



International Workshop on Offshore Geologic CO₂ Storage



6th International Workshop

13-14 September 2023

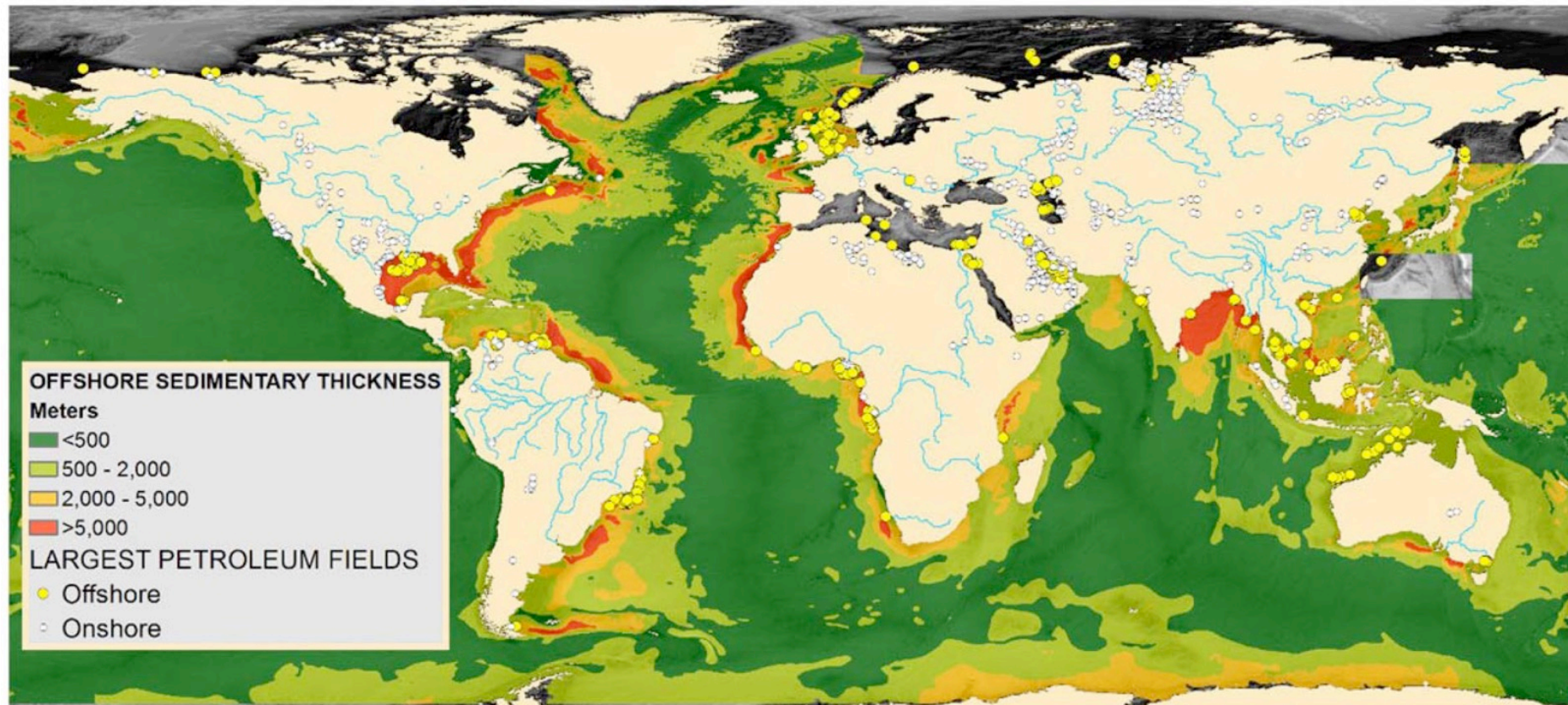
Aberdeen



STOREGDA



The global offshore continental shelves represent the largest near-term storage for gigaton-scale CCS



CSLF Report on Offshore Geologic CO₂ Storage



“There is a growing wealth of research, development and practical experiences that are relevant to CO₂ storage offshore, but this expertise is familiar only to a few specific countries around the world. However there is also significant global potential for offshore CO₂ storage, and countries who are not yet active but may become interested in offshore storage, would benefit from knowledge sharing from these existing experiences and expertise. Such international knowledge sharing would be facilitated by international workshops and by international collaborative projects.”

