrastructure and/or Aramis & CO2Next infrastructure
- South Wales Industrial Cluster to export CO2 via shipping



# DEFINITIONS & CAUTIONARY NOTE

The companies in which Shell plc directly and indirectly owns investments are separate legal entities. In this presentation "Shell", "Shell Group" and "Group" are sometimes used for convenience where references are made to Shell plc and its subsidiaries in general. Likewise, the words "we", "us" and "our" are also used to refer to Shell plc and its subsidiaries in general or to those who work for them. These terms are also used where no useful purpose is served by identifying the particular entity or entities. "Subsidiaries", "Shell subsidiaries" and "Shell companies" as used in this presentation refer to entities over which Shell plc either directly or indirectly has control. Entities and unincorporated arrangements over which Shell has joint control are generally referred to as "joint ventures" and "joint operations", respectively. Entities over which Shell has significant influence but neither control nor joint control are referred to as "associates". The term "Shell interest" is used for convenience to indicate the direct and/or indirect ownership interest held by Shell in an entity or unincorporated joint arrangement, after exclusion of all third-party interest.

All statements concerning the financial condition, results of operations and businesses of Shell other than statements of historical fact are, or may be deemed to be, forward-looking statements. Forward-looking statements are statements of future expectations that are based on management's current expectations and assumptions and involve known and unknown risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied in these statements. Forward-looking statements include, among other things, statements concerning the potential exposure of Shell to market risks and statements expressing management's expectations, beliefs, estimates, forecasts, projections and assumptions. These forward-looking statements are identified by their use of terms and phrases such as "aim", "ambition", "anticipate", "believe", "could", "estimate", "expect", "goals", "intend", "may", "milestones", "objectives", "outlook", "plan", "probably", "project", "risks", "schedule", "seek", "should", "target", "will" and similar terms and phrases. There are a number of factors that could affect the future operations of Shell and could cause those results to differ materially from those expressed in the forward-looking statements included in this [report], including (without limitation): (a) price fluctuations in crude oil and natural gas; (b) changes in demand for Shell's products; (c) currency fluctuations; (d) drilling and production results; (e) reserves estimates; (f) loss of market share and industry competition; (g) environmental and physical risks; (h) risks associated with the identification of suitable potential acquisition properties and targets, and successful negotiation and completion of such transactions; (i) the risk of doing business in developing countries and countries subject to international sanctions; (j) legislative, judicial, fiscal and regulatory developments including regulatory measures addressing climate change; (k) economic and financial market conditions in various countries and regions; (l) political risks, including the risks of expropriation and renegotiation of the terms of contracts with governmental entities, delays or advancements in the approval of projects and delays in the reimbursement for shared costs; (m) risks associated with the impact of pandemics, such as the COVID-19 (coronavirus) outbreak; and (n) changes in trading conditions. No assurance is provided that future dividend payments will match or exceed previous dividend payments. All forward-looking statements contained in this [report] are expressly qualified in their entirety by the cautionary statements contained or referred to in this section. Readers should not place undue reliance on forward-looking statements. Additional risk factors that may affect future results are contained in Shell plc's Form 20-F for the year ended December 31, 2020 (available at www.shell.com/investor and www.sec.gov). These risk factors also expressly qualify all forward-looking statements contained in this presentation and should be considered by the reader. Each forward-looking statement speaks only as of the date of this presentation, 14 December 2022. Neither Shell plc nor any of its subsidiaries undertake any obligation to publicly update or revise any forward-looking statement as a result of new information, future events or other information. In light of these risks, results could differ materially from those stated, implied or inferred from the forward-looking statements contained in this presentation.

# TotalEnergies

## $CO_2$ Transportation and storage development

ETS Innovation Fund's closed-door knowledge sharing workshop: the emerging EU $CO_2$ transport & storage market

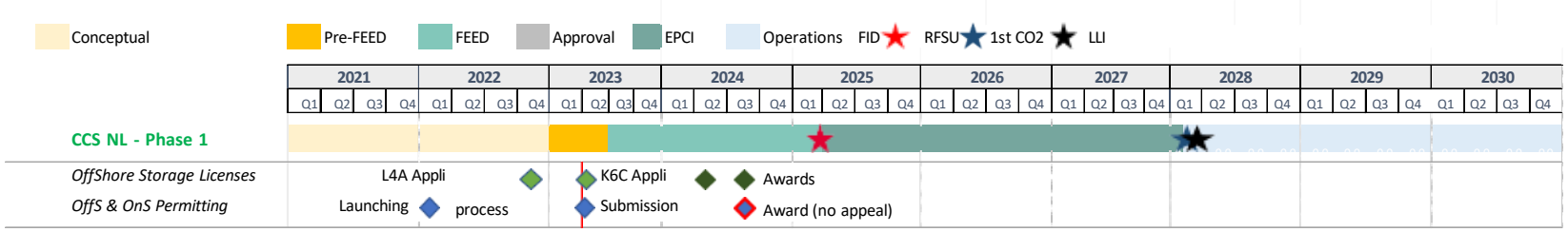
30 March 2023, Bruxelles

Alexia GENIN

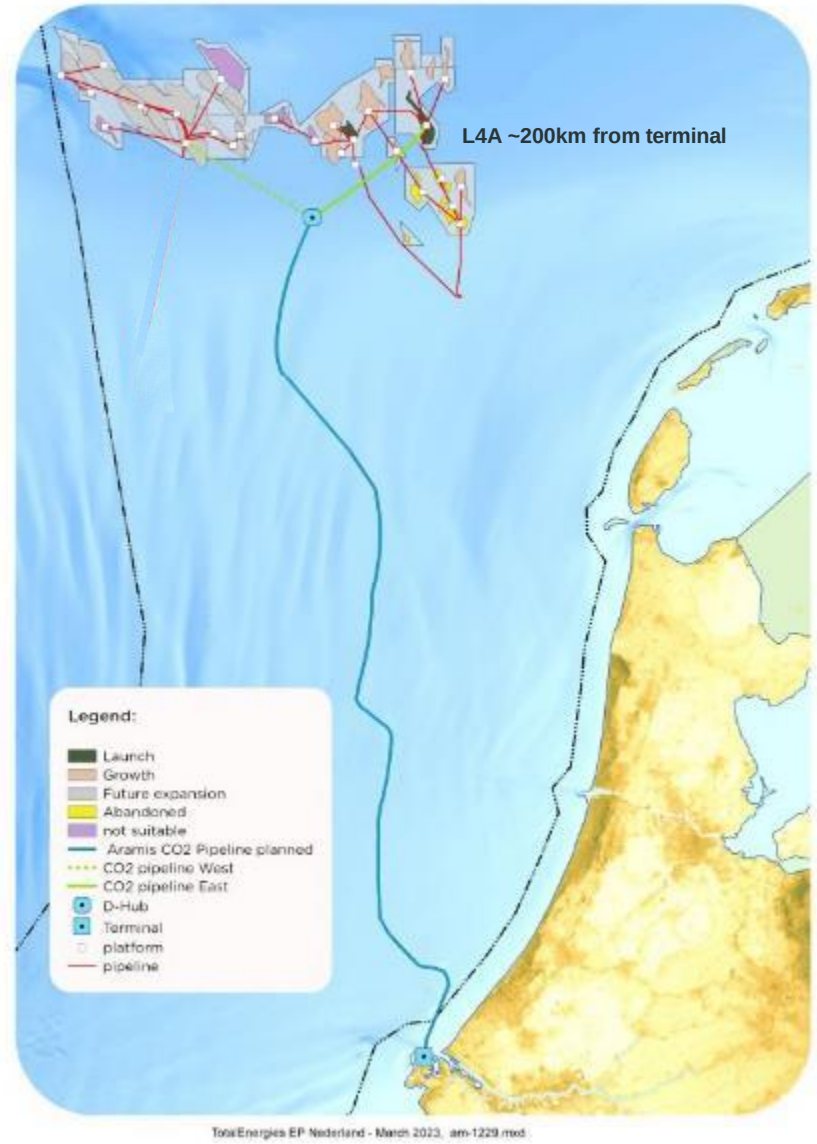
Berend-Jan KLEIN-SWORMINK

# Aramis connected Storage Development

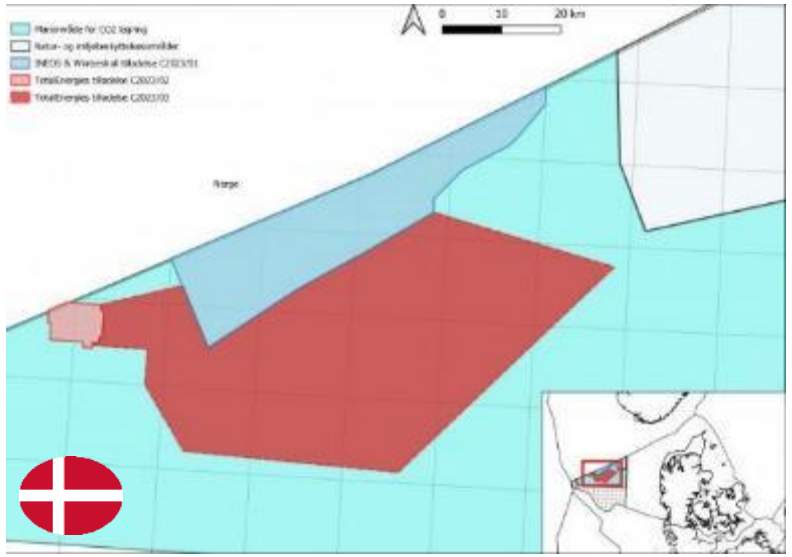
- **Phase 1 - Brownfield $CO_2$ Storage Project moving into FEED-phase Q3-2023**
  - Re-using gas production facilities L4A/K6C with 4 injection & 2 monitoring wells
  - Target is 2,5 Mtpa storage capacity in Q1-2028, Shell doing the same
  - Based on 41,1 MT storage capacity in 2 license applications
  - Timeline below is driven by the infrastructure development, storage development not on critical path
  - Shell/TTE Joint marketing for open access T&S services: 5 Mpta @ 15 yrs (majority 3rd party) 50/50 stored
- **Design criteria**
  - Build a cost-effective store on a fit-for-purpose basis at an affordable tariff
  - 97% injection availability, post ramp-up
  - Balancing principle (in steady state operation) in case of under-injection of Shell store; requirement to injection up to 5 Mtpa for a max. 3 months (1st 5 yrs)
- **Phase 1 Challenges**
  - Aggressive schedule: requiring no significant delays in permit award or appeal
  - Maintain an affordable tariff range whilst developing the project in FEED phase
- **Growth beyond Phase 1**
  - Growth volumes marketing: open access for European customers
  - 3 additional stores planned to be connected to Aramis in 2029/30
  - TTE storage ambition is 8 Mtpa after 2030, with plateau maintained until beyond 2050




CO2 storage portfolio at TotalEnergies EP Nederland fields

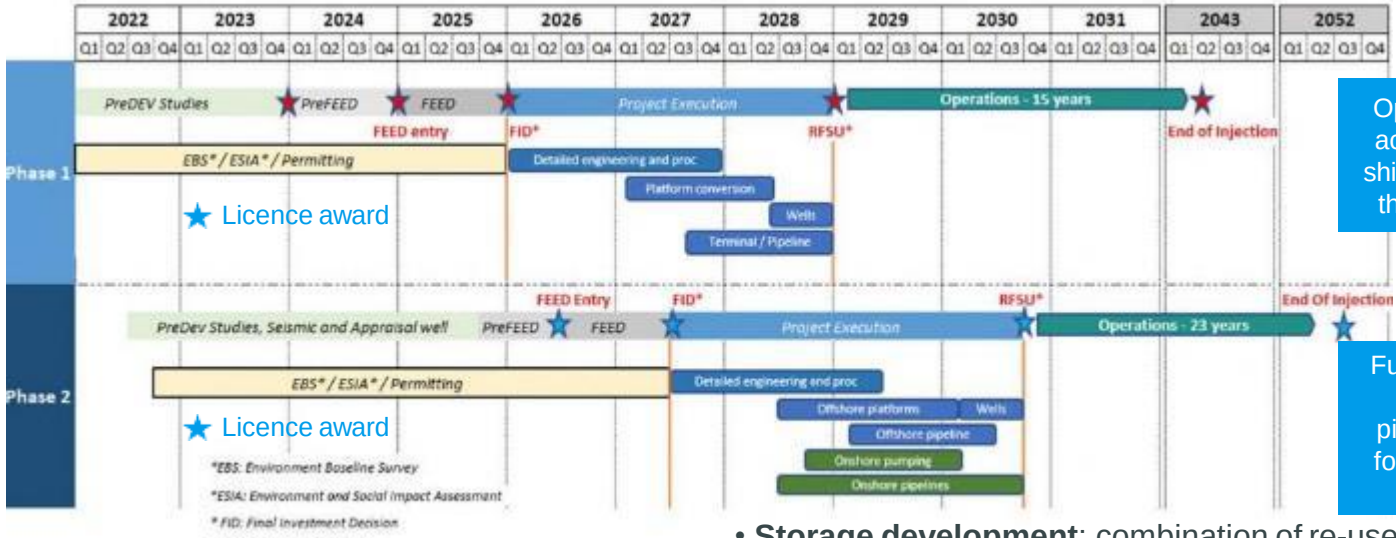


# Bifrost $CO_2$ transportation and storage project



- **Offshore storage** based on 2 licences awarded to TotalEnergies as operator on Feb'23, to deliver more than 5 MTPA
  - Future depleted gas fields of Harald, currently operated by TotalEnergies
  - Nearby saline aquifer structure, appraisal campaign starting (seismic acquisition & well)
- Full project potential connecting additional storage sites offshore Denmark to increase capacities above 10 MTPA over 25 years.
  - Project timeline contingent to $CO_2$ licence tenders opening.

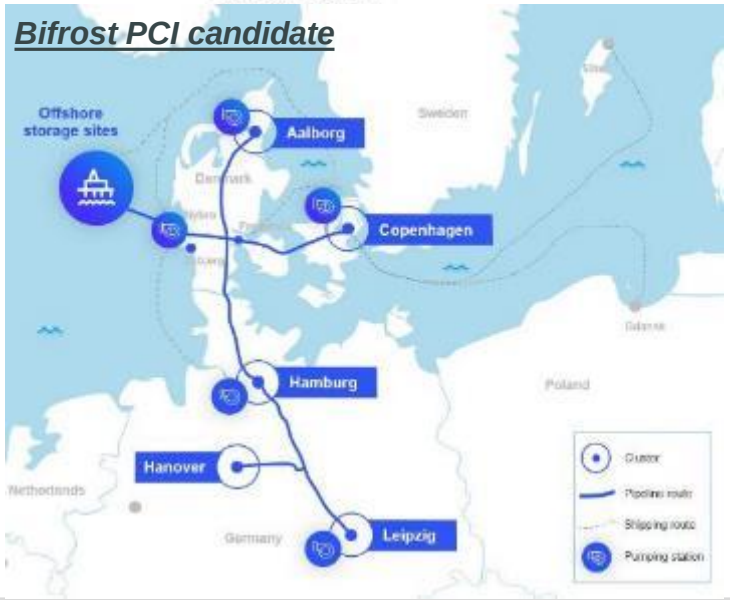
***Indicative timeline***




Opportunity for project acceleration based on shipping solution should the market be mature

Full scale development mainly based on pipeline transportation for economies of scale and competitivity

***Bifrost PCI candidate***




- **Storage development**: combination of re-use of existing O&G and new built facilities
- **Transportation development**: combination of shipping/ marine facilities and pipeline transport
  - Large-scale pipeline transportation for competitive T&S service. Main backbones in DK and GE. Interconnection possible with other transportation projects. Pipeline infrastructure in the critical path towards 2030 (permitting).
  - Shipping solution (either directly offshore or via an onshore hub, under investigation) to open the service to more remote market in the Baltic Sea or early birds in the North Sea: acceleration opportunity contingent on availability of depleted gas fields and market appetite for such solution.
- **T&S services** based on open access principles to serve European emitters. Multiple cooperations along the CCS chain to deliver the service as per planning.

# Avertissement - Propriété intellectuelle

**Définition TotalEnergies / Compagnie**
Les entités dans lesquelles TotalEnergies SE détient directement ou indirectement une participation sont des personnes morales distinctes et autonomes. Les termes « TotalEnergies », « compagnie TotalEnergies » et « Compagnie » qui figurent dans ce document sont utilisés pour désigner TotalEnergies SE et les entités comprises dans le périmètre de consolidation. De même, les termes « nous », « nos », « notre » peuvent également être utilisés pour faire référence à ces entités ou à leurs collaborateurs. Il ne peut être déduit de la simple utilisation de ces expressions une quelconque implication de TotalEnergies SE ni d'aucune de ses filiales dans les affaires ou la gestion d'une autre société de la compagnie TotalEnergies.

**Avertissement**
Cette présentation peut contenir des déclarations prospectives, au sens du Private Securities Litigation Reform Act de 1995, relatives à la situation financière, aux résultats d'exploitation, aux activités, à la stratégie et aux projets de TotalEnergies, qui sont soumis à des facteurs de risque et à des incertitudes résultant de changements dans, notamment, le développement et l'innovation technologiques, les sources d'approvisionnement, le cadre juridique, les conditions de marché, les événements politiques ou économiques. TotalEnergies n'assume aucune obligation de mettre à jour publiquement les déclarations prospectives, que ce soit en raison de nouvelles informations, d'événements futurs ou autres. De plus amples informations sur les facteurs susceptibles d'affecter les résultats financiers de la Compagnie sont fournies dans les documents déposés par TotalEnergies auprès de l'*Autorité des Marchés Financiers* et de la US Securities and Exchange Commission. En conséquence, aucune certitude ne doit être accordée à l'exactitude ou à la justesse de ces déclarations.

**Propriété intellectuelle**

# ETS Innovation Fund’s closed-door knowledge sharing workshop

Neptune Energy

30 March 2023

# General & Disclaimer

Except as the context otherwise indicates, 'Neptune' or 'Neptune Energy', 'Group', 'we', 'us', and 'our', refers to the group of companies comprising Neptune Energy Group Midco Limited ('the Company') and its consolidated subsidiaries and equity-accounted investments.

In this presentation, unless otherwise indicated, our production, reserves and resources figures are presented on a basis including our ownership share of volumes of companies that we account for under the equity accounting method, in particular, for the interest held in the Touat project in Algeria through a joint venture company. Production for interests held under production sharing contracts is presentation on an appropriate unit of production basis.

The discussion in this presentation includes forward-looking statements which, although based on assumptions that we consider reasonable, are subject to risks and uncertainties which could cause actual events or conditions to materially differ from those expressed or implied by the forward-looking statements. While these forward-looking statements are based on our internal expectations, estimates, projections, assumptions and beliefs as at the date of such statements or information, including, among other things, assumptions with respect to production, future capital expenditures and cash flow, we caution you that the assumptions used in the preparation of such information may prove to be incorrect and no assurance can be given that our expectations, or the assumptions underlying these expectations, will prove to be correct.

Any forward-looking statements that we make in this presentation speak only as of the date of such statement or the date of this presentation.

This presentation contains non-GAAP and non-IFRS measures and ratios that are not required by, or presented in accordance with, any generally accepted accounting principles ('GAAP') or IFRS. These non-IFRS and non-GAAP measures and ratios may not be comparable to other similarly titled measures of other companies and have limitations as analytical tools and should not be considered in isolation or as a substitute for analysis of our operating results as presentation under IFRS or GAAP. Non-IFRS and non-GAAP measures and ratios are not measurements of our performance or liquidity under IFRS or GAAP and should not be considered as alternatives to operating profit or profit from continuing operations or any other performance measures derived in accordance with IFRS or GAAP or as alternatives to cash flow from operating, investing or financing activities.

# Neptune Energy ambitions

- Aiming **to store more carbon than is emitted** from its operations and the use of its sold products by 2030
- Aiming for **6.0 kg $CO_2$/boe** carbon intensity by 2030; **Zero** methane emissions by 2030; **Zero** routine flaring by 2030
- **Working together** to achieve climate goals by storing $CO_2$ safely

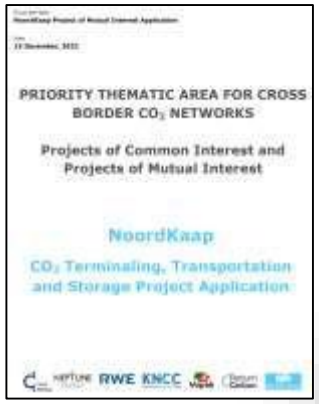
# Our North Sea CCS Vision

A X-border network of CO2 stores to meet customers need for flexibility and redundancy

01 Our strategic relationships enable shared success

02 Focus on shipped and pipeline solutions

03 Uniquely-placed to provide customer focused solutions

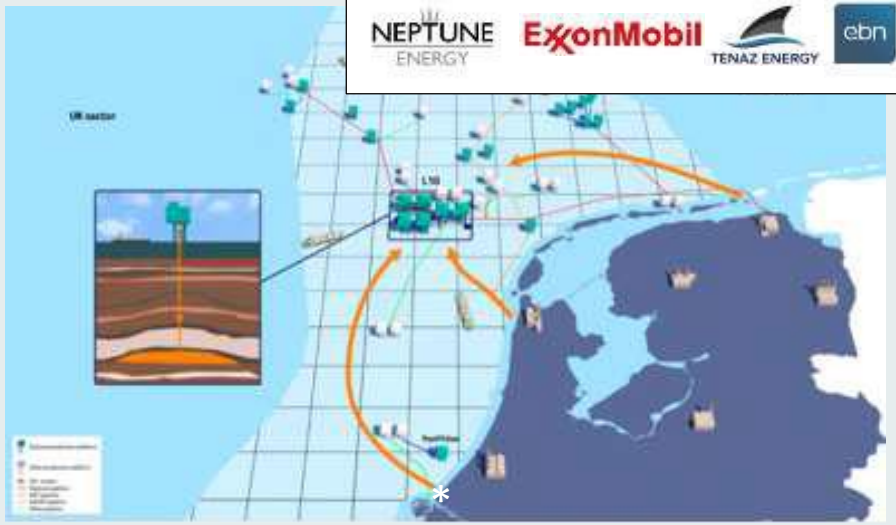




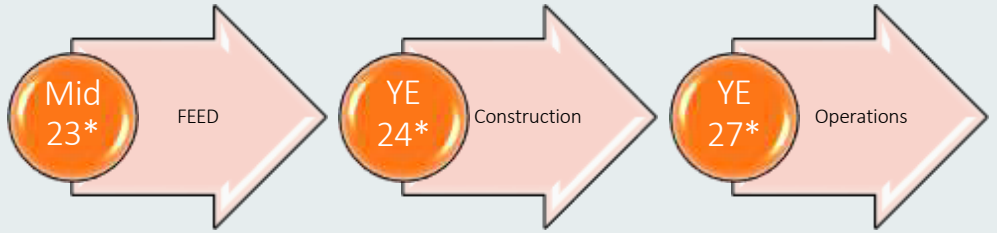
Note: Locations are illustrative

# Progress on ambitions

## Netherlands




**L10 CCS:** 5MTPA store accessible via the Aramis value chain




* Anticipated timeline, final timeline influenced by Aramis timeline

# Thank you

Putting words into action

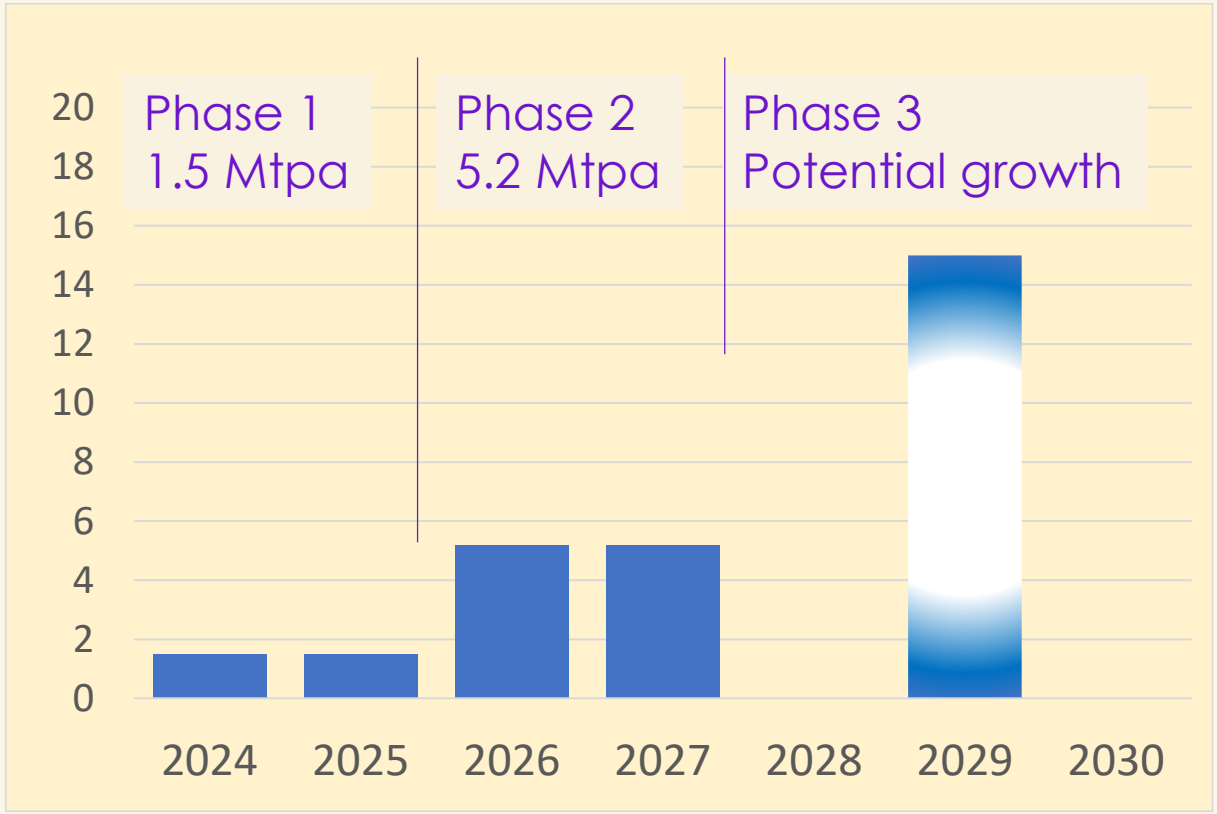
# Ship construction

# Delivering on commitments

| | |
|---|---|
| 1 | **Deliver Phase 1** - operational in 2024 |
| 2 | Develop **commercial expansion** (**Phase 2**) |
| 3 | Deliver on **growth ambitions**, planning for further expansion initiated |

