Carbon Capture Global Summit

Top 100 CCUS Projects Worldwide

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Introduction:

Abandoning the development of Carbon Capture, Utilization, and Storage (CCUS) would make it nearly impossible to achieve the net zero emissions target by 2050. Although the development of renewable energy is progressing rapidly, most countries, for energy security, cannot rely solely on intermittently generating wind and solar power. Therefore, coal-fired power generation, which provides stable electricity, will continue to be the main method of power generation in many countries. This underscores the indispensable role of CCUS in mitigating emissions within the energy sector.

Furthermore, heavy industries account for nearly 20% of global carbon dioxide emissions, including cement, chemical, and steel production. The development of CCUS is also essential in these industries to significantly curb their carbon footprint.

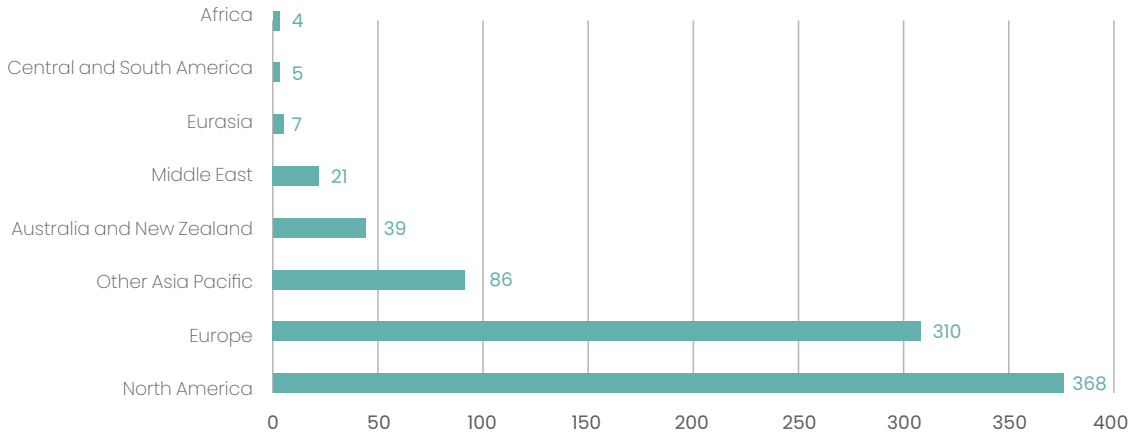
Currently, a global trend is emerging, with numerous countries enacting supportive policies for CCUS advancement. North America, Europe, Australia, and China are leading the charge, positioning themselves as the principal markets for CCUS technologies. These initiatives are pivotal in steering our global trajectory towards a sustainable and carbon-neutral future.

Analysis of Global CCUS Projects:

As of March 2024, there are a total of 844 global CCUS projects. Among these, only 51 projects are operational, accounting for 6%, while 44 projects are under construction, representing 5%. The majority of the projects, making up 88%, are in the planning stages.

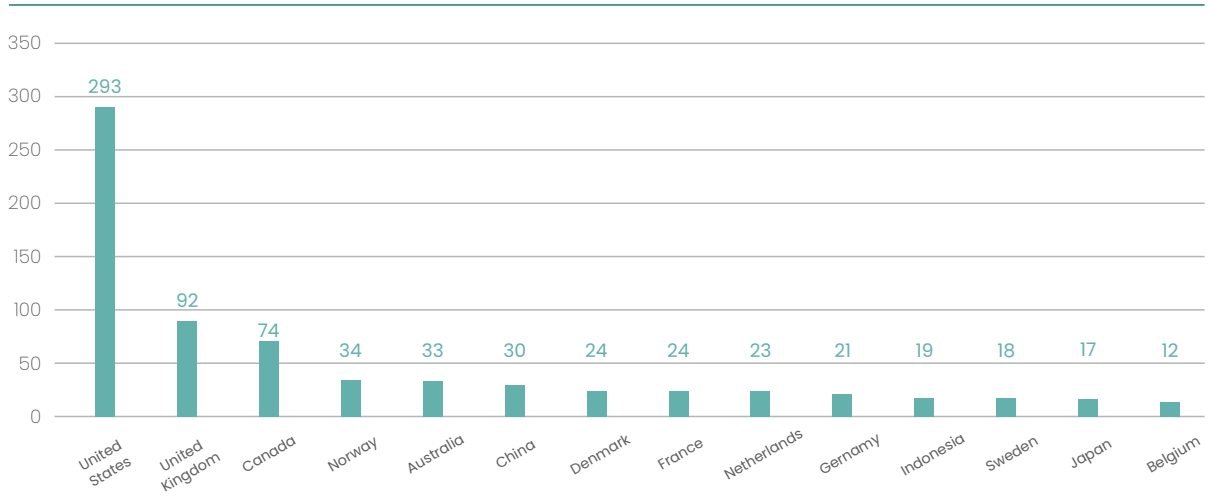
These projects are primarily located in North America and Europe, with these two regions together hosting 678 projects, which constitute 80.3% of the global total. The United States has the highest number of CCUS projects, totaling 293 and accounting for 34.7%. Following closely are the United Kingdom and Canada, with 92 and 74 projects respectively, accounting for 10.9% and 8.8%. Additionally, Norway, Australia, and China each have more than 30 projects, with totals of 34, 33, and 30 respectively. Six countries hold 65.9% of the global projects, indicating a concentrated distribution. Beyond these six nations, eight other countries each have more than 10 CCUS projects.

