



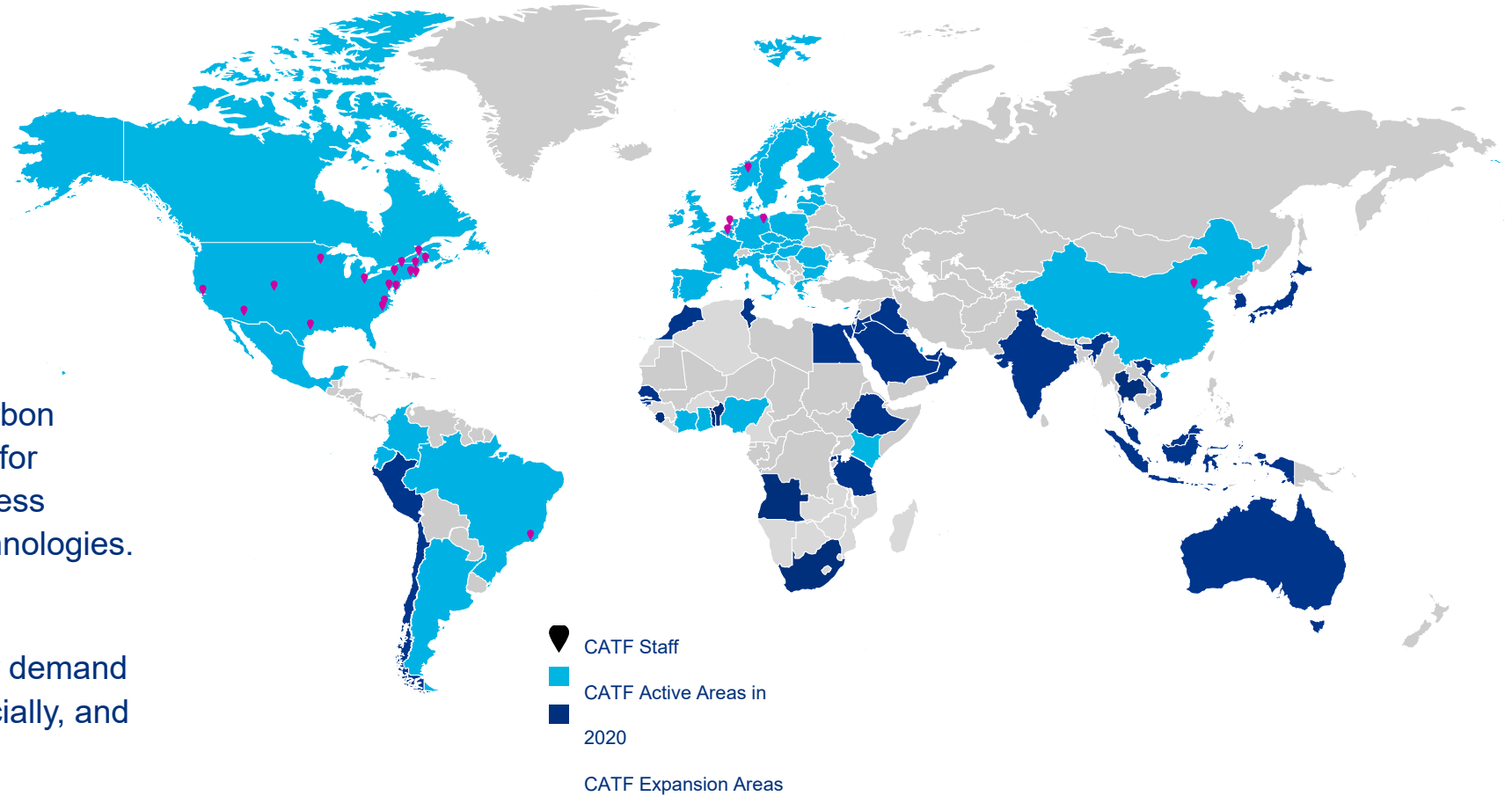
CLEAN AIR
TASK FORCE

Implications of the Net Zero Industry Act for CO₂ storage development in the EU

IEAGHG workshop on offshore geologic CO₂ storage, Aberdeen, 13th September 2023

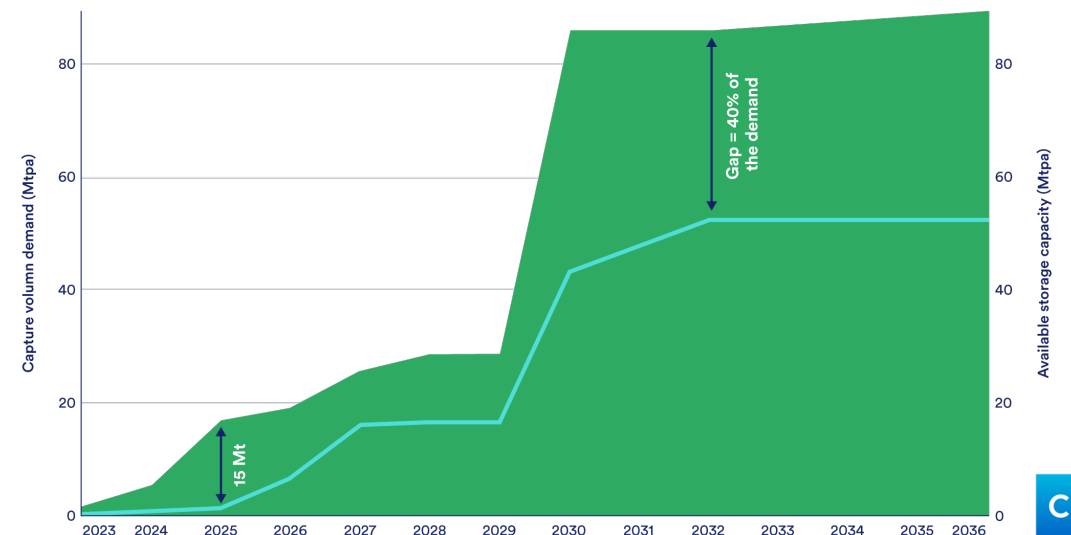
About Clean Air Task Force

- Founded in 1996
- Headquartered in Boston, 160+ global staff
- Funding is philanthropic
- **Our Mission:**
Create an affordable, zero carbon energy system by advocating for pragmatic policies, new business strategies, and advanced technologies.
- **Our Vision:**
Meet the world's rising energy demand in a way that is financially, socially, and environmentally sustainable.