# Phase 2 expansion plans

- **FEED completed**
- **FID planned 2023**
- **Expected operational in 2026**

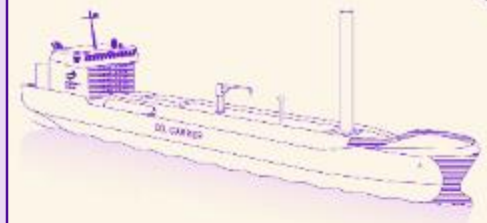


# EU Project of Common Interest (PCI)

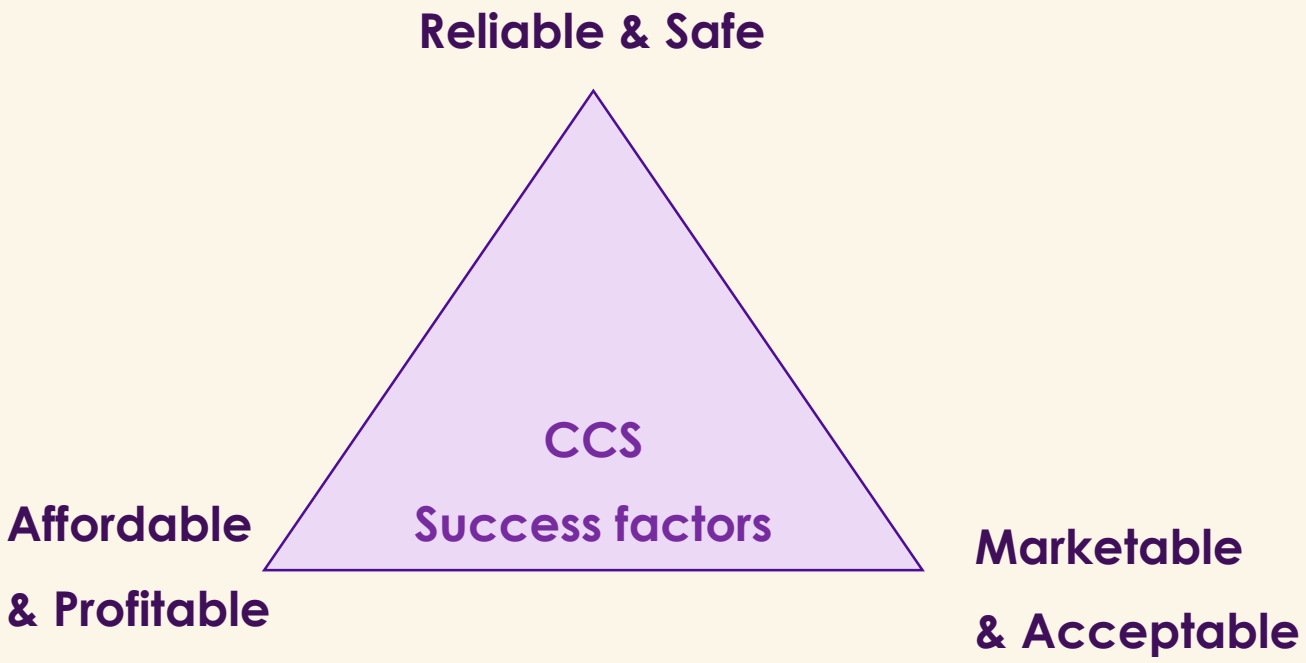
- ✓ Infrastructure projects that link the energy systems of EU countries
- ✓ Eligible for European **Connecting Europe Facilities (CEF) funding**, accelerated permitting and authorisation processes
- ✓ Preselected for EU funding €4.25 M for Phase 2 FEED studies

## Northern Lights is on the 5th PCI list with 18 promoters and 22 affiliates

- Capture potential of ~19 Mtpa in 2030 by promoters only (~32 Mtpa including affiliates)
- Promoters in Norway, France, Belgium, Netherlands, Germany, Sweden, and Finland
- Capture sites and promotion on standardisation



# Public - private collaboration




Experiences Northern Lights:

- Proven technology
- New value chain
  - First contracts of this type
  - Little/no operational experience
  - Mindset change needed
- Risks management
  - Non-performance
  - Liabilities
- Costs
  - De-risking subsurface is expensive
  - Inflationary environment
- Regulatory requirements – many firsts
  - Currently oil and gas based
  - Clarify financial guarantees
- Timing – chicken and egg

Ragna Björk Bragadóttir
Innovation Project Manager


Funded by
the European Union

Coda Terminal

Carbfix

# Project Timeline

End of IF Grant Agreement

Start of IF Grant Agreement

$3MtCO_2/yr$

$1MtCO_2/yr$

$500ktCO_2/yr$

2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036

| Design and licensing | Construction and development | Operation with scale-up | Operation |
|---|---|---|---|

**Funded by the European Union**

Coda Terminal

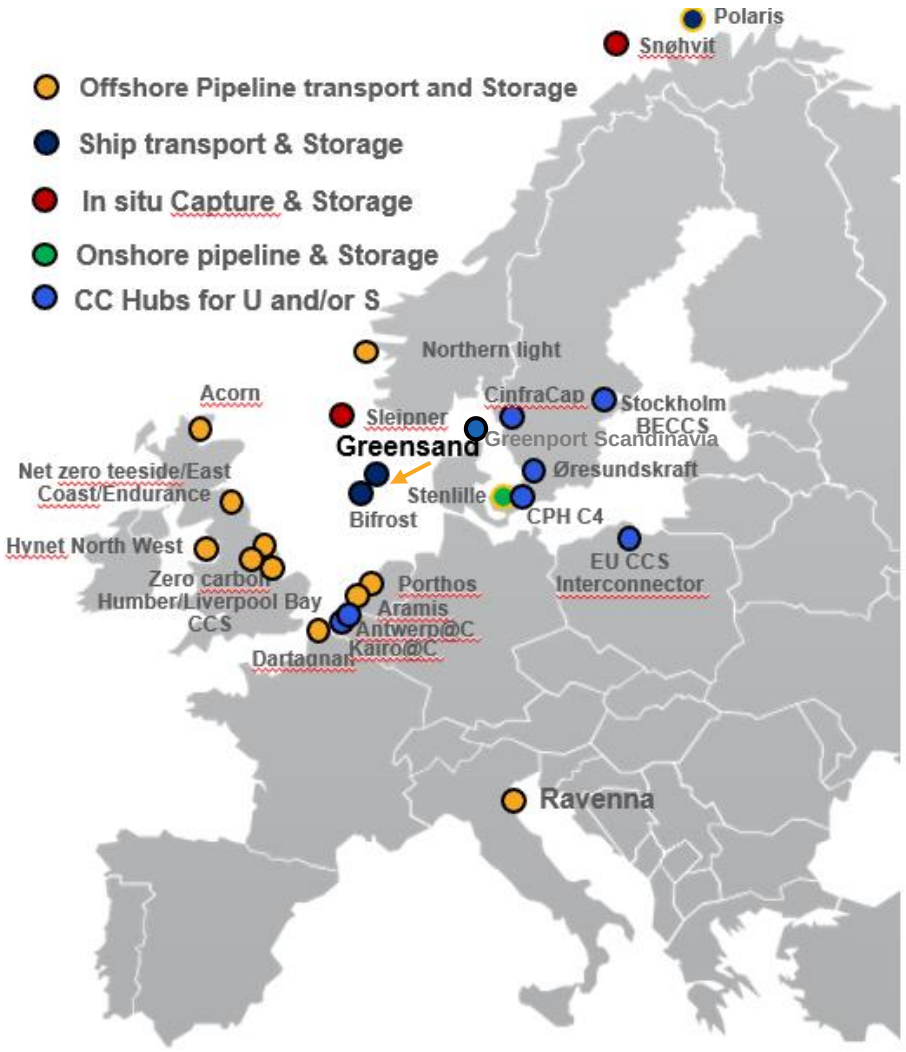
Carbfix

Location: Straumsvík, Iceland

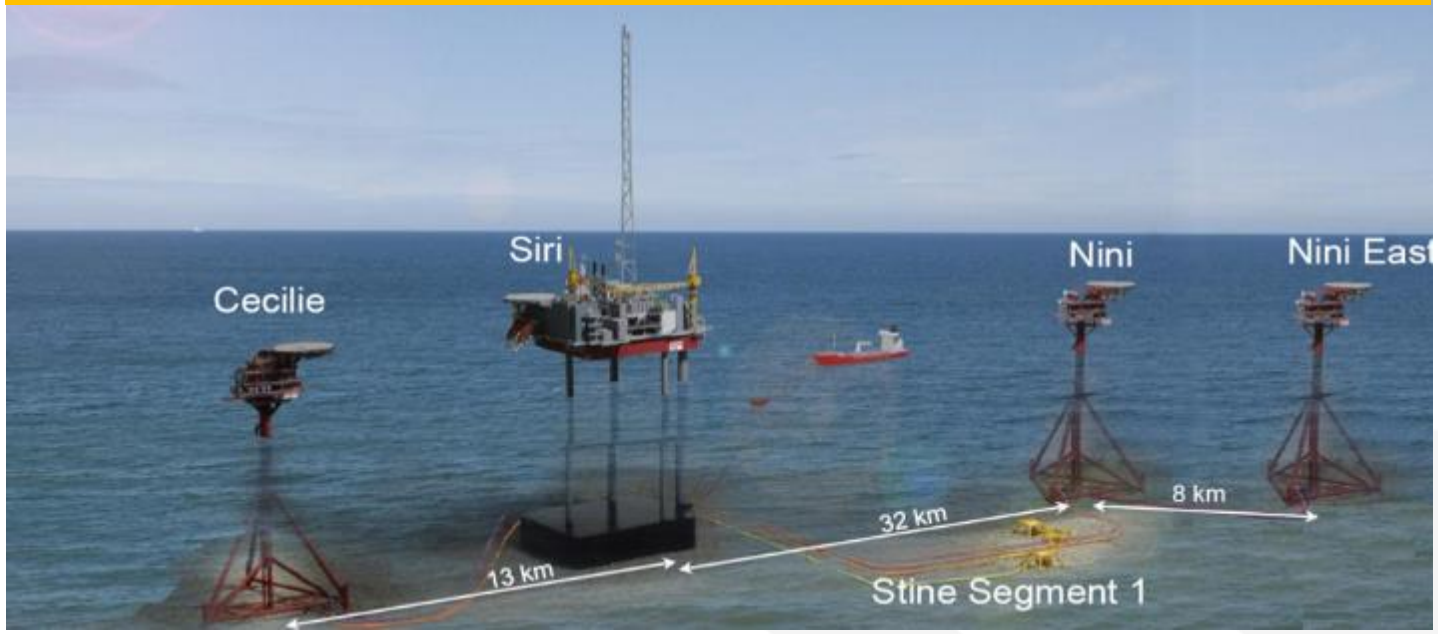
# Agenda

| | |
|---|---|
| **1. Policy introduction & update by the Commission services** | (9:30 - 10:00h) |
| **2. CO2 storage developments in MS – part 1** | (10:00 - 11:00h) |
| *11:00 – 11:30h Coffee break* | |
| **2. CO2 storage developments in MS – part 2** | (11:30 - 12:30h) |
| **3. Storage support programmes in Europe** | (12:30 - 13:15h) |
| *13:15 – 14:30h Lunch break* | |
| **4. Needs of CO2 capturing projects supported by the Innovation Fund** | (14:30 - 15:15h) |
| **5. Cross-border CO2 network developments supported by TEN-E** | (15:15 - 16:00h) |
| *16:00 – 16:30h Coffee break* | |
| **6. Questions and moderated open discussion** | (16:30 - 17:30h) |
| *17:30h End of the meeting* | |

# INEOS in the CCUS space - Greensand Project Overview




## Turning the Siri area into a $CO_2$ storage hub




INEOS CCUS project involvements:

- **Greensand**
- **Acorn**
- **Zero Carbon Humber**
- **HyNet**
- **Antwerp@C**



Disclaimer: Map produced by Greensand Project based on available public data, not complete and only illustrative

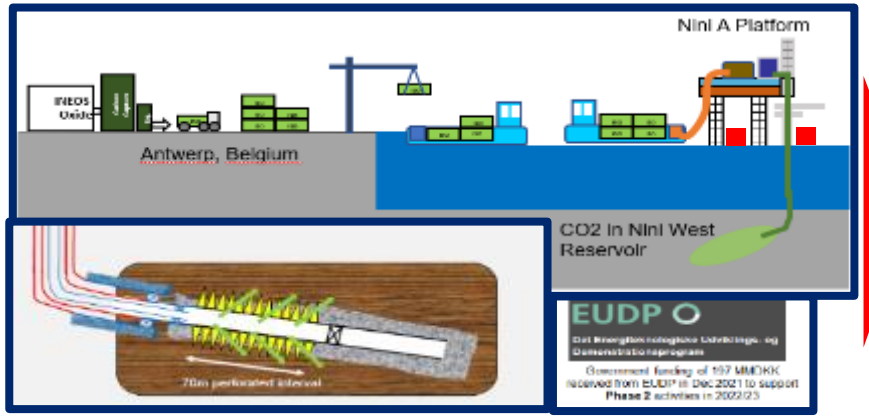
wintershall dea

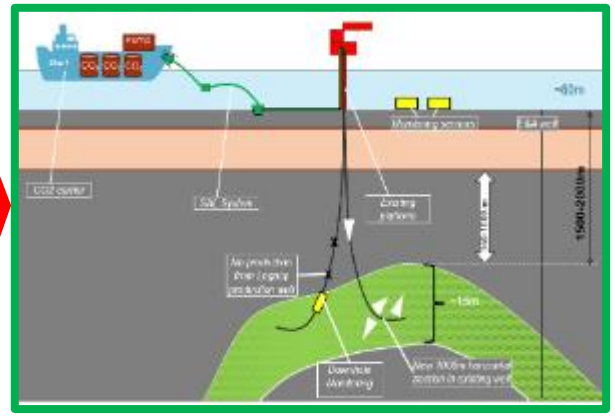
INEOS Energy

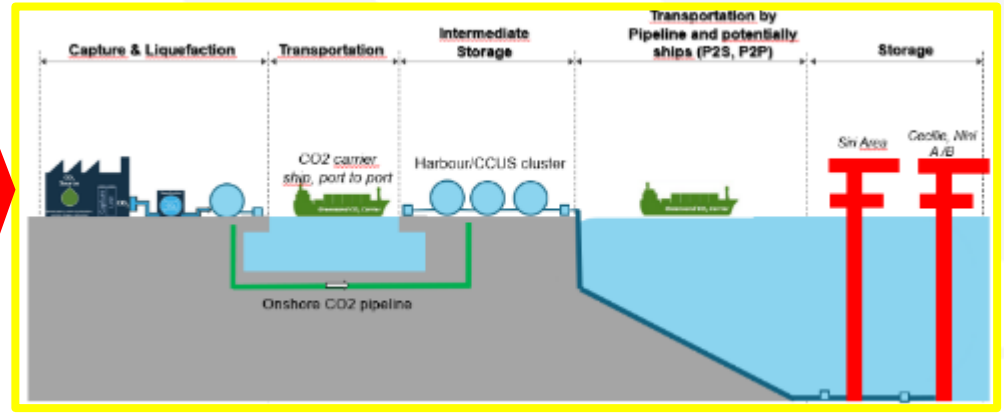
# Greensand Project Phases and Timelines

## Development maturation is ongoing towards offshore transport & storage of CO2 in 2025/26

| | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Storage Capacity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phase 1 | | | | | | | | | | | | |
| Phase 2 - Pilot (Nini West) | | | | | | | | | | | | |
| - Offshore injection period | | | | | | | | | | | | |
| Full Scale (Nini West/Main) | | | | | | | Start Storage | | | | | Up to 1.5 MTPA |
| Siri Fairway Expansion Project | | | | | | | | | | | | Up to 8 MTPA |








INEOS Energy

# ”First Carbon Storage” 8. march 2023

*”This is a big moment for Europe's green transition and our clean tech industry. The first ever, full value chain for carbon capture and storage in Europe. You are showing that it can be done. That we can grow our industry, through innovation and competition. And at the same time, remove carbon emissions from the atmosphere, through ingenuity and cooperation”*

Speach by President Ursula von der Leyen at the ”First carbon storage” event celebrating the first full value chain cross-border offshore carbon storage

# Smeaheia – bringing scale

## Building on Northern Lights and >25 years of $CO_2$ storage in the North Sea

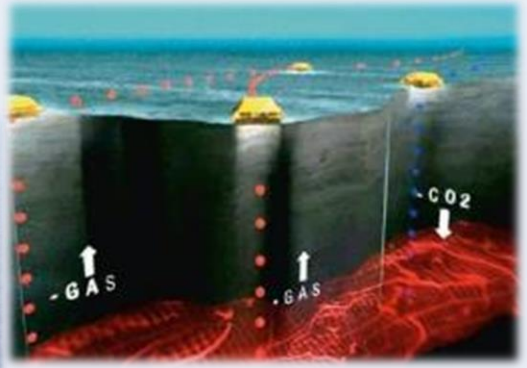
**Equinor ambition**

15-30 Mtpa $CO_2$ transport and storage capacity by 2035

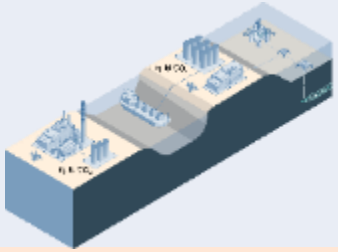
Equinor share

**SLEIPNER**


**SNØHVIT**




**NORTHERN LIGHTS**
**Operation 2024**



**NORTHERN ENDURANCE PARTNERSHIP**
**Operation 2026**

**SMEAHEIA**
**Operation 2028**
**20 Mtpa**

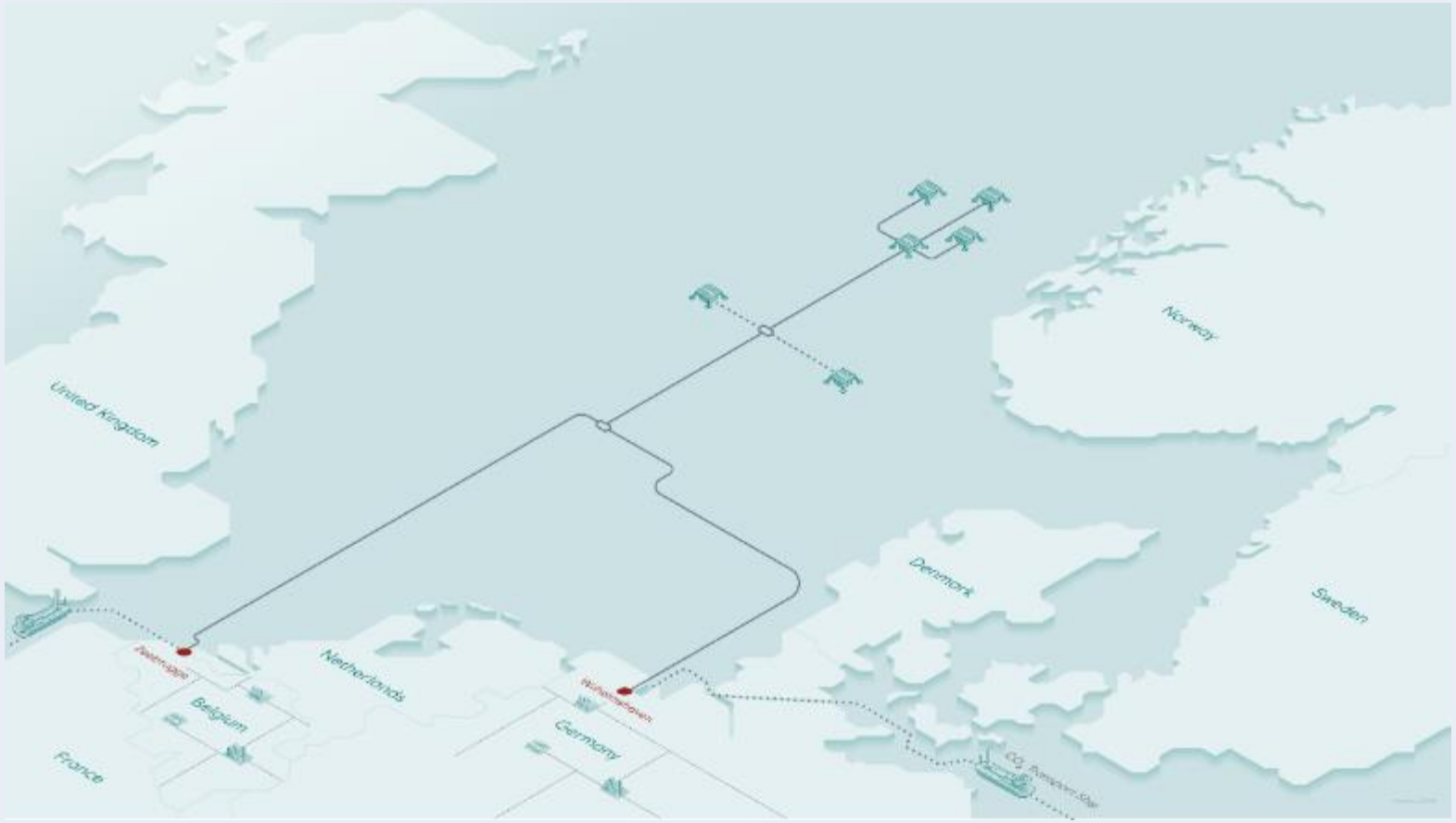
3. Cost down by bringing scale

**2. Northern Lights** – Market opener

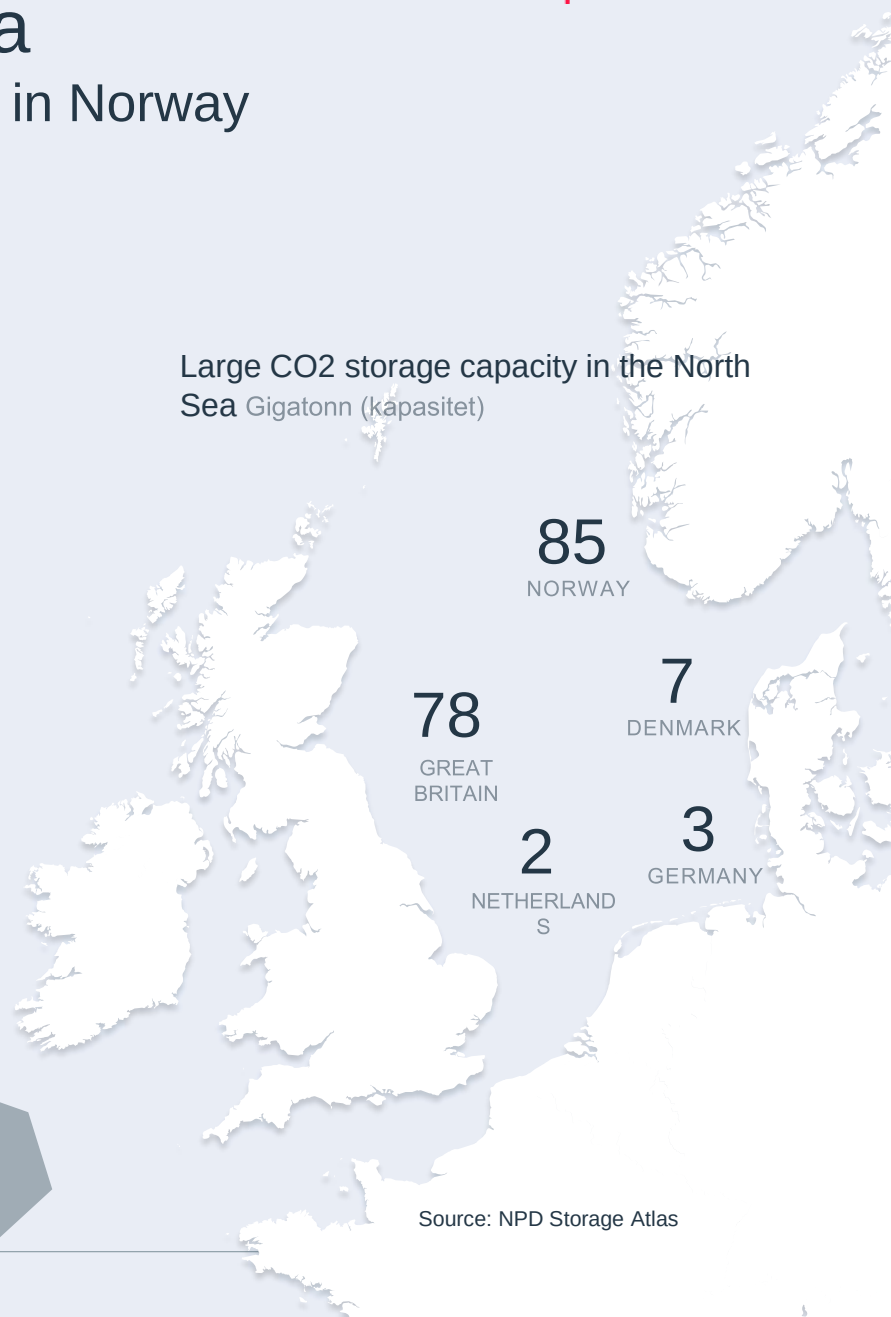
1. Operation experience – technology works!