Figure 1: Number of CCUS projects by region



Source : IEA & Leader Associates

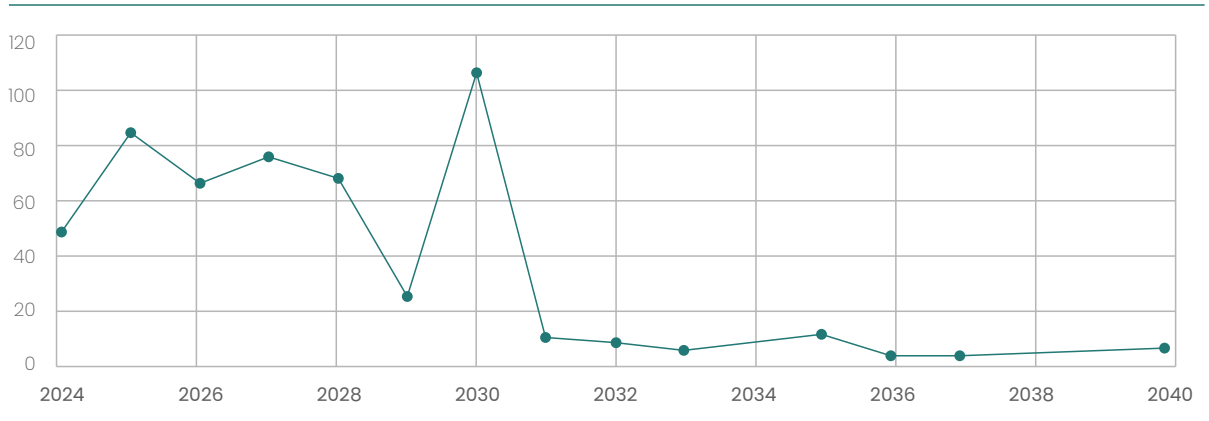
Figure 2 : Number of CCUS projects by country



Source : IEA & Leader Associates

Among the 499 projects that have disclosed their operational timelines, the vast majority are scheduled to be completed before 2030, with 467 projects accounting for 93.6%. In 2024, 47 projects are expected to become operational, followed by 84 in 2025, and 106 CCUS projects are slated to be completed in the year 2030.

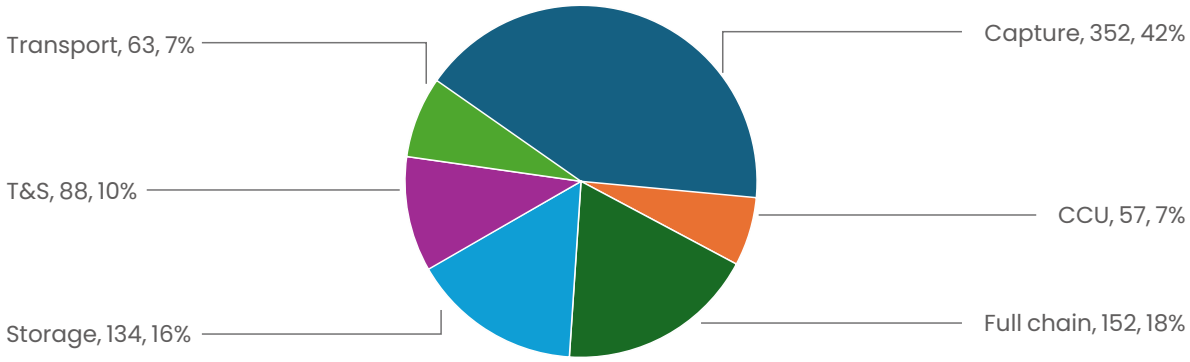
Figure 3: Operation time of CCUS projects



