



International Workshop on Offshore Geologic CO₂ Storage

5th International Workshop

19-20 May 2022

New Orleans

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Bureau of Economic Geology

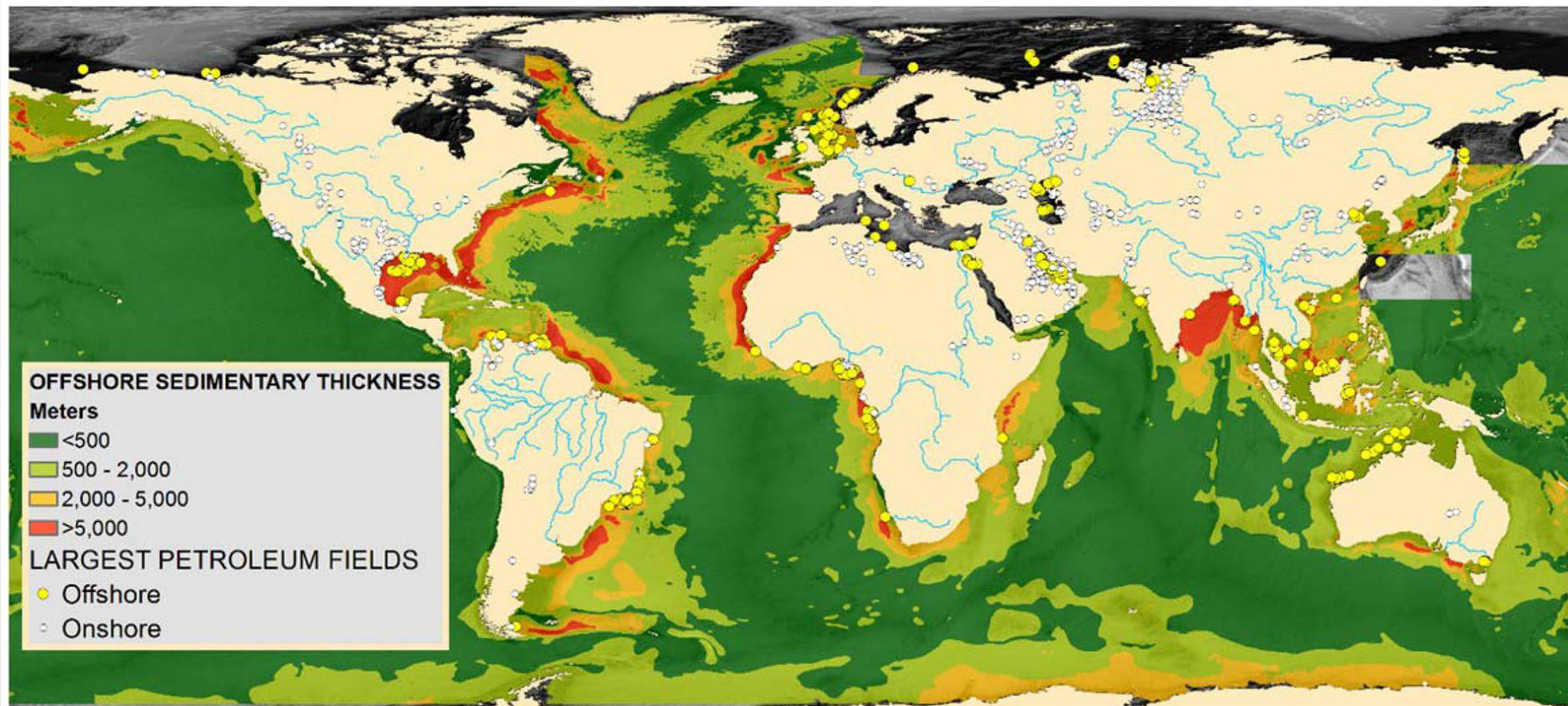
Carbon Project Management Meeting
August 17, 2022



BUREAU OF
ECONOMIC
GEOLOGY



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



Proposal – A CSLF Task Force

- Assess barriers to implementation of offshore CO₂ storage & technology needs
 - Serve Many Nations
 - Share and Synergize Technology Strengths
 - Share Experience
- Success Criteria
 - Accelerate Deployment of Offshore Field Test(s)