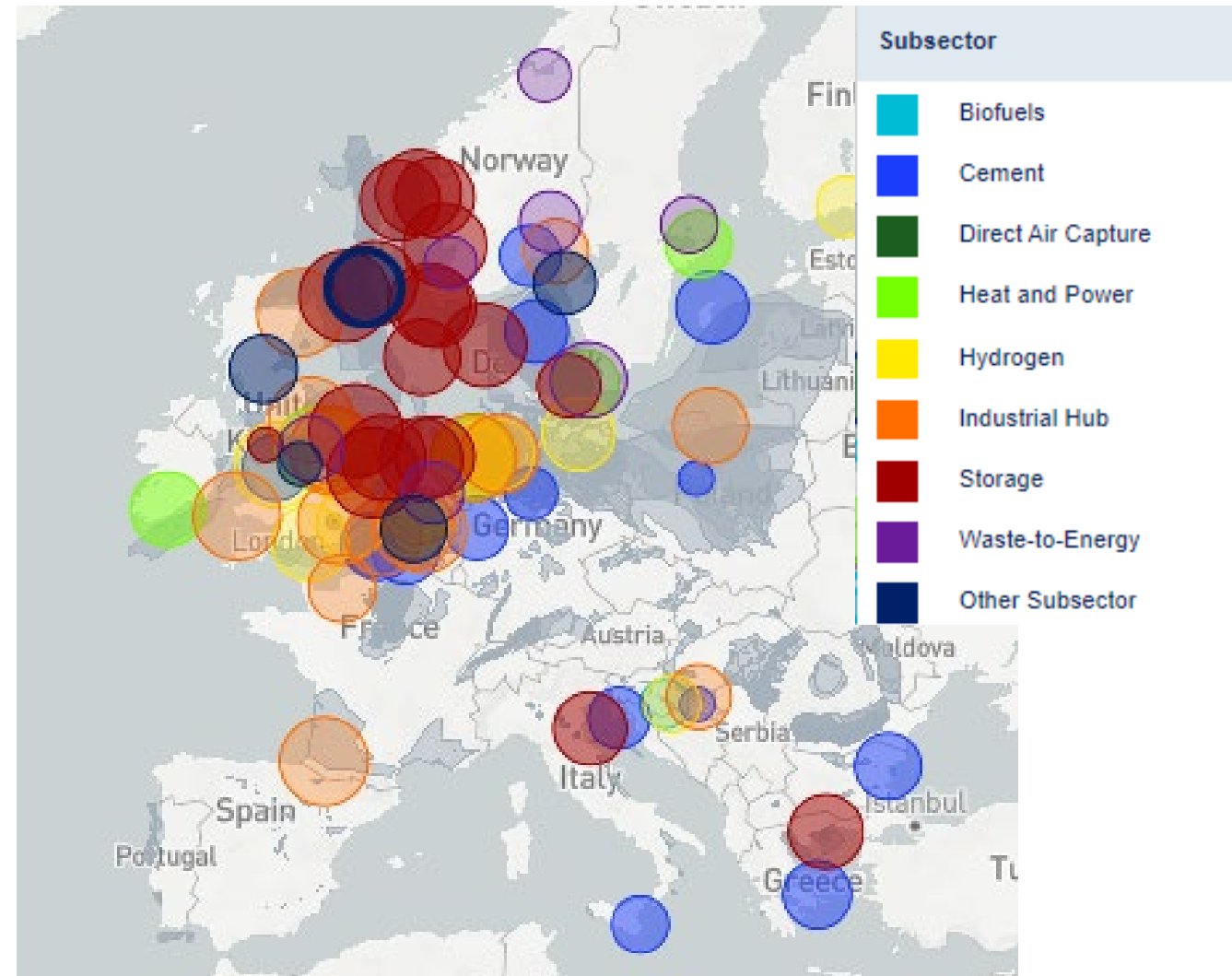
Our work in the EU

- **Priorities:** Coordinated infrastructure build-out and enduring ‘beyond demonstration’ policy
- Highlighting the storage and funding gaps
- Campaigned for inclusion of CO₂ storage in the TEN-E regulation, and for non-pipeline transport in ‘TEN-T’
- Published ‘A European Strategy for CCS’ (2022)
- Co-chaired the Commission’s Working Group on ‘CCS Vision’ - Issue paper released Jan 2023



CCS in Europe

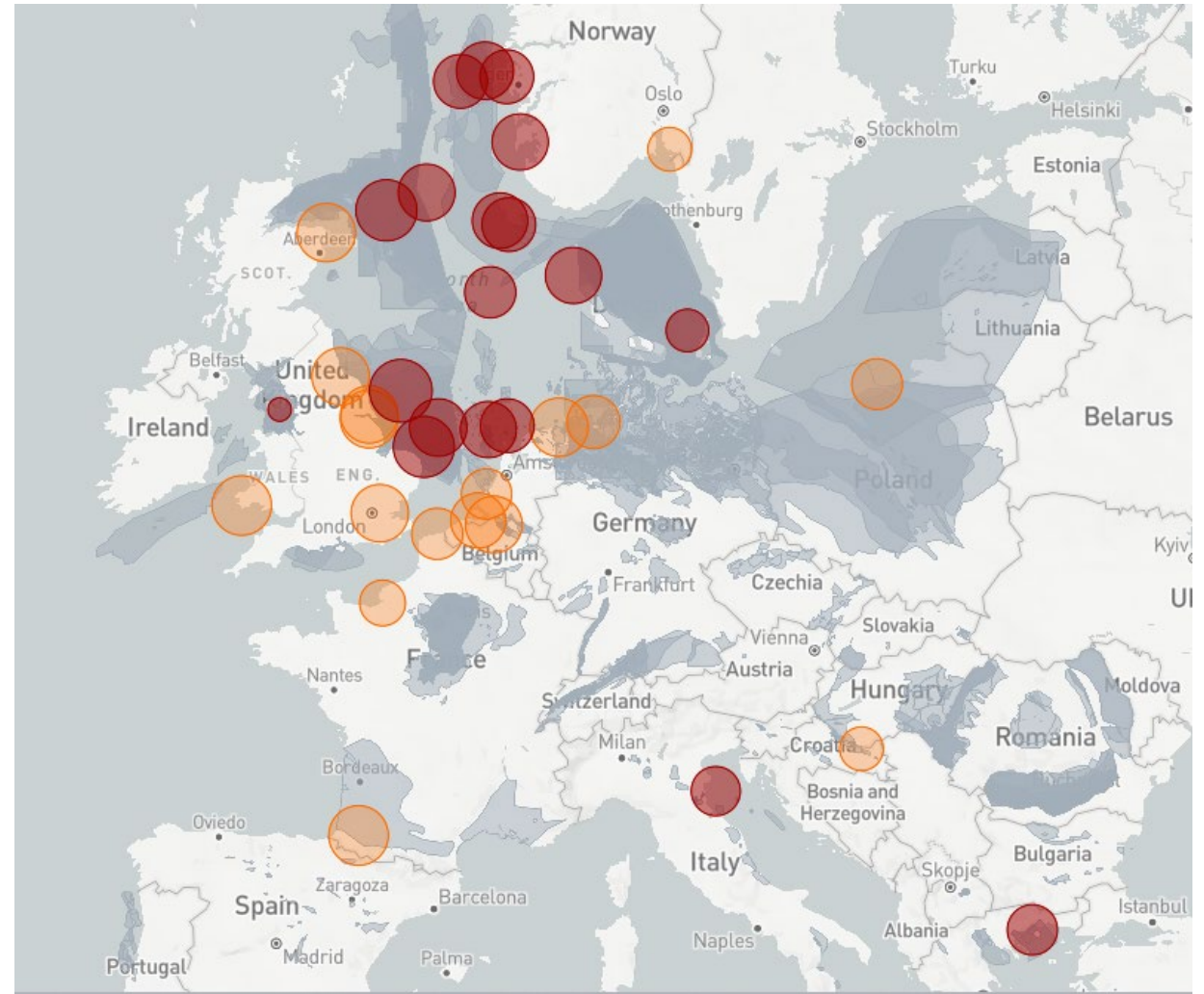
- CATF tracking over 100 proposed projects
- Largely based around storage options in the North Sea
- Dedicated policy support in the UK, Netherlands, Norway, Denmark, Sweden (BECCS)
- Emerging support in France and Germany
- Only 4 projects have taken FID (all associated with Northern Lights)