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(CSLF Ministerial Nov 2015: CSLF-T-2015-06)

Offshore Workshop Series

- 1st Workshop, 19-21 April 2016, at the BEG, University of Texas, Austin. **Northern Lights “Hub” was announced!** (IEAGHG Report 2016/TR2)
- 2nd Workshop 19-20 June 2017, at Lamar University, Beaumont, Texas. (IEAGHG Report 2017/TR12)
- 3rd Workshop Hosted by Research Council of Norway, Oslo, 3-4 May 2018. (IEAGHG Report 2018-TR02)
- 4th Workshop Hosted by University of Bergen, Norway, 11-12 Feb 2020. **Results of STEMM-CCS Project!** (IEAGHG Report 2020-TR02)
- 5th Workshop, New Orleans. 19-20 May 2022. Hosted by BEG UT and SSEB. **Regular Workshop** (IEAGHG Report 2016/TR2)

Northern Lights- Leading the Way

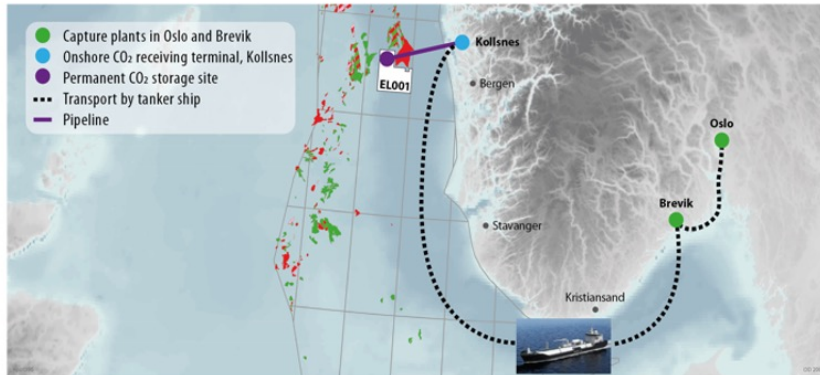
A CCS activity has started:

Longship- a full scale CCS demonstration project on the way to large-scale deployment



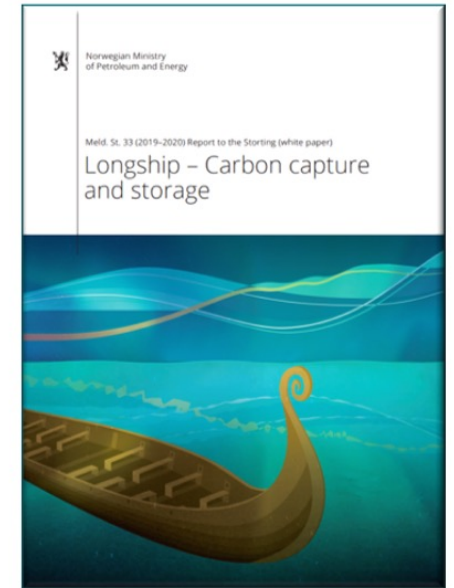
First proposal of:

- Hub model
- Ship transport model
- International CO₂ trade enabled by a provisional application to the London Convention



- Contribute to developing technology for capture, transport and permanent storage of CO₂
- Develop a full-scale CCS value chain in Norway by 2024
- Demonstrate that CO₂ management are safe and possible

