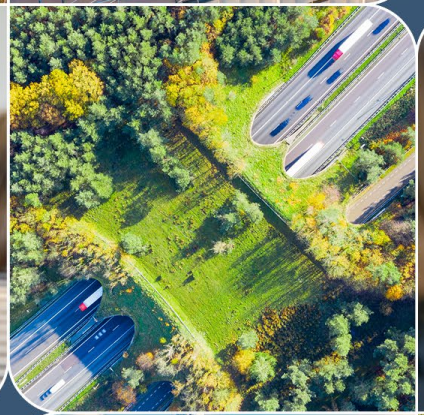
CCS Netherlands Portfolio Developments

20 March 2024, Joris de Iongh









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Energising the transition

About Joris de Iongh

Integrated CCS Project/Asset Manager and Geoscientist with international experience in the Energy sector.

Very motivated to work in the Energy Transition, focusing on the realization of major CO2 storage projects that are foreseen in the Dutch offshore.

I have strong experience with project management of subsurface oriented operations and studies, including stakeholder management and business development.

Mission

Moving forward, faster, towards a sustainable energy system for all

In line with its public task, Energie Beheer Nederland (EBN) deploys its knowledge and connecting force to accelerate the implementation of Dutch energy and climate policy with the aim of achieving a sustainable, reliable and CO2-neutral energy system by 2050, at the lowest possible cost to society.

Societal motivations

Towards a sustainable energy system

Working towards a CO_2-neutral and integrated system

Security of energy supply

Ensuring that the system is resilient to the uncertainties the transition may bring

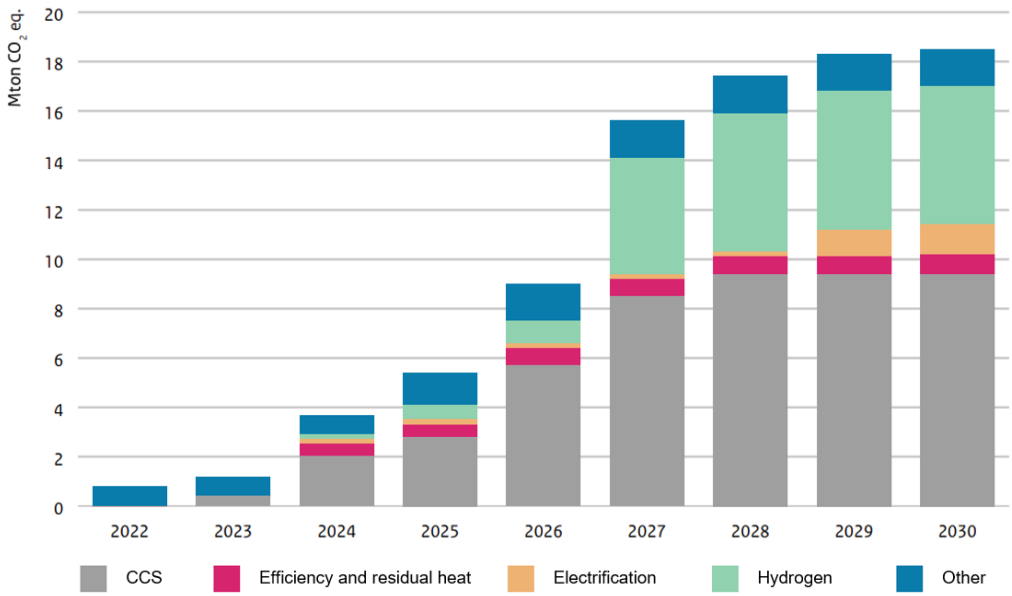
Value creation for society

Contributing to a just transition, together with and on behalf of society as a whole

CCS and Dutch Climate Targets

Dutch "Climate Agreement" and European Fit for 55-plans in the Netherlands:

- Ambition is 60% CO_2-reduction in 2030
- Industry: 18.8 Mton reduction towards 2030
- PBL plan: 9 Mton CCS in 2030 = **50%** of industry reduction

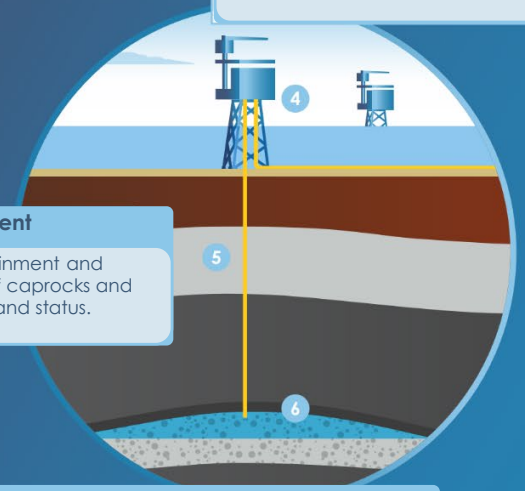


Graph source: Klimaatnota 2022

Why CCS in the Netherlands?

4. Offshore facilities

In place offshore infrastructure (platforms, interfiled pipelines and wells) available for reuse



5. Containment

Proven containment and knowledge of caprocks and well integrity and status.

6. Depleted gas field

50+ year production history and knowledge of the storage complexes.