Source : IEA & Leader Associates

Figure 4 displays the types of global CCUS projects. Carbon dioxide capture projects constitute the highest percentage, with 352 projects accounting for 42%. This is followed by full chain projects, totaling 152 and making up 18%. Carbon dioxide storage projects are also numerous, totaling 134 and comprising 16%. The least prevalent are projects involving carbon dioxide transport and storage, carbon dioxide transport, and carbon dioxide capture and utilization, with 88, 63, and 55 projects respectively.

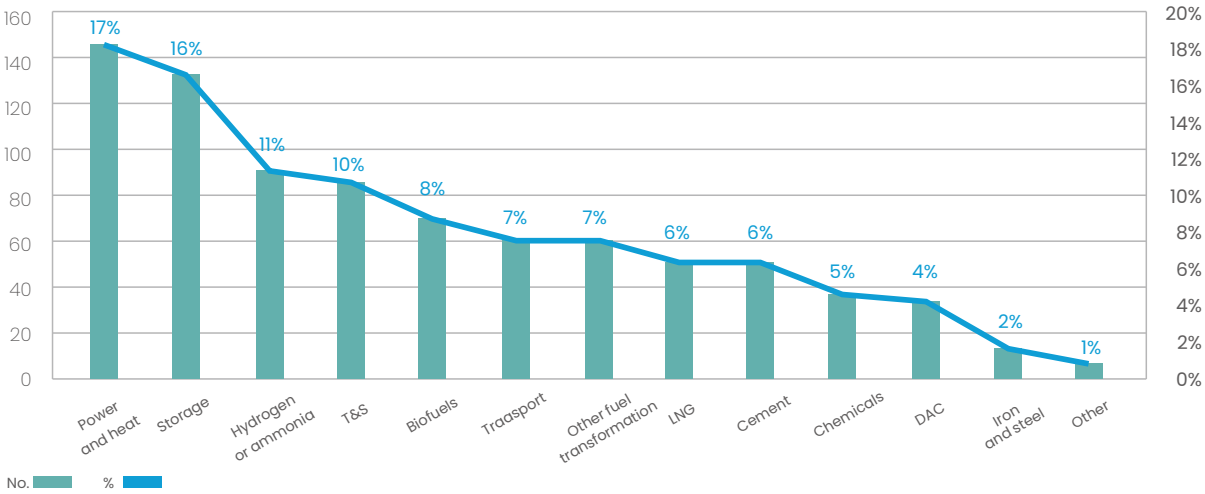
Figure 4: Proportion of different types of CCUS projects



Source : IEA & Leader Associates

Figure 5 shows the sectors in which global CCUS projects are involved. The power and heat sector hosts the most projects, totaling 147 and accounting for 17%. Transportation and storage of carbon dioxide are also separately listed. Beyond these, the hydrogen and ammonia, biofuel sectors each feature a substantial number of CCUS projects, with 91 and 70 respectively. Additionally, other fuel transformation, liquefied natural gas, and the cement industry each have over 40 projects, with totals of 55, 50, and 48 respectively. Most of these CCUS projects are concentrated in the energy sector.

Figure 5: Number of CCUS projects by sector



DA : Direct Air Capture
Source : IEA & Leader Associates

Significant Global CCUS Projects:

The largest global CCUS project is the Port of Corpus Christi-Mississippi pipeline (TX) in the United States. This project primarily handles the transportation of carbon dioxide from multiple sources to various storage locations along the Gulf Coast, with a capacity to transport 250 million tonnes of carbon dioxide annually. Managed by Howard Midstream, which received $3 million from the US Department of Energy (DOE) to research this initiative, the project is one of the recipients of DOE funding. The DOE has allocated a total of $251 million to support 12 CCS projects across seven states. Additionally, the DOE announced a second open call for a five-year, $2.25 billion funding opportunity to foster the ongoing development of commercial-scale CCS infrastructure.

