Heat of Absorption of CO2 in Aqueous Solutions of DEEA, MAPA and their Mixture

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GHGT-11

Conference Programme

11th International Conference on
Greenhouse Gas Control Technologies

CCS: Ready to Move Forward

18th - 22nd November 2012
Kyoto International Conference Center - Japan

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Contents

Steering Committee

As you can imagine, a lot of preparation and work goes into the establishment of the GHGT conferences, and a large part of this work is conducted by the Steering Committee. The Steering Committee is comprised of a mix of representatives from the hosts; in the case of GHGT-11, RITE, and the conference custodians, IEAGHG.

The Steering Committee is co-chaired by Prof. Kaya from RITE and Mr Gale from IEAGHG, and under their leadership the committee has arranged the conference, with assistance from the Technical Programme Committee (TPC) who worked from the Expert Review Panel suggestions to formulate the technical programme.

Some committee members perform dual roles, such as Prof. Yamaji and Mr Dixon, who co-chaired the TPC, and Mrs Twinning, who sits on the Steering Committee and acts as secretariat for the TPC.


Prof. Yoichi Kaya (co-chair)


Mr. John Gale (co-chair)


Prof. Kenji Yamaji


Mr. Tim Dixon


Mr. Takashi Honjo


Ms. Akemi Sasaki


Mrs. Siân Twinning


Mr. Toby Aiken

Welcome

The Steering Commitee would like to take the opportunity to welcome you to the 11th International Conference on Greenhouse Gas Control Technologies, and to the beautiful city of Kyoto. As you are no doubt aware, the GHGT conference series has established itself as the premier international platform for the presentation of cutting edge research and the latest developments in CO_2 Capture and Storage technologies, and you are part of it.

When the series started in 1992, CCS was very much a novel concept with limited research at the laboratory scale underway around the world. Having seen a significant technological development in recent years, CCS is now at the phase where large demonstration projects operate around the world, which will be followed by commercial deployment.

To facilitate demonstration and deployment, developments are still needed in the areas of CO_2 capture, transportation, storage and the integration of these components, both in terms of reliability and efficiency. Legal and regulatory frameworks, funding, and communication with stakeholders on CCS will all require consideration in the surrounding political and financial environments.

This unique situation, with significant technological developments awaiting the final breakthroughs in the areas outlined above, led to the theme for the conference:

CCS: Ready to Move Forward.

Building on Previous Success

Since its 1992 inception, the conference has grown from strength to strength, and we are happy to see this trend continuing for this 11th event. With recent global economic conditions, there was a fear that delegate numbers and attendance would drop, but despite this, and the more remote location for many potential participants, it would appear that GHGT-11 has held its place, and continues to be the conference of choice for many researchers. It is anticipated that GHGT-11 will attract between 1200 and 1400 delegtes, demonstrating this continued success.

GHGT-10, held in Amsterdam in 2010 held a very successful exhibition where delegates were able to get in touch with the exhibitors' technologies and experiences, and enter into free discussions relating to these technologies.

GHGT-11 will also hold an exhibition, to facillitate technology suppliers to get in touch with researchers again, and hopefully overcome barriers for widescale deployment, forge new relationships and partnerships and move CCS technology forward.

Social Programme

The social programme will comprise of a Welcome Reception and registration on Sunday the 18th of November, and a Conference Dinner on Wednesday the 21st of November. More information on this can be found on page 10.

Meet the Organisers

About RITE

The Research Institute of Innovative Technology for the Earth (RITE) was established in 1990 as a centre of excellence to conduct research on technologies for mitigating global warming, by the joint efforts of the government of Japan and Japanese industries.

The direction of its research activities is in line with the concept of the "New Earth 21" plan proposed by the Japanese government which envisages stabilisation of carbon dioxide concentrations in the atmosphere by developing long term innovative technologies for substantial reduction of carbon dioxide emissions.

RITE focusses its attention mainly on the following three areas:

- Bio-refinery technologies for transforming cellulose into biofuels,
- Technologies for carbon dioxide capture and storage (CCS), and
- Scenario studies on future paths toward low carbon society.

RITE has already conducted an experiment in 2003-04 of storing 10,000 tons of CO_2 in the subsurface at a a depth of one thousand meters in Nagaoka, a city in Northern Japan, which provided a wealth of useful information on the behavior of CO_2 stored deep underground.