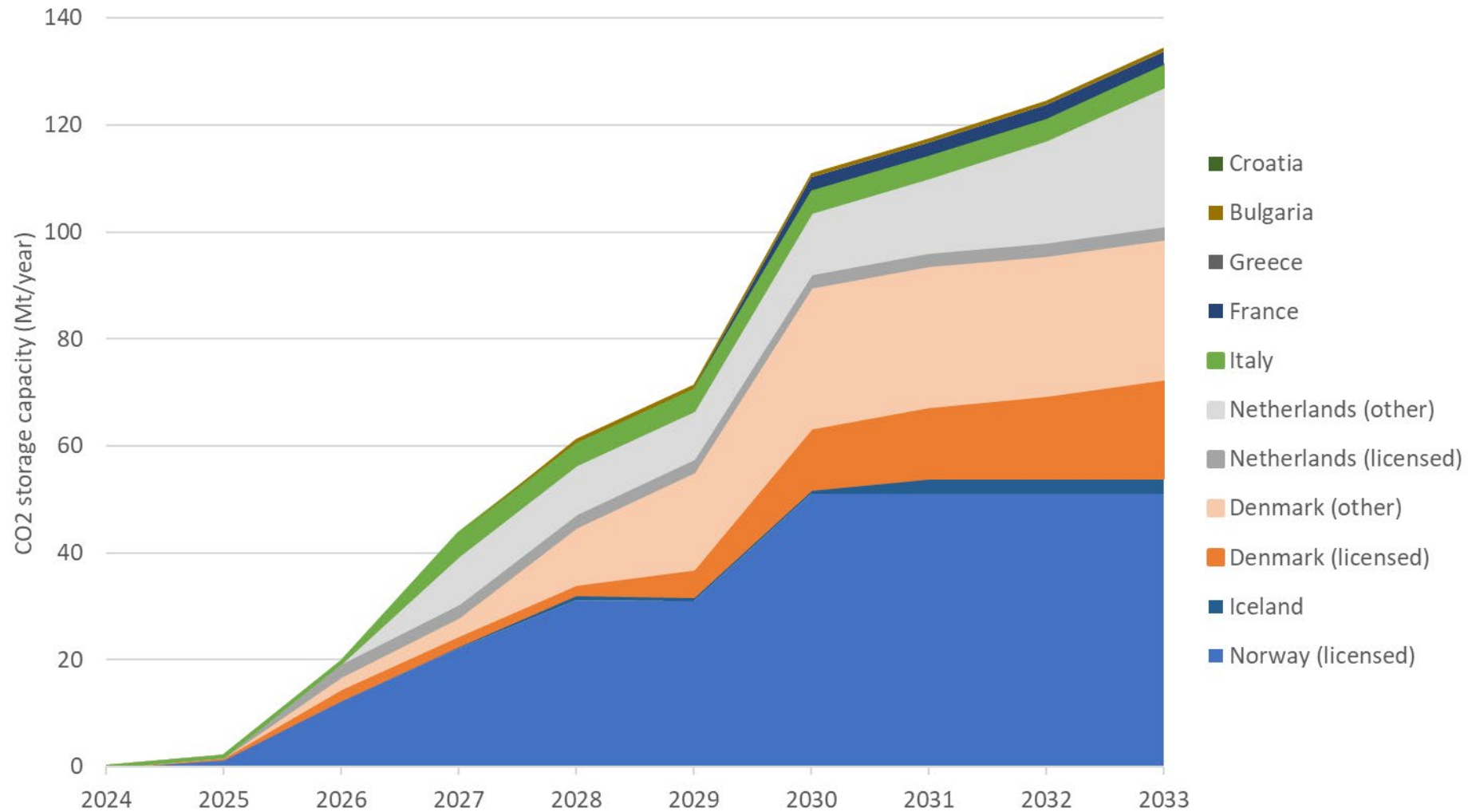
<https://www.catf.us/ccsmap europe/>

CO₂ storage

- The past year has seen a big increase in North Sea exploration licences
- Storage locations with activity other than the North Sea:
 - **Offshore:** Irish Sea, Adriatic, Aegean, Black Sea (Bulgaria)
 - **Onshore:** Denmark, SW France, NE Croatia
- All projects still reliant on pass-through of subsidies targeted at emitters



Storage capacity tracking



Theoretical CO₂ storage capacity across Europe is estimated to be between **262 and 1520 GtCO₂**

This study identifies 17 countries that could potentially store over 10 GtCO₂

- **Bulgaria** (3-450 GtCO₂)¹ and **Norway** (70-280 GtCO₂)² have the **largest** theoretical storage capacities.
- **Belgium, Austria and Slovenia** have the **smallest** theoretical storage capacities (≤1 GtCO₂) which may be a barrier to CCS in these countries.
- **Finland and Estonia** have **no suitable sedimentary basins** for CO₂ storage.

High and low storage capacity estimates were made for each country

- Estimates were compiled from across the literature.
- These estimates were supplemented with estimates for countries with only one capacity estimate in the literature³.

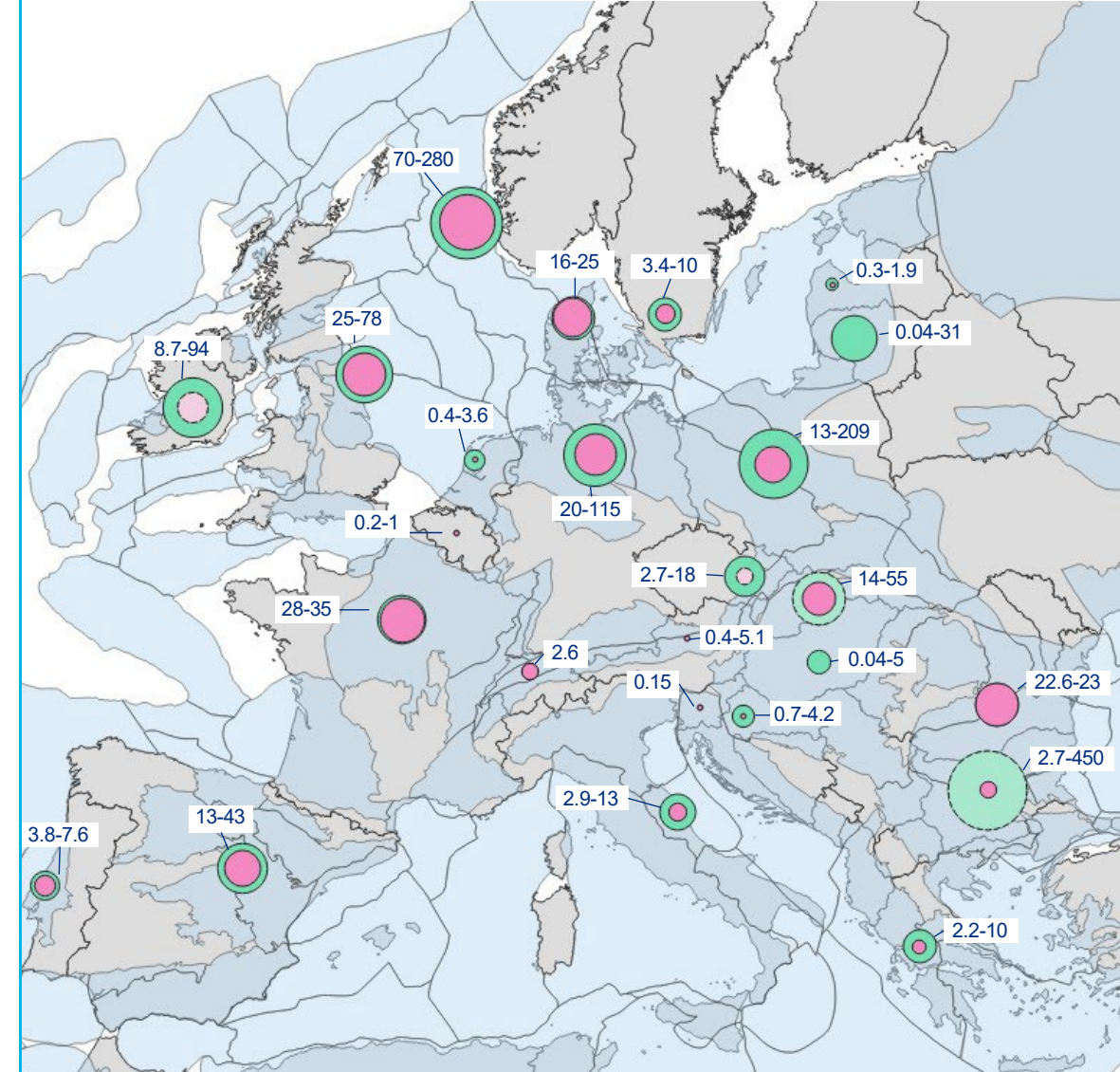
¹Bottom-up estimates were made for Bulgaria's storage capacity (more speculative)