Apart from projects that solely transport carbon dioxide, the Oxy DAC potential expansion scenario represents the largest full-chain CCUS project. Rather than a single project, it is a combination of DAC plants. 1PointFive and Carbon Engineering announced their deployment method for direct air capture (DAC) factories in 2022. Each factory is expected to capture one million tonnes of carbon dioxide from the atmosphere annually, with 1PointFive announcing plans to deploy 70 DAC facilities globally by 2035. The captured carbon dioxide can be securely stored in deep saline aquifers underground or used to produce hydrocarbons for low-carbon or net-zero transportation fuels, as well as for chemicals and building materials. The first DAC factory began construction in the third quarter of 2022 and is expected to commence operations by the end of 2024.

Another noteworthy project is the UK Poseidon CCS project, which is also one of the largest carbon dioxide storage projects globally. This project is divided into three phases: the first phase aims to store 1.5 million tonnes of carbon dioxide annually by 2029, the second phase aims to increase this to 10 million tonnes by 2034, and the third phase aims to reach 40 million tonnes by 2040. Operated by Prenco UK, the company currently manages one of the largest natural gas asset portfolios in the UKCS (UK Continental Shelf), leveraging existing infrastructure and capabilities to provide world-class CCS operations. The company obtained a license in 2023 to advance the Poseidon CCS project.

Table 1 details the 100 largest global CCUS projects. The actual number of projects listed exceeds 100 due to some projects having forecasted capacities that tie them in ranking positions.

Table 1: Top 100 CCUS Projects in the World

No.	Project name	Country	Partners	Project type	Operation	Project Status	Estimated capacity by IEA(Mt CO2/yr)
1	Port of Corpus Christi-Mississippi pipeline (TX)	USA	Phoward Midstream Energy Partners LLC	Transport		Planned	250
2	Project WyoTCH pipeline (WY)	USA	Carbon Solutions LLC, Enhanced Oil Recovery Institute of University of Wyoming	Transport		Planned	120
3	Fluxys-Equinor Belgium-Norway Trunk Line	Belgium -Norway	Fluxys, Equinor, Heidelberg Materials	Transport	2030	Planned	40
4	Oxy DAC potential expansion scenario global 2030	Unknown	1PointFive, Oxy low carbon ventures (Occidental)	Full chain	2030	Planned	38.2
5	North Sea CO2 corridor	Belgium -Germany	Wintershell dea, Fluxys, OGE	Transport	2030	Planned	30
