



3rd
International Workshop on
Offshore Geologic CO₂ Storage



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May 3 - 4, 2018

Research Council of Norway
Oslo, Norway





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**Venue: Research Council of Norway, Drammensveien 288,
Lysaker, Oslo**

Auditorium Moser

DAY 1 THURSDAY MAY 3, 2017

Common Session Capture and Storage workshops

Welcome, Objectives of meeting, agendas, logistics (safety announcements)

08:30 Welcome: Torgeir Knutsen, Deputy Director General, Ministry of Petroleum and Energy, Norway

08:40 Safety moment, Research Council of Norway

Session 1: Value Chains for Offshore: Chair - Lars Ingolf Eide

08:45 Emerging hydrogen value chains for Norway - Steinar Eikaas, Statoil

09:05 Emerging hydrogen value chains for Japan - KHI/Ryoza Tanaka, RITE

09:25 USA 45 Q and how it should accelerate potential CCUS projects – Brian Hill, SSEB

09:45 Discussion

09:55 COFFEE BREAK and POSTERS

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10:20 Welcome and Scene-setting: How to ‘Learn from our learnings’ Tim Dixon IEAGHG and Katherine Romanak, BEG

Session 2: Infrastructure: Chair - Paulo Negrals Seabra

10:35 New subsea systems for CO₂ storage/EOR– making it cheaper and more efficient - Pål Nøkleby, Aker Solutions

10:55 Technical considerations in re-use of pipelines platforms - Steve Murphy, ACORN / Pale Blue Dot

11:15 New technology for handling legacy well integrity issues - Malin Torsæter, SINTEF

11:25 Discussion

Session 3: Monitoring offshore CO₂ storage/EOR - Chair: Katherine Romanak

11:45 Handling microseismic background – Volker Oye, NORSAR, Norway



- 12:05 STEMM-CCS project updates on seafloor/environmental monitoring – Maribel I. García-Ibáñez, University of Bergen
- 12:35 UK AUV update on seafloor/environmental monitoring – Graham Brown, Sonardyne
- 12:55 LUNCH and POSTERS**
- 13:55 Update on leakage detection – Keisuke Uchimoto, RITE
- 14:15 Update on shallow seismic (p-cable) at Tomakomai– Tip Meckel, BEG
- 14:35 Geophysical monitoring offshore – Philip Ringrose, Statoil
- 14:55 Discussion

Session 4: Offshore CO₂ storage resource assessment - Chair: Mike Carpenter

- 15:05 Storage resource assessment for offshore CO₂-EOR in Norway - Eva Halland, Norway Petroleum Directorate
- 15:25 Update on US projects – Darin Damiani, US DOE
- 15:45 Approaches to evaluations, example from Gulf of Mexico - Tip Meckel, BEG
- 16:05 COFFE BREAK and POSTERS**
- 16:35 Updates on databases for CO₂ Storage - informal discussion
- 16:45 South Africa depleted fields and platform re-use - Noel Kamrajh, SANEDI on behalf of PetroSA
- 17:05 Discussion

Session 5: Project updates: Chair - Phillip Ringrose

- 17:25 Update on Norwegian project under development - Mike Carpenter, Gassnova
- 17:45 Pre-salt development and CO₂ management - Paulo Negrais Seabra, formerly of Petrobras
- 18:05 Tomakomai - Jiro Tanaka, Japan CCS
- 18:25 Discussion
- 18:35 Adjourn day 1**
- 19:00 Reception at Research Council of Norway, drinks and tapas to be served, co-hosts Statoil and Research Council of Norway.**

DAY 2 FRIDAY MAY 4, 2018

- 08:30 Welcome - Åse Slagtern, Lars Ingolf Eide

Session 6: Standards and Regulatory Frameworks - Chair: Tim Dixon

- 08:55 Tomakomai lessons learned in offshore CO₂ storage regulations - Ryoza Tanaka, Rite



- 09:15 ISO storage standard (ISO 27914), and certification framework - Jorg Aarnes, DNV
09:35 Discussion on London Protocol application to Norway and EOR- Ingvild Ombudstvedt, GCCSI and Tim Dixon, IEAGHG, Chaired by Ryozo Tanaka, RITE
09:55 Discussion
10:05 COFFEE BREAK and POSTERS

Session 7: Interactive Session - Brainstorming towards an international collaborative project - facilitated by Katherine Romanak, Tim Dixon