²Storage capacities for Norway are based on published literature (more reliable)

³Bottom-up estimates were made for Ireland (low estimate), Czechia (low estimate), Slovakia (high estimate) and Bulgaria (high estimate)

⁴[Storage Capacity in the West Mediterranean](#)

⁵[CGG Robertson Basins and Plays](#)



Theoretical storage capacity estimates for each country (GtCO₂)

○ = 10 GtCO₂

■ High estimates

■ Low estimates

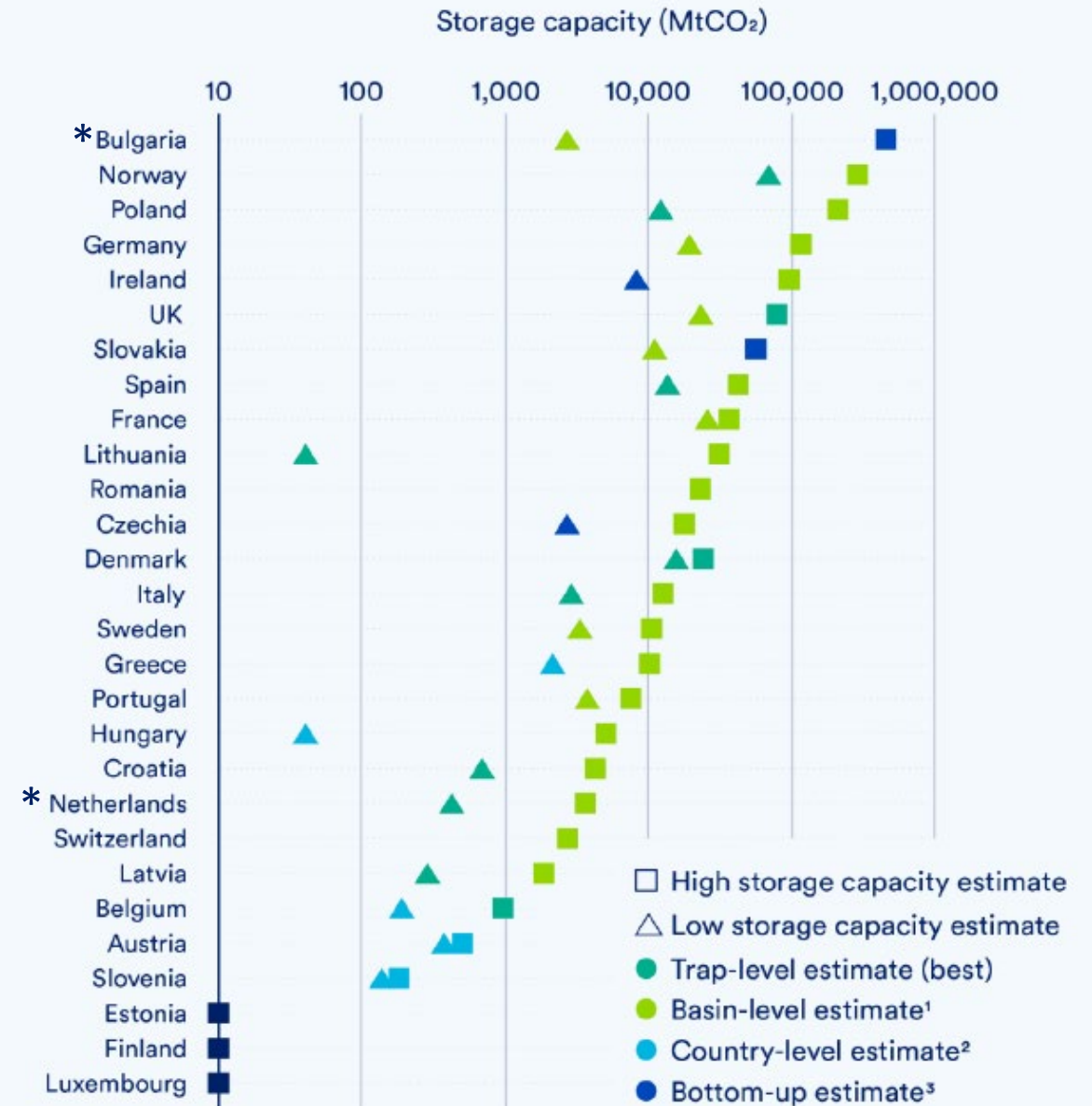
■ Sedimentary basins⁵

Storage capacity estimates by country

Estimates based on assessments from:

- **Bottom-up** – storage estimates made during this study
- **Country-level** - no methodology is publicly available although the storage capacity value is published for the entire country.
- **Basin-level** - use regional aquifers within a country to estimate CO₂ storage capacity.
- **Trap-level** – sites with storage capacity and caprock

Geological CO₂ storage capacity estimates, coloured by reliability of literature estimate, on a logarithmic scale (MtCO₂)



Net Zero Industry Act (Commission proposal)

- Sets a 50 Mt target for storage capacity in the EU by 2030 (not including Norway)
- An obligation on Member States to share storage data and declare their carbon capture and storage plans and needs
- An obligation on oil and gas companies to share data and develop storage capacity in proportion to their production 2020-2023
- Minimum permitting times for CO₂ storage projects and capacity building through Net Zero Platform
- Eligible CO₂ storage capacity must have access to CO₂ – e.g., via a pipeline or shipping terminal.

Questions:

- Will storage capacity be developed in the regions that most need it?
- Will sufficient captured CO₂ be available?
- Will transport networks be able to deliver CO₂ to where it can be stored?