# European $CO_2$ pipeline anchored by Smeaheia

## Connecting large emissions in Europe with storage opportunities in Norway




Large CO2 storage capacity in the North Sea Gigatonn (kapasitet)




**Candidate PCI 'EU2NSEA':**

- 16 emitters
- 32 Mtpa $CO_2$
- 10 Countries
- 2 Storage sites

Source: NPD Storage Atlas

wintershall dea

ETS INNOVATION FUND'S CLOSED-DOOR KNOWLEDGE SHARING WORKSHOP

# THE EMERGING EU CO2 TRANSPORT AND STORAGE MARKET

**CARBON MANAGEMENT & HYDROGEN**
**KEVIN MEISEL, ANDREAS MÖLLER**
Brussels – March 2023

# STORAGES OVERVIEW & PERSPECTIVE

## Indicative figures

| Project | Country | Ind. start-up | Gross capacity [mtpa] | WD capacity [mtpa] | Supply | Status |
|---|---|---|---|---|---|---|
| Luna | | 2026 | 5 | 3 | Ship/ pipeline | Awarded Q4/2022 |
| Havstjerne | | 2027 | 3.7 | 1.5 | Ship | Submitted Q3/2022 |
| Utsira South | | 2031 | 5 | 2.5 | Ship/ pipeline | Submitted Q1/2023 |
| Greensand | | 2026 | 8 | 3.2 | Ship | Pilot injection Q1/2023 |
| Q1B | | 2028 | 2 | 0.9 | Pipeline (Aramis) | SLA Submission 2024 |
| P6 | | 2028 | 1.5 | 0.7 | Pipeline (Aramis) | SLA Submission 2024 |

# OUR CCS VALUE PROPOSITION: TAILORMADE ONE STOP SHOP CCS SOLUTIONS FOR INDIVIDUAL EMITTERS OR CLUSTERS

- Large emitters can be **connected directly to WHV** via the railway system, allowing **consideration of individual needs** of emitters.
- Emitters could be connected in **local clusters for joint $CO_2$ evacuation** via railways or pipelines which increases economies of scale.
- With the $CO_2$ hub, we increase **economies of scale** and provide **security of offtake** by realizing portfolio effects with the connected storages.
- We can offer CCS solutions with a **single CCS service fee** and take the $CO_2$ at a **delivery point at emitters plant gate**, e.g. at the outlet flange of a train loading station.

## OUR ROLE: THE CARBON MANAGER

**Project Development**

**$CO_2$ Sourcing** | **Capture** | **Onshore Transport** | **Gathering Hubs** | **Offshore Transport** | **$CO_2$ Storage**

- WD makes
- WD makes/buys services
- WD/Emitter buys services

# The Norne Carbon Storage Hub

30 March 2023

# Norne Carbon Storage Hub – Onshore CO2 storage in Denmark

**A cross-region, cross-border, large-scale carbon storage network on Danish soil to deliver true climate impact in a European context**

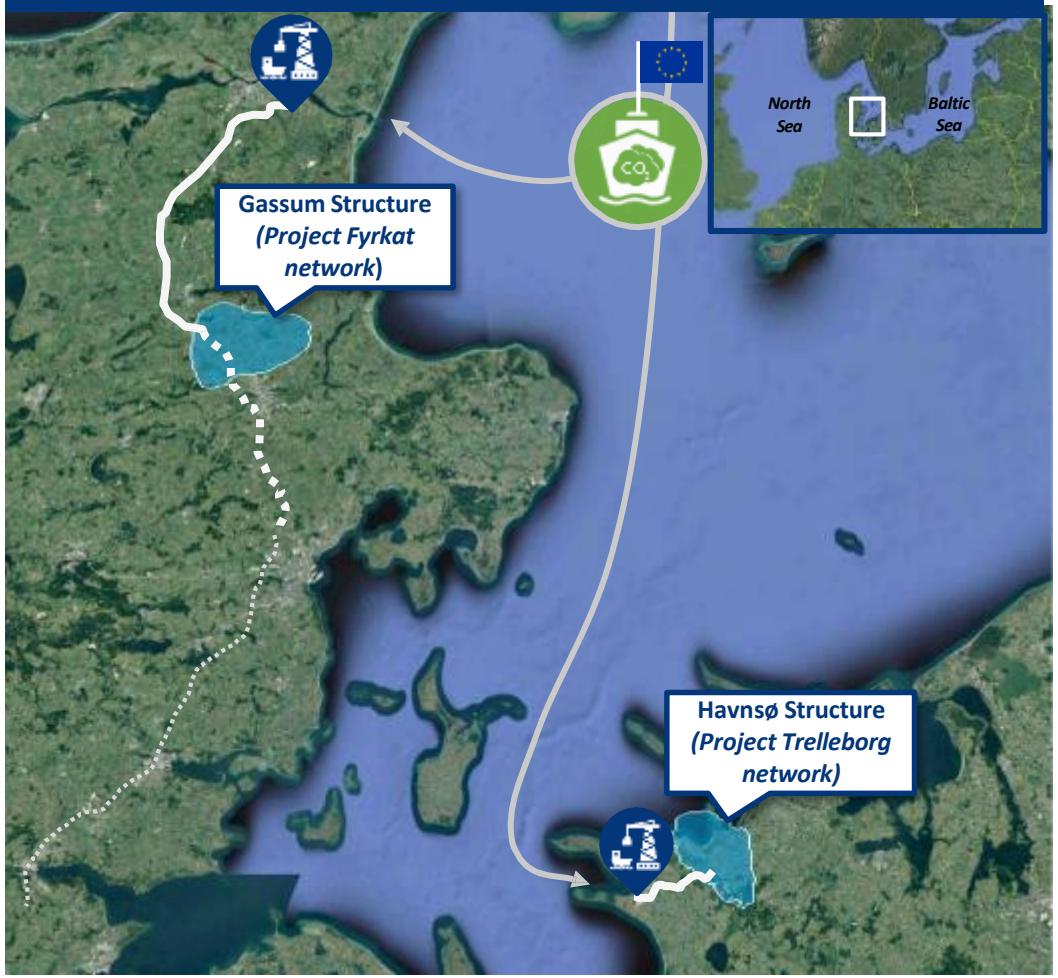
## Key figures

| 30 mTPA[1] | 12 mTPA | >20 mTPA |
|---|---|---|
| Combined pipeline capacity to sinks | Combined marine volume capacity with expansion option | 2030 injection ambition |

## Main infrastructure items

1. *Three, 4 mTPA liquid CO2 ("LCO2") receiving facilities with expansion options*
2. *In aggregate, 20 mTPA CO2-dedicated high-pressure trunklines to carbon sinks*
3. *High-pressure compression equipment*
4. *LCO2 intermediary storage at receiving facilities*
5. *New onshore CO2 injection wells, targeting >20 mTPA injection rate*

## Map of network

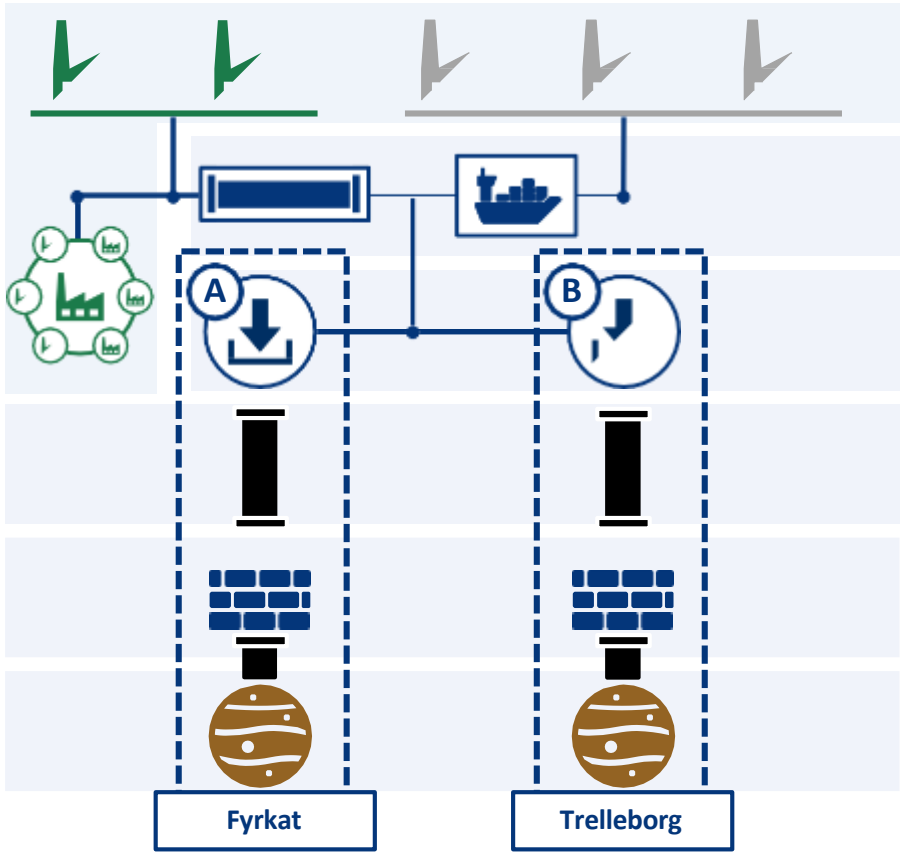



1) Million tons per annum

# Norne Carbon Storage Hub and its key risks

## The Norne Carbon Storage Hub

**Piped emitters** | **Marine emitters**




## Regulatory wheel

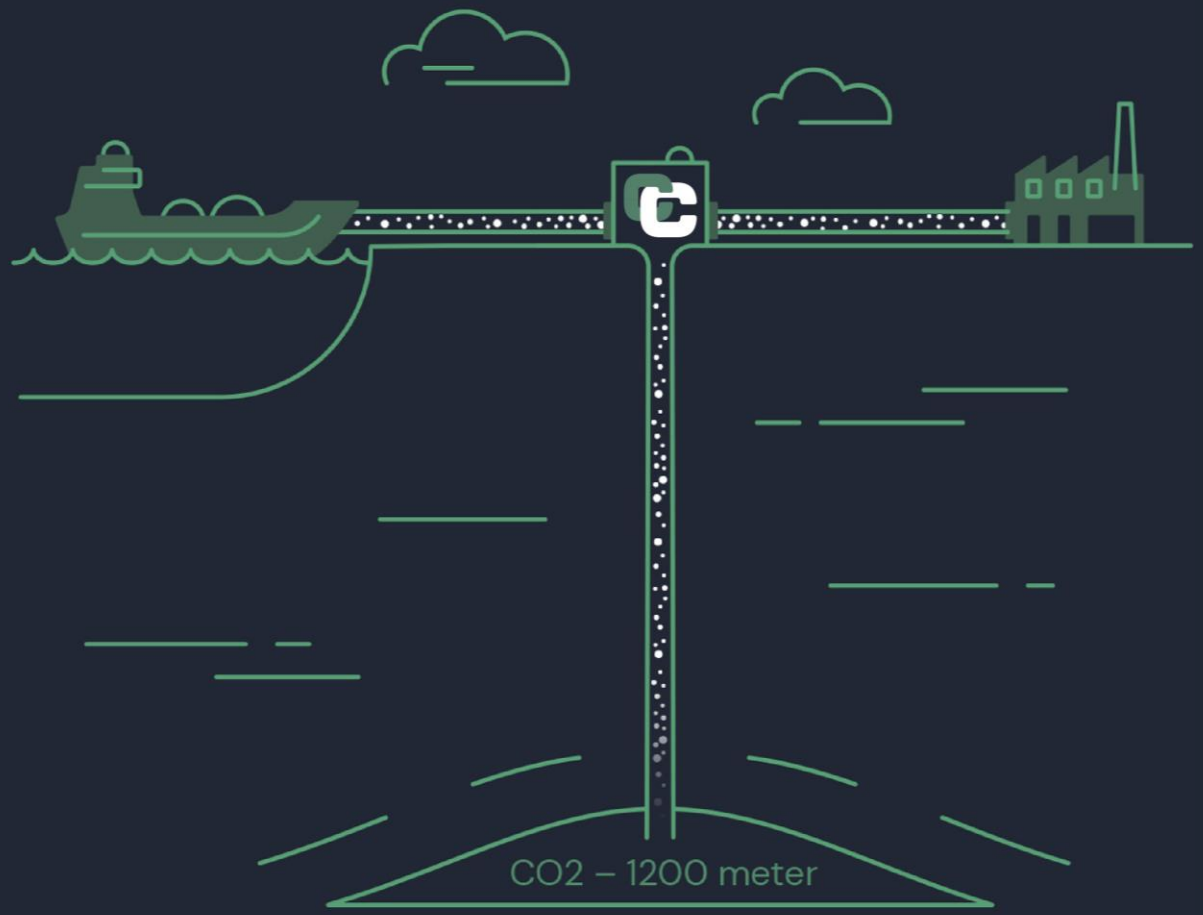

## Norne's ambition

***COD end 2026***

## Key risks

- ***Authority case handling*** *(Time and complexity)*
- ***Regulatory uncertainty***
- ***Licensing process, effects on*** *(Speed, customer, and funding)*

# Ruby – an Onshore $CO_2$ Storage Site in Denmark




**ETS Innovation Fund closed-door knowledge sharing workshop:**
**'The emerging EU CO2 transport and storage market'**
**Brussels, 30 March 2023**

CarbonCuts
CARBON CAPTURE UTILISATION TRANSPORT STORAGE

# CarbonCuts

## Our Goals

- Contribute to reaching the Paris Agreement's 1.5-degree goal
- Build and Operate a deep geological CO2 storage site

## Our Heritage

- Development and operation of large subsurface projects is our expertise
- Many years experience in gas injection, production, storage and geothermal energy projects

## Our Priorities

- Partnering with the local community
- Collaboration and sector coupling with local energy and CCU industry
- Innovation and knowledge sharing

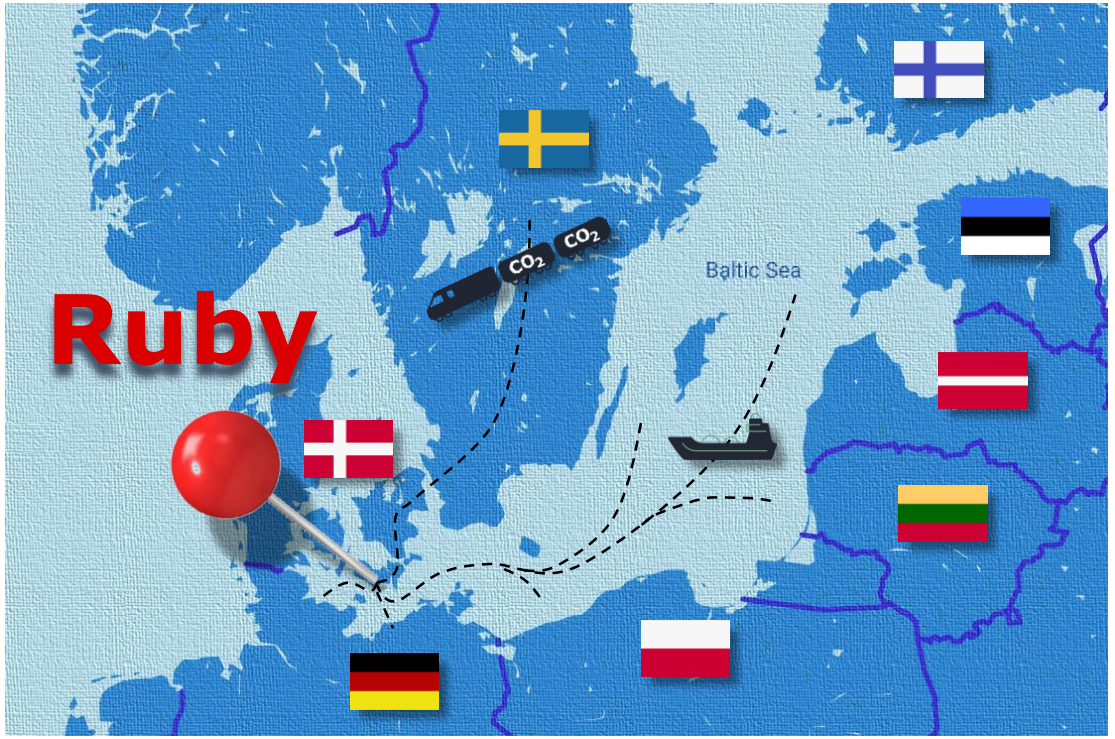
## Our Investor

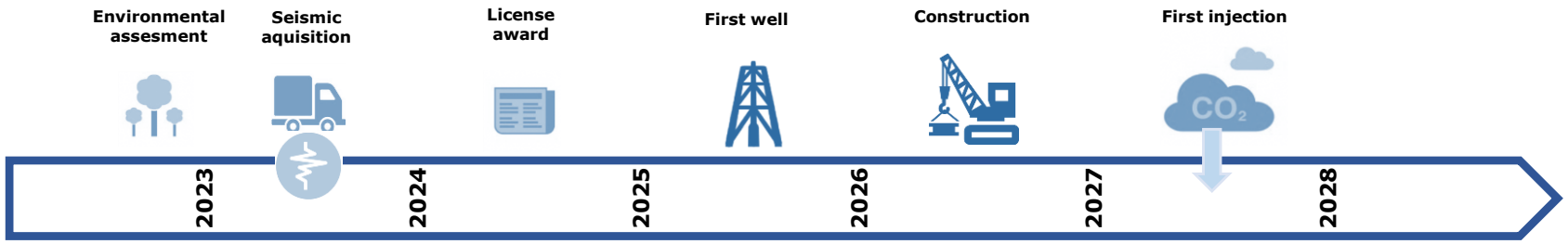
- Noreco – Norwegian Energy Company
- Strong presence in Denmark and partner in the offshore $CO_2$ storage project Bifrost

# Ruby by CarbonCuts

**Geological on-shore storage in deep saline aquifer**

- Significant storage capacity of +300MT
- Favourable for high injection:
  - 1 MT/year from 2027 planned
  - Increasing to 5-10 MT/year from 2030
- Local project support - strong municipal pull and public accept
- Excellent harbour facilities located for Baltic Sea region
- Short shipping distances in “safe” waters

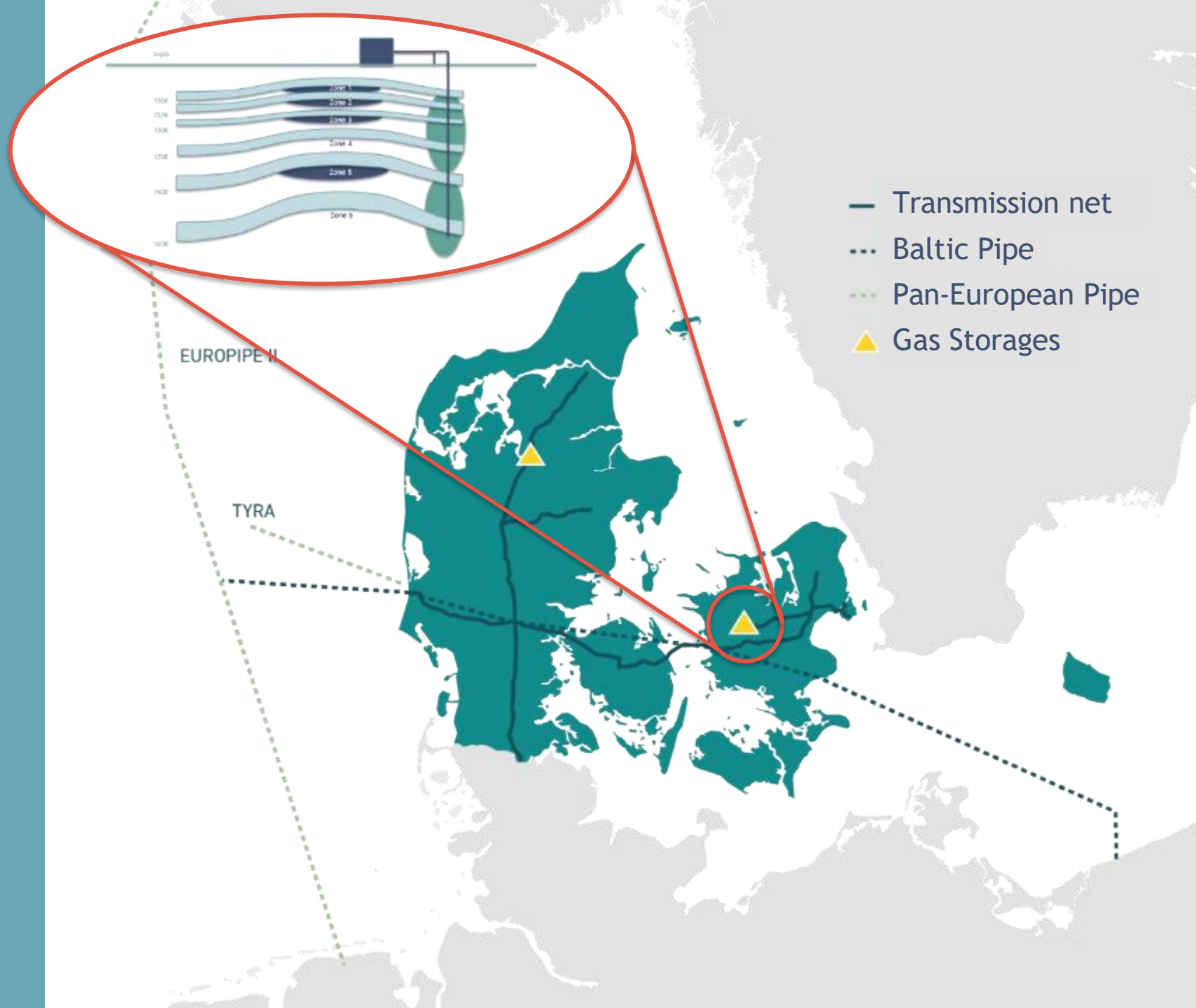



CarbonCuts

# CCS PILOT IN STENLILLE IN DENMARK

- 8 MT capacity, with 0,5 MTA from 2026
- Close to existing natural gas storage, that continue to be in operation for 30 years
- Potential for fast and effecient deployment utilising existing infrastructure, expertise and knowledge



