



# International Workshop on Offshore Geologic CO<sub>2</sub> Storage

## Report of the 5th International Workshop

**19-20 May 2022**

New Orleans

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The University of Texas at Austin  
Bureau of Economic Geology

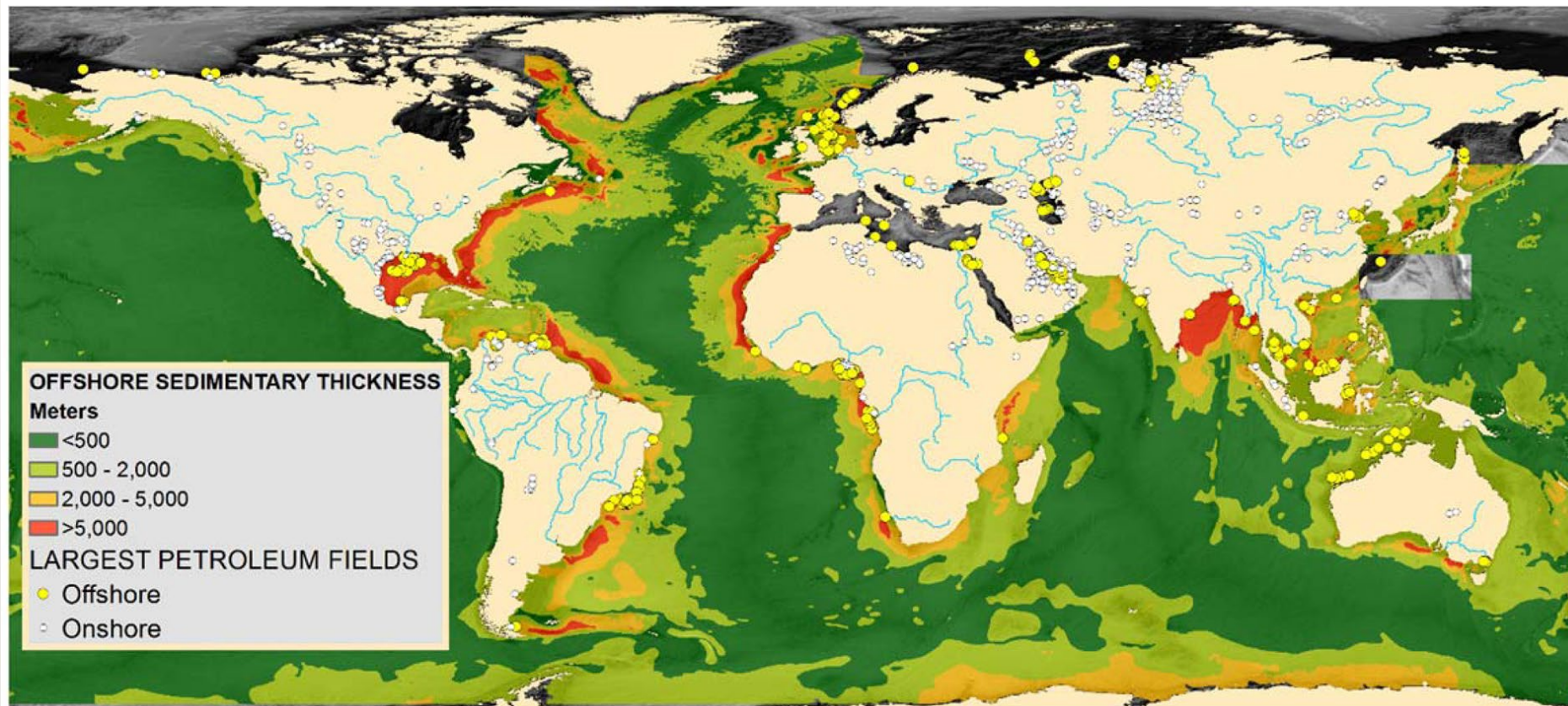
Carbon Project Management Meeting  
August 17, 2022



BUREAU OF  
ECONOMIC  
GEOLOGY



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



Ringrose and Meckel, Nature 2019



# 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.csforum.org/publications/documents/OffshoreStorageTaskForce\\_FinalCombinedReport.pdf](http://www.csforum.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)**

# Workshop Series



- **1<sup>st</sup> 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**
- **2<sup>nd</sup> 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



- **3<sup>rd</sup> 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**
- **4<sup>th</sup> 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**



# 5<sup>th</sup> Offshore Workshop

New Orleans, Louisiana

May 19-20

50 in person, >120 Online


Mix of Industry, Academia, Regulators



# 5<sup>th</sup> 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 CO<sub>2</sub> Storage  
May 16 - 20 | New Orleans**







**International Workshop on  
Offshore Geologic CO<sub>2</sub> Storage**

**5<sup>th</sup> International Workshop on Offshore Geologic CO<sub>2</sub> Storage**  
Organised by GCCC, BEG at the University of Texas, with IEAGHG  
New Orleans, Louisiana  
Thursday 19<sup>th</sup> – Friday 20<sup>th</sup> May 2022