ARAMIS

Storage: ~7.5 Mton per year (Initial)
Planning: Operational in 2028

Porthos

Storage Capacity: 37,5 Mton
Storage: ~2.5 Mton per year
Planning: Operational in 2026

3. Public-private

Experieced public-private partnerships with national regulatory schemes and policies in place (SDE++)

2. Rotterdam Hub

Rotterdam Port central location with short distance access to North Sea

1. Industrial cluster

Centralized industrial cluster and access to multiple EU industrial clusters

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Development of CCS in the Netherlands

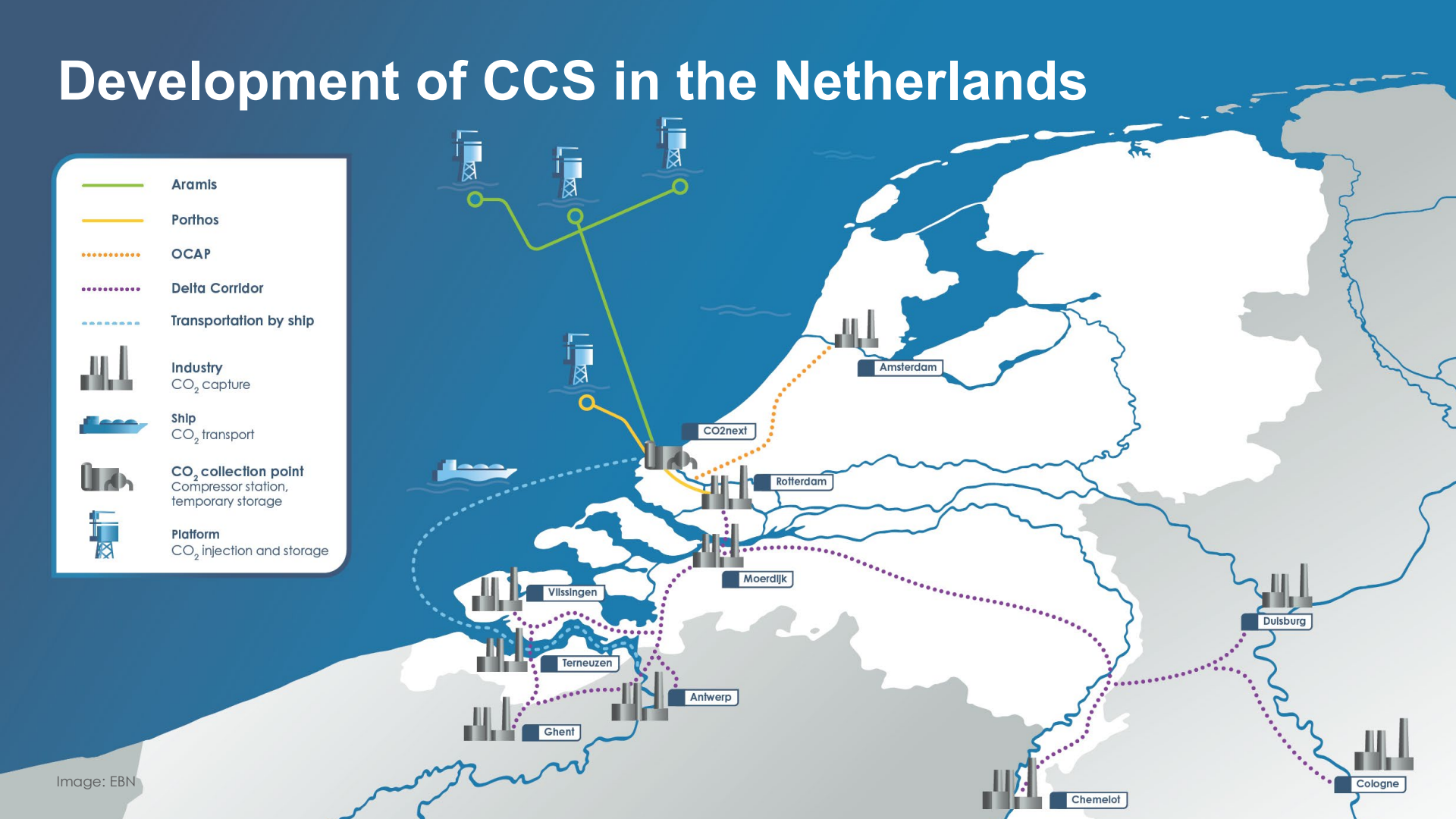
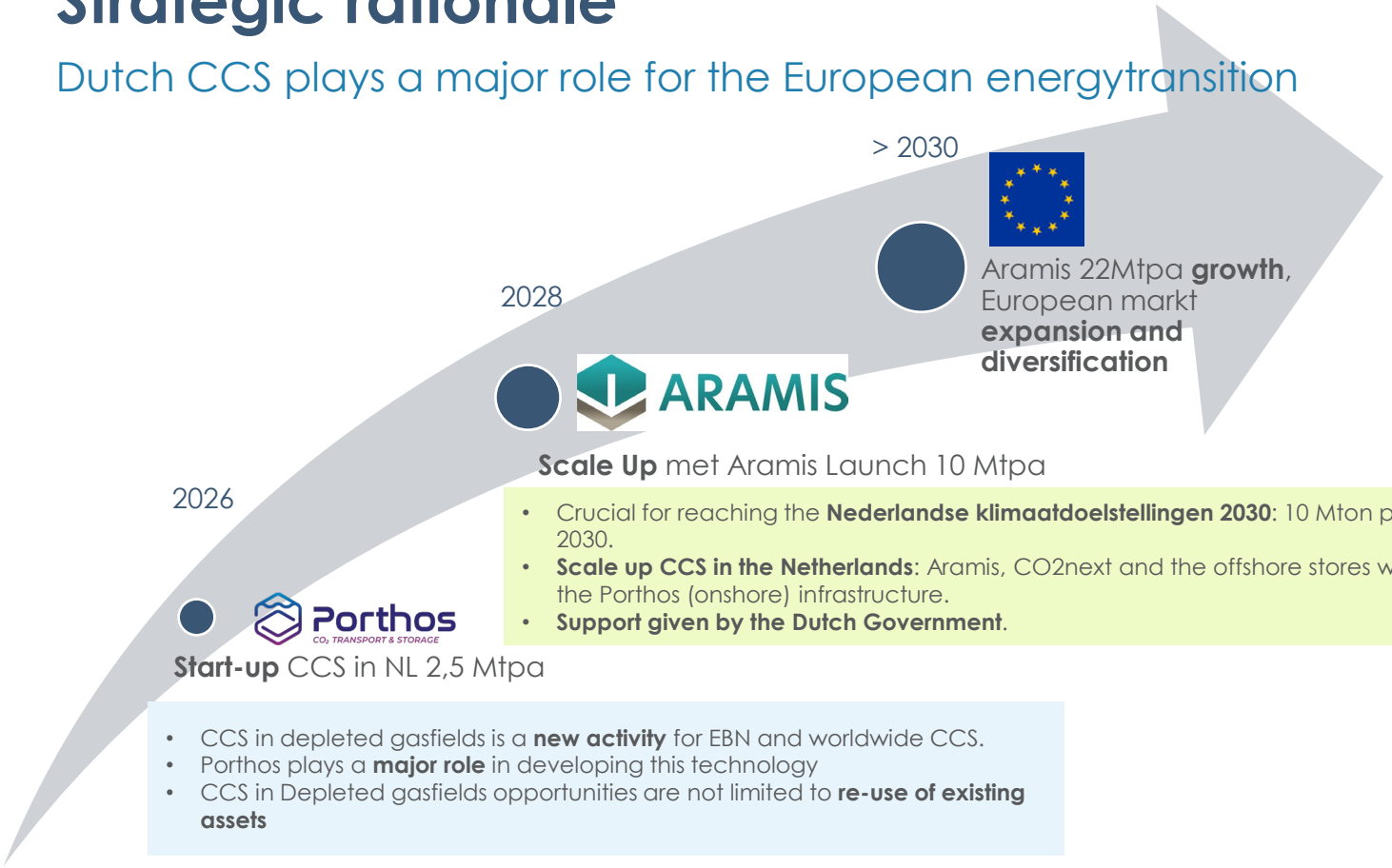