# CRUCIAL STEP FOR ONSHORE-CCS IN DK

- Pilot Project supports initial CO2 capture in DK
- On-shore licenses will be awarded in 2024 in DK
- Truck and train are flexible and fast and immediate
- Pipelines are efficient, but requires long-term commitment and timelines


| | 2024 | 2026 | 2030 | 2040 |
|---|---|---|---|---|
| | On-shore licenses | Stenlille CCS Pilot | Full-scale DK CCS | Pan-European Network |
| Cost: €/Ton | | 25-50 | 7-10 | |
| Transport options: | | Truck/Train<br>Ship | Pipelines | |

# Agenda

| | |
|---|---|
| **1. Policy introduction & update by the Commission services** | (9:30 - 10:00h) |
| **2. CO2 storage developments in MS – part 1** | (10:00 - 11:00h) |
| *11:00 – 11:30h Coffee break* | |
| **2. CO2 storage developments in MS – part 2** | (11:30 - 12:30h) |
| **3. Storage support programmes in Europe** | (12:30 - 13:15h) |
| *13:15 – 14:30h Lunch break* | |
| **4. Needs of CO2 capturing projects supported by the Innovation Fund** | (14:30 - 15:15h) |
| **5. Cross-border CO2 network developments supported by TEN-E** | (15:15 - 16:00h) |
| *16:00 – 16:30h Coffee break* | |
| **6. Questions and moderated open discussion** | (16:30 - 17:30h) |
| *17:30h End of the meeting* | |

# CCS STATUS - DENMARK

30 MARCH 2023

# Status on CCS in Denmark

# STATUS ON CCS IN DENMARK

**Political agreements:**

- *Climate agreement on energy and industry 22 June 2020*
  - Decision to make CCS legal and to be used in hard to abate sectors
  - Emphasizing CCS does not mean less-ambitions on the climate agenda

- *Agreement on CCS roadmap part 1, 30 June 2021 + part 2, 14 December 2021*
  - Decision to make import/export of CO2 legal
  - Decision to give GEUS funding for investigating potential storage sites
  - Decision to make DK a European hub for CCS, and to roll out CCS on market terms in the long run in CCS strategy
  - Decision to involve municipalities, regions and citizens + industry dialogue + CCUS stakeholder forum

- *Agreement on framework conditions for CO2 storage June 21 2022*
  - State co-ownership of storage permits at 20%
  - Onshore pilot project in Stenlille

# STATUS ON CCS IN DENMARK

**Legislation**

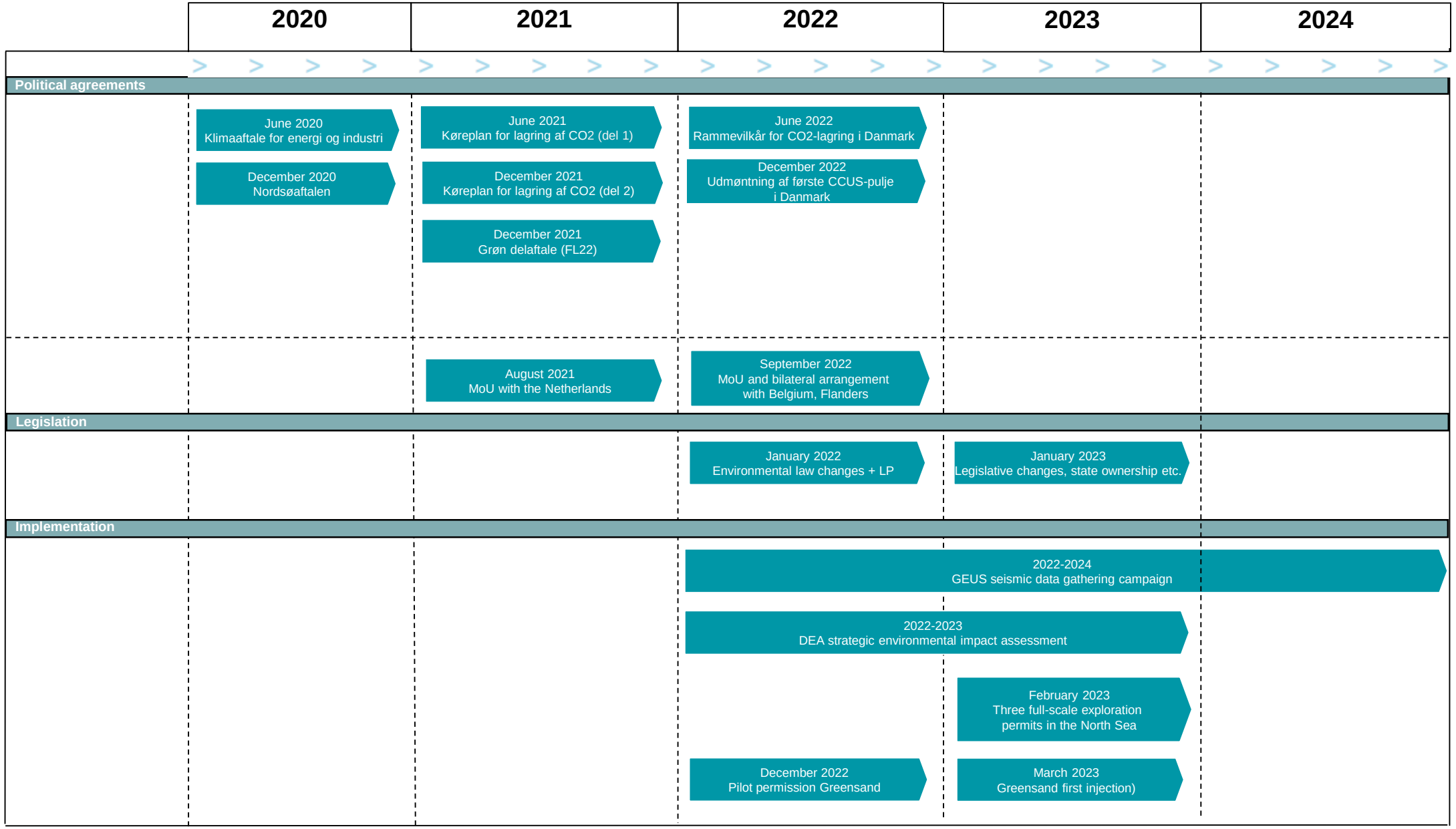
- Speedier and less extensive approval process for storage pilot projects in the North Sea entered into force on 1 July 2022.
- Exempting storage and transport of CO2 from the prohibitions against dumping in the Marine Environment Act entered into force 1 August 2022.

**Implementation**

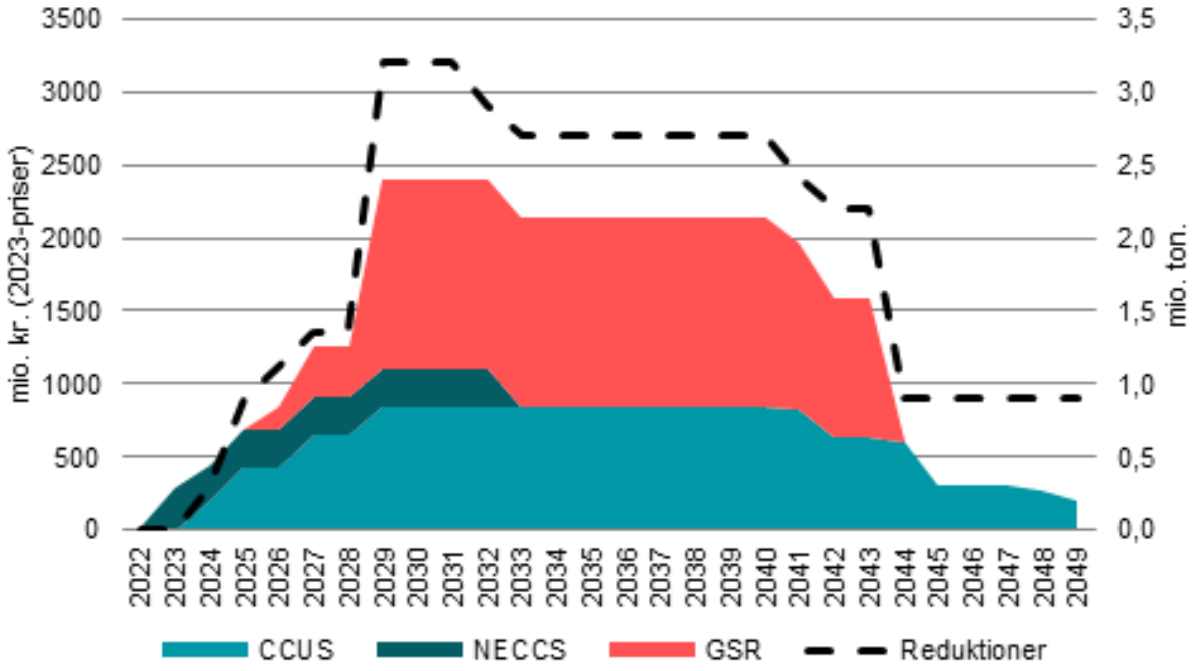
- First pilot project permit given for exploration and storage of CO2 in a delimited area in the Danish part of the North Sea.
- Three full scale exploration permits given as of beginning February 2023 (Bifrost and Greensand)
- Prequalification of three organizations in the first round of the CCUS funds.
- GEUS has begun seismic preliminary studies of possible storage structures on land and near the coast and Danish Energy Authority has started the Environmental Impact assessment.
- MoU on CCUS with the Netherlands. MoU on CCUS with Belgium + bilateral arrangement on CO2 transportation.

**Overall:**

- Total funding for CC(U)S of approx. 37 billion DKK (approx. 5 bill. EUR) in 2023 prices.
- Total expected reduction estimate from CC(U)S of DKK 3.2 million tonnes of CO2 annually from 2030.


2020
2021
2022
2023
2024
Political agreements
June 2020
Klimaaftale for energi og industri
December 2020
Nordsøaftalen
June 2021
Køreplan for lagring af CO2 (del 1)
December 2021
Køreplan for lagring af CO2 (del 2)
December 2021
Grøn delaftale (FL22)
June 2022
Rammevilkår for CO2-lagring i Danmark
December 2022
Udmøntning af første CCUS-pulje
i Danmark
August 2021
MoU with the Netherlands
September 2022
MoU and bilateral arrangement
with Belgium, Flanders
Legislation
January 2022
Environmental law changes + LP
January 2023
Legislative changes, state ownership etc.
Implementation
2022-2024
GEUS seismic data gathering campaign
2022-2023
DEA strategic environmental impact assessment
February 2023
Three full-scale exploration
permits in the North Sea
December 2022
Pilot permission Greensand
March 2023
Greensand first injection)

# OVERVIEW OF FUNDS



# OVERVIEW OF FUNDS

| | CCUS | NECCS | GSR |
|---|---|---|---|
| Eligible for funding | Negative eimissions and reductions from technological flue gas processes | Negative emissions from technological processes | Negative emissions and reductions from technological processes, agricultural sector excluded |
| Eligible sources of CO2 | Fossil and biogenic | Biogenic (incl. DACCS) | Fossil and biogenic (incl. DACCS) |
| Contract period | Up to 20 years per contract w opt-out option w/ retention penalty | Up to 8 years per contract w/ opts-out option (limited retention penalty) | Up to 15 years per contracts w/ opt-out option (limited retention penalty) |
| First reduction year | 2025/26 | 2024/25 | 2026/27 |
| Support period | 2025-2049 | 2024-2032 | 2026-2043 |
| Budget | 16,6 billion DKK | 2,6 billion DKK | 17,2 billion DKK |

# POTENTIAL $CO_2$ CAPTURE SOURCES AND TRANSPORT OF $CO_2$

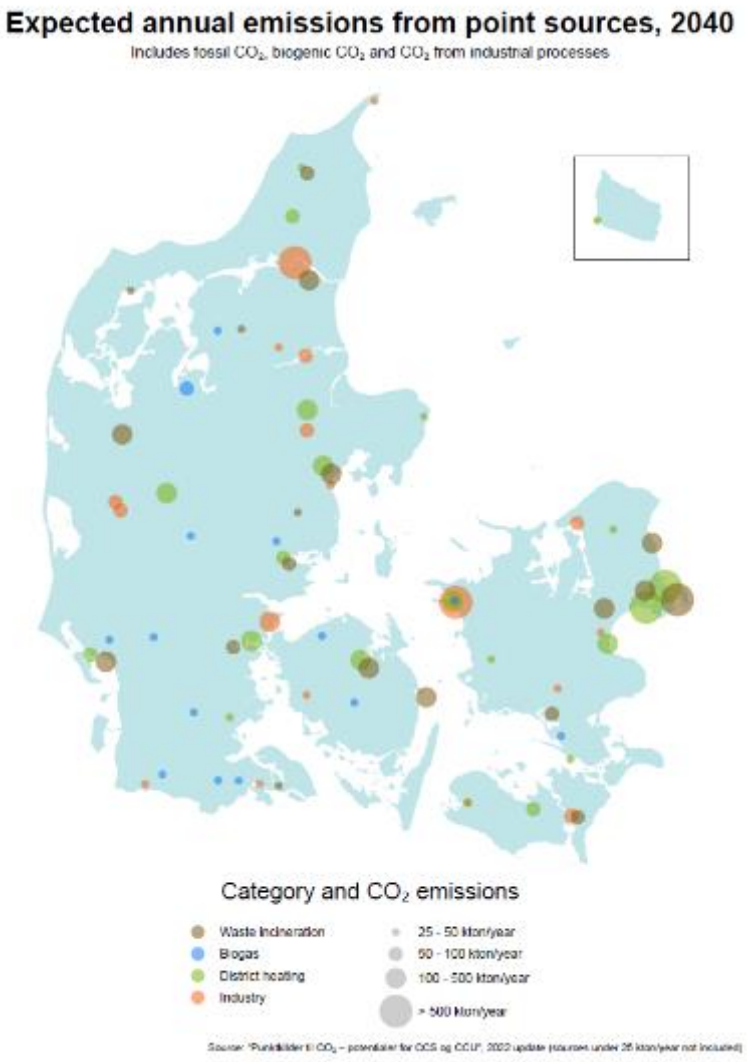
## Main capture sources

- The annual long-term $CO_2$ capture potential from Danish point sources is estimated to be 5.4-10.8 million tonnes of $CO_2$.
- Major emitters in Denmark are waste incineration, industry and combined heat and power plants.
- In addition, biogas plants.
- Most are centered around the major cities, all of which have port facilities.

## Transport of $CO_2$

Once $CO_2$ is captured, it must be transported for e.g. storage:

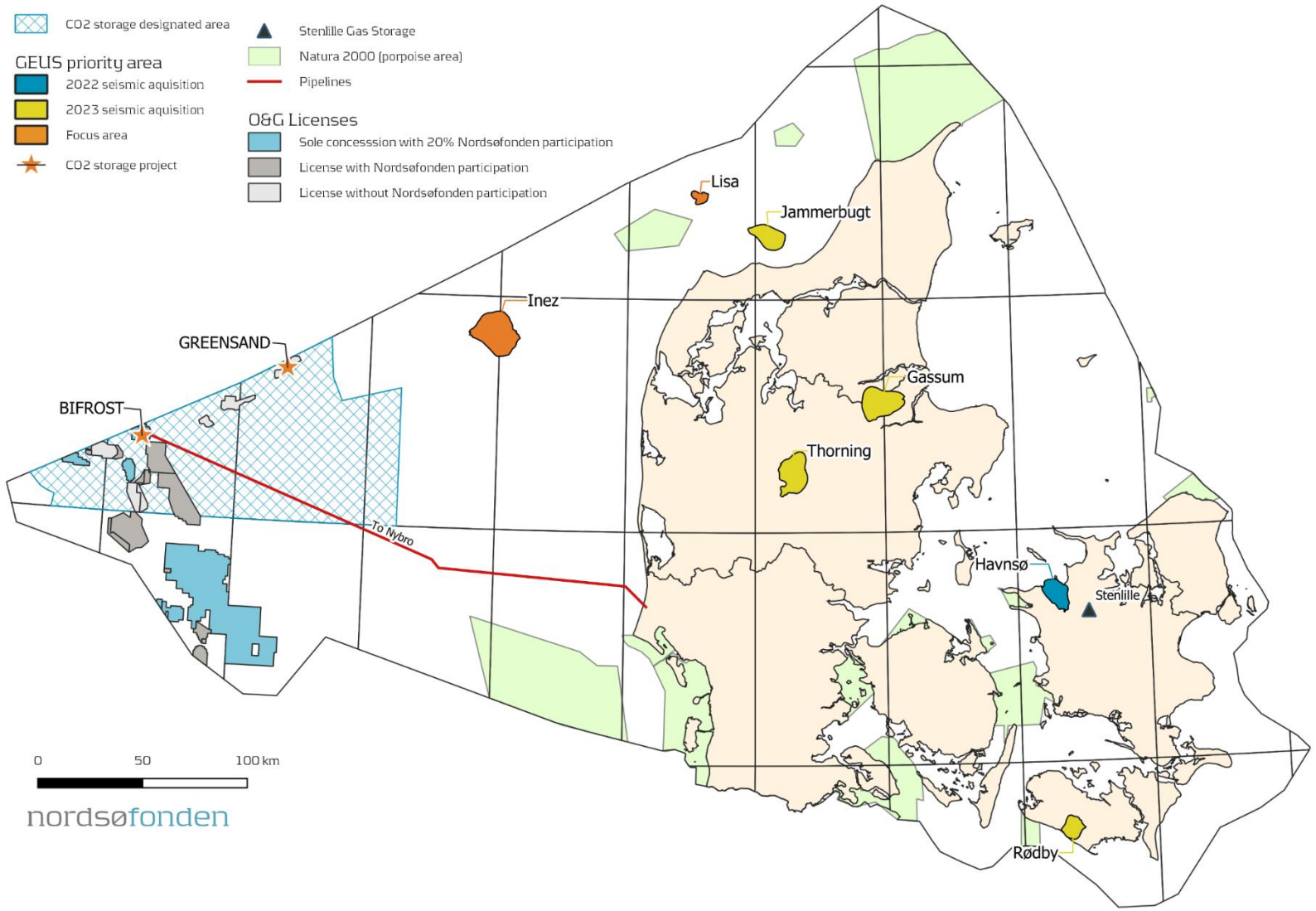
- To port by truck or pipe - and on to storage by ship (or pipe) if storage is offshore.
- To port by truck or pipe and then further in pipes at sea or direct pumping at storage near-shore.
- In truck or pipe on land at onshore storage solution.



# OVERVIEW OF POTENTIAL CO2 STORAGE SITES – PHASE 1

| Site | Municipality | Type | GEUS planning starts | GEUS conducting seismic survey | GEUS repport | Danish Energy Agency conducting EIA |
|---|---|---|---|---|---|---|
| Gassum | Mariagerfjord og Randers | Onshore | Aug. 2022 | Feb. 2023 | Oct. 2023 | Started, expected to finish end 2023 |
| Havnsø | Kalundborg | Onshore | March 2022 | Aug. 2022 | April 2023 | Started, expected to finish end 2023 |
| Inez | - | Nearshore | Not necessary, structure mature enough | - | - | Started, expected to finish end 2023 |
| Jammerbugt | - | Nearshore | Aug. 2022 | April 2023 | Jan. 2024 | Started, expected to finish end 2023 |
| Lisa | - | Nearshore | Not necessary, structure mature enough | - | - | Started, expected to finish end 2023 |
| Rødby | Lolland | Onshore | Oct. 2022 | Late spring 2023 | Spring 2024 | Started, expected to finish end 2023 |
| Stenlille | Sorø | Onshore | Aug. 2021 | Feb. 2022 | Oct. 2022 | Started, expected to finish end 2023 |
| Thorning | Ikast-Brande, Silkeborg, Viborg | Onshore | Oct 2022 | August 2023 | Spring 2024 | Started, expected to finish end 2023 |

Note: Timeline subject to change, and dependent on dialogue with relevant municipalities.


CO2 storage designated area
GEUS priority area
2022 seismic aquisition
2023 seismic aquisition
Focus area
CO2 storage project
Stenlille Gas Storage
Natura 2000 (porpoise area)
Pipelines
O&G Licenses
Sole concesssion with 20% Nordsøfonden participation
License with Nordsøfonden participation
License without Nordsøfonden participation
Lisa
Jammerbugt
Inez
GREENSAND
BIFROST
Gassum
Thorning
To Nybro
Havnsø
Stenlille
Rødby
0
50
100 km
nordsøfonden

# Projects

- **Project Greensand (offshore):**
  - INEOS consortium (Maersk Drilling, GEUS, Wintershall DEA etc.)
  - Expected storage capacity of up to 1,5 million tonnes $CO_2$ /y in 2025 up to 8 million tonnes $CO_2$ /y in 2030.

- **Project Bifrost (offshore):**
  - TotalEnergies consortium (Noreco, Nordsøfonden, Ørsted, DTU etc.)
  - Expected storage capacity of 2-3 million tonnes $CO_2$ /y in 2029-2030 and 10-15 million tonnes $CO_2$ /y in 2030-2032.

- **Project Norne:**
  - Expected storage capacity of 2.3 million tonnes $CO_2$ /y in 2026 and 18.7 million tonnes $CO_2$ /y in 2030.

- **Project Ruby:**
  - Expected storage capacity of 1 million tonnes $CO_2$ /y in 2027 and 5-10 million tonnes $CO_2$ /y in 2030.

- **Stenlille demo project (onshore)**
  - Storage capacity of 0,5 million tonnes $CO_2$ /y in 2025.

- **Total expected capacity up to 52 million tonnes $CO_2$/y in 2030-3032**

# THE PROCESS - OVERVIEW

1
- Tender area must have undergone a strategic environmental assessment (SEA)
- Danish Energy Agency (DEA) receives applications.

2
- DEA evaluates the applications and recommends to the Minister of Climate, Energy and Utilities which licenses to award.

3
- Awarding of the new licenses takes place after the Minister of Climate, Energy and Utilities has presented a report to the Climate, Energy and Utilities Committee of the Danish Parliament explaining which licenses the minister intends to issue

4
- Licenses can initially be granted for exploration for up to six years, during which the exploring company has exclusive rights to the area.

5
- All activities regarding specific storage projects must be approved by the DEA before establishment. If a suitable location for CO2 storage is identified, the license can be extended for up to 30 years for storage operations.

# WHAT DOES A LICENSE ENTAIL?

## EXCLUSIVE RIGHT TO EXPLORE, INVESTIGATE AND STORE $CO_2$

Environmental impact assessments are required before collecting new seismic data or drilling wells

Monitoring required *before*, *during* and *after* injection

### Exploration

- Awarded up to 6yrs
- Possible extension up to 10 yrs
- Work program

### Storage

- Up to 30yrs
- Plan for activity, monitoring and closure

### Closure

- 20yrs
- Post-closure plan

# GENERAL APPLICATION PROCESS – OFFSHORE

| | |
|---|---|
| August 15th | • Application window opens |
| October 1st | • Application deadline<br>• Press release disclosing company names of applicants |
| October-January | • DEA evaluation of applications with GEUS, NSF and DWEA<br>• Meetings with DEA and applicants |
| January-february | • Expected grant of licenses<br>• Press release disclosing licenses |

# NEXT STEPS

- ENABLING CCS IN DENMARK

- Future tenders for subsidy schemes
- The legal framework for transport infrastructure for $CO_2$
- Clear regulatory framework for CCS on waste incineration and combined heat and power plants
- Bilateral agreement/arrangements on import and export of $CO_2$ for off-shore storage
- Cross border infrastructure
- International and EU regulation on CCS

# KEY LEARNING POINTS

- WHAT TO CONSIDER

**Political vision:**

- Is there a will? What is the vision/scope of the activity?

**Technical knowledge:**

- Geological agency, companies etc.?
- Large emitters?