Learning- cost reductions – business development

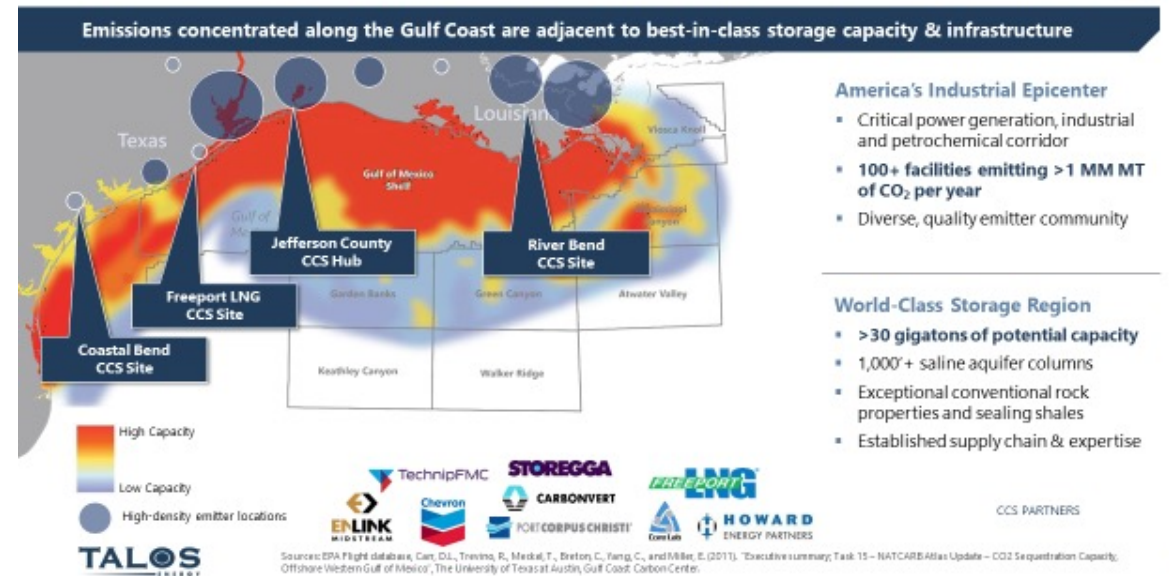


Eva Halland

Momentum - CCS in the Gulf of Mexico Region

- Sept 2021 -Jefferson County TX- 40,000 acres lease – Talos, Carbonvert
- Sept 2021- MOU with GLO and Port of Corpus Christi to co-develop CO₂ storage for CO₂ captured in the Port.
- August 2023- 6 CCS leases to half a million acres in state-owned waters along the TX coast - undisclosed.
- Sept 2023 – Cameron Parish, LA, - 24,000 acres to natural gas producer Castex and Carbonvert.

U.S. Gulf Coast: World-Class CCS Market Opportunity



Permitting Framework For the OCS

BRACEWELL

Under the Sea: Congress Amends OCSLA to Provide for Offshore CCS

December 2, 2021 | [Updates](#) | By: [Ann D. Navaro](#), [Jeffrey R. Holmstead](#), [Kevin A. Ewing](#), and [Daniel J. Pope](#)

Offshore carbon sequestration on the Outer Continental Shelf ("OCS") could be just over the horizon. The Infrastructure Investment and Jobs Act (the "Infrastructure Act"), signed into law by President Biden on November 15, 2021, amends the Outer Continental Shelf Lands Act ("OCSLA") to allow for it and directs the Department of the Interior to establish a permitting framework within a year of President Biden's signature. Companies interested in offshore geologic sequestration should follow the agency's progress closely.

6th International Offshore Workshop

- University of Aberdeen, Scotland
- 13-14th September, 2023
- Organized by UT Austin BEG with IEAGHG
- Co-hosted and sponsored by Storegga
- 190 delegates
- 60 in-person and 130 virtual
- 35 countries, 44 presentations
- Mix of industry, research regulators.



Agenda



- International Project Roundup – 20 projects
- Injection, Wells, Capacity
- Legal, Regulatory and Accounting – including NSTA licencing (21 awarded)
- Interaction with other Users – with windfarms in North Sea
- Transport and Infrastructure
- Stakeholder Engagement – UK and US work
- Monitoring
- Environmental Aspects – including use of STEMM-CCS outputs, Smart AUVs
- Conclusions and Recommendations

Project Roundup

1. Acorn, UK
2. Prinos, Greece
3. Corpus Christi, Texas
4. Viking CCS, UK
5. Pilot Strategy, Portugal
6. Northern Lights, Norway
7. South Korea
8. Porthos, NL
9. Liverpool Bay, UK,
10. Ravenna, Italy, ENI
11. Deep C Store, Australia
12. Taiwan

13. Poseidon, UK
14. Talos, Texas
15. Petrobras, Brazil
16. Pelican, Australia
17. Enping, China
18. Timor Leste

Plus summaries of:

Greensand (INEOS), Denmark; Bifrost, Denmark; (NL) L10; Poseidon, Norway; Polaris, Norway; Smeaheia, Norway; Woodside, Australia; Endurance Field, East Coast UK; Carbon-Zero (Cox Oil) Gulf of Mexico; Sleipner; Snovit; K12B; Tomakomai.