Image: EBN

Strategic rationale

Dutch CCS plays a major role for the European energytransition

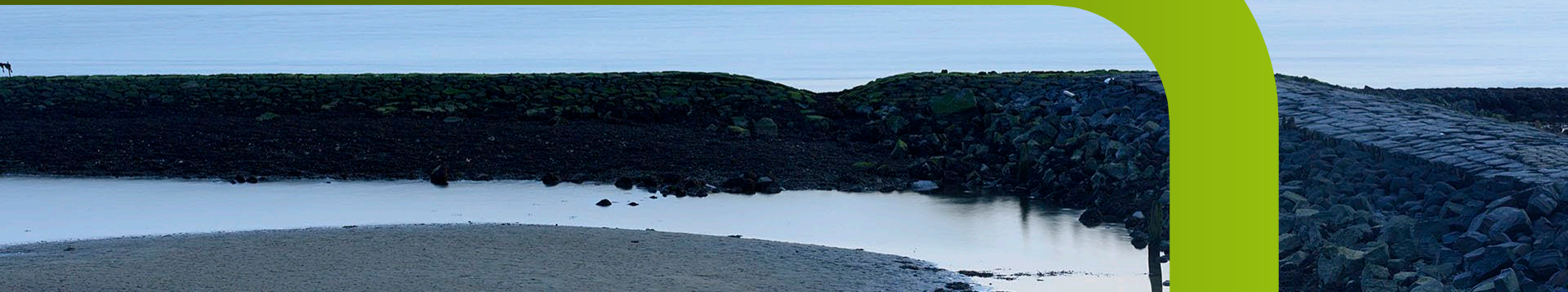


- Crucial for reaching the **Nederlandse klimaatdoelstellingen 2030**: 10 Mton per annum in 2030.
- **Scale up CCS in the Netherlands**: Aramis, CO2next and the offshore stores will build out of the Porthos (onshore) infrastructure.
- **Support given by the Dutch Government**.