**Legislative frameworks:**

- Different framework offshore/onshore
- Not just about the storage site, also emitters, transport, temp. storage site etc.
- Regulations in other areas need adjustment to enable CCS value chains

**Local engagement:**

- Local acceptance and support will be key to the actual implementation

# Questions?

Ministry of Economic Affairs and Climate Policy

# CCS support programma – The Netherlands

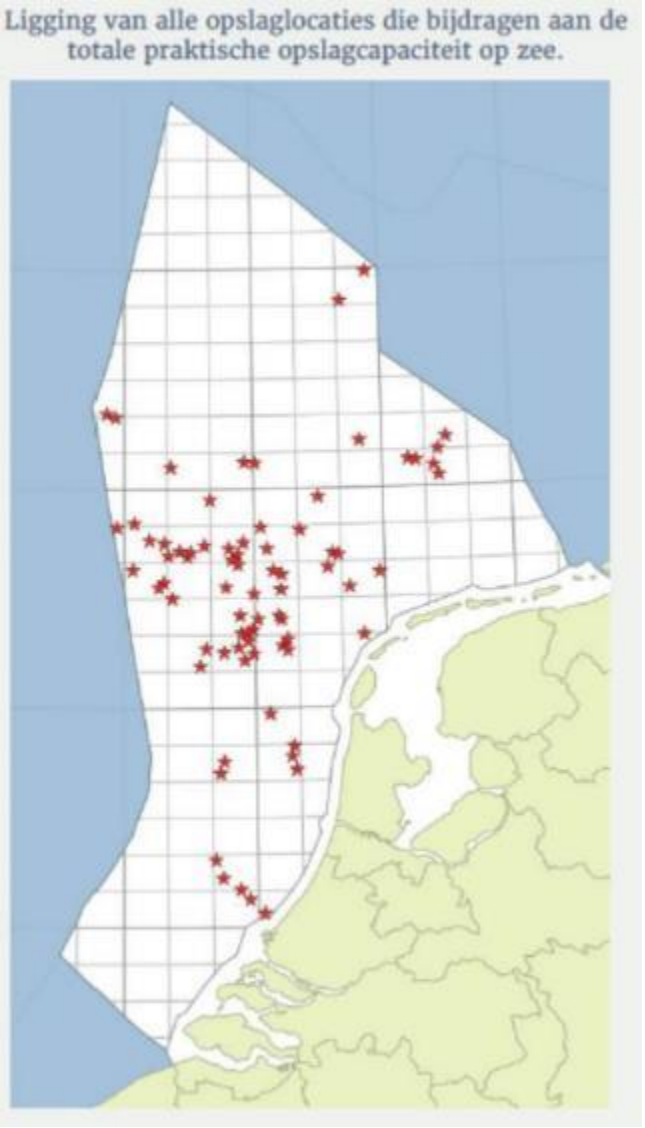
Presentation at the EC – 30 March 2023

# Disclamer

This presentation is designed for an informal and open exchange of views. It is written with the utmost care and precision. However it does not reflect the final and official position of the government of The Netherlands.

# Supporting CCS via policy framework

- Contract of difference subsidy for most cost effective solutions (SDE++)
- Investment in Research and Development: ACT, CETP
- Public private partnerships / State owned Enteprises active in CCS market
- Sufficient legal framework in place



# 2030 targets, the Climate Agreement and ‘Fit for 55’ adjustment

2020 - 14.3 mton $CO_2$ reduction in 2030
2022 – ‘Fit for 55’+ 5.9 mton
Total budget reservation of €22 billion in Coalition Agreement

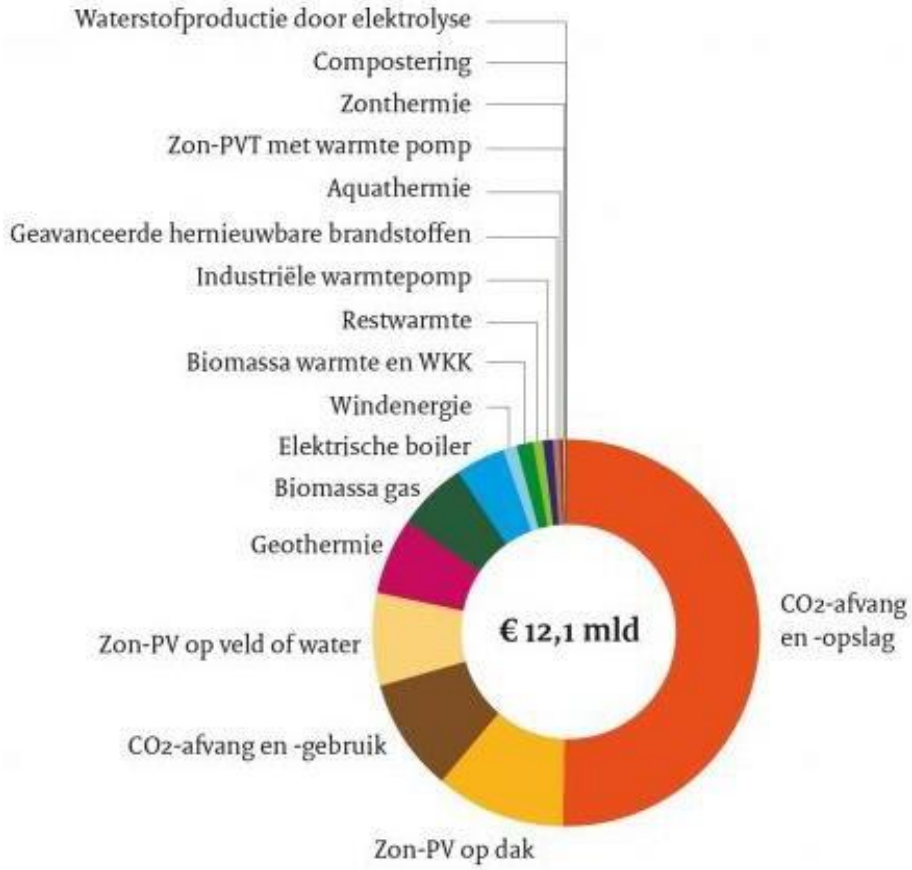
Achieve emissions reductions while:
- Improving the competitiveness and investment climate
- prevention of carbon leakage

How to get there?
1. Regulation, minimum emission price, standards
    - $CO_2$ levy, energy efficiency requirements, renewable hydrogen offtake obligations
2. Expanding and adding new subsidy instruments
    - SDE++, DEI+, VEKI, EIA, MIA, VAMIL
3. Tailored agreements with large industrial emitters
    - Step 1: Inventorisation
    - Step 2: Agreement framework
    - Step 3: Letters of intent
    - Step 4: Binding agreements
    - €7 billion reserved

# Policy overview – SDE++

- SDE stands for Stimulating Sustainable Energy Production and Climate Transition.
- Broadened in 2020 to include industrial CO2 reduction techniques.
- The unprofitable top of investments is covered by an operating subsidy (capex and opex).
- The budget will be determined annually; €5bn in 2021, up to €11bn in 2022, up to €9bn in 2023.
- All techniques compete with each other, the cheapest techniques win the subsidy
- Necessary technologies such as hydrogen, electric cracking, process efficiency, bio-based and recycling do not fit in the SDE system or fit in only very poorly.

**Requested budget SDE++ 2021**



# Draft of the financial flows

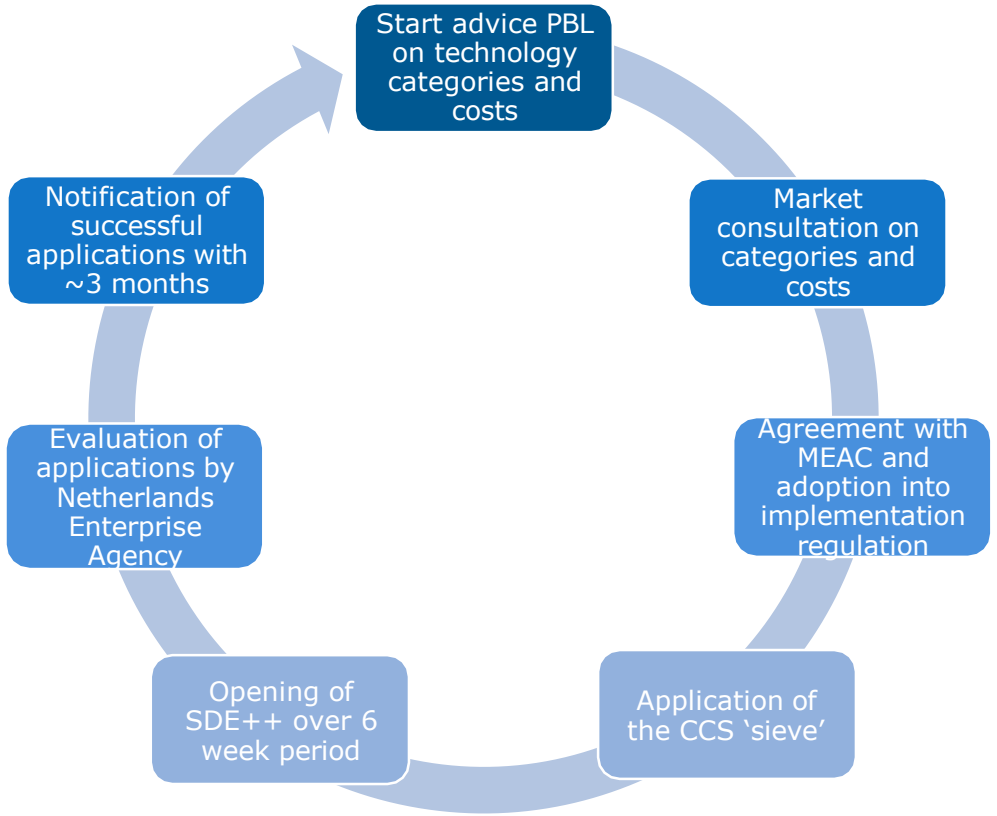
# Bid evaluation and grant agreement

- The bids need to be accompanied with:
  - Relevant permits
  - Feasability study describing the technical and financial side of the project
  - For CCS: proof that the captured CO2 can be stored;

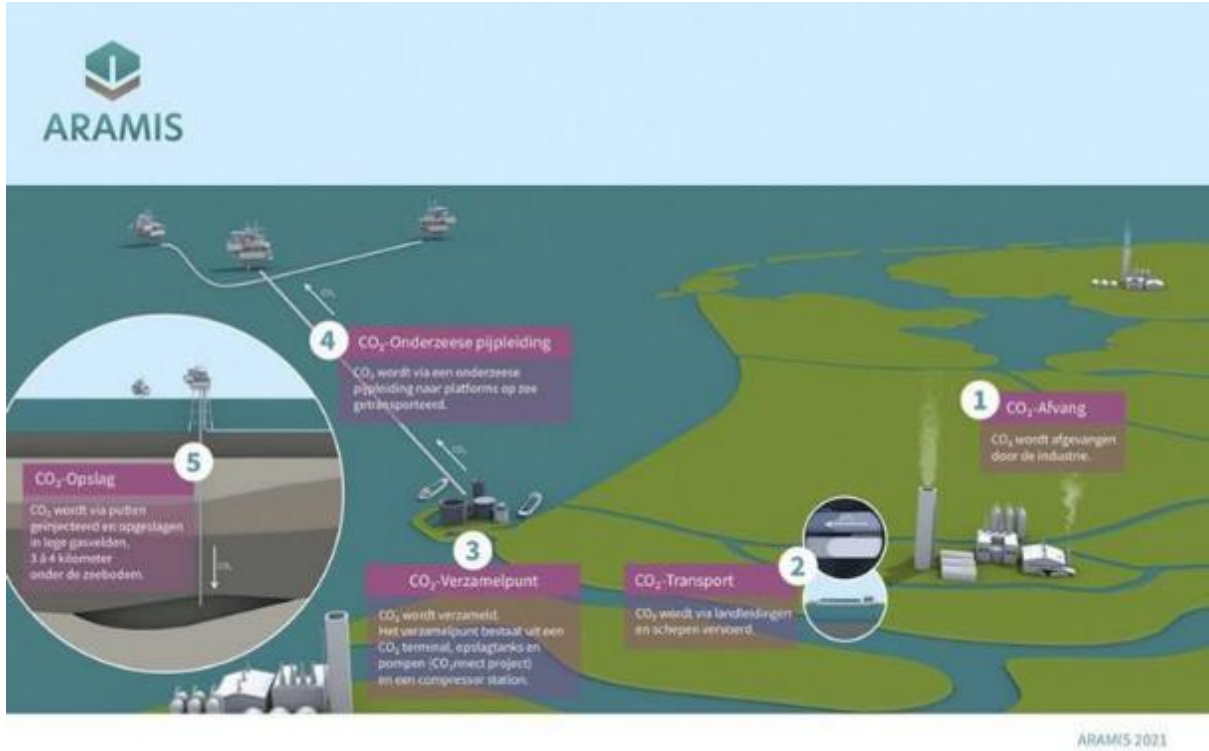
- After tender close all bids will be evaluated by RVO within 13 weeks: subsidies for winning applicants;

- For CCS: after letter of positive subsidy decision: execution agreement (within 2 weeks) and a bank guarantee (within 4 weeks).

# SDE++ process (simplified)



# Current projects

# Financing transport and storage infrastructure developments

- Initial $CO_2$ transport and storage infrastructure 'Porthos' started in 2017 is a public initiative from Gasunie, EBN and Port of Rotterdam to act as a 'market-maker' for CCS.
- Since 2020, the SDE++ policy now provides a robust business case to facilitate commercial T&S solutions.
- Aramis is a commercial initiative, whereby EBN (a state-owned enterprise) has received an exceptional consent from Minister EZK to participate in the pre-FEED phase.
- Independent bottom-up expert calculations of transport and storage tariffs for T&S infrastucture have been conducted to verify SDE++ subsidised amounts for T&S tariffs.

| | Euros / tonne | | |
|---|---|---|---|
| | Xodus - Mid | Porthos - Mid | *Difference* |
| Capex | 23.7 | 24.0 | *0.3* |
| P50 to P90 - 6% Contingency | 0 | 2.1 | *2.1* |
| Opex | 22.3 | 21.9 | *-0.4* |
| Other | 5.1 | 5.1 | *0.0* |
| Total | 51.1 | 53.1 | *2.0* |

| EUR/tonne (22 RT) | Base Case |
|---|---|
| Base Case | 71.8 |
| Xodus Bottom-Up | 67.4 |
| Aramis Expectation Case | 67.0 |

# Towards a (NW) European CCS Market

- Smart policy design for cost effective solutions and to prevent fossil lock in
- A contribution by all member states
- EU target that is ambitious and realistic, and implementable

Norwegian Ministry
of Petroleum and Energy

# Norwegian CCS policy

Bjørnar Gilje, Alex Engh

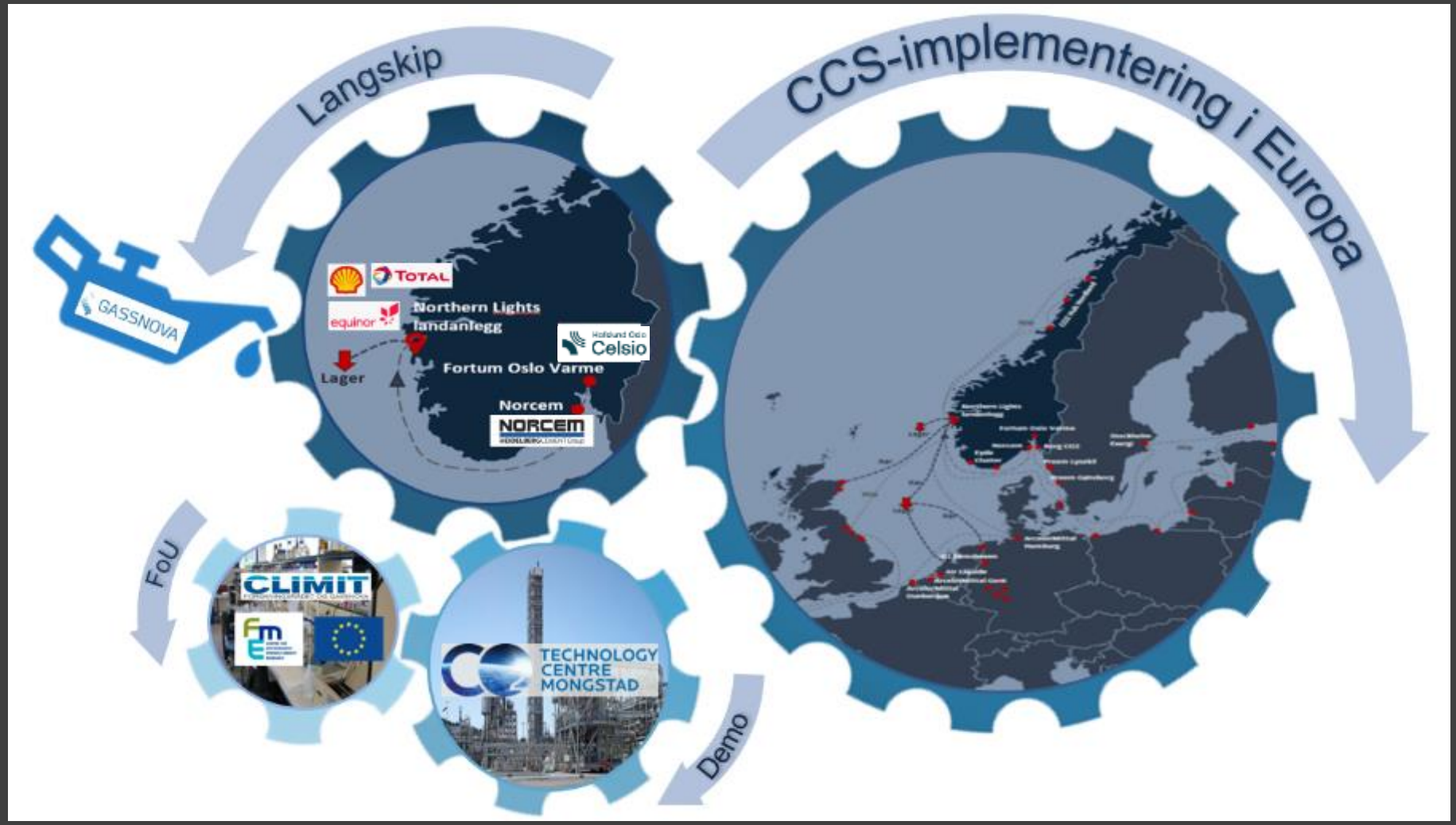
Brussels 30 March 2023

# The government's objectives for CCS


1. Demonstrate that CCS is part of the solution
2. Speed up the development of CCS globally
3. Develop new green industry
4. Facilitate development of $CO_2$ storage on a commercial basis
5. Permanent and safe storage

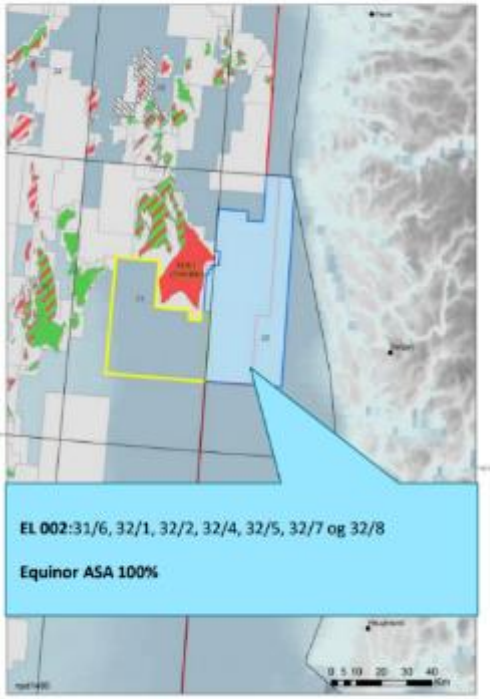

LONGSHIP
Storage site
NORTHERN LIGHTS
Receiving terminal
CELSIO
$CO_2$ capture
BREVIK CCS
$CO_2$ capture
YARA SLUISKIL
$CO_2$ capture

# A Comprehensive CCS approach

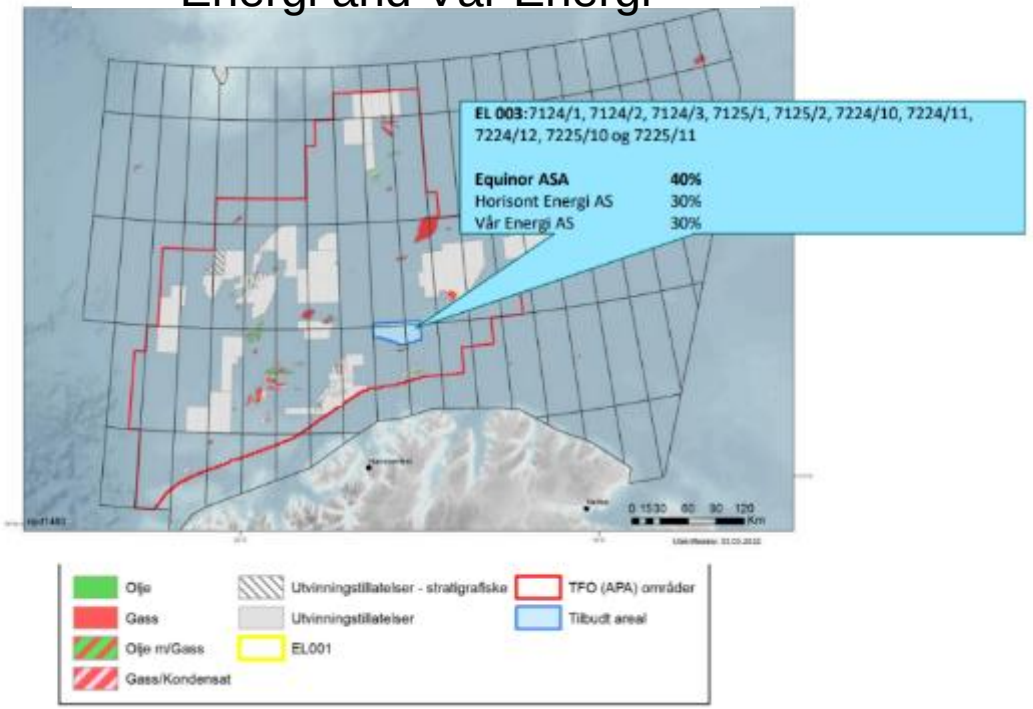


# New licences for exploration of $CO_2$-storage awarded in June and October last year

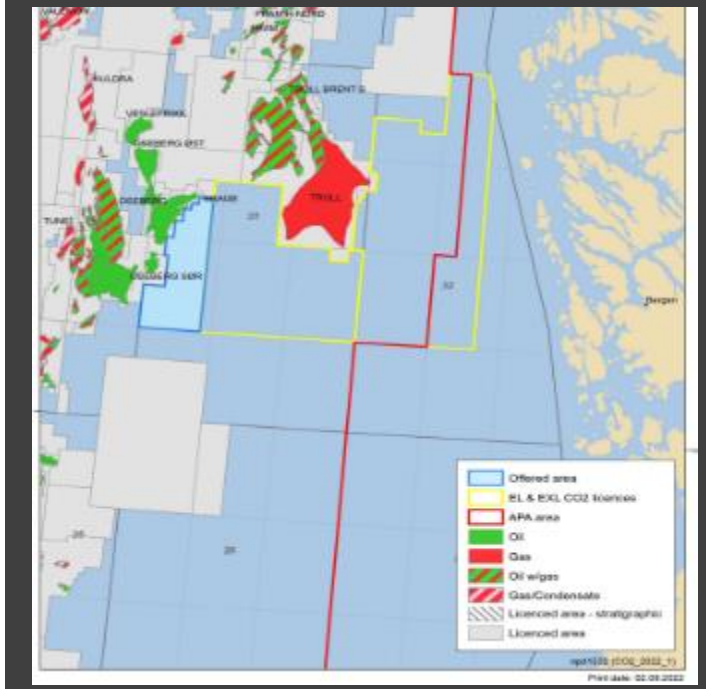
EXL002: Equinor




EXL003: Equinor, Horisont Energi and Vår Energi




EXL004: Wintershall Dea & CapeOmega



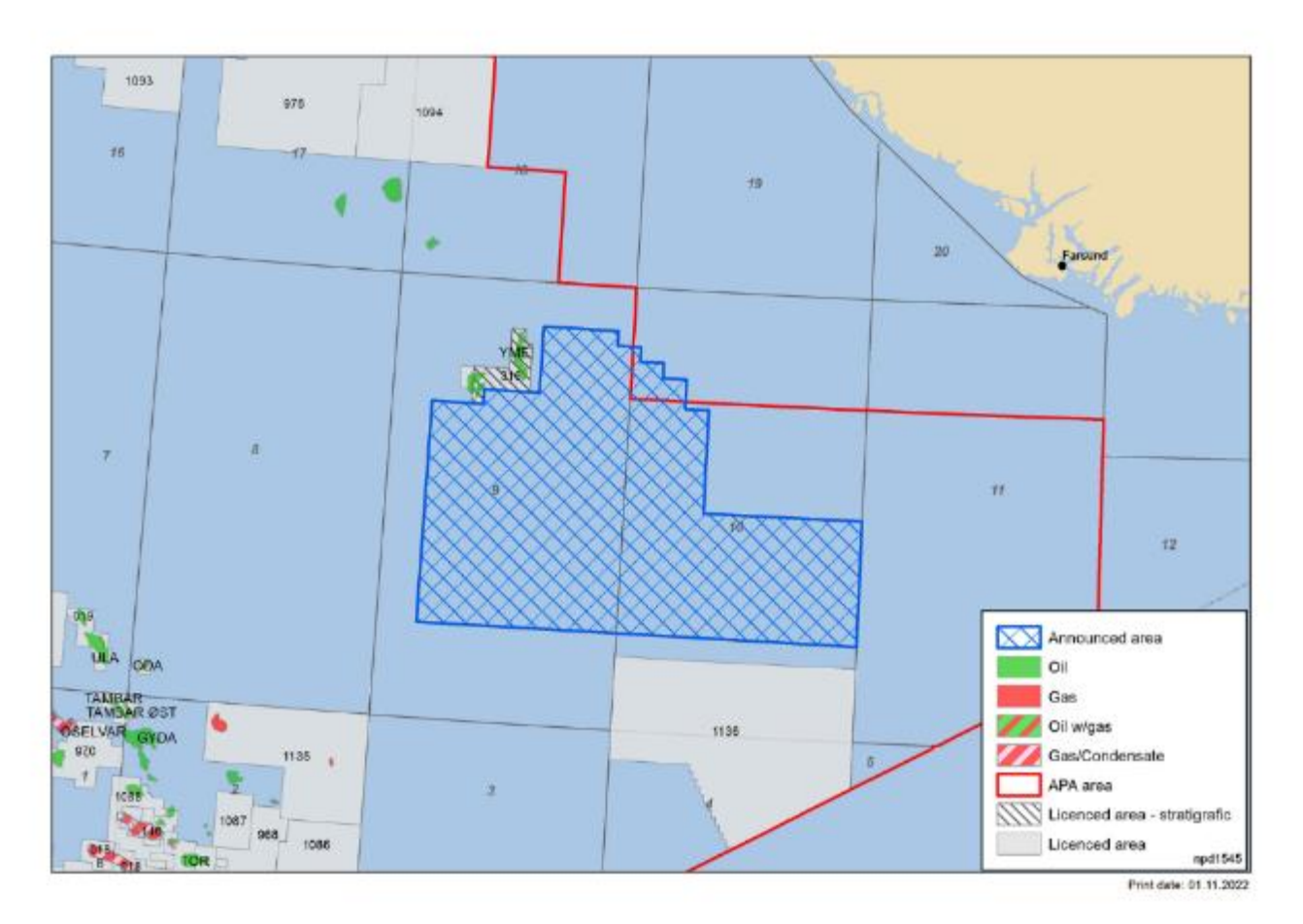



https://www.npd.no/globalassets/1-npd/fakta/co-to/tillatelser/nr-1-2021/tildeling/arbeidsprogram-ccs-2021.pdf