Attributes of Projects in Development

Courtesy of Yashoda Joshi, BEG GCCC

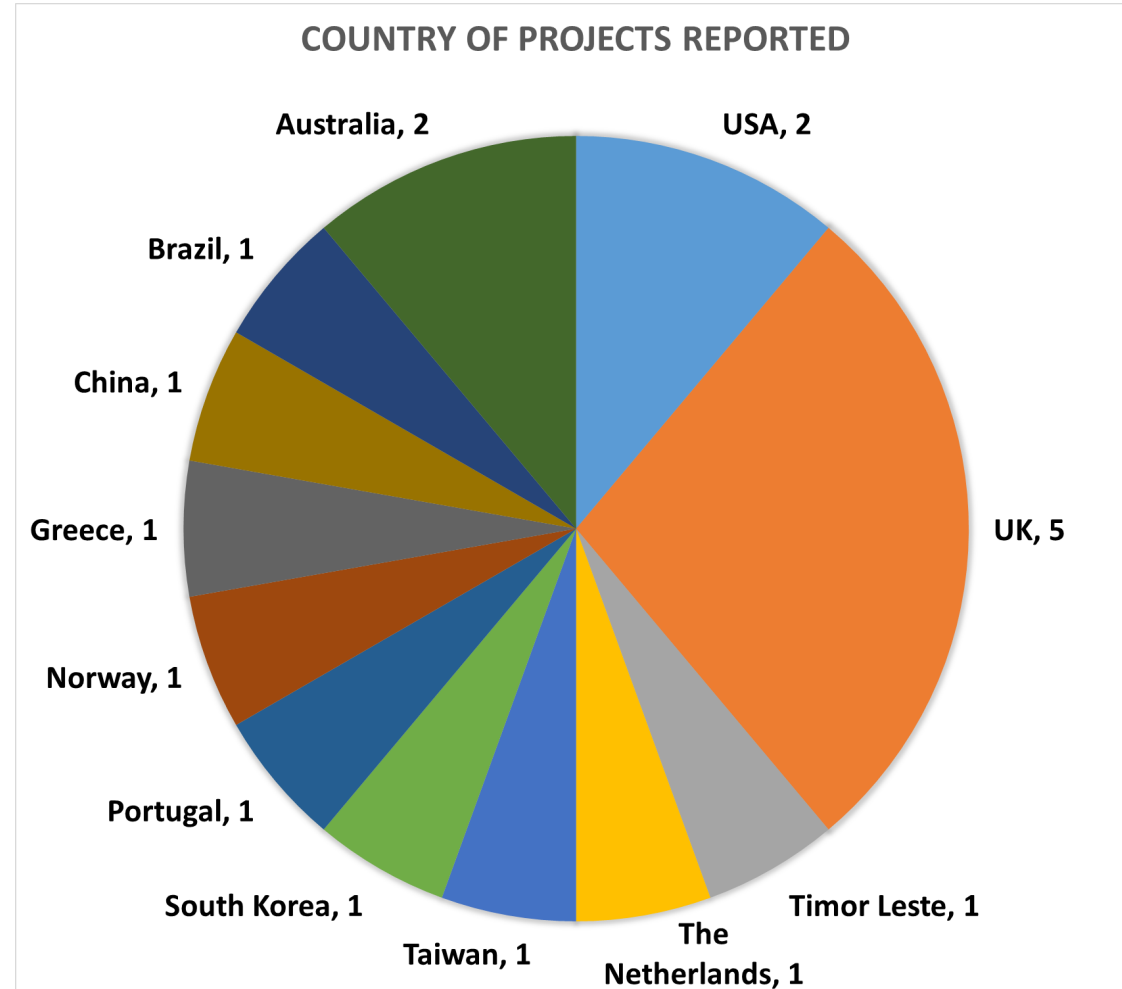
60 MMT/year by 2030

Project Name	Country	Storage Type	Project phase	In Operation	Estimated Storage Capacity (Mt)	Storage Rate Target (Mt/yr)	CO2 Sources	CO2 Transport	CO2 Handling	Infrastructure Reuse?
Coastal Bend Offshore CCS (Corpus Christi)	USA	Saline	In Development	2023	50+	-	Industrial	Ship	Floating vessel	Yes
Talos Energy, Gulf of Mexico	USA	Saline	In Development	2024-2026	800 (4 sites)	5-10	Industrial	Pipeline	Fixed platform	Yes
Acorn (Storegga)	UK	Depleted Gas + Saline	In Development	2017	-	2	Any Emitter	Pipeline	Fixed platform	Yes
Viking CCS (Harbour Energy & BP)	UK	Depleted Gas	In Development	2022	300	10	Industrial	Pipeline	Fixed platform	No
Liverpool Bay (ENI)	UK	Depleted Oil & Gas	In Development	2020-2024	109	4.5	Industrial	Pipeline	Fixed platform	Yes
Poseidon (Carbon Catalyst)	UK	Depleted Gas + Saline	In Planning	2027-2029	935	1.5	Any Emitter	Ship + Pipeline	Fixed platform	Yes
Orion (Carbon Catalyst)	UK	Depleted Gas	In Planning	2029-2031	126	1 (up to 6)	Industrial	Pipeline	Fixed platform	Yes
ANPM (Bayu-Undan)	Timor Leste	Depleted Oil	In Planning	2025	200+	10	Any Emitter	Ship + Pipeline	Fixed platform	Yes
