International Association of Oil & Gas Producers

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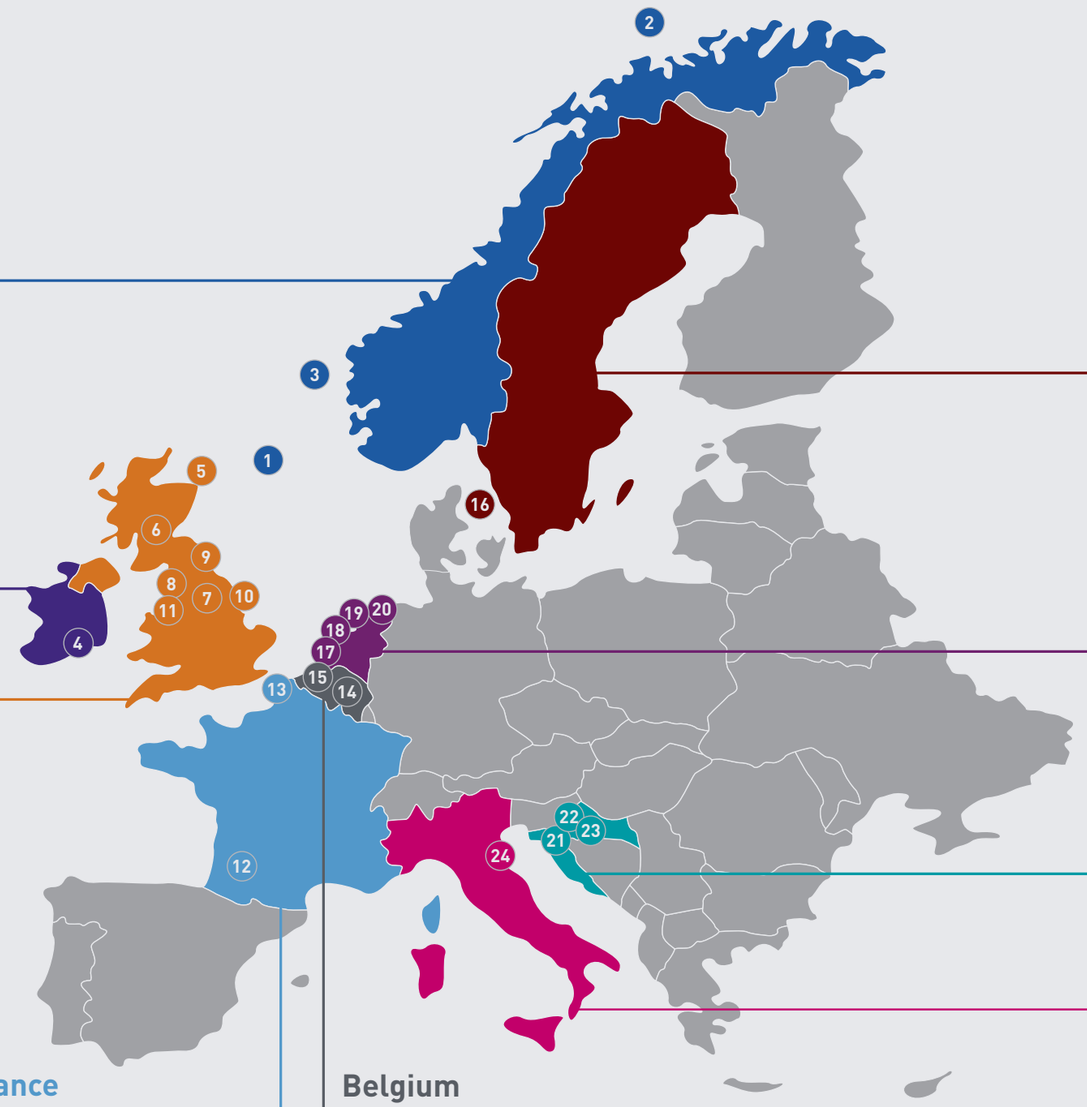
CCUS projects in Europe