- 10:25 Discussion on technical criteria for international collaborative project
10:50 Comments on public funding and new funding mechanisms from Hans Olav Ibrekk, Norwegian MFA, and Egil Meisingset, Norwegian MPE
11:00 Discussion
11:30 **Workshop Conclusions and Recommendations** - Lars Ingolf Eide, Tim Dixon, Katherine Romanak, Tip Meckel
12:00 LUNCH (Box lunches distributed)
12:30 BUS DEPARTURE FOR KLEMETSRUD WASTE-TO-ENERGY PLANT
15:00 BUS RETURNS FROM KLEMETSRUD TO OSLO CENTRAL STATION

POSTERS

Title	Presenter/author	Affiliation
Integration of laboratory rock physics and field scale monitoring for offshore CO ₂ storage	Joonsang Park, Magnus Soldal, Guillaume Sauvin and Lars Grande	Norwegian Geotechnical Institute (NGI), Oslo, Norway
Simplified transport models for statistical representation of seep footprints, with application to machine learning and inverse modelling.	Anna Oleynik ¹ , Kristian Gundersen ¹ , Guttorm Alendal ¹ , Hans J. Skaug ¹ , Helge Avlesen ³ , Jarle Berntsen ¹ , Jeremy Blackford ² , Nello Blaser ¹ , Pierre Cazenave ² .	¹ Department of Mathematics, University of Bergen, Bergen, Norway, ² Plymouth Marine Laboratory, Plymouth, UK., ³ Uni Research, Bergen, Norway
Acoustic and chemical technologies for environmental monitoring of geological carbon storage	Ann Blomberg, Espen Eek, Ivar-Kristian Waarum, Joonsang Park	Norwegian Geotechnical Institute (NGI), Oslo, Norway
Sub-sea compression	Zabia Elamin, Pål Helge Nøkleby	Aker Solutions, Bærum, Norway
CO ₂ Data Share - establishing and sharing reference datasets from CO ₂ storage projects	Odd Andersen	SINTEF Digital, Mathematics and Cybernetics Oslo, Norway
Fast tracking infrastructure development for future offshore	Brian W. Hill	Southern States Energy Board, USA



CO ₂ storage		
Integrated pre-feasibility study for CO ₂ sequestration in the Cascadia Basin, offshore of Washington State and British Columbia	Lydia Cumming on behalf of CarbonSAFE Cascadia Phase 1 Project Team	Battelle, USA
Ensuring CO ₂ reservoir containment from well pressure monitoring	A. Shchipanov, L. Kollbotn, R. Berenblyum	International Research Institute of Stavanger (IRIS), Stavanger, Norway
The stoichiometric ΔC_{seep} method as a monitoring tool for detection of CO ₂ leakage from subsea storage sites	M. I. García-Ibáñez ¹ , A. M. Omar ¹ , and G. Alendal ² .	¹ Uni Research, Bjerknes Centre for Climate Research, Bergen, Norway, ² University of Bergen, Bergen, Norway.
Carbon storage resource assessment for offshore Mid-Atlantic United States	Lydia Cumming	Battelle, USA
DEMODAS - Distributed seismic monitoring for geological carbon sequestration	Kirtsi Midttømme, Arvid Nøttvedt	Christian Michelsen Research (CMR), Bergen, Norway
Structural derisking for Smeaheia -Improved fault characterization workflow	Elin Skurtveit ^{1,2} , Mark Mulrooney ² , Johnathon Osmond ² , Jung Chan Choi ¹ and Alvar Braathen ²	¹ NGI Oslo, Norway, ² Department of Geosciences, University of Oslo (UiO), Oslo, Norway
STEMM -Ensuring efficient and robust offshore storage – the role of marine system modelling.	Jerry Blackford ¹ , Guttorm Alendal ² , Yuri Artioli ¹ , Helge Avlesen ³ , Pierre Cazenave ¹ , Baixin Chen ⁴ , Andy Dale ⁵ , Marius Dewar ⁴ , Kristian Gundersen ² , Matthias Haeckel ⁵ , Soroush Khajepor ⁴ , Gennadi Lessin ¹ , Anna Oleynik ² , Umer Saleem ⁴ .	¹ Plymouth Marine Laboratory, Prospect Place, Plymouth, PL1 3DH, UK ² Department of Mathematics, University of Bergen, Bergen, Norway ³ Uni Research, Bergen, Norway ⁴ Institute of Mechanical, Process and Energy Engineering, Heriot-Watt University, Edinburgh, EH14 4AS, UK ⁵ GEOMAR Helmholtz Centre for Ocean Research Kiel, Wischhofstrasse 1-3, 24148 Kiel, Germany
Numerical estimation of the position and rate of CO ₂ seepage at the seafloor	Ryosuke Sakaizawa ¹ , Chiaki Mori ¹ , Toru Sato ¹ , Hiroyuki Oyama ¹ , Daisuke Tsumune ² , Takaki Tsubono ² , Yuki Kano ³	¹ University of Tokyo, ² CRIEPI, ³ AIST
Safe CO ₂ Storage Workflow	Roland Kaufmann,	Uni Research CIPR