Task Force Progress

- November 2013: (Washington, DC) – BEG introduced concept to gauge international interest in collaborative offshore projects.
- March, 2014: (Seoul, Korea) - US DOE volunteers to lead CSLF Task Force, committee formed (7 countries) .
 - **USA, UK, Australia, Japan, Netherlands, Norway, China**
- September 2015: (Regina, Canada) - Findings and conclusions of the Task Force Report presented.
- November 2015: (Riyadh, Saudi Arabia) – Final report submitted
http://www.cslofforum.org/publications/documents/OffshoreStorageTaskForce_FinalCombinedReport.pdf

“Significant opportunities exist in offshore storage. Recommendation for **international knowledge sharing through workshops** and collaborative projects” (CSLF Ministerial Nov 2015: CSLF-T-2015-06)

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.”

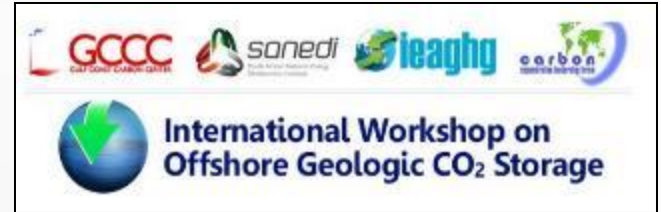
(CSLF Ministerial Nov 2015: CSLF-T-2015-06)

Workshop Series



- **1st Workshop, 19-21 April 2016, at the BEG, University of Texas, Austin.** 50+ attendees from 13 countries.
 - Organized by the Bureau of Economic Geology (BEG) at the University of Texas at Austin in collaboration with the South African Center for CCS at SANEDI, IEAGHG, and with support from CSLF and UNFCCC's CTCN.
 - To facilitate sharing of knowledge and experiences among those who are doing offshore storage and those who may be interested.
 - **Northern Lights was announced!**
 - **IEAGHG Report 2016-TR2**
- **2nd Workshop 19-20 June 2017, at Lamar University Beaumont, Texas.** 50+ attendees from 9 countries
 - To address and build on the recommendations and topics raised at the first workshop offshore storage forward. Continuing the theme of 'how to do'
 - **IEAGHG Report 2017-TR12**

Workshop Series



- **3rd Workshop, Research Council of Norway, Oslo, 3-4 May 2018, 50+ attendees** from 13 countries.
 - Organized by the **Research Council of Norway** in collaboration with The University of Texas at Austin and IEAGHG, and with support from CSLF.
 - To address and build-on the recommendations and topics raised at the first two workshops to take offshore storage forward. Continuing theme of ‘how to do’.
 - **IEAGHG Report 2018-TR02**
- **4th Workshop 19-20 February 2020, University of Bergen, Norway, 150 attendees**
 - Organized in collaboration with the STEMM-CCS Project meeting, University of Bergen, The University of Texas at Austin and IEAGHG
 - To address and build-on the recommendations and topics raised at the first three workshops to take offshore storage forward. Continuing theme of ‘how to do’. 150 attendees.
 - **IEAGHG Report 2020-TR02**

5th Offshore Workshop

New Orleans, Louisiana

May 19-20

50 in person, >120 Online



Mix of Industry, Academia, Regulators



5th Offshore Workshop



**SECARB Offshore – GoMCarb Gulf Regulator Workshop
Agenda (CDT)
May 16, 2022
Bourbon Orleans Hotel – Orleans Ballroom
New Orleans, Louisiana**



**SECARB Offshore & GoMCarb Joint
CCS Conference | International Workshop
on Offshore Geologic CO₂ Storage
May 16 - 20 | New Orleans**



**International Workshop on
Offshore Geologic CO₂ Storage**

5th International Workshop on Offshore Geologic CO₂ Storage
Organised by GCCC, BEG at the University of Texas, with IEAGHG
New Orleans, Louisiana
Thursday 19th – Friday 20th May 2022

5th Workshop, New Orleans

19-20 May, Hosted by BEG UT and SSEB

Agenda

- Welcome & Scene Setting
- International Project Roundup (17 projects)
- Technical Aspects of Depleted Fields
- Containment & Pressure Management
- Regulations and Offshore CCS
- Technical Aspects of Saline Formations
- Monitoring Offshore CCS
- Shipping & Shore Infrastructure
- Summary & Recommendations

Project Roundup

- Cascadia project -basalt storage, USA
- Gulf of Mexico, USA
- Project Greensand, Denmark
- Petrobras Pre-Salt CCS project, Brazil
- Deep C Store, Australia
- Pelican project, Australia
- Project developments –Taiwan
- Endurance field, East Coast Cluster, UK
- Liverpool Bay CCS, UK
- Ravenna CCUS project, Italy
- Aramis, The Netherlands
- Porthos, The Netherlands
- Northern Lights, Norway
- Polaris project, Norway
- Ebro Offshore project, Spain

5- minute presentations due to the sheer numbers!