- CCS in depleted gasfields is a **new activity** for EBN and worldwide CCS.
- Porthos plays a **major role** in developing this technology
- CCS in Depleted gasfields opportunities are not limited to **re-use of existing assets**

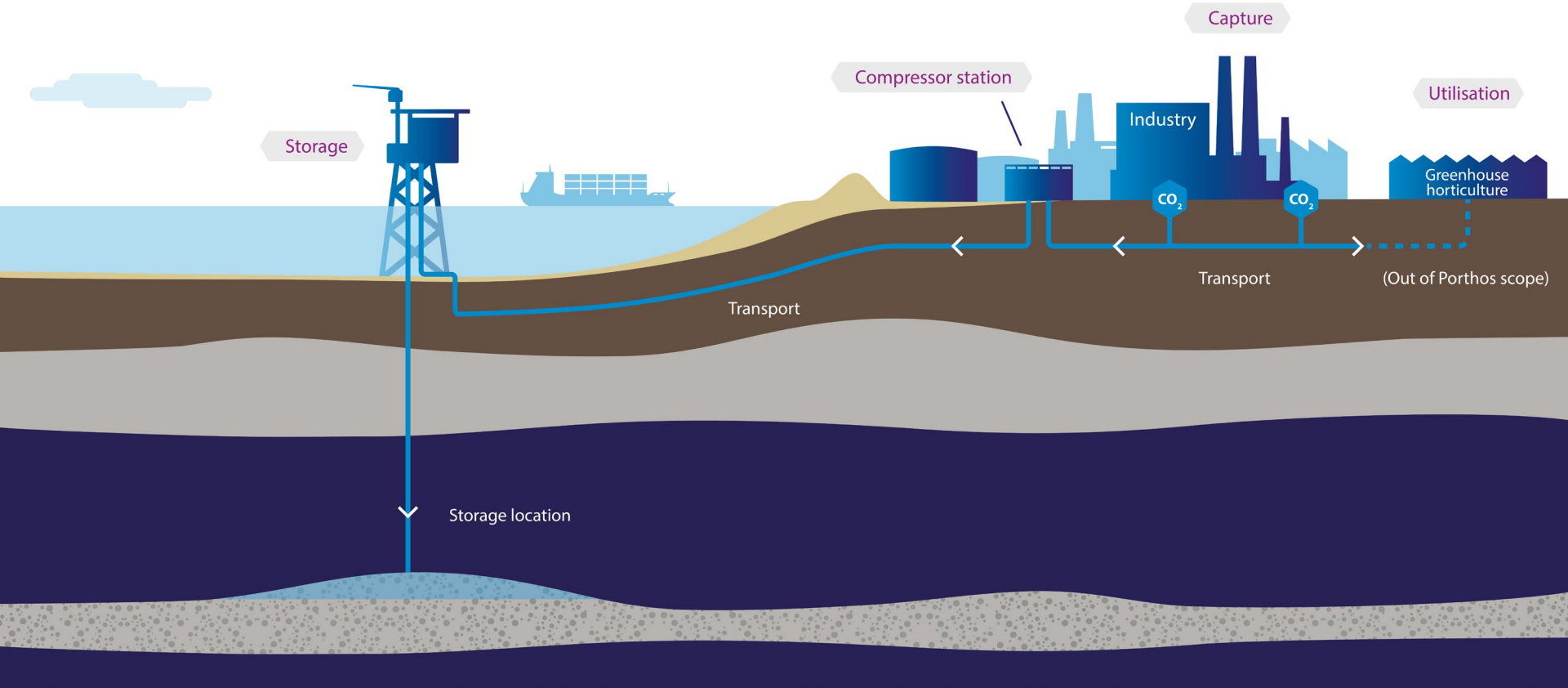
Responsible CO_2 storage

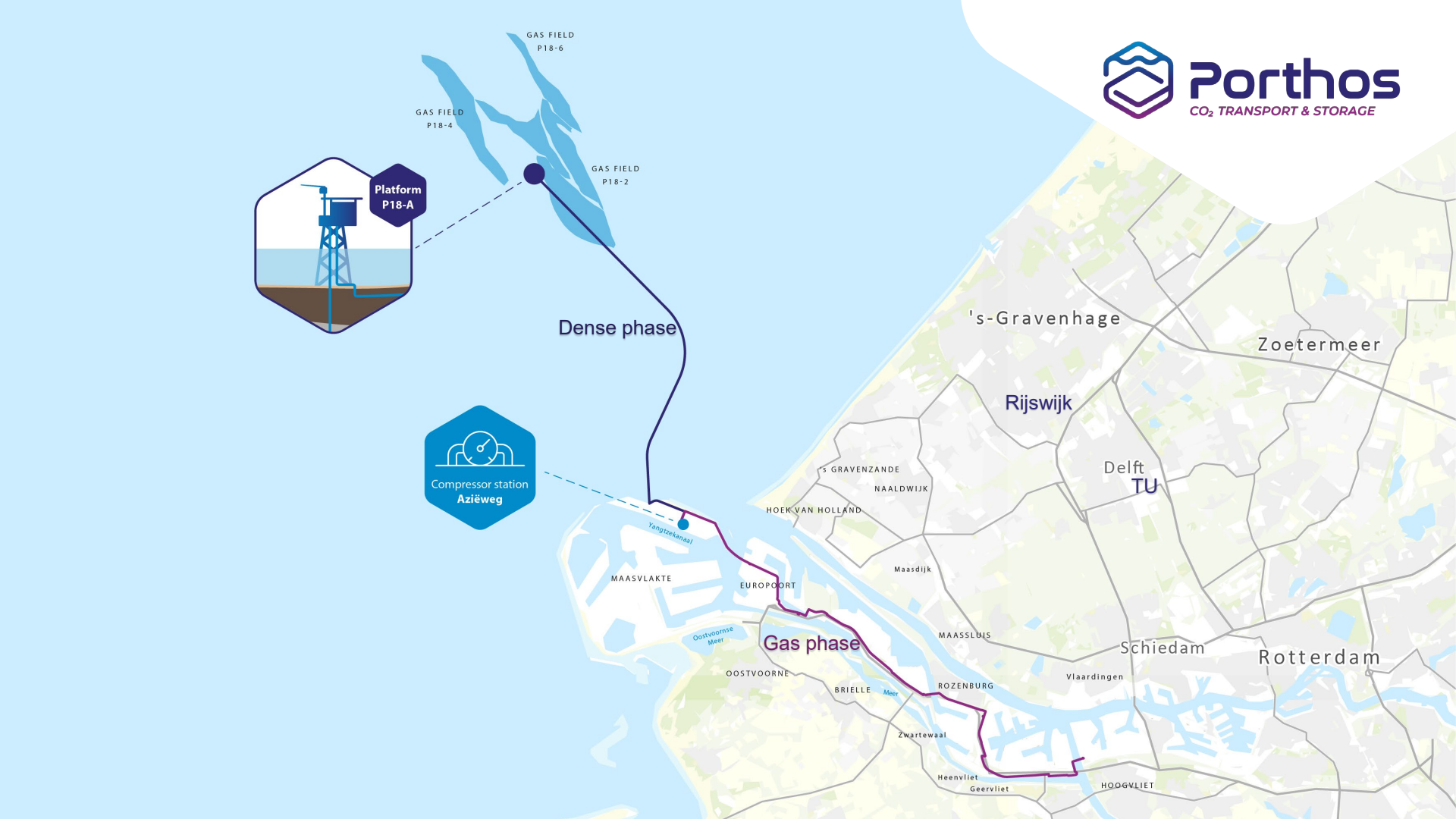
Porthos



Porthos CC(U)S system

Porthos
CO_2 TRANSPORT & STORAGE




Porthos
CO2 TRANSPORT & STORAGE
GAS FIELD P18-6
GAS FIELD P18-4
GAS FIELD P18-2
Platform P18-A
Dense phase
Compressor station Aziëweg
Gas phase
's-Gravenhage
Zoetermeer
Rijswijk
Delft
TU
's GRAVENZANDE
NAALDWIJK
HOEK VAN HOLLAND
Yangtzekanaal
Maasdijk
MAASVLAKTE
EUROPOORT
Oostvoornse Meer
MAASSLUIS
Schiedam
Rotterdam
OOSTVOORNE
BRIELLE
Meer
ROZENBURG
Vlaardingen
Zwartewaal
Heenvliet
Geervliet
HOOGVLIET

Storage

- From the platform to the P18 gas fields