# 5<sup>th</sup> 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

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?
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

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

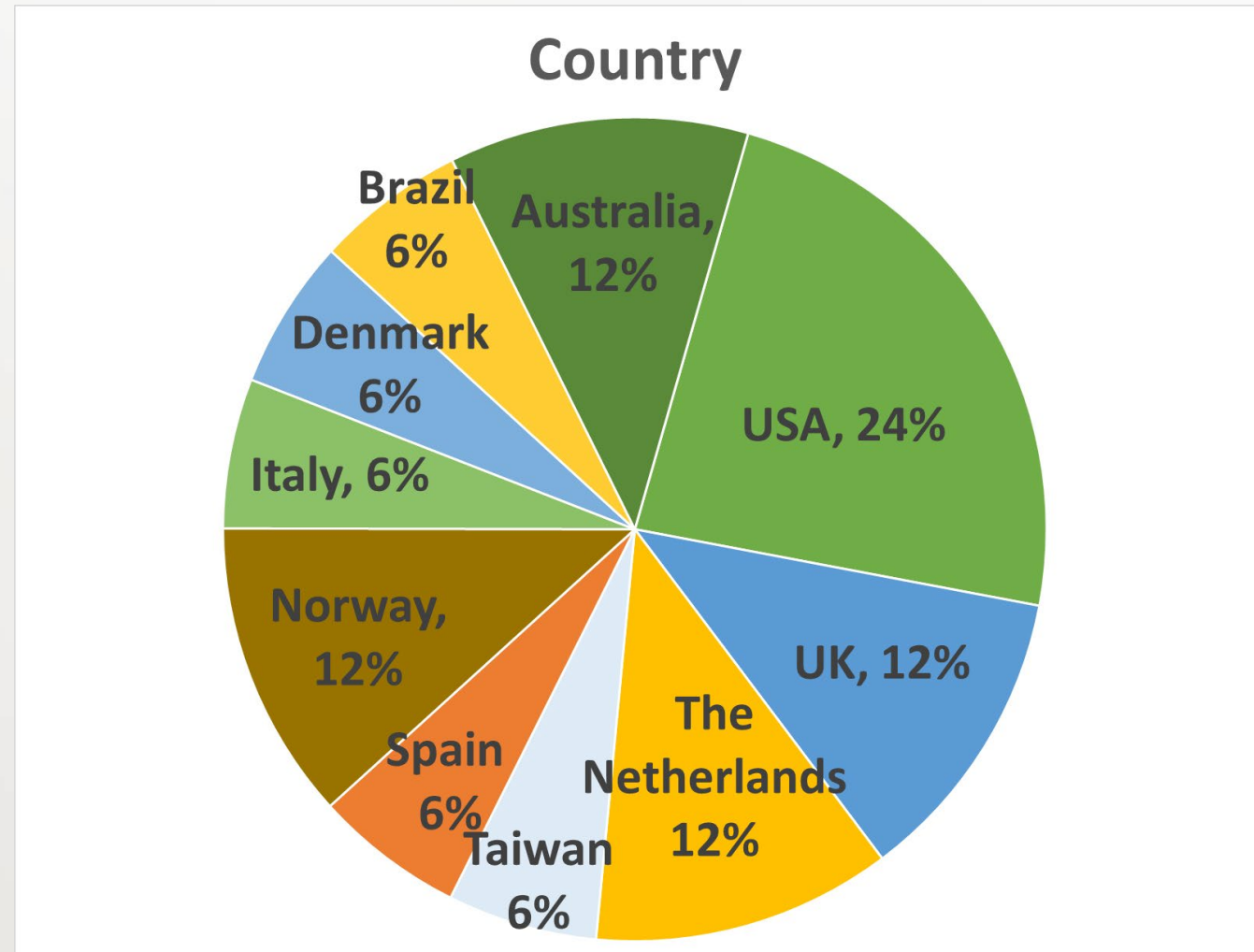
Aramis	The Netherlands	Depleted Gas	In planning	2026–2027	–	4	Industrial	Ship + Pipeline	Fixed platform	Yes
CCS Status in Taiwan	Taiwan	Saline	Planning	2025	45,900	3.5	Energy + Industrial	Pipeline	Fixed platform	No
Ebro Offshore project	Spain	Saline + Shale caprock	In planning	Undisclosed	40	–	Industrial	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