Attributes of Projects in Development

Courtesy of Ben Pullen, IEAGHG

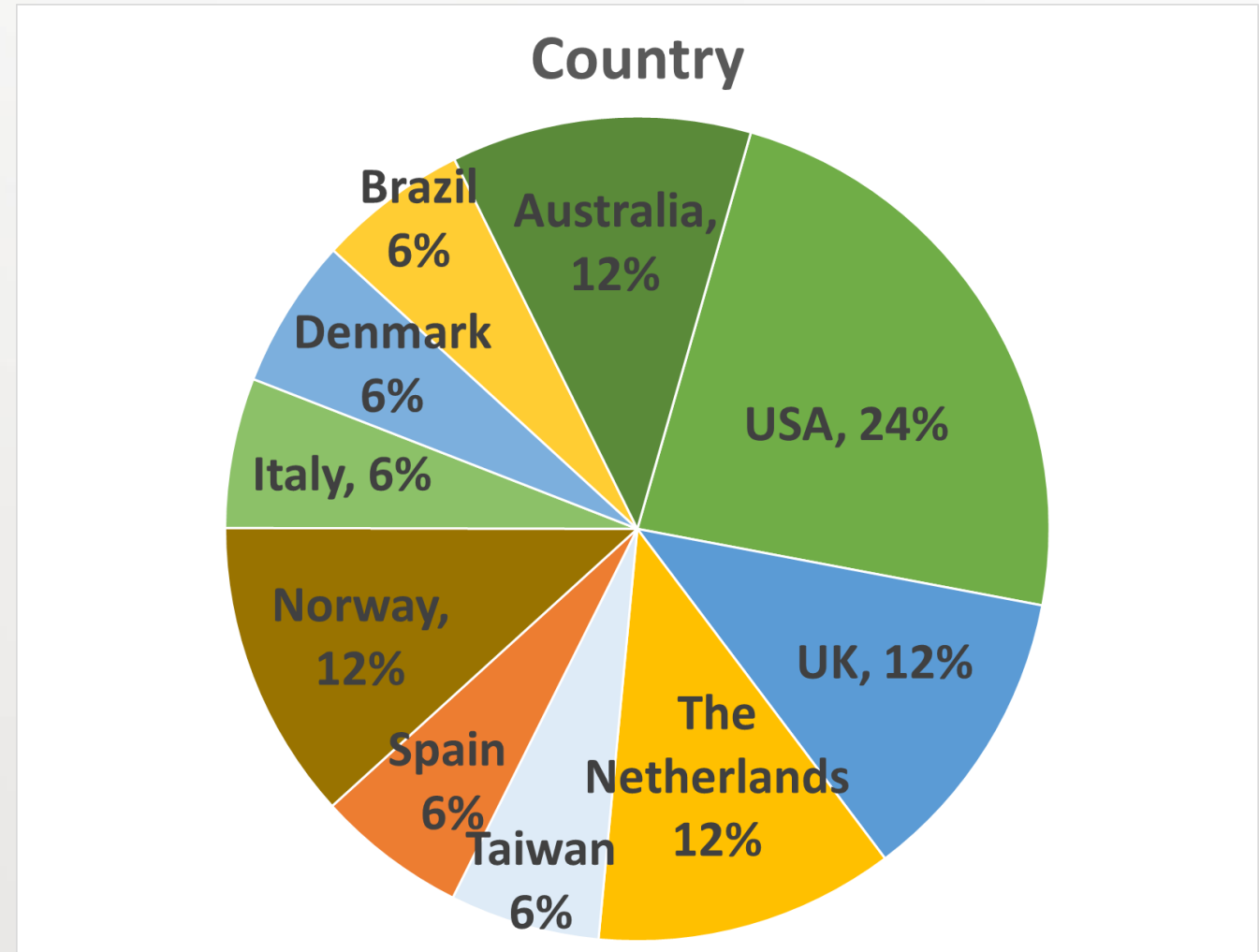
**Additional 90
million tonnes
per year by
2030!**