- Re-use of existing platform and wells
- Natural closing through sealing layers

- ~ 20 km off the coast
- Depth: between 3.175 and 3.455 meter

- Capacity: ~ 37 Mton
- ~ 2.5 Mton CO_2 per year

Important conditions were met

Porthos
CO_2 TRANSPORT & STORAGE

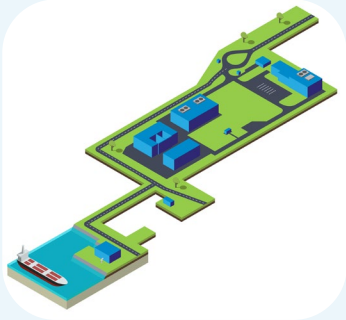
Contracts with customers
were signed, subsidies were allocated

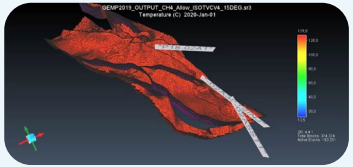
Air Liquide, Air Products, ExxonMobil, Shell


REUTERS

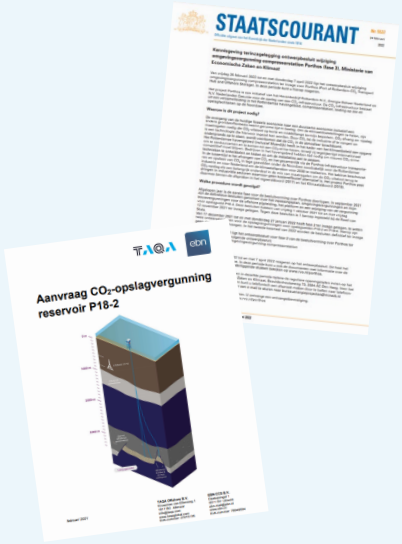
Dutch govt grants $2.4 bln in subsidies to huge carbon storage project

FEED engineering
was completed





Irrevocable storage permits
received from Ministry


STAATSCOURANT

Aanvraag CO_2-opslagvergunning reservoir P18-2

Successful decommissioning
of complex well

Porthos has taken FID

- 17 October 2023: Final Investment Decision (FID) was taken

What's next:

- Awarding contracts for realisation
- Ongoing preparations for construction phase
- Delivery of materials for onshore pipeline
- Finalising permits

- March/April 2024: start of construction
- 2026: system operational

Responsible CO_2 storage

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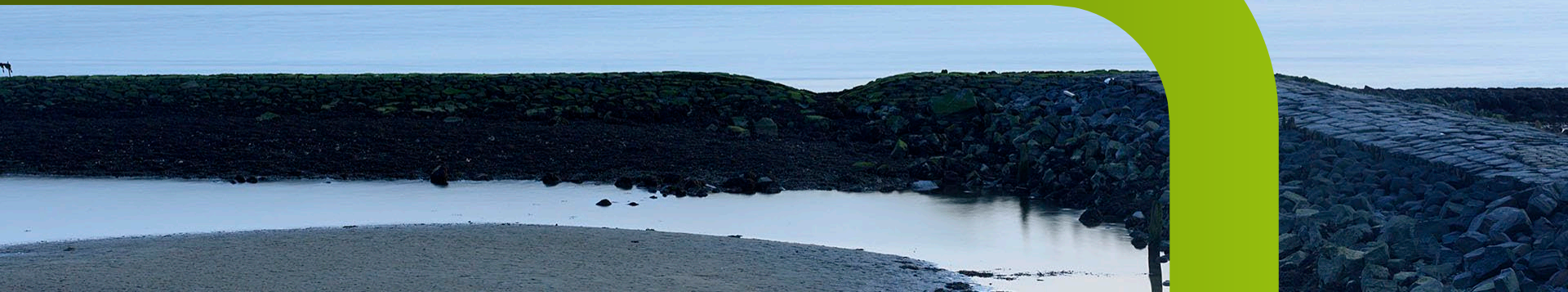
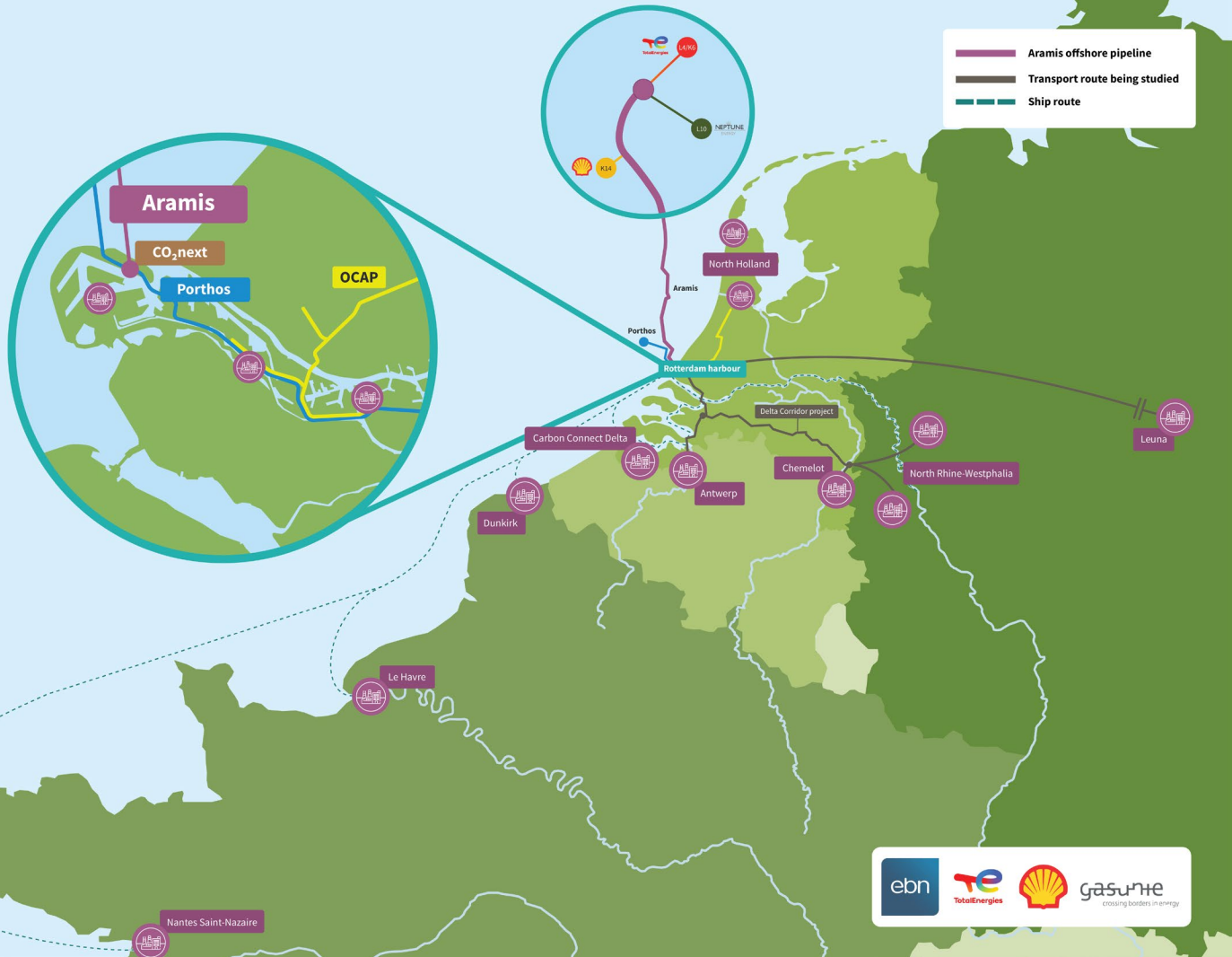
Aramis