# Six companies have applied for area in the southern North Sea

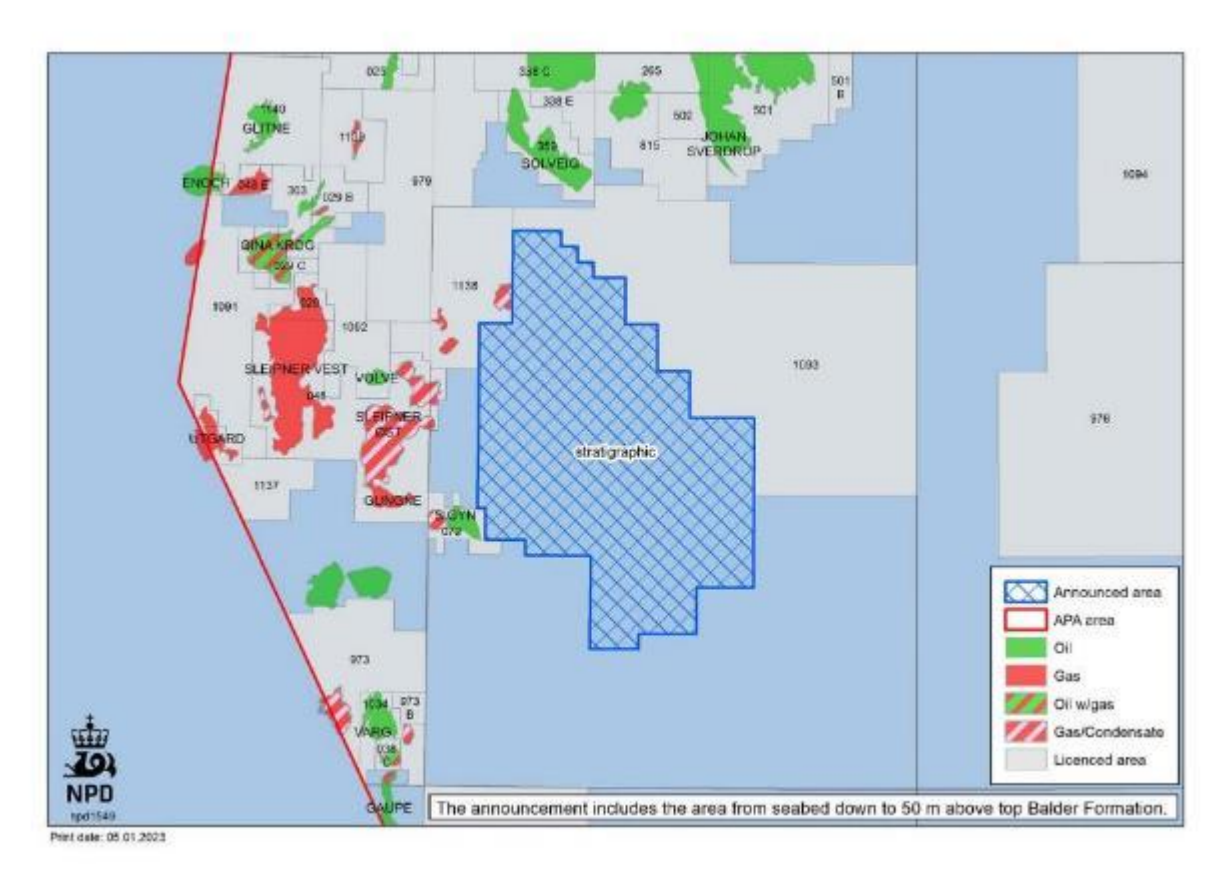
- Aker BP
- Altera Infrastructure Group
- Horisont Energi
- Neptune Energy
- OMV
- Wintershall Dea

(Deadline was 3 January 2023)



# Five companies have applied for latest announced area in the North Sea

- Equinor
- Neptune Energy
- Storegga
- Sval Energi
- Wintershall Dea



Norwegian Ministry
of Petroleum and Energy

# Agenda

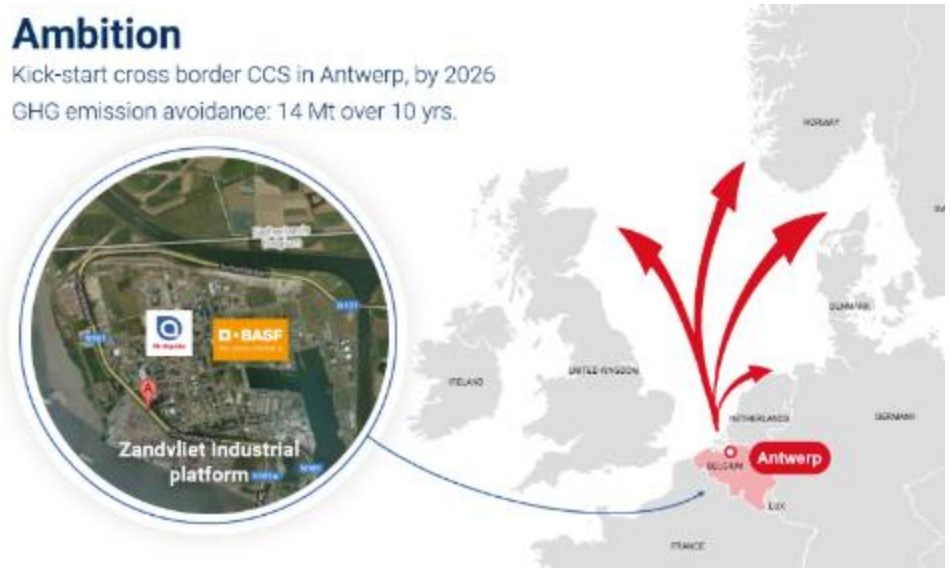
| | |
|---|---|
| **1. Policy introduction & update by the Commission services** | (9:30 - 10:00h) |
| **2. CO2 storage developments in MS – part 1** | (10:00 - 11:00h) |
| *11:00 – 11:30h Coffee break* | |
| **2. CO2 storage developments in MS – part 2** | (11:30 - 12:30h) |
| **3. Storage support programmes in Europe** | (12:30 - 13:15h) |
| *13:15 – 14:30h Lunch break* | |
| **4. Needs of CO2 capturing projects supported by the Innovation Fund** | (14:30 - 15:15h) |
| **5. Cross-border CO2 network developments supported by TEN-E** | (15:15 - 16:00h) |
| *16:00 – 16:30h Coffee break* | |
| **6. Questions and moderated open discussion** | (16:30 - 17:30h) |
| *17:30h End of the meeting* | |

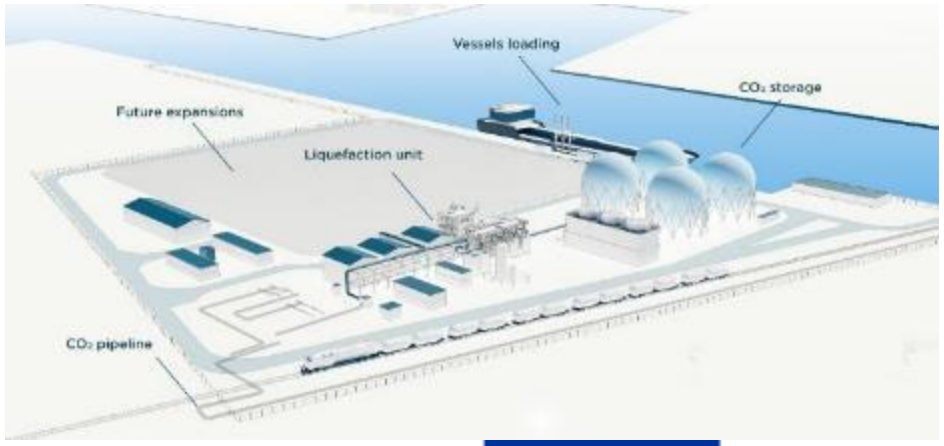
# *Kairos@C*

European Commission

# Kairos@C: Air Liquide & BASF in Antwerp

- *Development of a full cross-border CCS chain*
- *Capture of the emissions of 5 plants on the Zandvliet Industrial platform*
- *14 million tons of CO2 over 10 years*
- *Will enable to kick start Antwerp@C infrastructures in Antwerp harbour (backbone and liquefaction terminal)*
- *FiD Q3 2023, Entry into Operation Q4 2026*
- *Shipping of CO2 to sinks in the North Sea*
  - *Looking into own shipping solution, permanent storage options considered: Norway and Denmark*
- *FEED of on-site capturing facilities very advanced, FEED of infrastructure within the port of Antwerp almost finished*




Funded by the European Union

# Challenges

- ***Cost + model, and no "excessive profit" principle, considering***
  - *Significant amount of public support involved on all sides*
  - *PCI status*
  - *Current scarcity of capacity and lack of fluidity in the market and risk of abuse of dominant position*
  - *Still challenging CCS economics and overall high cost of the CCS value chain (even more after Ukraine war), need to find a fair allocation of rewards*
  - *Need to remain competitive on global scale*
  - *No indexation on ETS*

- ***Transparency on tariff and its various components**, as per CCS directive and state aid rules*

- ***Balanced terms & conditions***
  - *Need to find a right balance between need of "predictive cash flow" for investors and need of flexibility for emitters (CO2 is a by product)*
  - *Capped liabilities*

- ***Unbundling storage & shipping and open access to receiving terminals and infrastructure from day 1,** as per the CCS directive*

Funded by the European Union

*K6*

European Commission

# *Lumbres K6 Project*

**CO2**

- **20%** with incremental innovations → **Phase 1** : Modern process kiln suitable for oxy-fuel and alternative fuels

- **80%** with disruptive innovations → **Phase 2** : Carbon Capture and Storage

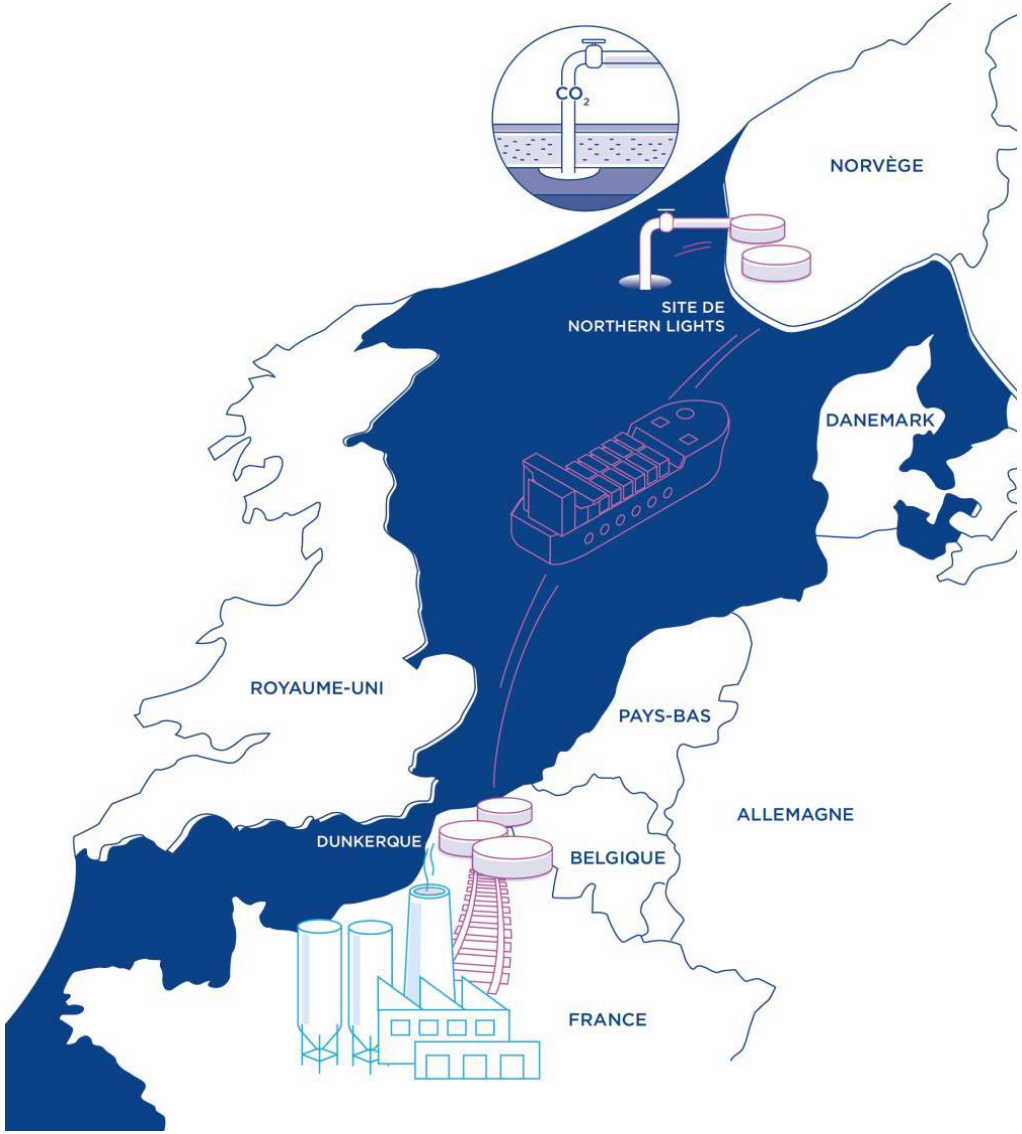
**1884**

**1,1**

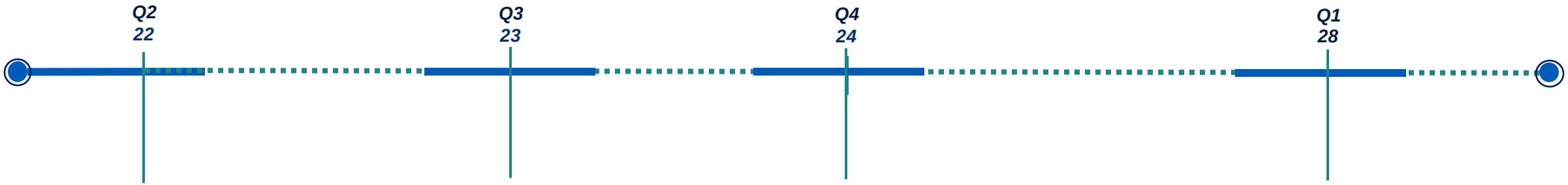
**850**

**2028**

**153**



# *Lumbres K6 Project timeline*




**K6 Phase 2 : Innovation Grant Agreement**

**K6 Phase 1 : French Funding Grant Agreement**

- **Financial Close**
- **All permits in place**

**CCS Start-up**

A timetable linked to the development of the transport and hub infrastructure of the **D'Artagnan Project...**

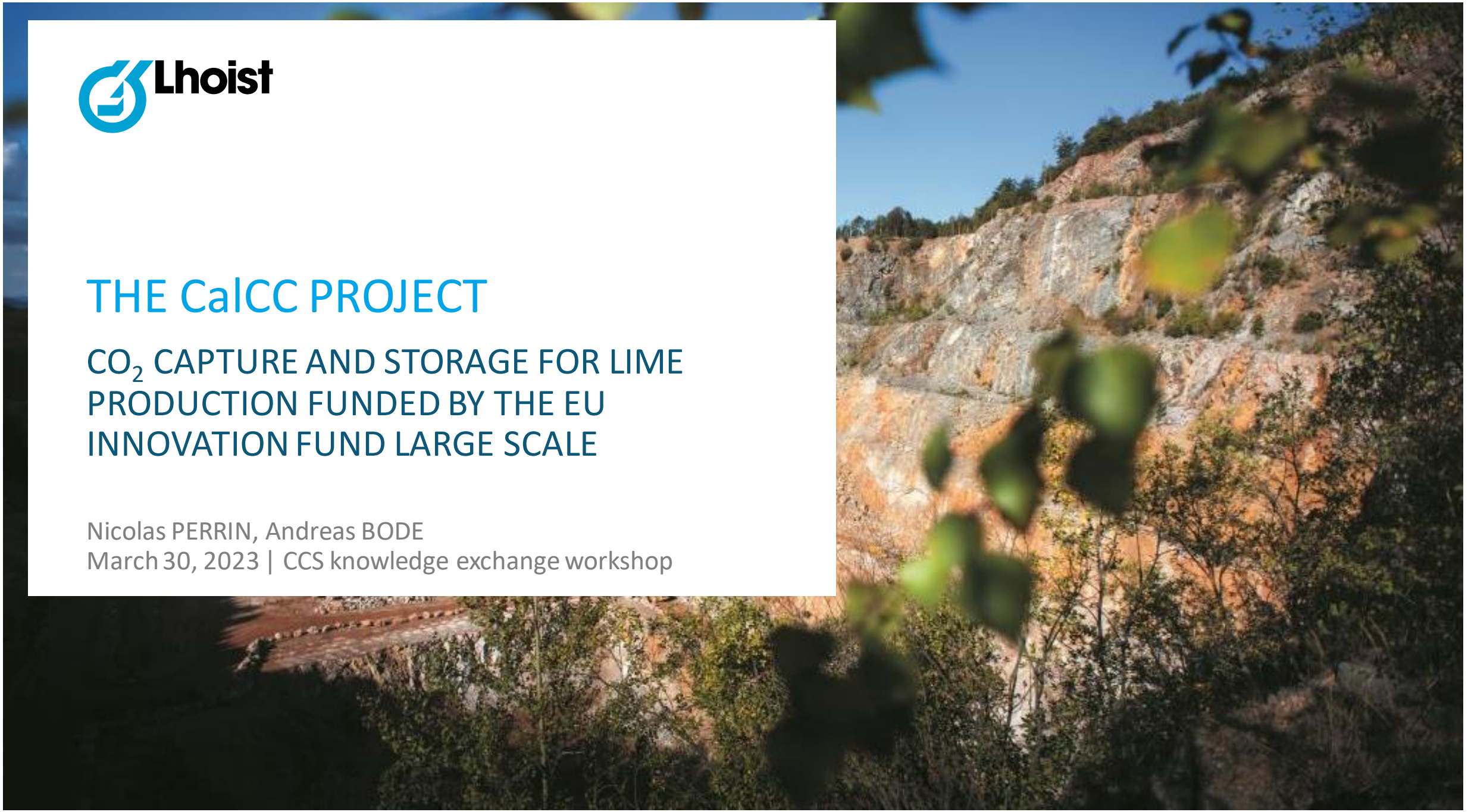
European Commission

# The Net Zero Industry Act is a positive step forward. As EQIOM, CRH we would like to highlight a few points

| Topic | Public Policy request – Summary |
|---|---|
| **Regulation** | • Ensuring unbundled and common access to the CCS infrastructure<br>• Cost-based and transparent tariffs : tariffs should be based on a "cost +" model rather than on "supply & demand" principles. |
| **Infrastructure** | • Plan the CO2 transport infrastructure<br>• Assess the needs and plan the infrastructure to provide the energy |
| **Funding** | • Support both CAPEX and OPEX costs<br>• Introduce a Carbon Contracts for Difference scheme for industrial installations<br>• Funding amounts should be able to evolve over the life of the project |
| **Specification / tech** | • Harmonised specifications |
| **Risk management** | • Clear EU guidelines on risk management of leaks and losses and CO2 ownership are needed. |
| **Acceptability** | • Enable an informed debate with civil society. |

# *CalCC*

European Commission



# THE CalCC PROJECT

## $CO_2$ CAPTURE AND STORAGE FOR LIME PRODUCTION FUNDED BY THE EU INNOVATION FUND LARGE SCALE

Nicolas PERRIN, Andreas BODE

March 30, 2023 | CCS knowledge exchange workshop

# THE CalCC PROJECT

## Scope and objective of the project:

**First industrial-scale carbon capture for lime production integrated with transport of $CO_2$ to coastal hub and shipping to geological storage in the North Sea**

Coordinator:

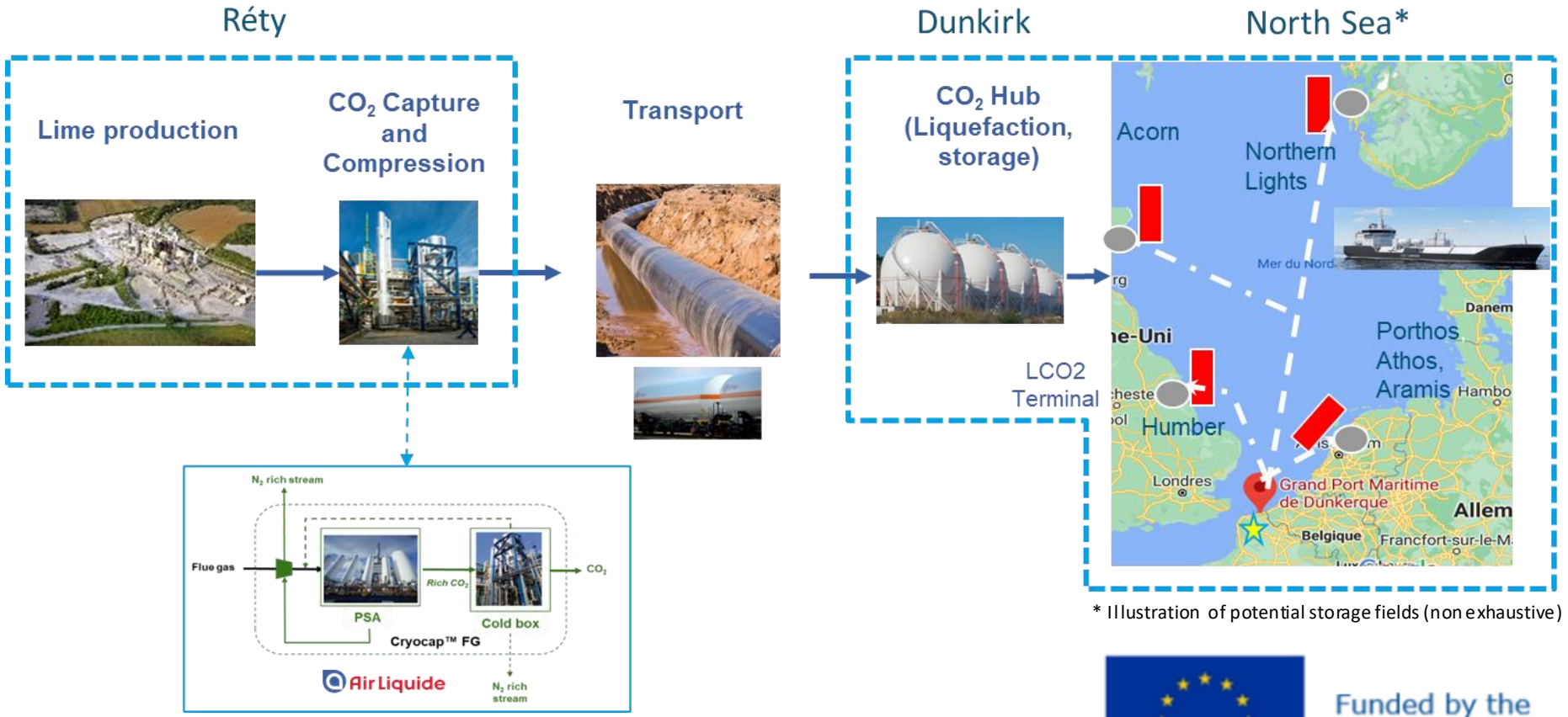
**Chaux et Dolomies du Boulonnais (Lhoist Group)**

Beneficiary:

**Air Liquide France Industrie**

Location:

**capture in Réty, pipeline from Réty to Dunkirk Terminal, shipping to North Sea storage**




* Illustration of potential storage fields (non exhaustive)

Funded by the European Union

# $CO_2$ TRANSPORT AND STORAGE NEEDS



- Expected volumes of $CO_2$ captured to be stored: > 600 ktpy
- Targeted Financial Close on 31/12/2024 and Entry into Operation on 31/12/2027
- $CO_2$ Transport: onshore dense phase pipeline & shipping
- Permanent storage option/s considered: offshore NO, DK, NL…
- Under way: Capture FEED, Pipeline & Terminal Pre-FEED & FEED, permitting preparation, public consultation…
- Other relevant points or challenges:
  - *Storage offer development: open & non-discriminatory access, cost+, unbundled offshore transport*
  - *Availability of cost-effective storage by 2027/28*
  - *Permitting duration, inflation, regulatory framework, € /t ETS uncertainty…*

Funded by the European Union

# *GO4ECOPLANET*

European Commission

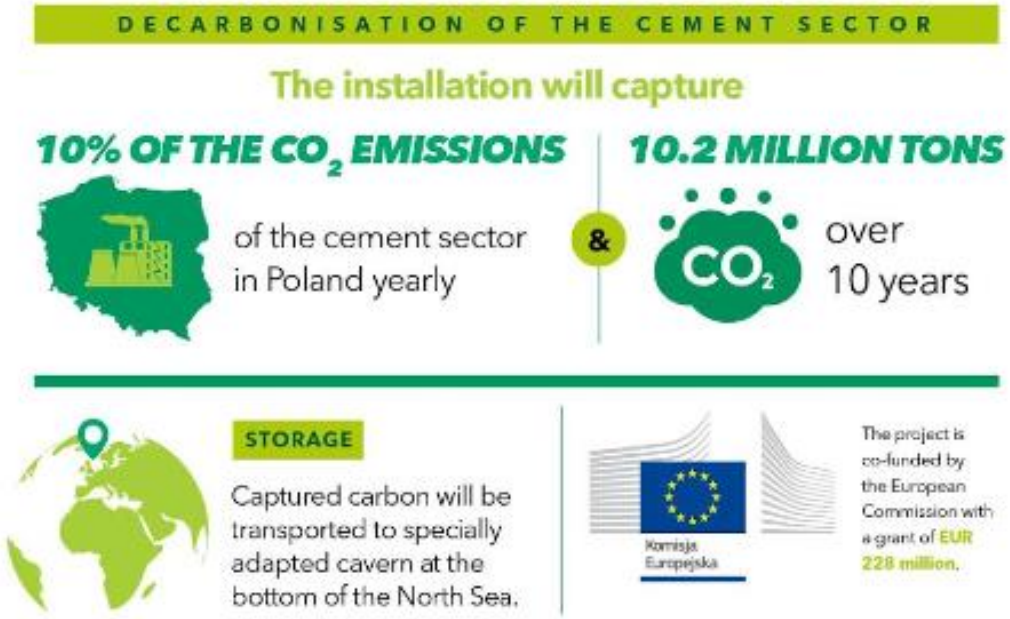
# KUJAWY GO4ECOPLANET, POLAND

- Lafarge Cement S.A. is planning to implement the Kujawy Go4ECOPlanet Project.
- The project aims to fully decarbonize cement production at **Kujawy Plant** located in Piechcin, Poland

**Kujawy Go4ECOPlanet** involves a world-unique **CryoCap™FG** technology designed by Air Liquide.

The scope of the project includes the capture and liquefaction of CO2. The solution will capture ~100% of the plant's CO2 emissions, which will be transported to storage areas in the North Sea.

The project is a key part of Holcim Group's decarbonisation roadmap to meet its Net Zero Pledge.




Funded by the European Union

# FIRST OF ITS KIND PROJECT AT KUJAWY PLANT

Go4ECOPlanet

ECO2CEE

**Inside Kujawy site**
**Block 1 - Capture and Liquefaction**

**$CO_2$ Capture & Liquefaction**
**Cryocap™ FG** (1.05 Mtpa)

**$LCO_2$ Storage**

**Kujawy cement plant**
(1.2 Mtpa $CO_2$ emissions with biomass $CO_2$)

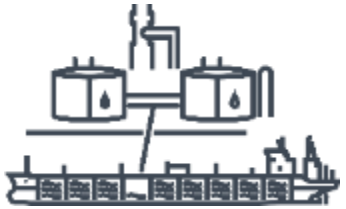
**Wastewater treatment**

**$O_2$**
**360 TPD**

**Air Separation Unit**
**(Oxygen supply)**

**Block 2**
**Transport**

**$LCO_2$ Train**

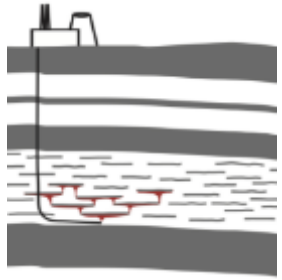


**$LCO_2$ terminal in the port of Gdansk**

**$LCO_2$ sea going vessel**

**Block 3**
**Storage**

**CO2 Storage in the North Sea**
(1.04 Mtpa)



European Commission

# CO2 TRANSPORT & STORAGE NEEDS: 1.1MTPA FROM 2027

Nov 2022 - June 2024

- Volumes of CO2 captured and stored - **1.1mt/a**
- Financial Close - 30 June 2024
- **Entry into Operation - 30 April 2027**
- LCO2 will be transported from Kujawy by train to a Hub in Gdańsk, then via ship to a CO2 storage site in the North Sea.
- The $ECO_2CEE$ project aims to create the Hub (consortium led by Orlen with Air Liquide, Lafarge)
- Project activities on going - FEED documentation for the capture, Environmental Decision, Building Permit file

**Work Package 1: Project Preparation**

**Key steps:**

- Grant agreement signed
- Final design approved
- Engineering, permitting
- Signed contracts (EPC with Air Liquide, Transport, Storage)
- Green energy delivery / power grid extension

**Timing:** end of H1 2024 (Financial Close)

Funded by the European Union

# *Beccs Stockholm*

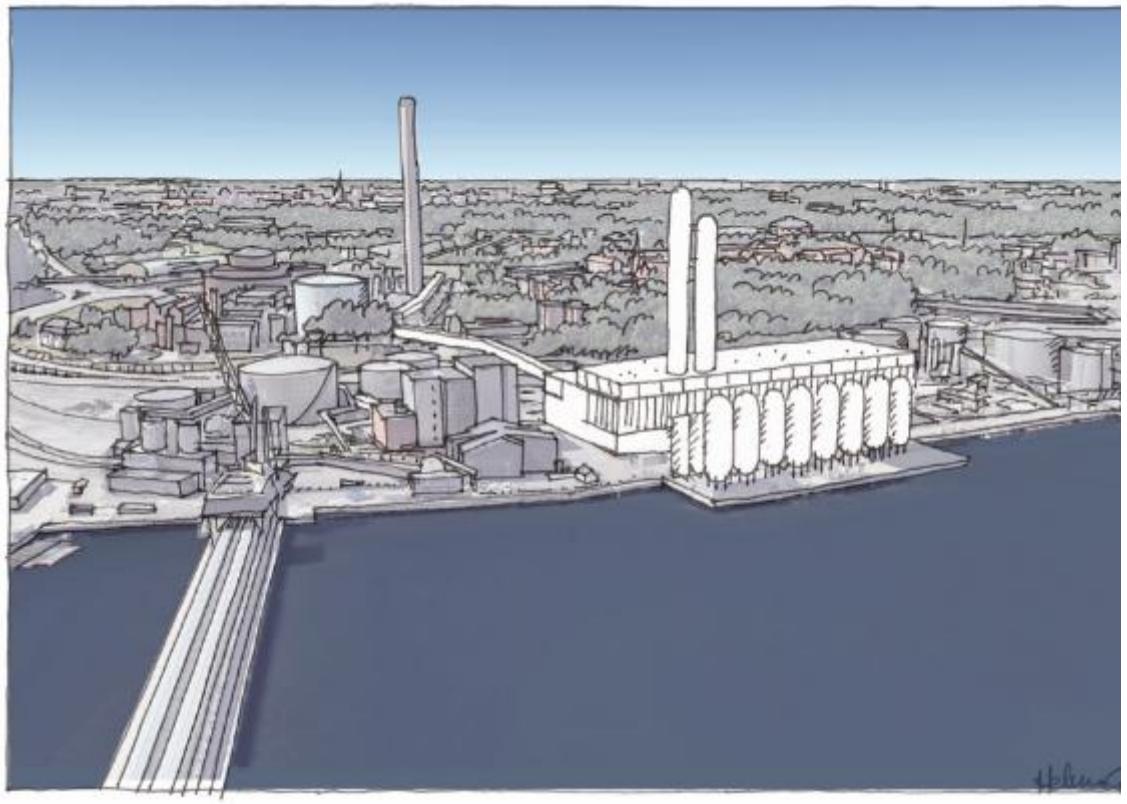
European Commission

# *Beccs Stockholm*

***Objective:*** Capture of 800 kt biogenic $CO_2$ by the end of 2026 from an existing bio fuel fired heat & power plant (KVV8)

***Location and participants:*** Located at Värtaverket, Stockholm, in the heart of Stockholm's district heating system. Implemented by Stockholm Exergy, Sweden's largest district heating company. (Owned by the City of Stockholm and Ankhiale.)

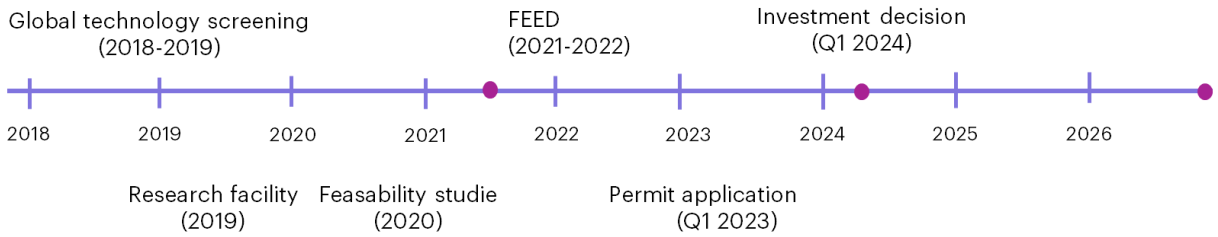
***Project overview:*** *Investment in a post-combustion Carbon Capture facility based on HPC technology, as well as liquefaction and intermediate storage for further transport of the* $CO_2$



Funded by the European Union

# *CO2 transport and storage needs*

- The project will capture 140 t per hour or ~100 kt per month at full load. 800 kt on a full season due to seasonality (lower summer load)
- FID planned to Q1 2024 with hot commissioning Q4 2026. Contracting of EPC-partners will be finalised during April 2023
- Optimisation of transports ongoing with multiple storage sites in consideration. 11 m draft with day light restrictions. ~16 000 ton on site storage planned. (Base case 12-18 kton vessels)
- Final storage site not yet appointed/selected. Coordination of time lines and project milestones crucial




- CO2 HUB in Norvik south of Stockholm investigated together with Port of Stockholm and other potential $CO_2$ Capturers in the region
- Aim is to finance the project in a combination of EiF grant, Swedish reversed auction and the voluntary carbon market
- Pre studies on further CCS implementation on two WtE-plants in Stockholm Exergi´s network initiated

Funded by the European Union

# ANRAV

European Commission

# CCUS ANRAV / Bulgaria

Anrav is the first project funded by the Innovation Fund in Eastern Europe and first CCUS project in that region. Devnya Cement AD, part of Heidelberg Materials, is the Coordinator and main beneficiary.

**Amount of Innovation Fund Grant:** EUR 189,694,949

**Strategic Partner:** Petroceltic Bulgaria EOOD

| $CO_2$ capturing | $CO_2$ transport. | $CO_2$ storage |
|---|---|---|
| Amine technology<br>Oxyfuel technology | Through a pipeline | Storage in the Black Sea (depleted gas field) |



ANRAV
GREEN FUTURE SOLUTIONS

**Konstantin Bojinov**
Project Manager of ANRAV

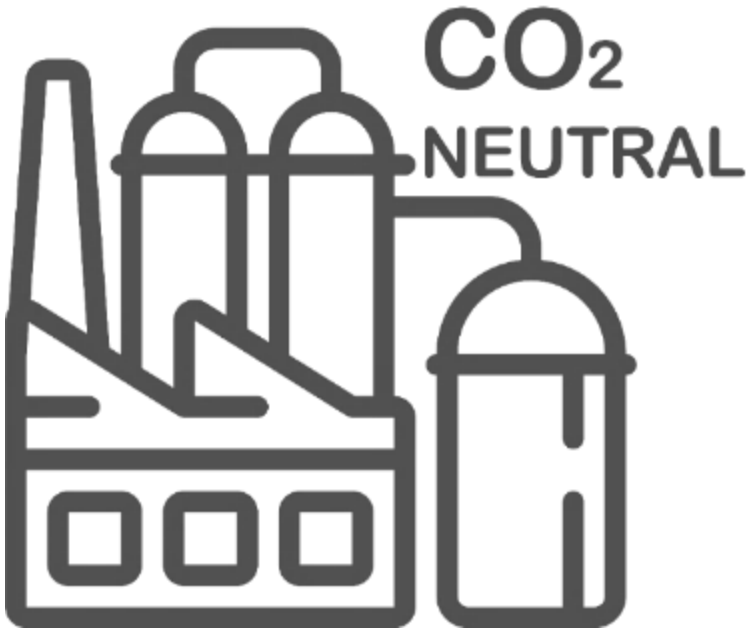
Co-funded by the European Union

# CO2 TRANSPORT AND STORAGE NEEDS

**Technology:**
Combining two innovative technologies Amine and Oxyfuel

**Range:**
Capture, liquefaction, transport and safe storage

**Annual quantity of captured carbon emissions:**
Approximately 800 kt/ CO2 per year (approximately 99.2% of the emissions of Devnya Cement AD on an annual basis)




Co-funded by
the European Union

# ANRAV TIMELINE

**2023**
Project Start

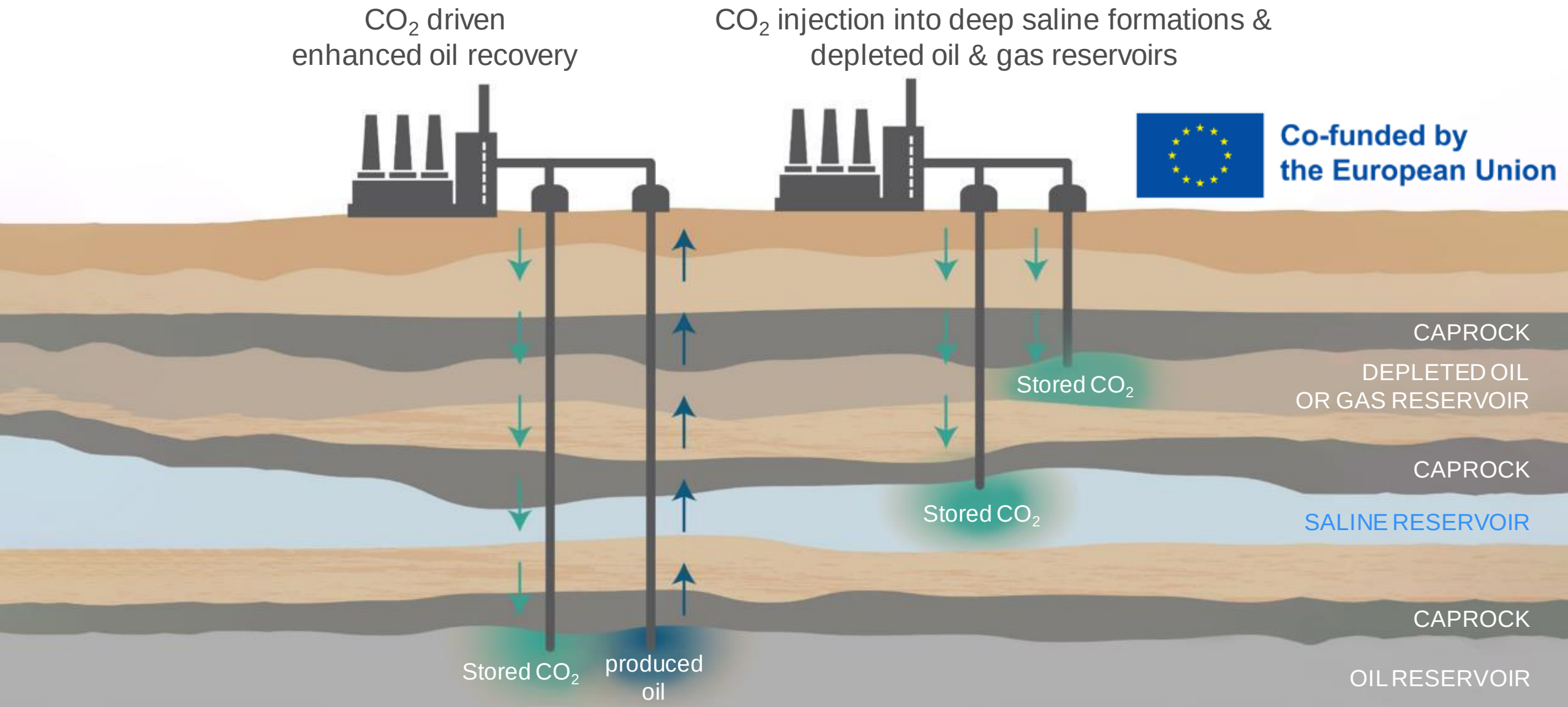
**2024**
Final Investment Decision

**2025**
Construction Phase

**2028**
Commissioning


Co-funded by
the European Union

# PROCESS OF CAPTURING AND STORAGE



# ANRAV CHALLENGES & BENEFITS

Challenges:

- No history of Bulgarian projects;
- First CCUS project in Eastern Europe;
- Choosing the right team;
- Public acceptance;

Benefits:

- Carbon capture and storage focus of the fund;
- Fund scope;
- Clear and transparent application;
- Easy application platform;
- Clear reporting structure;
- Know-how and professional CCUS background of Innovation Fund;
- Good experience within the group Heidelberg Materials.


Co-funded by
the European Union

# Agenda

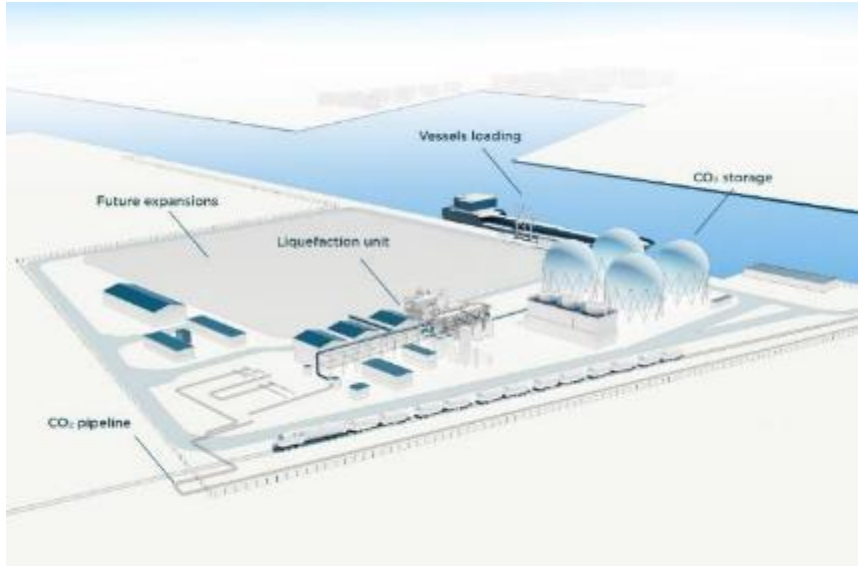
| | |
|---|---|
| **1. Policy introduction & update by the Commission services** | (9:30 - 10:00h) |
| **2. CO2 storage developments in MS – part 1** | (10:00 - 11:00h) |
| *11:00 – 11:30h Coffee break* | |
| **2. CO2 storage developments in MS – part 2** | (11:30 - 12:30h) |
| **3. Storage support programmes in Europe** | (12:30 - 13:15h) |
| *13:15 – 14:30h Lunch break* | |
| **4. Needs of CO2 capturing projects supported by the Innovation Fund** | (14:30 - 15:15h) |
| **5. Cross-border CO2 network developments supported by TEN-E** | (15:15 - 16:00h) |
| *16:00 – 16:30h Coffee break* | |
| **6. Questions and moderated open discussion** | (16:30 - 17:30h) |
| *17:30h End of the meeting* | |

*Antwerp@C*

European Commission

# Antwerp@C CO2 Export Hub

- Participants: Air Liquide, Fluxys & Port of Antwerp-Bruges
- Location: Antwerp port platform, Belgium
- Open-access and modular CO2 transport & export facilities:
  - 22-km pipeline connecting emitters on the Antwerp port platform
  - First-of-a-kind CO2 liquefaction and export terminal
  - Innovative, energy-efficient CO2 liquefaction process
- First phase of broader Antwerp@C initiative:
  - 2,5 Mtpa initial export capacity, scalable to up to 10 Mtpa
  - Launching customers: Kairos@C (Air Liquide & BASF)
  - Open to all interested CO2 emitters in Antwerp and beyond
- Supported under CEF-Studies and CEF-Works programs




Air Liquide

fluxys

Port of Antwerp Bruges

Funded by the European Union

# Development status and challenges

- Overall progress:
  - Permit applications:
    - Terminal: submitted in Dec 2022
    - Network - South: granted; North: submission foreseen in April 23
  - Front-end engineering studies completion: 2Q 2023
  - FID: end of 2023
  - Entry into Operation: H2 2026
- Open to all permanent storage options (no “bundled” offers)
- Challenges:
  - Capex and energy cost increasing due to Ukraine & energy crisis
  - No harmonized CO2 specifications
  - How to ensure consistent commercial & operational principles along the CCS chain (scheduling rules, liability scheme…)