6	UK Poseidon CCS project phase 3	UK	Prenco UK (operator), Carbon Catalyst Ltd, Wintershall dea (10% of carbon catalyst license)	Storage	2040	Planned	30
7	The Bluestreak CO2 Joint Venture	UK	Navigator Holdings (50%), Bumi Armada Berhad (50%)	T&S		Planned	30
8	German carbon transport grid	Germany	Open Grid Europe (OGE), TES	Transport	2028	Planned	25.8
9	Equinor Smeaheia storage phase 2	Norway	Equinor	T&S	2035	Planned	24
10	Gismarvik CO2 hub	Norway	Horisont Energi, EON	Transport	2028	Planned	24
11	Project Crossroads (IN, IL, MI)	USA	BP Carbon Solutions LLC	T&S		Planned	23
12	Aramis CCS transport phase 1	Netherlands	TotalEnergies, Shell, EBN, Gasunie,	Transport	2029	Planned	22
13	Delta Rhyne Corridor	Netherlands -Germany	Shell, Port of Rotterdam, bp, RWE, thyssenkrupp, LyondellBasell, Heidelberg Materials, Attero and Chemelot	Transport	2027	Planned	22
14	Origins project (ALB)	Canada	Enhance Energy	T&S		Planned	20
15	Wintershall Dea-Equinor Gernany-Norway pipeline phase 1	Germany -Norway	Wintershall Dea, Equinor	Transport	2032	Planned	20
16	Wintershall Dea-Equinor Gernany-Norway pipeline phase 2	Germany -Norway	Wintershall Dea, Equinor	Transport	2037	Planned	20
17	EU2NSEA	Norway	Equinor and partners (incl. Heidelberg Materials)	Transport	2029	Planned	20
18	Corpus Christi carbon storage hub (TX)	USA	Repsol (operator), Carbonvert, MEPUSA (Mitsui E&P USA), POSCO	Storage		Planned	20
19	Orion (AL)	USA	ExxonMobil (formerly Denbury carbon solutions)	Storage	2026	Planned	20
20	Havnso storage/Trelleborg network (Norne carbon storage hub)	Denmark	Fidelis new energy, Gas Storage Denmark, Capio Danmark (PCI coordinator), Ross Energy	Storage	2030	Planned	16.4
21	Oxy DAC potential expansion scenario US 2030	USA	1PointFive, Oxy low carbon ventures (Occidental)	Full chain	2030	Planned	16.3
22	Lone Star Storage Hub Project (Jasper) (TX)	USA	BP carbon solutions, Linde (capture/CO2 supplier)	T&S	2026	Planned	15
23	Alberta Carbon Trunk Line (ACTL) (ALB)	Canada	Wolf Carbon Solutions (Wolf Midstream, Enhance Energy)	Transport	2020	Operational	14.6
24	River Parish Sequestration (LA)	USA	River Parish Sequestration LLC, Blue Sky Infrastructure	T&S		Planned	14
25	Aker CC power plant Europe (unknown facilities)	Unknown	Aker CC, unknown company	Capture		Planned	14
26	Mt Simon Hub CCS Pipeline (IA)	USA	ADM, Wolf Carbon Solutions (Wolf Midstream)	Transport		Planned	12
27	Midwest Carbon Express (NE, SD, ND, MI, IA)	USA	Summit carbon solutions (SK E&S 10%)	T&S	2025	Planned	12