High carbon prices are pushing heavy industry to decarbonise

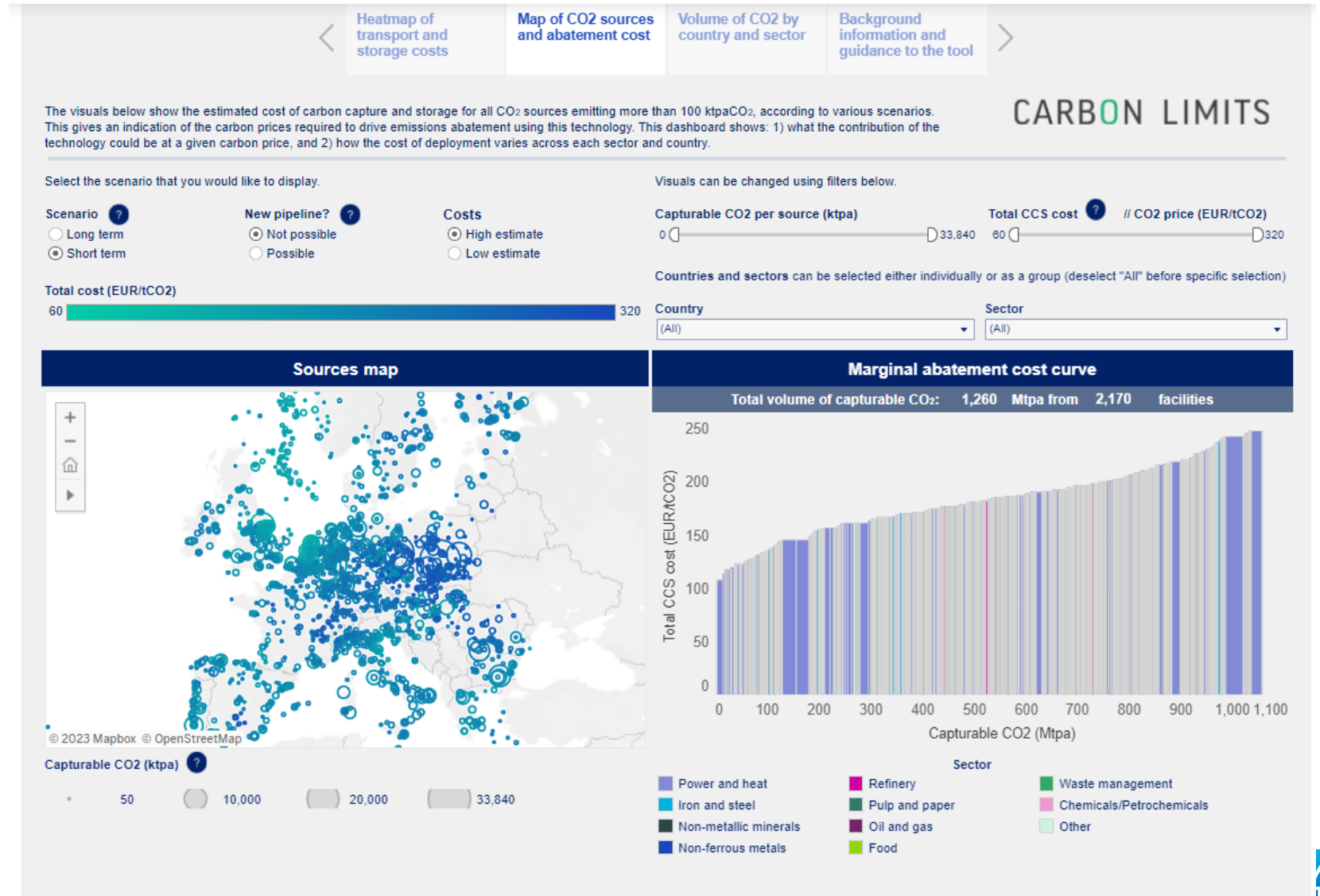
- Projected to rise to **over 120 €/t** by 2030
- How many facilities can do carbon capture and storage at this cost?
- **How can infrastructure help lower the cost?**
 - New transport links
 - New storage sites, not just in the North Sea



Will the market deliver the 50 Mt to store?

CATF CCS cost tool

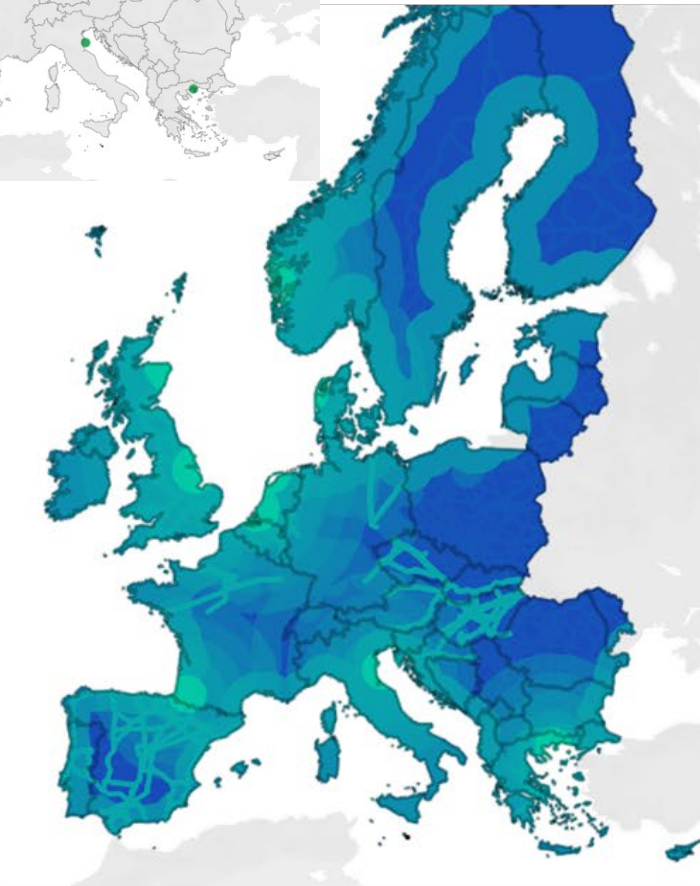
- 2170 facilities mapped
- Planned storage and possible storage considered
- Ship, rail, barge, existing/new pipeline considered
- High and low cost estimates
- Filter for cost, sector, country, CO₂ volume



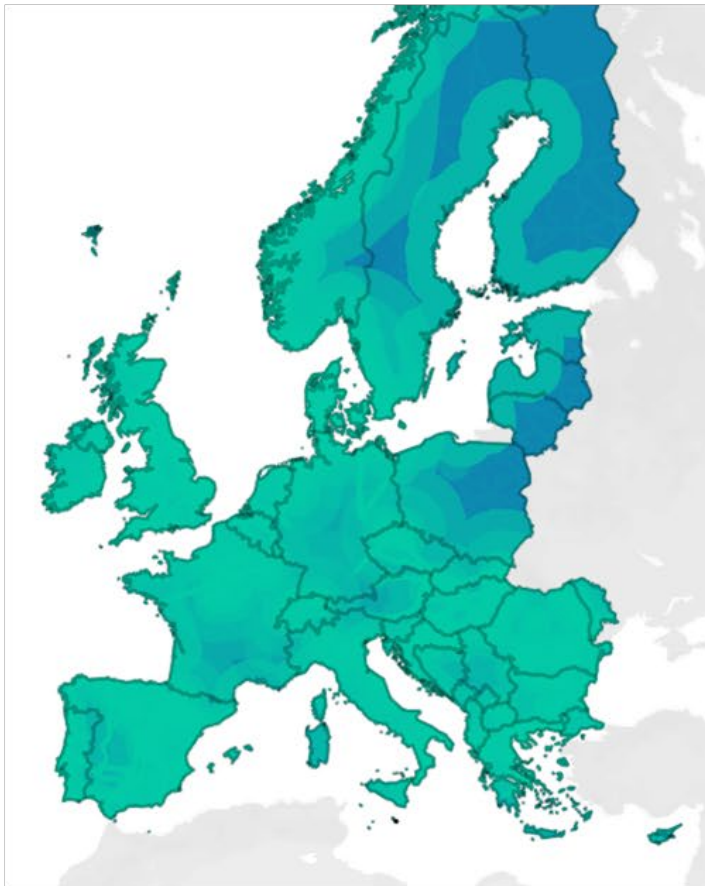
Transport and storage cost (EUR/tCO₂)