Porthos	The Netherlands	Depleted Gas	In Development	2026	37	2.4	Industrial	Pipeline	Fixed Platform	Yes
CCS Status in Taiwan	Taiwan	Saline	In Development	2023	0.06 (2 sites)	0	Energy + Industrial	Pipeline	Fixed platform	No
Donghae CCUS	South Korea	Depleted Gas	In Planning	2024-2030	-	1.2	Industrial	Pipeline	Fixed Platform	Yes
Pilot Strategy	Portugal	Saline	In Development	2020-2026	61-70	-	Industrial	Ship	Floating vessel	Yes
Northern Lights	Norway	Saline	Under Construction	2024	37.5	1.5-5	Industrial	Ship + Pipeline	Fixed platform	No
Prinos (Energean)	Greece	Depleted Oil	In Development	2022-2028	100	3	Any Emitter	Ship + Pipeline	Fixed platform	Yes
Enping	China	Saline	Operational	2023	1.46	0.3	Energy	Pipeline	Fixed platform	No
Petrobras' Pre-Salt	Brazil	Oil & Gas + Saline	Operational	2010	-	10+	Industrial	Ship (Direct Reinjection)	Floating vessel	Yes
Deep C Store	Australia	Depleted Oil & Gas	In Planning	2026	-	1.5	Industrial	Ship	Floating vessel	No
Pelican Project	Australia	Depleted + Coal	In Development	2025-2030	168	6	Industrial	Pipeline	Fixed platform	Yes

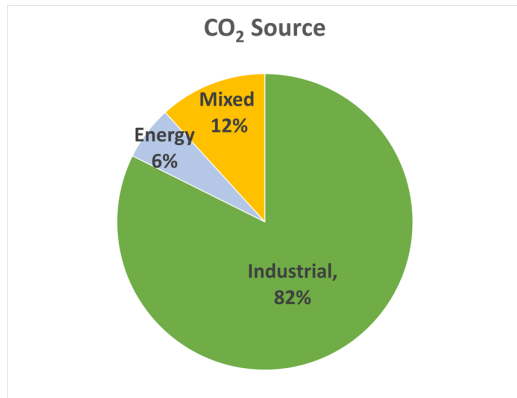
Project Attributes - Countries

20 Projects Reported
12 countries from many
regions of the world

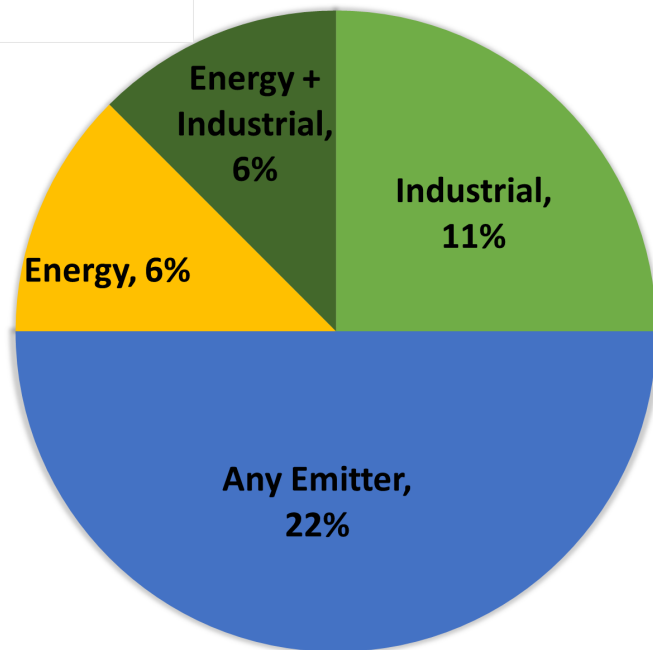
UK, Europe, Asia-Pacific,
Oceania, North America,
South America, Scandanavia