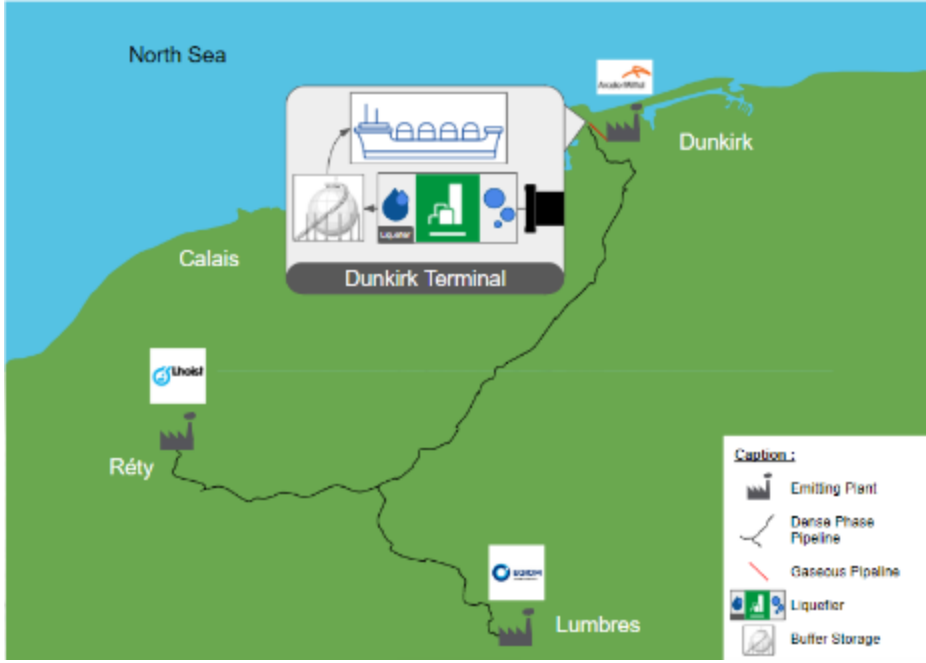

Air Liquide fluxys Port of Antwerp Bruges

Funded by the European Union

# *D'Artagnan*

# *D'Artagnan*

## *Standalone PCI in the 5th list*
## *Part of the Nautilus candidate PMI for the 6th list*




Extract from Nautilus candidate PMI application

- Main D'Artagnan participants: Air Liquide France Industrie (coordinator), Chaux et Dolomies du Boulonnais (Lhoist), EQIOM & ArcelorMittal France
  GRT Gaz & Dunkerque LNG are now part of the Dunkirk area of the Nautilus candidate PMI

- Overview:
  - Open access CO2 primary infrastructures.
  - CO2 collection from various emitters' sites in the Dunkirk harbour and its hinterland
  - Liquefaction and collection in intermediate storages in the Dunkerque harbour prior to its export by ship to permanent storage locations in the North Sea
  - In total, it is expected to start in 2027 and capture up to 2.0 Mtpa of CO2 by the end of 2028, 4.4 Mtpa by 2031 and further expand later on

Funded by the European Union

# *D'Artagnan*

## *Status and challenges*

- CEF Energy E Studies award for the transportation infrastructure including terminal
  - CO2 transport by pipeline : routing defined, detailed studies and permitting initiated
  - CO2 terminal : permitting initiated, FEED studies to start in April 2023
- Construction to begin early 2025, after the Final Investment Decision, until end 2027
- Open to all storages - no privileged access to any storage provider
- Sinks & receiving terminals listed in Nautilus PMI application: Errai (Horisont Energi & Neptune Energy), Northern Lights, Carbfix, Fidelis, BiFrost, CO2Next
- Challenges:
  - Cost-based and transparent tariffs, based on a cost+ approach rather than on supply and demand principles
  - Fair and balanced terms and conditions / fair sharing of risks and liabilities
  - Open access to CO2 transport and storage infrastructures
  - Unbundled access to shipping and storage services

Funded by the European Union

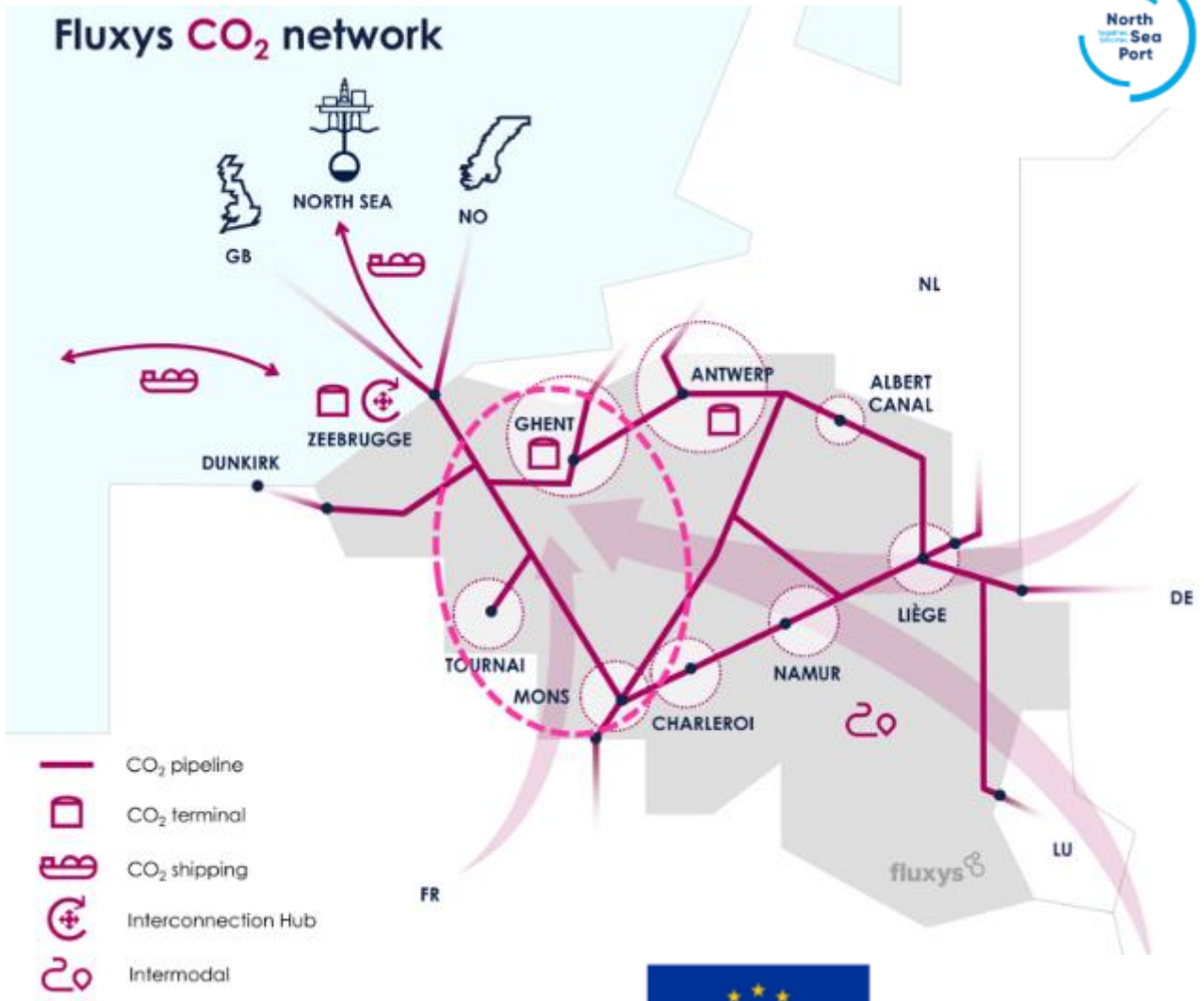
# *Ghent Carbon Hub*

European Commission

# Ghent Carbon Hub

## $CO_2$ hub for Belgium

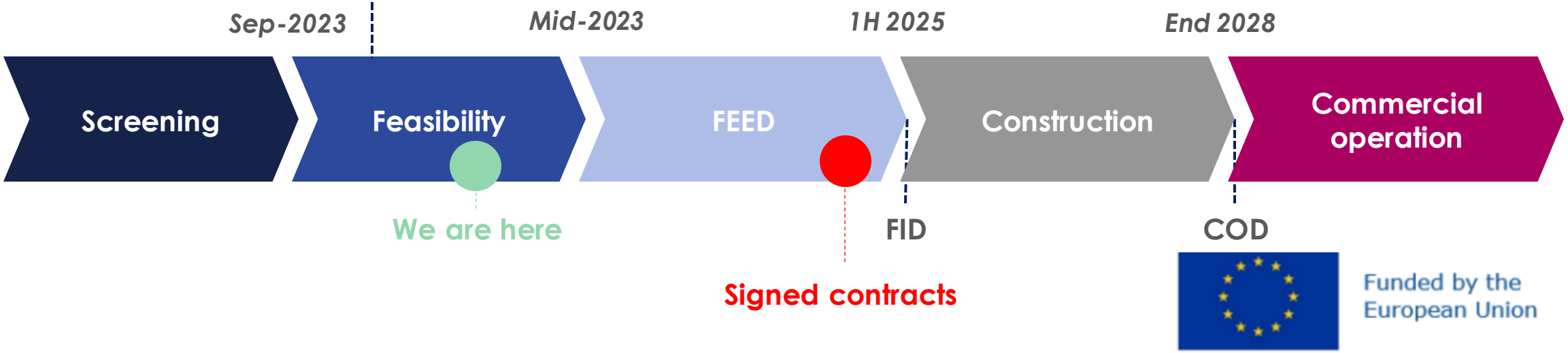
- Fluxys aims to provide an **efficient transport solution** for $CO_2$ emitters
- Ghent Carbon Hub is an **exit location** of the envisaged Fluxys' $CO_2$ network in Belgium
- The project concerns the development of **an open access scalable $CO_2$ terminal** for North Sea Port industry & hinterland, led by Fluxys and supported by ArcelorMittal and North Sea Port
- Providing **pipeline transport solution** for emitters located in Ghent and Wallonia
- Contacts are ongoing with multiple emitters, some of them are currently applying for **Innovation Fund**




Funded by the European Union

# $CO_2$ cross-border network developments

- **Scalable terminal** up to 6 Mtpa, developed at market pace
- **Kick-start of network** accommodating $CO_2$ transport from Belgian emitters and neighbouring countries towards Belgian exit points in Ghent, Antwerp, Zeebrugge,…
- Export of $CO_2$ will be possible to **multiple storage sites**
- **International standard** for $CO_2$ specifications (P, T, quality) to be developed urgently
- Success of project driven by **simultaneous development** of the full $CO_2$ value chain




Funded by the European Union

# *Aramis*

European Commission

ARAMIS

# The emerging EU CO2 transport and storage market

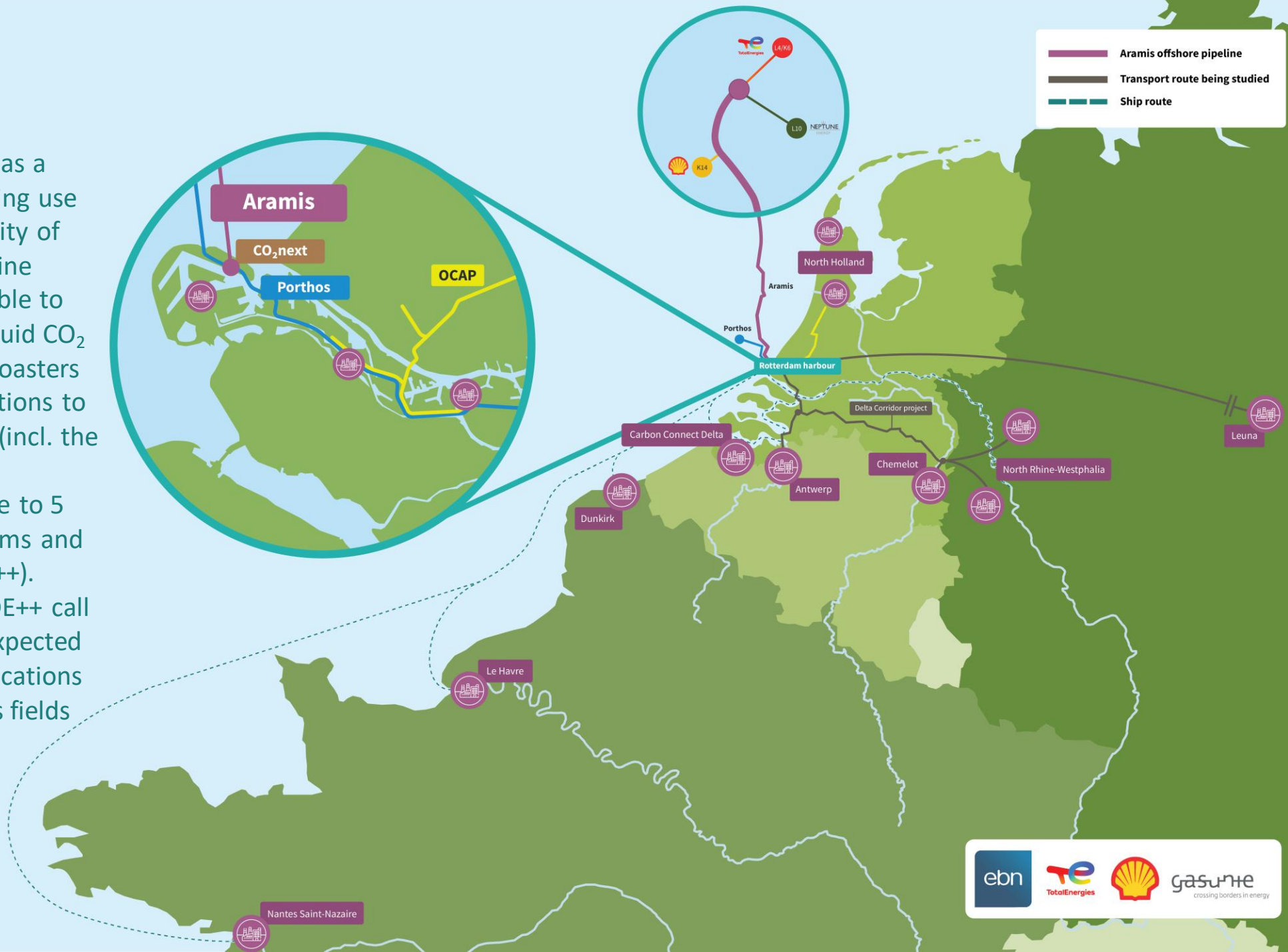
## Aramis Project of Common Interest (PCI 12.7)

Joep Sweyen (EBN) / Lex Backer (Shell)

30 March 2023

# ARAMIS

- Aramis offshore pipeline has a capacity of 22 Mtpa enabling use of the 7.5 Mtpa overcapacity of the Porthos onshore pipeline
- $CO_2$next terminal will be able to hold up to 40.000m$^3$ of liquid $CO_2$ and serve both barges & coasters
- Aramis will enable connections to several European clusters (incl. the Delta Corridor project)
- 7 Launching emitters (close to 5 Mtpa) signed Heads of Terms and applied for subsidies (SDE++). More expected in 2023 SDE++ call
- Overall storage capacity expected >400Mt. First license applications for storage in depleted gas fields have been submitted
- In permitting since Jan'22
- Re-applied for PCI-status



# Timeline

**STEP 1**

2019-2021

Feasibility study and setting-up of partnerships. Received EU PCI-status

**STEP 2**

2022-2024

Design of the concept jointly with emitters and other stakeholders. Apply for CEF subsidies. Aim to start FEED in summer 2023

**STEP 3**

2025-2026

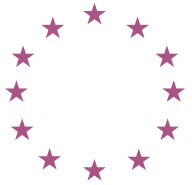
Construction phase. Modular design for Terminal & Compression. First phase possibly up to 10 Mtpa capacity

**STEP 4**

End-2027

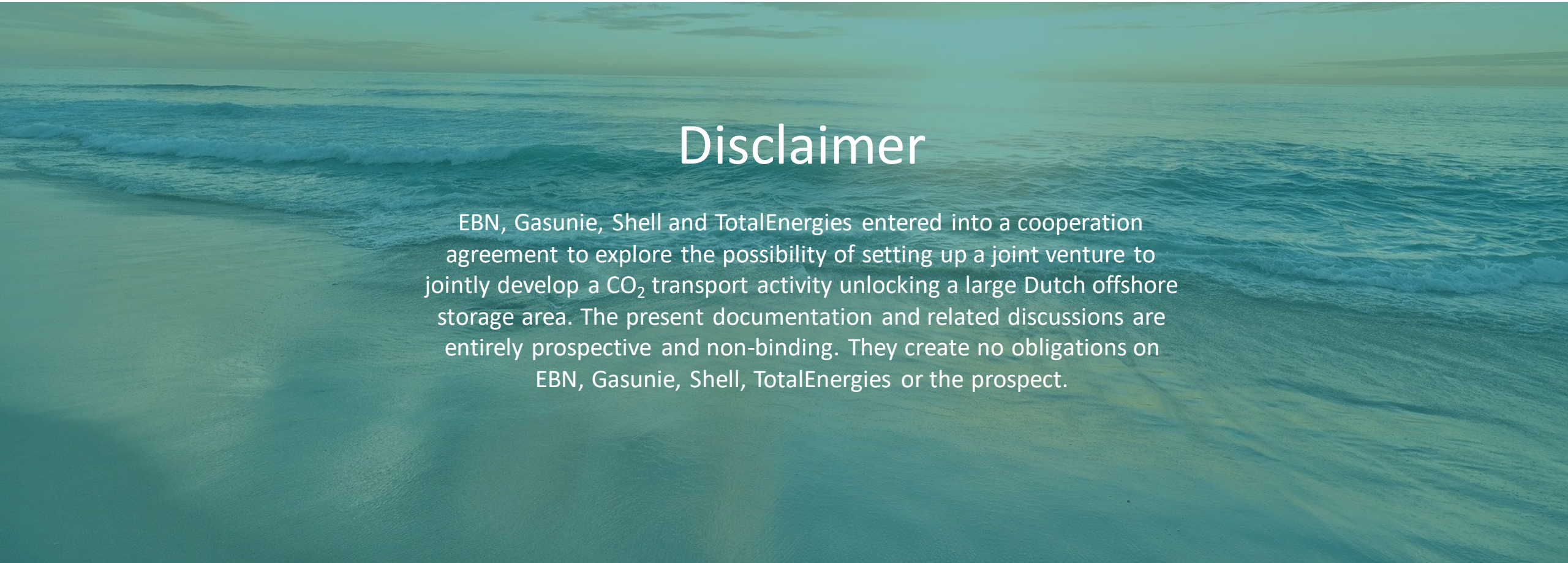
Go-live. First $CO_2$ transport & storage (will include a start-up and ramp-up period)

**STEP 5**



Beyond 2027

Expansion with cross-border $CO_2$ transport and eventually scale-up to >20 Mtpa after 2030 depending on demand for storage



ARAMIS

# Disclaimer

EBN, Gasunie, Shell and TotalEnergies entered into a cooperation agreement to explore the possibility of setting up a joint venture to jointly develop a $CO_2$ transport activity unlocking a large Dutch offshore storage area. The present documentation and related discussions are entirely prospective and non-binding. They create no obligations on EBN, Gasunie, Shell, TotalEnergies or the prospect.

# *PL-EU CCS Interconnector*

European Commission

## *PL-EU CCS Interconnector (currently ECO2CEE) Project – the scope and objectives of the project*

PL-EU Interconnector (currently ECO2CEE) Project has an ambition to establish an open access multi-modal $CO_2$ import - export terminal ('$CO_2$ Hub') in Poland with related $CO_2$ transport infrastructure as well as linking the biggest Lithuanian emitters to the planned multi-modal export terminal in the Lithuanian port of Klaipeda. The Project will create a common area on the Southern Baltic coast from which $CO_2$ can be shipped to storage sites in the North Sea basin and the Baltic Sea basin (in the future).

The Project will rely on 4 key promoters (Air Liquide Polska, Lafarge Cement, PKN ORLEN and ORLEN Lietuva) as well as several affiliated entities. The project objective is to connect the main industrial $CO_2$ emitters in Poland and Lithuania to the CCS chain (under development in the North Sea) for permanent storage.

## *What are the expected volumes of captured CO2 that can be collected, liquified and stored?*

The project is scheduled to transport 2.5M Ton of CO2 per year between 2027-2030 period, reaching 8.7M Ton of CO2 between 2031-2032 period and up to 9M Ton of CO2 from 2033 leading to a significant impact in global warming prevention.

Circa about 8.7 Mt of CO2 will come from Poland and rest of CO2 will come from Lithuania. Thus, this project will directly contribute to the ambitions of the Paris Agreement, the Polish low carbon strategy until 2040, the National energy and climate action plan of the Republic of Lithuania, and more globally to the objectives of the European Union towards carbon neutrality in 2050.

Funded by the European Union

## *Timeline*

| Name of the study | START | END |
|---|---|---|
| Conceptual and Cost Estimation for Hub | 3Q2022 | 2Q 2023 |
| Feasibility studies for transportation (rail, barges, pipeline) | 1Q 2023 | 4Q 2024 |
| Civil Engineering Design and Construction phase of $CO_2$ Hub in Poland | 4Q 2023 | 4Q 2026 |
| Construction phase of the Lithuanian part of the ECO2CEE | 2Q 2030 | 1Q 2032 |

## *What are the permanent storage option/s considered for the collected CO2 emissions?*

$LCO_2$ ships will follow normal shipping lanes between the ports and different potential connections to storage sites in the North Sea. Potential locations are: Kollsenss (Norway), Peterhead (UK), Teeside (UK), Rotterdam (the Netherlands), Bifrost location in Denmark, terminal in Wilhelmshaven (Germany). At these locations, CO2 might be unloaded and sent by pipeline to the local sequestration site.

The ECO2CEE project provides for the construction of the LCO2 Hub in the port in Gdansk. Thanks to the location, the accessibility to many possible storage locations by sea or inland waterway will allow to reach them in a typical round-trip time of 3 to 8 days, depending on the selected location.

## *How advanced is the project implementation, e.g. the activities completed?*

Work done: Location study (confirmed location).

In the middle of the Conceptual / Cost Estimation Studies and Feasibility Studies for transportation

Funded by the European Union

# Agenda

| | |
|---|---|
| **1. Policy introduction & update by the Commission services** | (9:30 - 10:00h) |
| **2. CO2 storage developments in MS – part 1** | (10:00 - 11:00h) |
| *11:00 – 11:30h Coffee break* | |
| **2. CO2 storage developments in MS – part 2** | (11:30 - 12:30h) |
| **3. Storage support programmes in Europe** | (12:30 - 13:15h) |
| *13:15 – 14:30h Lunch break* | |
| **4. Needs of CO2 capturing projects supported by the Innovation Fund** | (14:30 - 15:15h) |
| **5. Cross-border CO2 network developments supported by TEN-E** | (15:15 - 16:00h) |
| *16:00 – 16:30h Coffee break* | |
| **6. Questions and moderated open discussion** | (16:30 - 17:30h) |
| *17:30h End of the meeting* | |

# Challenges to turn into opportunities

- Sufficient capacity
- Open access
- Easy, fast, secure, agile T&S service / infrastructure
- Reasonable prices: what does this mean?
- Technical specifications
- Public support

# Open discussion: How can we structure the market in the best way? Who? EU/MS/projects alone/bilaterally?

- Regulation
  - Transparency: CO2 storage and capture capacities
  - Match-making?
  - Regulated tariffs and other rules to ensure open access
- Infrastructure
  - Planning: EU, regional, MS, projects
- Risks: technical, financial, regulatory, liabilities
  - Common liabilities/risk fund? EU, MS, insurance market, projects
- Public acceptance
  - Should the EU do more? How? MS? Or left to each project?
- Funding
- Technical specifications & Standards

# Next steps for the Commission

- **Public summary report** of the discussion today
- We will continue to host **knowledge-sharing meetings for projects and/or Member States** (“regulatory & market sandbox”).
- By the end of 2023:
  - Adoption of **CCUS Strategy Communication** (Q4 2023)
  - **Assessment of CO2 capture and storage needs in MS** as notified in draft **National Energy and Climate Plans (NECPs)** (due by June 2023)
  - **6th PCI list will be adopted in Q4 2023,** with CO2 Storage eligible

# Thank you
# &
# see you next time!

European Commission

# Where to find more information on the Innovation Fund?

**All (past) call documents available on the Funding and Tenders Portal including:**

- ✓ Guidance and calculation tools on GHG emissions and relevant costs
- ✓ Frequently asked questions

**https://europa.eu/!QB67by**

***Further info, planning of new calls, recorded webinars and videos available on the IF Website:***

**https://europa.eu/!rx34Dt**

***Innovation Fund - YouTube***

**https://bit.ly/2WxK8w7**


European Commission