Overview of existing and planned CCUS facilities



Norway

1. Sleipner CO_2 Storage*

2. Snøhvit CO_2 Storage*

3. Northern Lights*

Republic of Ireland

4. ERVIA

UK

5. Acorn*

6. Caledonia Clean Energy

7. H21 North of England*

8. Liverpool-Manchester Hydrogen Cluster

9. Net Zero Teesside*

10. Humber Zero Carbon Cluster*

11. Liverpool Bay Area CCS Project*

France

12. Lacq*

13. DMX Demonstration in Dunkirk*

Belgium

14. Leilac

15. Port of Antwerp*

Sweden

16. Preem CCS*

The Netherlands

17. Porthos (Port of Rotterdam)*

18. Athos (Ijmond)

19. Aramis (Den Helder)

20. Magnum (Eemshaven)*

Croatia

21. iCORD*

22. CO_2 EOR Project Croatia*

23. Bio-Refinery Project*

Italy

24. CCS Ravenna Hub*

* Project where IOGP members are involved
Projects listed in **bold** are in operation

LOCATION	PROJECT NAME	PROJECT TYPE	DESCRIPTION	CO_2 CAPTURED/YEAR	STARTING DATE (OPERATION)	STATUS OF THE PROJECT	PARTICIPANTS	IOGP MEMBERS INVOLVED
Belgium	**Leilac**	Industrial Capture	Cement plant carbon capture (pilot project)	N/A	2018-2020	2-year CO_2 capture test	HeidelbergCement, Calix	
	Port of Antwerp	Industrial Capture	CCS-equipped industrial cluster, CO_2 transportation and storage in the North Sea and reuse	N/A	N/A	Feasibility study	Air Liquide, BASF, Borealis, INEOS, ExxonMobil, Fluxys, Port of Antwerp and Total	ExxonMobil, Total
Croatia	**iCORD**	Industrial Capture	Capturing the CO_2 produced at a fertilizer plant at Location in central Croatia and at a concrete production plant at Location in eastern Croatia, and storing it at Moslavina basin oil fields and Pannonia basin oil fields as part of INA EOR project.	Approx. 1Mt/y	2025	Feasibility Study to be ordered by end of 2019, FS to be prepared by end of Q3 2020.	INA MOL	MOL
	CO_2 EOR Project Croatia	EOR	EOR project started in 2014. Injected 1.400 kt CO_2 in the EOR fields Ivanić and Žutica near Ivanic Grad (Zagreb County, 41 km from Zagreb) .The pipeline Molve-Ivanić is 88 km long (30 bar)	0,560 Mt/y	2015	In operation	INA MOL	MOL
	Bio-Refinery Project	Industrial Capture	Bio-Refinery plant (bio-Ethanol production) on the Sisak Refinery location (Sisak-Moslavina County, Sisak 60 km from Zagreb). On the existing pipeline route, new pipe of 16 km will be built for CO_2 storage, for the yearly production of 60 kt of CO_2, plus potential 300-400 kt of biogenic CO_2 from CHP.	0,06 Mt/y (additional potential on location 300-400 kt)	2024	Signing the contracts for basic design and technology selection	INA MOL	MOL
France	**Lacq**	Capture Storage (Oxy fuel combustion)	CCS Oxy fuel combustion CO_2 captured and storage in depleted natural gas field at Rousse (Pyrenees)	Approx. total 50,000 tonnes	2009	Capture and storage phase ended on 15/03/2013	Total	Total
	DMX Demonstration in Dunkirk	Industrial Capture	CCS-equipped steel-making plant, CO_2 transportation and storage in the North Sea	Approx. 1 Mtpa	2025		ArcelorMittal, IFPEN, Axens, Total, ACP, Brevik Engineering, CMI, DTU, Gassco, RWTH, Uetikon	Total
Italy	**CCS Ravenna Hub**	Power and capture (post-combustion), Blue Hydrogen	CO_2 capture in North of Italy (Pianura Padana Area) from Industrial Complex (i.e. Ravenna) and trasportation to depleted Reservoirs in Ravenna Hub	0.04-5,0 Mtpa phased program	2025-2028	Prefeasability Study	Eni	Eni
The Netherlands	**Porthos (Port of Rotterdam)**	Industrial Capture	CCS-equipped industrial cluster, CO_2 transportation and storage in the North Sea	Approx. 5 Mtpa	2024	Feasibility study	Gasunie, the Port Authority and EBN	BP, Shell
	Athos (Ijmond)	Industrial Capture	CCUS Network capturing CO_2 from TATA Steel plant and reusing it or storing it in empty gas fields under the North Sea	7.5 MT CO_2 per year	2030	Feasibility Study	Gasunie, EBN, Port of Amsterdam and Tata Steel	