INTERNATIONAL STEERING COMMITTEE

Tim Dixon, IEAGHG (Chair)	Ryozo Tanaka, RITE
Katherine Romanak, BEG (Co-Chair)	Owain Tucker, Shell
Lars Ingolf Eide, Research Council of Norway (Host)	Michael Carpenter, Gassnova
Åse Slagtern, Research Council of Norway (Host)	Mark Ackiewicz, US DOE
Susan Hovorka, BEG	Traci Rodosta, US DOE
Tip Meckel, BEG	Di Zhou, China Academy of Sciences
Philip Ringrose, Statoil	Filip Neele, TNO
Noel Kamrajh, SANEDI	Paulo Negrais Seabra, formerly of Petrobr

ATTENDEES

First name	Last name	Company/department name
Jørg	Aarnes	DNVGL Group Technology and Research
Odd	Andersen	SINTEF Digital
Roman	Berenblyum	IRIS / IRIS Energy
Geir	Berge	Petrell AS
Ann	Blomberg	NGI
Lynn	Brickett	U.S. Department of Energy/National Energy Technology Laboratory
Graham	Brown	Sonardyne International Ltd
Mike	Carpenter	Gassnova SF
Susan	Carroll	Lawrence Livermore National Laboratory
Pierre	Cerasi	SINTEF Industry
Lydia	Cumming	Battelle/Infrastructure & Environment
Darin	Damiani	US DOE Office of Fossil Energy
Ganeswara	Dasari	ExxonMobil
Marius	Dewar	Heriot-Watt University/EPS
Tim	Dixon	IEAGHG
Lars Ingolf	Eide	Research Council of Norway
Zabia	Elamin	Aker Solutions AS / Front End CCUS
María Isabel	García Ibáñez	Uni Research/Uni Research Climate
Sarah	Gasda	Uni Research/CIPR
Bettina	Goertz-Allmann	NORSAR
Arne	Graue	University of Bergen, Dept. of Physics and Technology
Alv-Arne	Grimstad	SINTEF Industry, Petroleum
Ying	Guo	IRIS
Eva	Halland	Norwegian Petroleum Directorate
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Hans Olav	Ibrekk	Ministry of Foreign Affairs
Michael	Jordan	SINTEF Industry
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Noel	Kamrajh	South African National Energy Development Institute/ Cleaner Fossil Fuels
Roland	Kaufmann	Uni Research CIPR
Jun	Kita	Marine Ecology Research Institute / Central Laboratory
Espen Bernhard	Kjærgård	MPE
Torgeir	Knutzen	Ministry of Petroleum & Energy
Michael	Matuszewski	US DOE NETL/CCSI2
Tip	Meckel	Gulf Coast Carbon Center /Texas Bureau of Economic Geology
Egil	Meisingset	Norwegian Ministry og Petroleum and Energy
Kirsti	Midttømme	Christian Michelsen Research
Nazmul Haque	Mondol	University of Oslo/Dept. of Geosciences
Stephen	Murphy	Pale Blue Dot Energy
Paulo	Negrais Seabra	Independent Consultant
Pål Helge	Nøkleby	Aker Solutions ASA/CCUS
Arvid	Nøttvedt	NORCE/Christian Michelsen Research AS
Anna	Oleynik	Department of Mathematics, University of Bergen
Ingvild	Ombudstvedt	Global CCS Institute
Volker	Oye	NORSAR
Jeffrey	Palmer	ExxonMobil Exploration Company
Joonsang	Park	NGI
Philip	Ringrose	Statoil Research & Technology
Katherine	Romanak	UT Bureau of Economic Geology
Kari-Lise	Rørvik	Gassnova
Toru	Sato	University of Tokyo
Elin	Skurtveit	NGI/UiO
Aage	Stangeland	Research Council of Norway
Anja	Sundal	University of Oslo / Institute of Geosciences
Ryozo	Tanaka	RITE
Jiro	Tanaka	Japan CCS Co., Ltd./International Relations
Malin	Torsæter	SINTEF
Robert	Trautz	Electric Power Research Institute
Keisuke	Uchimoto	Research Institute of Innovative Technology for the Earth
Ning	Wei	Institute of Rock and Soil Mechanics, Chinese Academy of Sciences
Joshua	White	Lawrence Livermore National Laboratory
Viktoriya	Yarushina	IFE/Environmental Analysis
Di	Zhou	UK-China(Guangdong) CCUS Centre
Peter	Zweigel	Statoil ASA