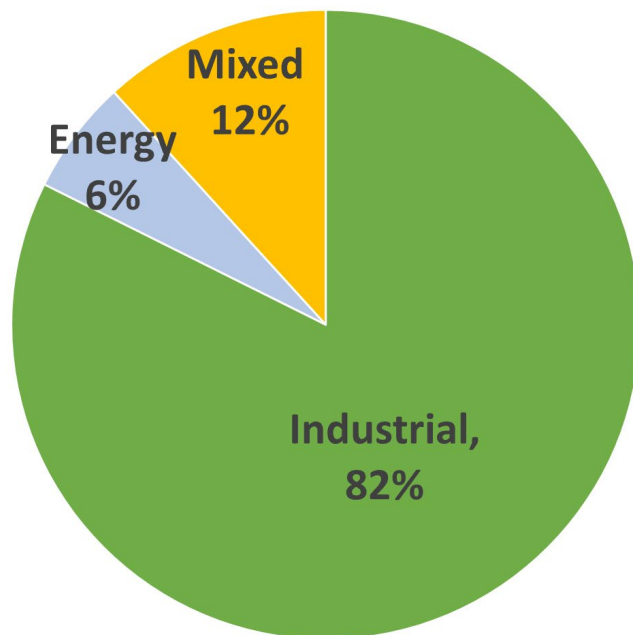
10 countries from many  
regions of the world

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

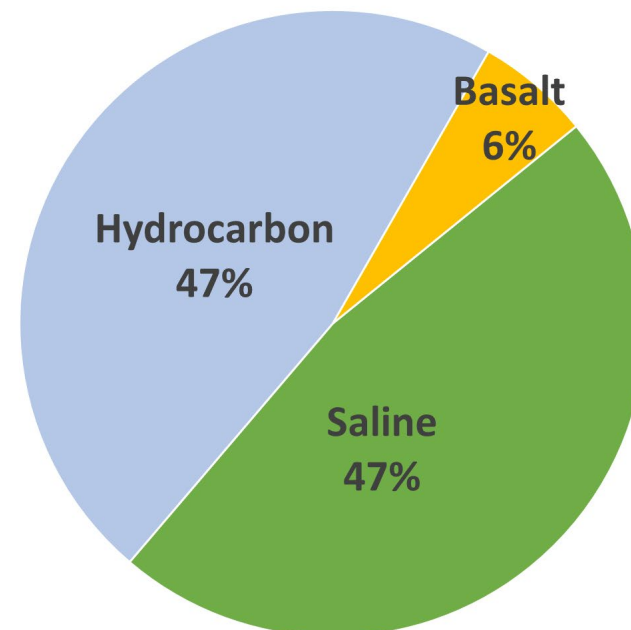


# Developing Project Attributes

CO<sub>2</sub> Source

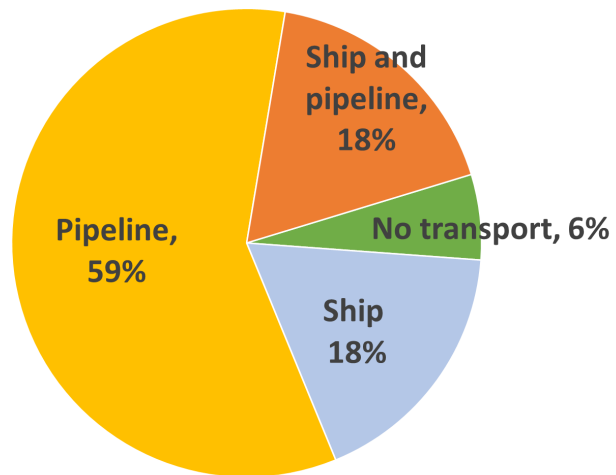


Storage Target

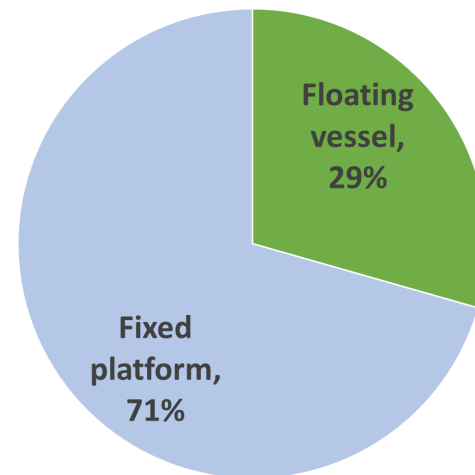


# Developing Project Attributes

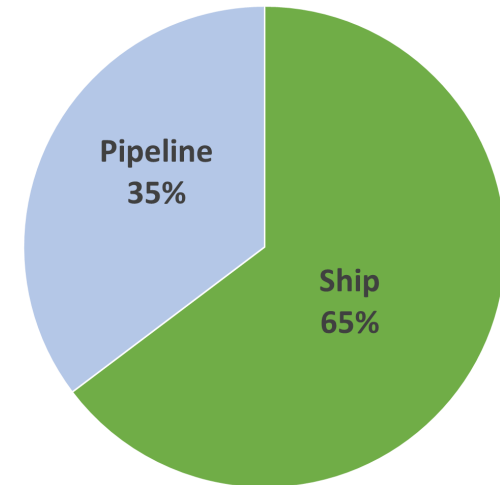
CO<sub>2</sub> Transport



CO<sub>2</sub> 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 ECO<sub>2</sub> 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 will be produced by IEAGHG
- Drafted by Carlos Uroza, BEG



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## Global Offshore Initiative



**International Workshop on  
Offshore Geologic CO<sub>2</sub> Storage**

### 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

# Thank you for your attention

!

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