	Aramis (Den Helder)	Industrial Capture	CO_2 supplied by third parties from Den Helder and stored in the North Sea floor. This CO_2 can be brought to Den Helder by boat or by pipeline (for example from IJmuiden)	N/A	N/A	N/A	N/A	
	Magnum (Eemshaven)	Natural Gas-to-H2 (pre-combustion)	CCS-equipped production of hydrogen for power generation, CO_2 transportation and storage in the North Sea	Approx. 4 Mtpa	2023	Feasibility study	Equinor, Vattenfall, Gasunie, MHPS	Equinor
Norway	**Sleipner CO_2 Storage**	Industrial Capture	CCS-equipped natural gas production, CO_2 directly injected into North Sea reservoirs	Approx. 1 Mtpa, and over 17 million tonnes has been injected since inception to date.	1996	Operational	Equinor (operator) Vår Energi, Total	Equinor, Vår Energi, Total
	Snøhvit CO_2 Storage	Industrial Capture	CCS-equipped LNG facility, CO_2 transportation and storage in the Barents Sea	0.70 Mtpa	2008	Operational	Equinor (operator) Petoro, Total, Engie, Norsk Hydro, Hess Norge	Equinor, Total, Hess
	Northern Lights	Industrial Capture	CCS-equipped industrial capture, CO_2 transportation and storage in the North Sea	0.8 Mtpa from possible 2 industrial plants: cement and waste to energy	2023–2024	Final Investment Decision (FID)	Shell, Equinor,Total	Shell, Equinor, Total
Republic of Ireland	**ERVIA**	Power & Capture (post-combustion)	CCS-equipped CCGTs and refinery, CO_2 transportation and storage in the Celtic Sea	2 Mtpa	2028	Feasibility study	ERVIA	
Sweden	**Preem CCS**	Industrial Capture	CCS-equipped refinery, CO_2 transportation and storage in the North Sea (pilot study)	500,000 tonnes	N/A	Pre-study	Preem, Chalmers University of Technology, SINTEF Energy Research, Equinor and Aker Solutions	Equinor, Aker Solutions
UK	**Acorn**	Industrial Capture	CCS-equipped natural gas processing plant, CO_2 transportation and storage in the North Sea	The Reference Case assumes a flat rate of 200,000T/yr can be captured from one of the gas terminals at St Fergus	2023	Feasibility Study	Project is led by Pale Blue Dot Energy, with funding and support from industry partners (Chrysaor, Shell and Total) the UK and Scottish Governments	Chrysaor, Shell, Total
	Caledonia Clean Energy	Power & Capture (post-combustion)	CCS-equipped natural gas power plant, CO_2 transportation and storage in the North Sea	3 Mtpa	2023	Feasibility Study	Summit Power	
	H21 North of England	Natural Gas-to-H2 (pre-combustion)	Natural gas-to-hydrogen conversion with CCS, CO_2 tranportation and storage in the North Sea and salt caverns	Approx. 3 Mtpa	2020s	Feasibility study	Northern Gas Networks, Cadent and Equinor	Equinor
	Liverpool-Manchester Hydrogen Cluster	Natural Gas-to-H2 (pre-combustion)	Natural gas-to-hydrogen conversion with CCS, CO_2 transportation and storage in the North Sea	1.5 Mtpa (10% H2) - 9.5 Mtpa (100% H2)	2020s	Feasibility study	CADENT	
	Net Zero Teesside	Power & Capture (post-combustion)	CCS-equipped natural gas power plant, CO_2 transportation and storage in the North Sea	5 Mtpa	2026	Technical evaluation and business model options	BP, OGCI	BP, ENI, Repsol, Shell, Equinor, Total
	Humber Zero Carbon Cluster	Industrial Capture, Natural Gas-to-H2, Power & Capture	CCS-equipped industrial cluster, CCS-equipped hydrogen production, bioenergy with CCS (BECCS), CO_2 transportation and storage in the North Sea	N/A	2020s	Technical evaluation and business model options	Drax Group, Equinor, National Grid Ventures	Equinor
	Liverpool Bay Area CCS Project	Carbon Capture Sequestration	CO_2 capture from the existing industrial facilities and new hydrogen production plant in the North West of England	1-3 Mtpa phased program	2025	Concept Selection Phase	Eni	Eni