Scaling Worldwide CCUS Value
Chain to Reach Net-Zero by 2050

No.	Project name	Country	Partners	Project type	Operation	Project Status	Estimated capacity by IEA(Mt CO2/yr)
28	Ascension Clean Energy (ACE) complex (LA)	USA	Clean Hydrogen Works (Joint venture between Denbury Carbon Solutions (ExxonMobil) (T&S), Hafnia (ammonia export), MOL (shipping))	Capture	2027	Planned	12
29	Pathways Alliance (T&S) (ALB)	Canada	Pathways Alliance (CNRL, Cenovus Energy, ConocoPhilips, Imperial, MEG Energy, and Suncor)	T&S	2030	Planned	12
30	Pathways alliance (ALB) (14 facilities)	Canada	Pathways Alliance (CNRL, Cenovus Energy, ConocoPhilips, Imperial, MEG Energy, and Suncor)	Capture	2030	Planned	12
31	Petrobras Santos Basin pre-salt oilfield CCS	Brazil	Petrobas	Full chain	2013	Operational	10.6
32	CO2NEXT terminal phase 2	Germany	Vopak, Gasunie	Transport		Planned	10.3
33	Alberta Carbon Grid (ALB) phase 1 (Industrial heartland)	Canada	Pembina Pipeline Corporation, TC Energy	T&S	2027	Planned	10
34	Porthos onshore transport	Netherlands	Energie Beheer Nederland (EBN), Gasunie, and the Port of Rotterdam	Transport	2026	Under construction	10
35	Daya Bay CCS Hub (Guangdong)	China	Shell, ExxonMobil, CNOOC, and Guangdong Provincial Development & Reform Commission (JSA)	T&S		Planned	10
36	Gemini (formerly Denbury Ascension Parish sequestration) (LA)	USA	ExxonMobil (formerly Denbury carbon solutions)	Storage	2026	Planned	10
37	Alberta Carbon Grid (ALB) phase 2	Canada	Pembina Pipeline Corporation, TC Energy	T&S		Planned	10
38	East Calgary Region Carbon Sequestration Hub (ALB)	Canada	Reconciliation Energy Transition Inc. (RETI), Sumitomo	Storage		Planned	10
39	Tourmaline Clearwater CCUS (ALB)	Canada	Tourmaline Oil Corp.	Storage		Planned	10
40	Bacton Thames Net Zero	UK	Eni	T&S	2030	Planned	10
41	CO2nnectNow HES Wilhelmshaven Tank Terminal phase 1	Germany	Wintershall Dea	Transport	2028	Planned	10
42	Integrated clean ammonia production, Port of Corpus Christi (TX) phase 2	USA	RWE, Lotte Chemical Corporation, Mitsubishi Corporation (JSA)	Capture		Planned	10
43	Bayu-Undan field storage hub Timor-Leste phase 2	Australia	Santos (43.4%), SK E&S (25%), INPEX (11.4%), ENI (11%), JERA (6.1%), Tokyo Gas (3.1%)	T&S		Planned	10
44	WH2V therminal (Wilhelshaven green energy hub phase 1)	Belgium, Germany, Netherlands, Switzerland, USA	TES	Transport	2029	Planned	10
45	Trudvang storage project (EXL007)	Norway	Eni (following acquisition of Neptune Energy) (30%), Sval (40% op), Storegga (30%)	Storage	2029	Planned	10
46	Trailblazer CO2 pipeline	USA	Tallgrass energy	Transport		Planned	10
47	Libra (LA)	USA	Lapis Energy (50% permitting process pre-FID), ExxonMobil (formerly Denbury carbon solutions) (50%; operatorship managing construction)	Storage	2027	Planned	10
48	Enquest CCS Project	UK	Enquest CCS Ltd	Storage		Planned	10
49	Project Tellus - CS020 (Area 1)	UK	Eni (following acquisition of Neptune Energy) (100%)	Storage	2030	Planned	10
50	Leo (MS)	USA	ExxonMobil (formerly Denbury carbon solutions)	Storage	2025	Planned	10
51	Aries (LA)	USA	ExxonMobil (formerly Denbury carbon solutions)	Storage	2026	Planned	10
52	Pegasus (LA)	USA	ExxonMobil (formerly Denbury carbon solutions)	Storage	2027	Planned	10
53	Moomba CCS storage hub (phase 4)	Australia -Japan	Santos, JX Nippon Oil & Gas Exploration Corporation, ENEOS	T&S	2040	Planned	10
54	Four Corners Power Plant Integrated Carbon Capture and Storage (NM)	USA	Navajo Transitional Energy Company, LLC (NTEC), DOE Office of Clean Energy Demonstrations	Full chain		Planned	10
55	Illinois Clean Fuels Project (IL)	USA	Illinois clean fuels,	Capture	2026	Planned	9.7
56	Atlas Carbon Sequestration Hub Phase 2 (ALB)	Canada	Shell Canada Limited, ATCO Energy Solutions, Suncor Energy	T&S	2025	Planned	9.25