Project Name	Country	Storage Type	Project phase	In Operation	Estimated Storage Capacity (Mt)	Storage Rate Target (Mt/yr)	CO2 Sources	CO2 Transport	CO2 Handling	Infra Reus
Cascadia CarbonSAFE and Solid Carbon projects	USA	Basalt	Planning	Undisclosed	>50	1-3	Industrial	Ship + Pipeline	Floating vessel	No
Talos Low Carbon Solutions, Gulf of Mexico	USA	Saline	Planning	2024-2026	800 (Across 4 sites)	Regional hub: 5-10	Industrial	Pipeline	Fixed platform	Yes
GoM Depleted Field CCS Development by Cox Oil	USA	Saline	Planning	Undisclosed	-	-	Industrial	Pipeline	Fixed platform	Yes
ExxonMobil Houston CCS Hub	USA	Saline	Planning	2030	500,000	10	Industrial	Pipeline	Fixed platform	Yes
Endurance field, East Coast Cluster (ECC)	UK	Saline	In design	2026	-	4	Industrial	Pipeline	Fixed platform	No
Liverpool Bay CCS	UK	Depleted Oil & Gas	In design	2025	190	10	Industrial	Pipeline	Fixed platform	Yes
Porthos	The Netherlands	Depleted Gas	Design	2024	100	2.5	Industrial	Pipeline	Fixed platform	Yes
Aramis	The Netherlands	Depleted Gas	In planning	2026-2027	-	4	Industrial	Ship + Pipeline	Fixed platform	Yes
CCS Status in Taiwan	Taiwan	Saline	Planning	2025	45,900	3.5	Energy + Industrial	Pipeline	Fixed platform	No
Ebro Offshore project	Spain	Saline + Shale caprock	In planning	Undisclosed	40	-	Industrial	Pipeline	Fixed platform	Yes
Northern Lights	Norway	Saline	In build	2024	-	7	Industrial	Ship + Pipeline	Fixed platform	No
Polaris project	Norway	Saline + Shale caprock	Planning	2025	100	2-6	Industrial	Ship	Floating vessel	No
Ravenna CCUS project	Italy	Depleted Oil & Gas	In design	2027	-	4	Industrial	Pipeline	Fixed platform	Yes
Project Greensand	Denmark	Depleted Oil & Gas	In design	2025	-	4-8	Any emitter	Ship	Floating vessel	Yes
Petrobras' Pre-Salt CCS project	Brazil	Oil & Gas reservoirs + Saline	Operational	2012	-	8.7	Industrial	Direct reinjection from ship	Floating vessel	Yes
Deep C Store	Australia	Depleted Oil & Gas	Planning	2029	16,000	5	Any emitter	Ship	Floating vessel	No
Pelican project	Australia	Depleted Oil & Gas + Coal seams	In design	2025-2030	>125	5	Industrial	Pipeline	Fixed platform	Yes

Developing Project Attributes

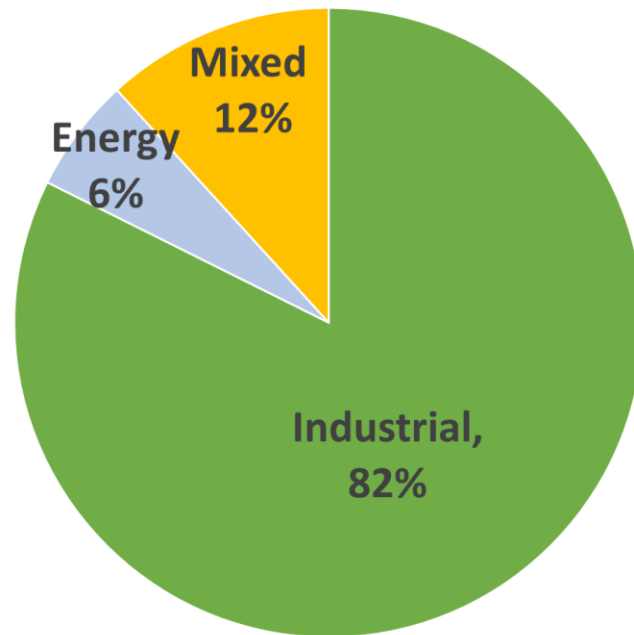
10 countries from many regions of the world