ARAMIS

- Public-private partnership
- Open access & non-discriminatory terms and conditions
- Aramis offshore pipeline capacity of **22 Mtpa**
- Minimum **7,5 Mtpa** starting volume
- Overall storage capacity expected **>400 Mt**
- Aramis will enable connections to several European clusters
- Strong cooperation needed across the CCS value chain



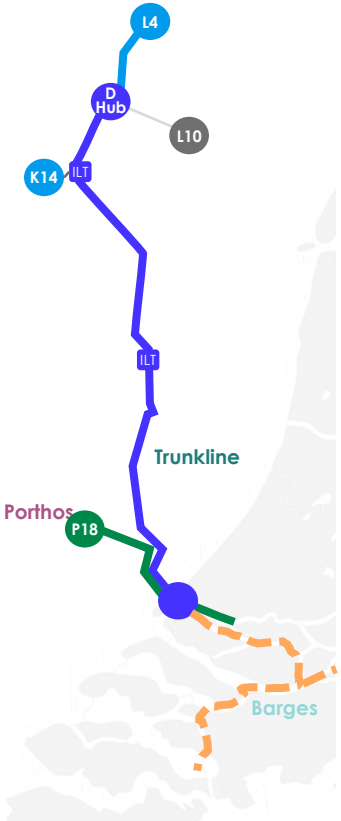
Project planning

ARAMIS
www.aramis-ccs.com

* in case of an appeal against the final permits, a one year delay of the Final Investment Decision and start-up is anticipated

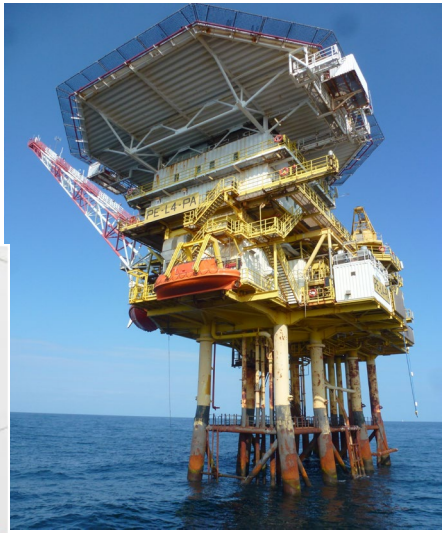
CCS Stores in depleted gas fields Aramis