Scaling Worldwide CCUS Value
Chain to Reach Net-Zero by 2050

No.	Project name	Country	Partners	Project type	Operation	Project Status	Estimated capacity by IEA(Mt CO2/yr)
57	Jubail CCS Hub agreement (*capture sources under evaluation)	Saudi Arabia	Saudi Aramco, SLB, Linde	T&S	2027	Planned	9
58	Norvik Infrastructure CCS East (NICE)	Sweden	Ports of Stockhom, Stockholm Exergi, Mälarenergi, Söderenergi, Vattenfall, Heidelberg Materials, Nordkalk, and Plagazi	Transport		Planned	9
59	UK Poseidon CCS project phase 2	UK	Prenco UK (operator), Carbon Catalyst Ltd, Wintershall dea (10% of carbon catalyst license)	Storage	2030	Planned	8.5
60	Hynet Northwest phase 3	UK	Hynet consortium	Capture	2030	Planned	8.1
61	Polaris offshore storage facility	Norway	Horisont Energi, PGNiG Upstream Norway (operator)	Storage	2028	Planned	8
62	BlueBonnet Sequestration Hub (Chambers, Liberty, and Jefferson County) (TX)	USA	1PointFive, Oxy low carbon ventures (Occidental)	Storage	2026	Planned	8
63	Port of Kalundborg terminal and pipeline to Trelleborg phase 2 (Norne carbon storage hub)	Denmark	Fidelis new energy, Gas Storage Denmark, Capio Danmark (PCI coordinator)	Transport	2030	Planned	8
64	NL CCS Direct Injection (Noordkaap)	Netherlands	Eni (following acquisition of Neptune Energy), EBN, ExxonMobil, Tenaz Energy & Cape Omega	T&S	2030	Planned	8
65	Joint study CCS value chain Japan Malaysia phase 2	Japan -Malaysia	Japan Petroleum Exploration Co., Ltd. (JAPEX), JGC Holdings Corporation (JGC HD), Kawasaki Kisen Kaisha, Ltd. ("K" LINE), Petronas CCS Ventures	T&S	2030	Planned	8
66	Four corners carbon storage hub (NM)	USA	New Mexico Institute of Mining and Technology	Storage		Planned	8
67	Aramis CCS storage phase 1	Netherlands	TotalEnergies, Shell, EBN, Gasunie,	Storage	2029	Planned	7.7
68	Cstore 1	Australia	deepC-store (dev and operator), Mitsui (for shipping), Technip Energies (TEN) (pre-FEED for hub facility)	T&S		Planned	7.5
69	Antwerp@C CO2 Export Hub phase 2	Belgium	Air Liquide, BASF, Borealis, ExxonMobil, INEOS, TotalEnergies, Fluxys and the Port of Antwerp	Transport	2030	Planned	7.5
70	ExxonMobil Baytown petrochemical site (TX)	USA	ExxonMobil, Honeywell (tech), Technip Energies (FEED)	Capture	2028	Planned	7
71	RWE Eemshaven power plant	Netherlands	RWE	Capture	2030	Planned	7
72	RWE Amer power plant	Netherlands	RWE	Capture	2032	Planned	7
73	Havstjerne CO2 storage (Altera Stella Maris CCS Project Phase 1)	Norway	Altera (50%), Wintershall Dea (50%	T&S		Planned	7
74	Alberta Carbon Trunk Line (ACTL) - Edmonton Connector Phase 2	Canada	Wolf Midstream	Transport	2024	Under construction	7
75	ECO2CEE (previously Poland EU CCS Interconnector) phase 2	Poland, Latvia, Lithuania	Air Liquide Polska, PKN Orlen, Lafarge Cement, Orlen Lietuva	Transport	2031	Planned	6.5
76	Project Greensand phase 2	Denmark	INEOS E&P, Wintershell Dea, Welltec (storage)	T&S	2030	Planned	6.5
77	Project Ruby (Rodby) phase 2	Denmark	CarbonCuts, bluenord (funding)	Storage		Planned	6.5
78	Viking CCS Phase 2	UK	Harbour Energy (operator), BP (40%), Technip energies (FEED transport)	T&S	2030	Planned	6.4
79	Prairie State Generating Station Carbon Capture (IL)	USA	Prairie Research Institute (University of Illinois), Mitsubishi Heavy Industries, Kiewit Engineering Group, Sargent & Lundy	Capture	2025	Planned	6.05
80	CarbonNet	Australia	Victorian Government/Australian Government, (DNV)	T&S	2030	Planned	6
81	Ghent Carbon Hub	Belgium	Fluxys, ArcelorMittal, North Sea Port	Transport	2027	Planned	6
82	Medway Hub CCS	UK	Synergia Energy Ltd (50%) and Wintershall Dea (50%)	T&S	2032	Planned	6
83	Rockpoint and Inter Pipeline Carbon Sequestration Hub	Canada	Inter Pipeline and Rockpoint Gas Storage	T&S		Planned	6
84	Pelican sequestration hub (Livingston Parish) (LA)	USA	Pelican Sequestration Hub LLC (Oxy low carbon ventures, Occidental), and Rusheen Capital	Storage	2025	Planned	6
85	Project Tellus - CS021 (Area 5)	UK	Eni (following acquisition of Neptune Energy) (50%), EEPUKL (50%)	Storage	2033	Planned	6