15

175



Planned storage sites only

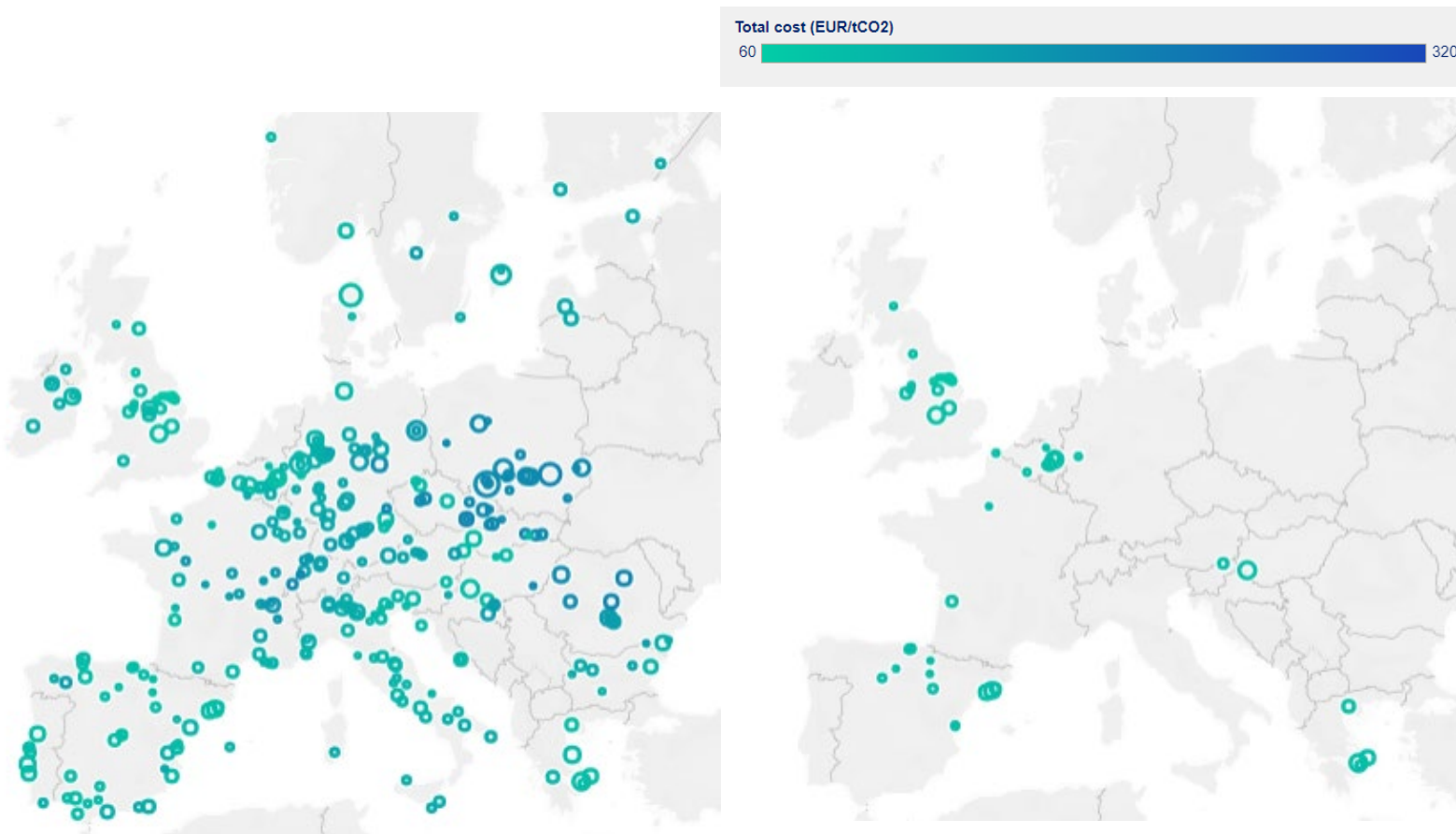


Suitable storage geology considered



New pipelines also possible

Heat map of CO₂ transport and storage: assuming ship, rail, river and pipeline reuse



All 343 facilities for cement, lime and other non-metallic minerals



The 42 non-metallic mineral facilities with an estimated total cost of <€90/tCO₂ (low estimate)



All possible storage locations considered: 238 facilities have an estimated total cost of <€90/tCO₂

- Wider storage development is key to bringing down transport costs for dispersed emitters
- Otherwise, many emitters that need CCS face >€150/t costs