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

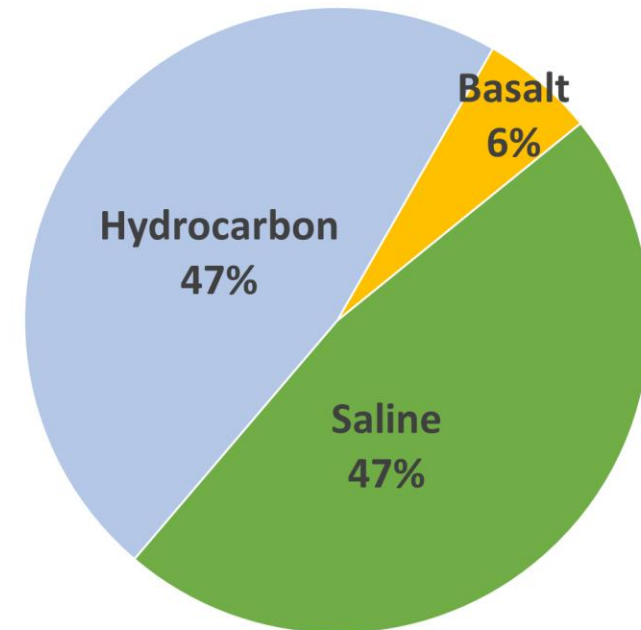


Developing Project Attributes

CO₂ Source

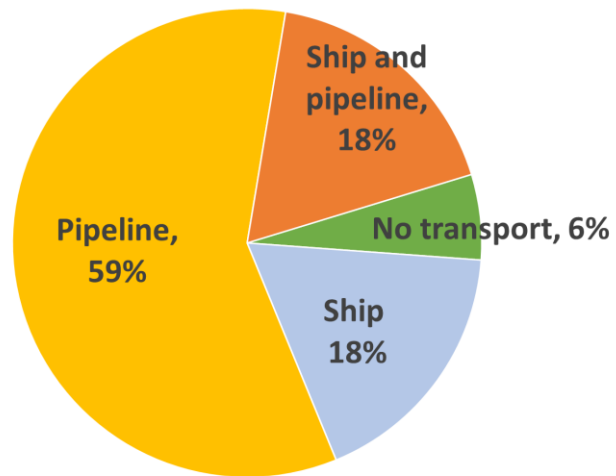


Storage Target

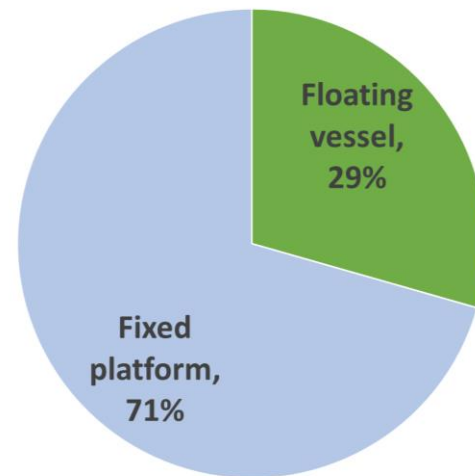


Developing Project Attributes

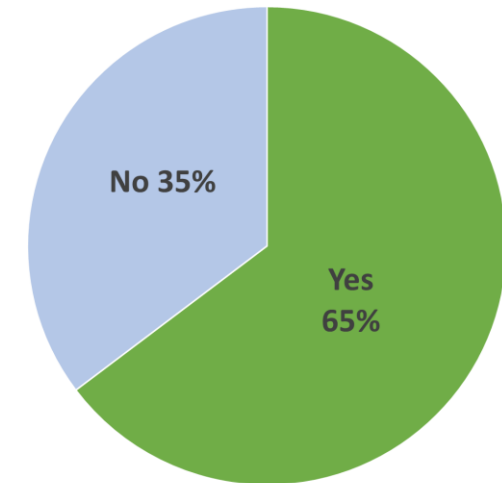
CO₂ Transport



CO₂ Handling



Infrastructure Reuse



Main Technical Outcomes

- Many industry sectors are involved (ammonia, fertilizer, power generation, waste incineration)
- Ship-based handling and injection is being developed, not just transport (similar to Lula Project, Brazil)
- Infrastructure reuse is still in question- site specific, REX-CO2 is developing a well screening tool
- Depleted fields - proven containment, infrastructure reuse, thermal affects,
- Saline – pressure management and brine management issues
- Environmental monitoring – informed by controlled releases, avoidance of false positives, fit for purpose.