86	Project Tellus - CS022 (Area 7)	UK	Eni (following acquisition of Neptune Energy) (100%)	Storage	2033	Planned	6
87	D'Artagnan Dunkirk CO2 Hub Phase 3	France	ArcelorMittal, Port of Dunkerque, Chaux et Dolomines du boulonnais, Verdalis, Air Liquide	Transport	2035	Planned	5.6
88	Hynet North West (Liverpool Bay CO2 storage) phase 2	UK	Eni, Halliburton (Well completions)	T&S	2030	Planned	5.5
89	CO2NEXT terminal phase 1	Germany	Vopak, Gasunie	Transport		Planned	5.4
90	Pembroke Net Zero Centre (PNZC)	UK	RWE	Capture	2040	Planned	5.15
91	Acorn CCS phase 2	UK	Storegga(30%), Shell (30%), Harbour (30%), North Sea Midstream partners (10%)	T&S		Planned	5
92	Eastern Louisiana Clean Hydrogen Complex (LA)	USA	Air Products	Full chain	2026	Under construction	5
93	L10 CCS	Netherlands	Eni (following acquisition of Neptune Energy), EBN, ExxonMobil, Tenaz Energy	T&S	2028	Planned	5
94	NextDecade Rio Grande LNG (TX)	USA	NextDecade, Mitsubishi HI (ESA/Tech)	Capture	2025	Planned	5
95	POET 17 bioprocessing plants (IA, NE, SD)	USA	POET	Capture	2025	Planned	5
96	Calpine Deer Park Energy Center (TX)	USA	Calpine Texas CCUS Holdings	Capture		Planned	5
97	Battle River Carbon Hub (ALB)	Canada	Heartland Generation Ltd., Carbon Alpha	Storage	2027	Planned	5
98	Bow River Hub (ALB)	Canada	Inter Pipeline Ltd. and Entropy Inc.	Storage		Planned	5
99	Rolling Hills Carbon Sequestration Hub (ALB)	Canada	AltaGas Ltd. and Whitecap Resources Inc.	Storage	2026	Planned	5
100	Santos Carnavon Basin storage (Reindeer CCS)	Australia	Santos Offshore Pty Ltd (50% and Operator) and Chevron Australia Pty Ltd (50%)	Storage	2028	Planned	5
101	Wintershall Dea Luna storage	Norway	Wintershall Dea (60%), TotalEnergies (40%) (formerly owned by CapeOmega)	Storage	2030	Planned	5
102	Morecambe Net Zero Cluster	UK	Spirit Energy (Centrica and Stadtwerke Mucnchen GmbH joint venture)	T&S	2030	Planned	5
103	Co2 TransPorts phase 2 (cross-border pipeline, phase 1 is Portos and Antwerp?)	Netherlands	Port of Rotterdam, port of Antwerp, North Sea Port, Fluxys, Gasunie	Transport		Planned	5
104	Viking CCS Phase 3	UK	Harbour Energy (operator), BP (40%), Technip energies (FEED transport)	T&S	2035	Planned	5
105	Poseidon CO2 storage	Norway	Aker BP (60%), OMV AS (4%)	Storage		Planned	5
106	ExxonMobil Vermilion parish storage: Pecan island (LA)	USA	ExxonMobil	Storage	2026	Planned	5
107	Equinor Smeaheia storage phase 1 (start up phase)	Norway	Equinor	T&S	2028	Planned	5
108	Orion CCS Project Phase 2	UK	Prenco UK (license 80%), Carbon Catalyst Ltd (10%), Summit Energy Evolution Limited (Sumitomo) (10%)	Storage		Planned	5
109	Draco (LA)	USA	ExxonMobil	Storage	2026	Planned	5
110	Dorado (TX)	USA	ExxonMobil	Storage	2026	Planned	5
111	Virgo (LA)	USA	ExxonMobil	Storage	2026	Planned	5
112	Corvus (WY)	USA	ExxonMobil	Storage	2026	Planned	5
113	Cygnus (WY)	USA	ExxonMobil	Storage	2027	Planned	5
114	Harvest Bend CCS White Castle (LA)	USA	Harvest Bend CCS LLC (Talos Energy, Enlink Midsteram, Storegga)	Storage		Planned	5
115	ADNOC CO2 storage hub (Phase 2 of fertiglobe pilot)	United Arab Emirates	ADNOC	Storage	2030	Planned	5
116	Moomba CCS storage hub (phase 3)	Australia -Japan	Santos, JX Nippon Oil & Gas Exploration Corporation, ENEOS	T&S	2035	Planned	5
117	GRTGaz CO2 backbone	France	GRTGaz	Transport	2028	Planned	5

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