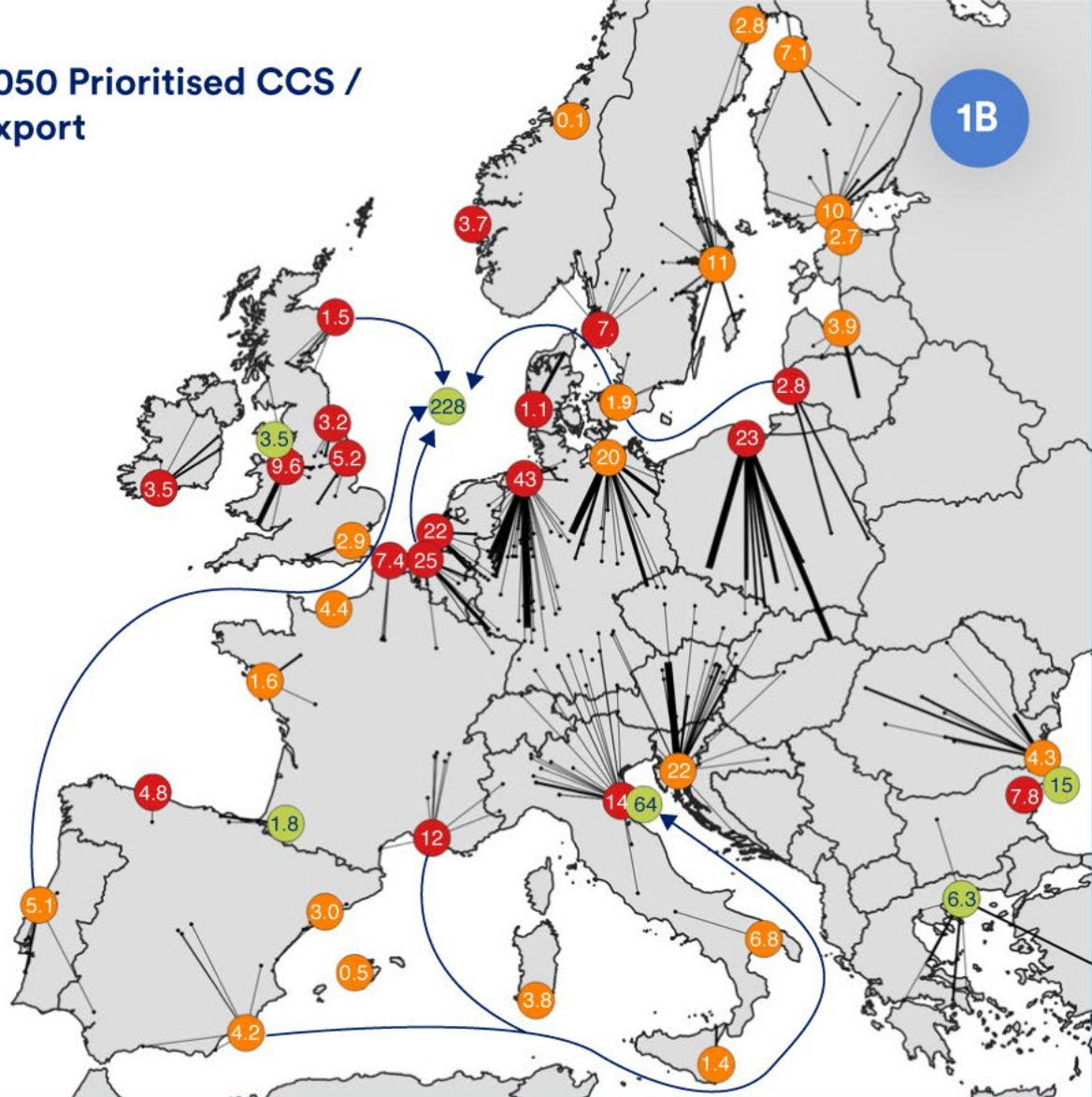
Making the NZIA work for CCS



- An ambitious storage target is feasible and can kickstart the industry – 50 Mt/year is a fraction of where we need to be by 2050
- The oil and gas sector has the resources and expertise to scale up rapidly to 2030
- The focus on the EU can help develop storage in regions beyond the North Sea
- There will still be a cost gap for many capture plants to 2030 – a clear line of sight to storage will help galvanise policy and emitters to bridge this gap
- But the NZIA and Industrial Carbon Management Strategy should encourage and assist Member States in developing the necessary frameworks (licensing rounds, transport regulations) and incentives

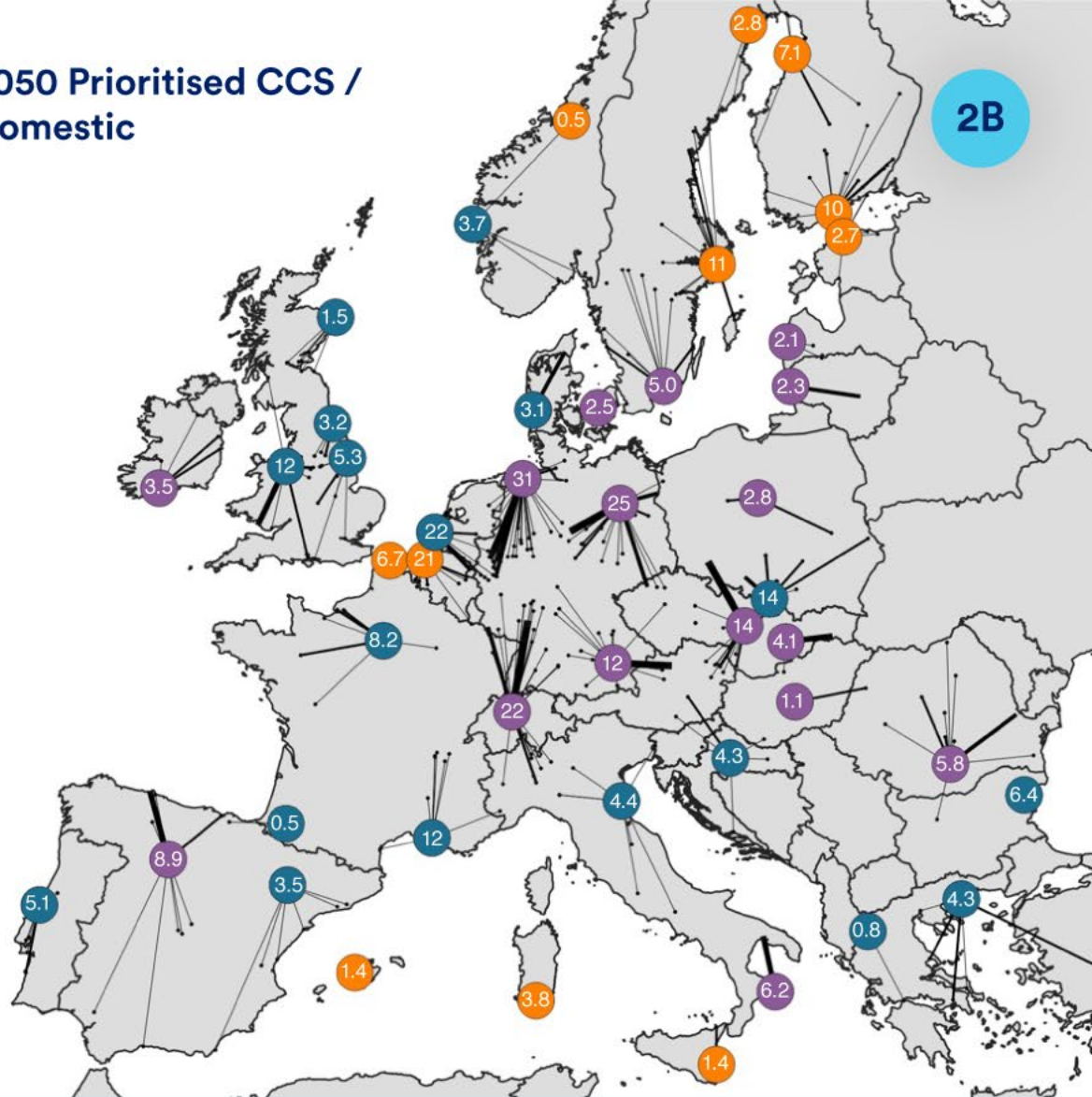
2050 Prioritised CCS / Export

1B



2050 Prioritised CCS / Domestic

2B



● Announced storage

● Other storage (location approximate)

● Other export locations

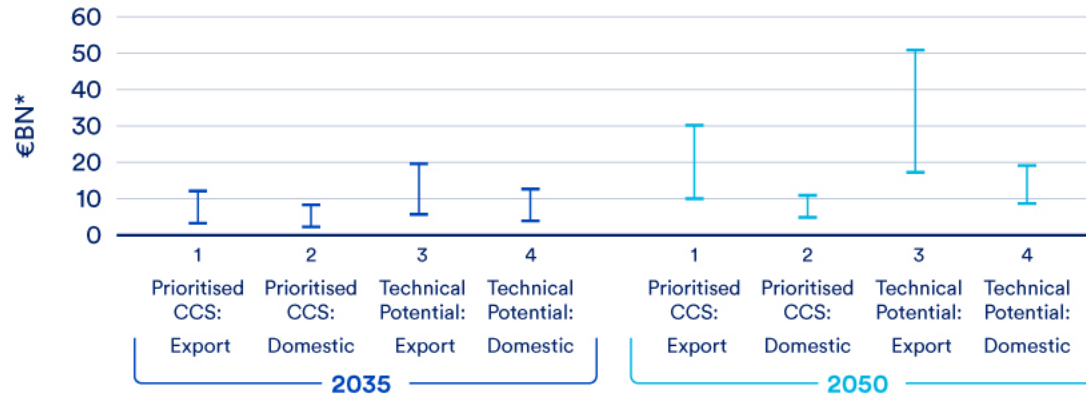
● Announced export locations

● Priority storage (with capture volumes)