Conclusions

- There is a growing number of projects since the last workshop! Momentum!
- There is a wide range of projects from which learning can arise.
- There is an increase in the use of ships for transport and/or injection
- Re-use of infrastructure is complex, technically and legally. The workshop provided good examples of the details that need to be considered.
- A question arises- can we co-locate offshore activities? Maybe, maybe not
- Environmental monitoring research outputs are being used by commercial projects (STEMM-CCS and ECO₂ to N. Lights, Greensand, Northern Endurance Partnership)
- N. Lights Environmental Monitoring plan is 'fit for purpose'
- Because of the timing of the workshop there was good participation by regulators
- Many new industry players are looking at CCS

Recommendations

- Continue this outreach – to new industry players and sectors, and to new countries
- Reach towards investors?
- Capacity estimations need consistency – use SRMS
- Need work on environmental impacts in GoM?
- Make needs and perspectives known to regulators ASAP
- Each site is different-need to let regulators know one size does not fit all.
- Need EPA engagement

Further Information

- Presentations are posted on GCCC Website
<https://www.beg.utexas.edu/gccc/research/goi>
- Report has been produced by IEAGHG 2022-TR-05
- Drafted by Carlos Uroza, BEG



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Global Offshore Initiative



Program Overview

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

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

AGENDA

DAY 1 – Thursday 19th May

SESSION 1: Welcome & Scene Setting

09:00 – 09:10 Welcome – Tim Dixon, IEAGHG, & Katherine Romanak, GCCC

09:10 – 09:20 Scene setting – COP26 outcomes in relation to offshore CCS – Tim Dixon, IEAGHG

SESSION 2: International Project Roundup - CHAIR: Sue Hovorka & Katherine Romanak

09:20 – 09:25 Offshore basalt storage / Cascadia project – David Goldberg, Columbia University

09:25 – 09:30 Project Greensand, Denmark – Søren Reinhold Poulsen, EBN

09:30 – 09:35 Porthos, The Netherlands [video] – Bram Herfkens, Porthos

09:35 – 09:40 Petrobras' Pre-Salt CCS project update – Leonardo Ribeiro & Ana Paula Mussi, Petrobras

09:40 – 09:45 Deep C Store, Australia – Daein Cha, deepC Store Ltd

09:45 – 09:50 Pelican project, Australia [video] – Nick Hoffman, CarbonNet Australia

09:50 – 09:55 Taiwan – Cheryl Yang, ITRI

09:55 – 10:00 Endurance field, East Coast Cluster (ECC), UK – Nicolas Bouffin, BP

10:10 – 10:05 Northern Lights, Norway – Cristel Lambton, Northern Lights

10:20 – 10:25 Liverpool Bay CCS, UK & Ravenna CCUS project, Italy – Alessandro Aleandri, ENI

10:25 – 10:30 Aramis, The Netherlands – Owain Tucker, Shell

10:30 – 10:35 Polaris project, Norway – Morten Sola, Horizont Energy

10:35 – 10:40 Ebro Offshore project, Spain [video] – Francisco Pángaro, Repsol

10:40 – 10:45 Gulf of Mexico, USA – Ryan Jones, Talos

10:45 – 10:50 CCS in the GoM – Ganesh Dasari, ExxonMobil

10:50 – 10:55 GoM (LA) Depleted Field CCS Development – Michael Hopkinson, Cox Oil

10:55 – 11:05 Discussion / Questions

6th International Offshore Workshop

- 13th – 15th September 2023
- Co-Hosted by Storegga and Aberdeen University
- Venue: Aberdeen University
- Focus on Global deployment of offshore storage.
- Highlighting Scottish & UK CCS plans, along with North Sea activities
- Expert Steering Committee begins in April
- Contact Katherine Romanak if you have content you wish to provide at the meeting

Thank you for your attention

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