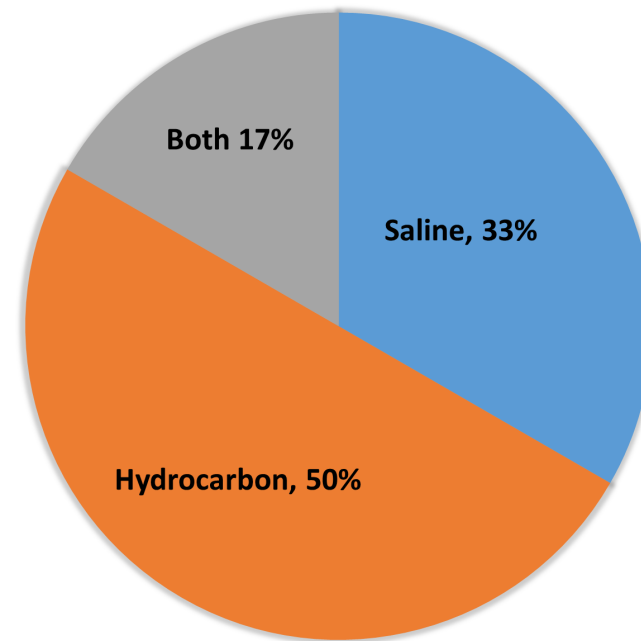
Project Attributes - Storage



CO₂ SOURCES

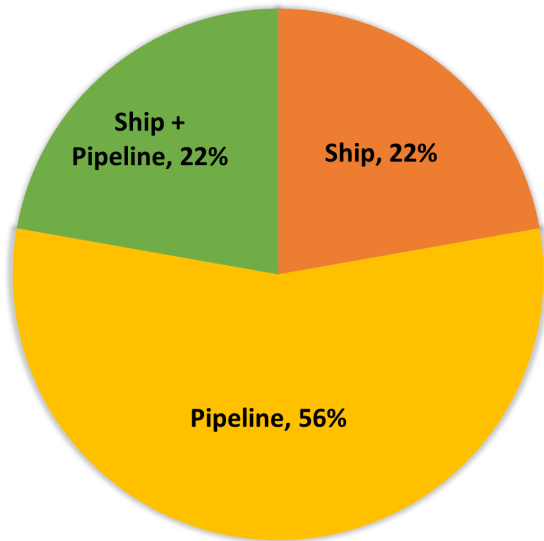


STORAGE TYPE

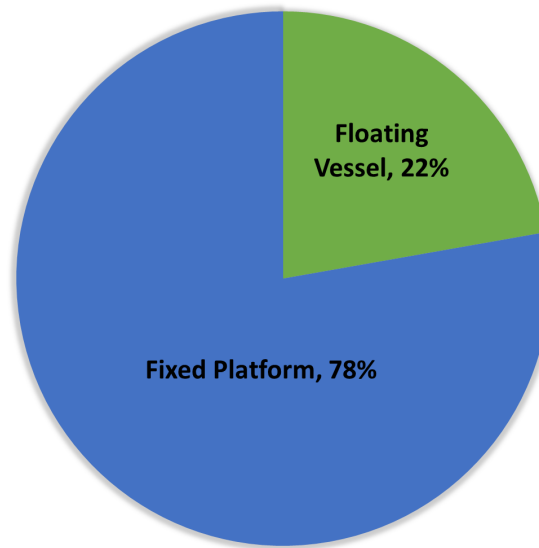


Project Attributes- Handling

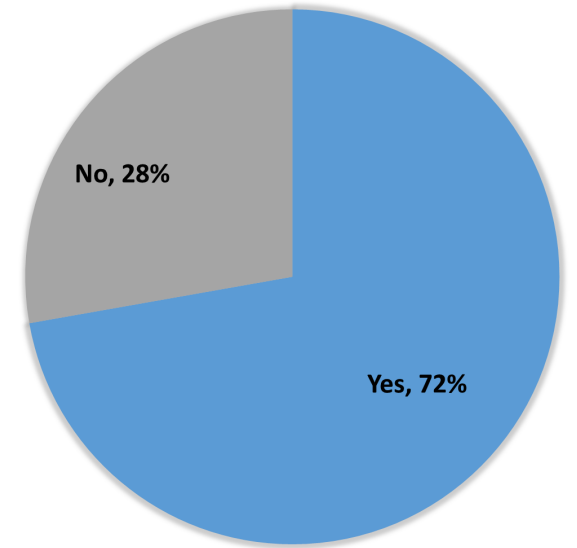
CO2 TRANSPORT



CO2 HANDLING



INFRASTRUCTURE REUSE?