Combination of New build and re-use of existing equipment

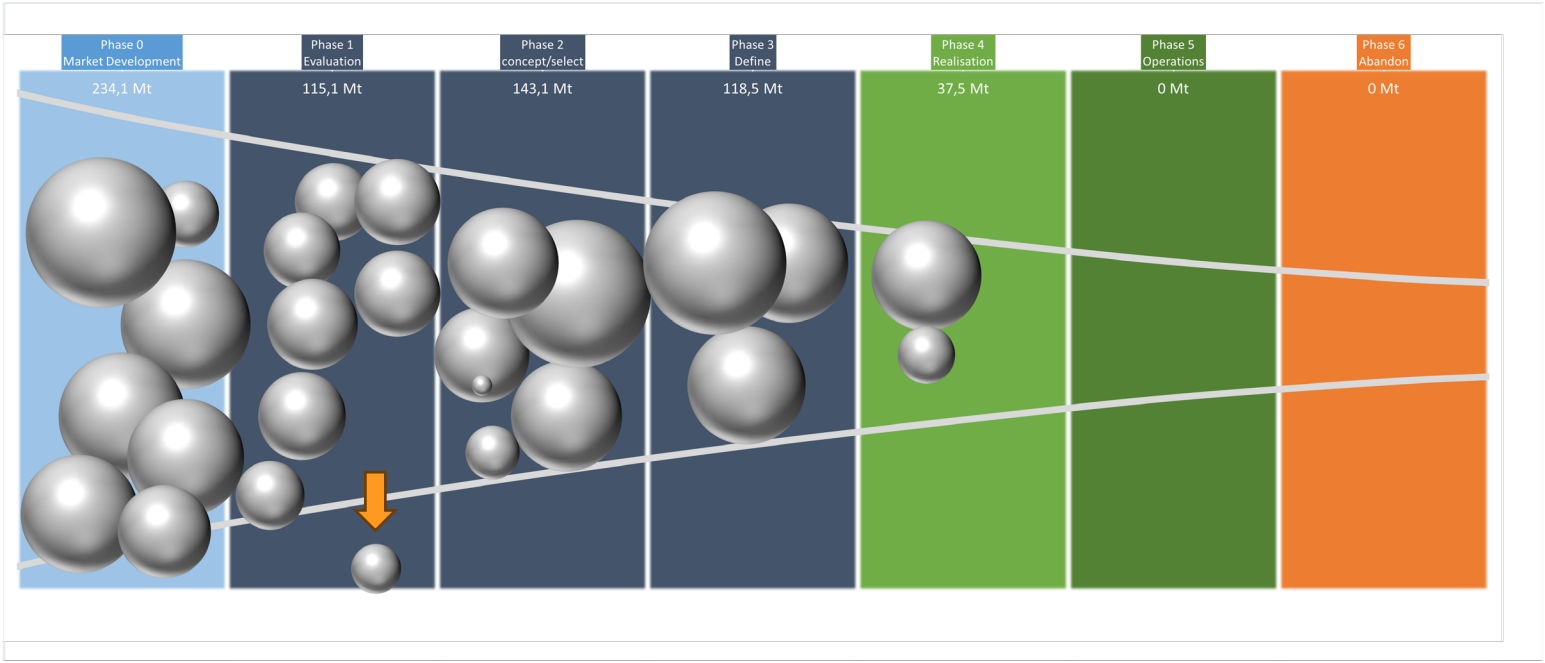


Example: L4-A operated by TotalEnergies

- 28 km Spurline from D-Hub to L4-A
- Re-use of the topside and jacket
- New electric powered crane
- Unmanned
- Solar panels / Wind turbines
- 4 Injection wells,
  - 2 side-track
  - 2 Slot recovery / Redrill
- 1 monitoring well
- First injection interlinked with Aramis, planned in 2028



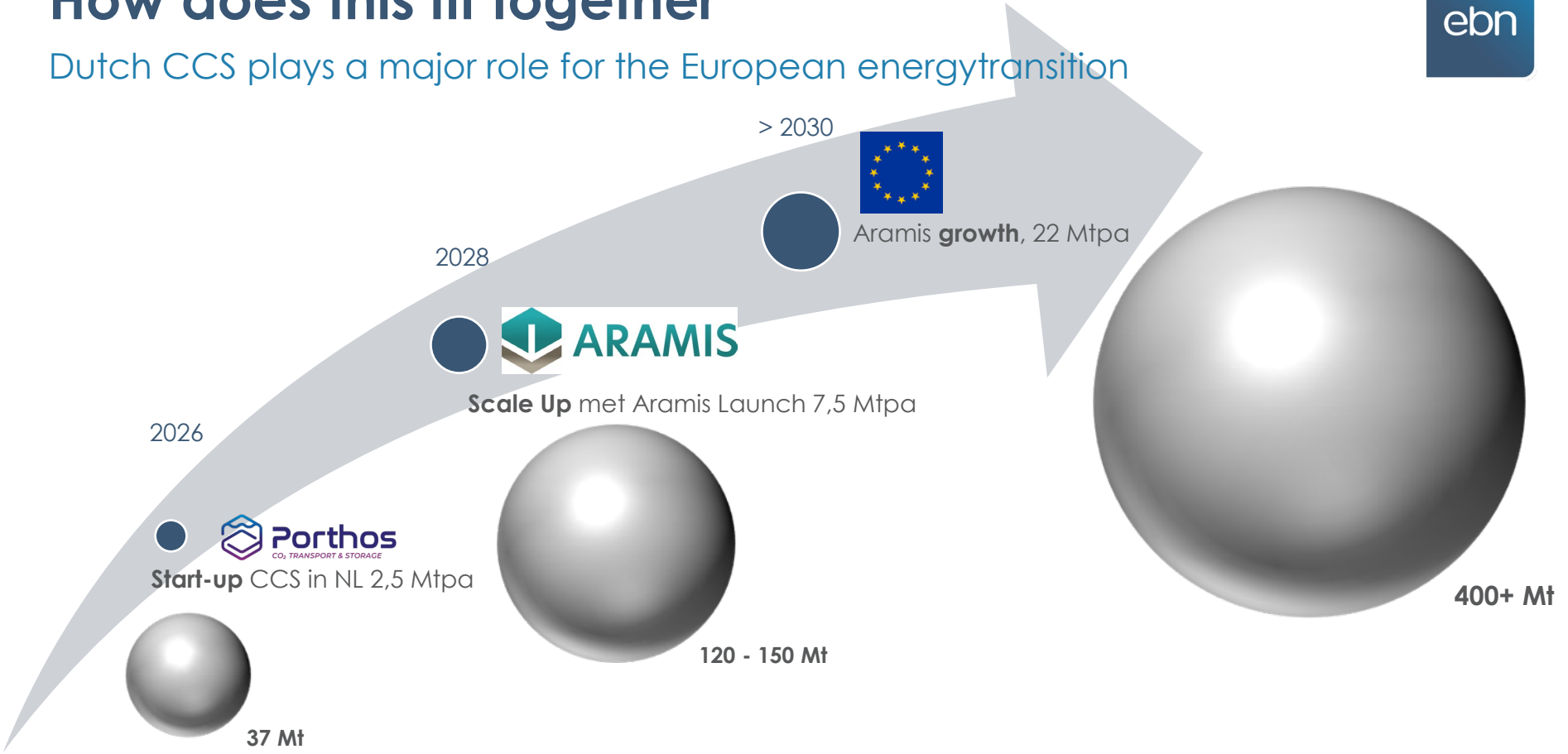
CCS Portfolio for Netherlands



Responsible CO_2 storage

How does this fit together

Dutch CCS plays a major role for the European energytransition



Thank you for your attention