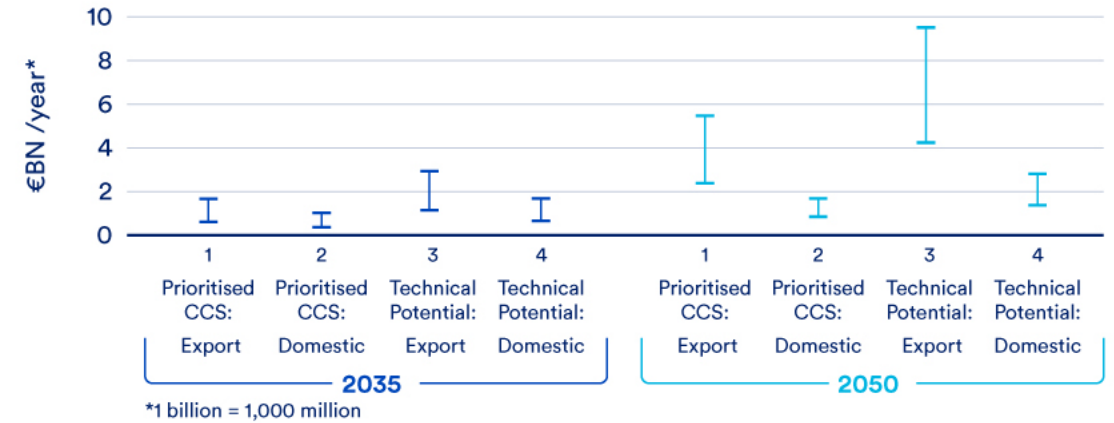
— Straight line distance (not transport routes)

→ Example shipping route

CAPEX cost of transportation for each scenario (up to year)

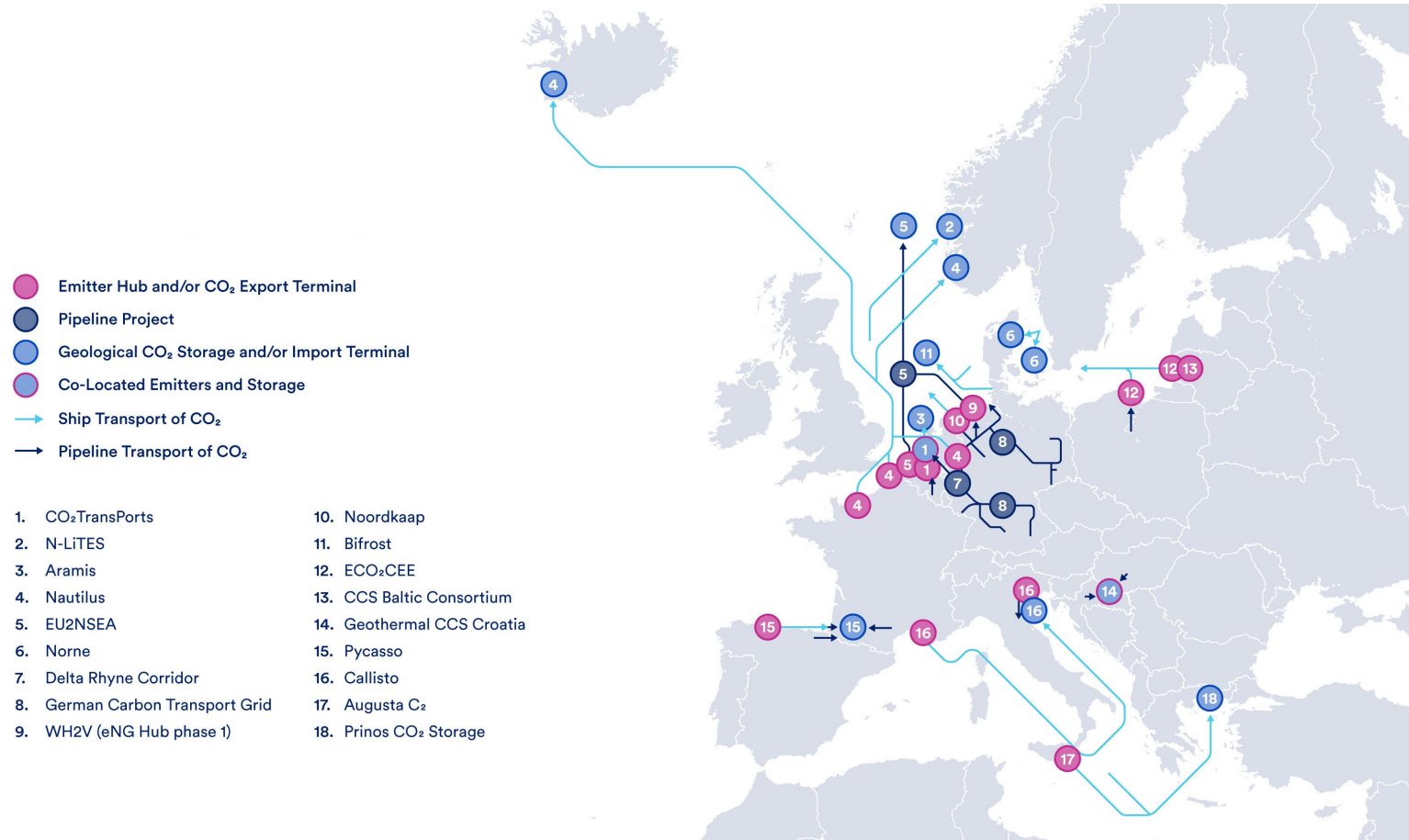


OPEX cost of transportation for each scenario (per year for that year)



Growing interest beyond the North Sea

- Candidates for 6th PCI list for CO₂ networks show real ambition in Southern, Central and Eastern Europe
- But, little funding available – capture project funding still to drive investment
- The NZIA can help accelerate these storage hubs and encourage Member States to support these plans
- CATF proposes adoption of criteria to help distribute the NZIA obligation across the EU
- Onshore storage is emerging (Denmark, Croatia, Poland?)



A European Capture and Storage Platform

- Any industry planning to capture or store CO₂ could join this platform, stating:
 - Planned volumes
 - Timeline for development
 - Transport infrastructure associated
- Such a platform could:
 - Provide assurance to storage and capture developers
 - Enhance transparency and competition
 - Enable aggregation of bids



Illustrative depiction of an aggregation platform for CO₂ capture and storage

Evolution of the NZIA on CCS

- Parliament vote next month
- Council – general approach by end of the year
- Trilogue under Belgian presidency

Summary

- CO₂ storage related articles of the NZIA are a bold addition to legislation primarily aimed at clean tech manufacturing scale up
- Targeted at breaking the 'chicken and egg' impasse and delivering storage ahead of demand
- Complicated by pre-empting the Carbon Management Strategy, but has legislative power
- Expected to largely ensure that existing (mostly offshore) project pipeline in the EU is delivered on schedule – has the potential to deliver more distributed storage in the region
- Facilitating amendments to the NZIA, the CM Strategy, and national policy will be needed to deliver the full value chain



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