Main Technical Outcomes

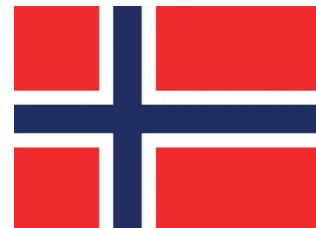
- Encouraging number of projects in development: but there aren't enough projects in the pipeline to deliver climate targets.
- Resource estimates are contingent upon well density and pressure space, and are easily exaggerated.
- Spatial resource allocation must be strategic – collaboration is key.
- Just Transition is being recognised with CCS projects. Community benefits are key, even for offshore
- MMV plans are maturing and being approved by regulators, first projects are setting precedents
- Response protocols are important for stakeholder engagement whether a project leaks or not, to attribute whether environmental anomalies represent leakage or some other phenomena of climate change.

Recommendations

- Develop/prove monitoring techniques for use in windfarms
- Resource allocation is strategic – maximise opportunity
- The timeline for all phases of license and permit approval needs to be accelerated. Work together to make plans – modify work programs and optimise the process.
- Know local community and collaborate
- Response protocols need to be established up front (there will be false accusations and false positives). Have the tools for signal attribution.
- We need more clarity over way that we licence,
- Need to improve public knowledge, and how to positively engage the media
- Need to accelerate information sharing to the Global South, esp countries with no hydrocarbon industry
- Need protocols for how to assess and monitor leaky wells
- Approaches for managing common space (e.g. pressure space) need to be developed regarding where liabilities and responsibilities fall. Does first mover win? - Basin wide management is an emerging topic.

Overall Summary

- The CSLF Taskforce and Report on Offshore storage which made recommendations for knowledge sharing has been successful in stimulating international cooperation, knowledge transfer and project development in the offshore.
- The USA and Norway have been leaders in advancing the International Workshop on Offshore Storage through their hosting and collaborative support of the meetings.
- The workshop has been effective at its mission to stimulate offshore storage through knowledge sharing.



Further Information

- Presentations are posted on GCCC Website
<https://www.beg.utexas.edu/gcc/research/goi>
- Report will be produced by IEAGHG



Global Offshore Initiative



International Workshop on Offshore Geologic CO₂ Storage

Program Overview

GCCC is pursuing various aspects of offshore carbon sequestration, including a global needs assessment and identifying synergies between an international community of parties interested in offshore storage.

Explore the links below for presentations, posters, and publications.

Sixth International Offshore Geologic CO₂ Storage Workshop September 13–14, 2023

AGENDA | All presentations

Day 1 – Wednesday 13 September 2023

SESSION 1: Welcome & Scene Setting

- 1.1 Welcome | Nick Forsyth, University of Aberdeen
- 1.2 Welcome from IEAGHG and UT Austin | Tim Dixon, IEAGHG & Katherine Romanak, University of Texas
- 1.3 What is different about Offshore | Owain Tucker, Shell

SESSION 2: Project Round-Up

- 2.1 Acorn, UK | Iain Morrison, Storegga
- 2.2 Prinos, Greece | Katerina Sardi, Energean
- 2.3 Corpus Christi, USA | Tip Meckel, presented by Katherine Romanak, University of Texas
- 2.4 Viking CCS, UK | Andrew Hood – Harbour Energy
- 2.5 Pilot Strategy, Portugal | Maria Helena Caeiro, University of Évora
- 2.6 Northern Lights, Norway | Catalina Acuna, Northern Lights
- 2.7 South Korea | Axel Lemus, CCUS

Katherine Romanak
Senior Research Scientist
Bureau of Economic Geology
The University of Texas at Austin

katherine.romanak@beg.utexas.edu

<http://www.beg.utexas.edu/gccc/>



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