Recognising the international nature of global warming studies, RITE has been conducting research with intense collaboration with international institutions such as IIASA and DOE in USA.

RITE also hosted the second International Conference on Carbon Dioxide Removal (ICCDR-2) in 1994 and GHGT-6 in 2002 both in Kyoto.

Research Institute of Innovative Technology for the Earth

About IEAGHG

The IEA Greenhouse Gas R&D Programme (IEAGHG) is an international collaborative research programme established in 1991 as an Implementing Agreement under the International Energy Agency (IEA).

The primary role of IEAGHG is to be an informed source of impartial information on greenhouse gas mitigation options. This is achieved by the instigation and management of research studies, technological evaluations, and maintenance of a series of international research networks that serve as a platform for academics, researchers and industrial parties to share information and experiences and to discuss new developments.

IEAGHG studies and evaluates technologies that can reduce greenhouse gas emissions derived from the use of fossil fuels. The Programme aims to provide its members with definitive information on the role that technology can take in reducing greenhouse gas emissions.

IEAGHG takes pride in being an informed but unbiased source of technical information on greenhouse gas mitigation.

The programme's main activities are:

- To evaluate technologies aimed at reducing greenhouse gas emissions,
- To help facilitate the implementation of potential mitigation options,
- To disseminate the data and results from evaluation studies, and
- To help facilitate international collaborative research, development and demonstration activities (R,D&D).

ieaghg

Technical Programme Committee and Expert Review Panel

The Technical Programme Committee (TPC) is responsible for the content, organization and programming of all the conference technical programme for GHGT-11. Over 1200 abstracts were received, and the initial task of evaluating these fell to the Expert Reviewers. These consisted of over 140 internationally recognised experts from 16 countries, and each abstract was independently reviewed by at least 2 experts.

The TPC evaluated these reviews, made decisions on the selection of papers, and allocated them to sessions. This task was extremely intensive. The organisers would like to thank both the TPC and the Expert Reviewers for their outstanding and diligent work; without them, there would be no technical programme for you to enjoy.

The TPC was greatly assisted by Mrs Siân Twinning who carried out the TPC secretariat duties.

The TPC are listed here, but the Expert Review Panel is too extensive to list in a printed programme, they are thanked all the same and they are listed with gratitude on the conference website:

www.ghgt.info.


Prof. Kenji Yamaji
(co-chair)


Mr. Tim Dixon
(co-chair)


Prof. Kozo Sato


Mr. Chris Hendriks


Dr. Howard Herzog


Prof. Sally Benson


Prof. Olav Bolland


Ms. Peta Ashworth

General Information

Cloakroom & Luggage Facilities

The Kyoto International Conference Center has 2 cloakrooms on the ground floor where luggage may be left. All personal belongings must be collected by the end of the day.

Emergency Contact Numbers

While we will ensure that every aspect of the conference runs without a hitch, if for any reason you are in need of emergency assistance, the following numbers should be used while in Japan.

Police:	110
Fire Service / Ambulance:	119

Public Transport - Getting Around Kyoto

The Kyoto International Conference Center has its own stop on the Karasuma Line, and the stop is Kokusaikaikan (K01) Station. Kyoto's subway system is quick and convenient, and most areas are accessible using the subway. There are two lines, one running North-South; the Karasuma Line, and one running East-West; the Tozai Line. Included in your registration is a 5 day pass for the subway, valid for travel from Sunday the 18th of November to Thursday the 22nd of November.

GHGT-11 Blog and Twitter Hashtag

For the first time, a GHGT conference has its own dedicated blog site and pre-determined Twitter Hashtag. The Blog will be regularly updated with interesting points raised for discussion, and will hopefully generate a lively debate.

Please use #GHGT11 in your tweets, so that all tweets can be easily and quickly found and read. We may even use some of these in the Conference Summary Brochure.

The Blog can be found at www.ghgt-blog.org and is a Wordpress blog, so either download the Wordpress app to comment on the move, or alternatively, view the blog online, and click the Follow link for new posts to be delivered to your email inbox.

Wireless Internet

Wireless LAN will be available in the main lobby and outside the conference rooms while in the Kyoto Conference Center.

Language & Translation

All presentations, plenary, keynote and technical, will be in English, however a subsidy has been made by Global Industrial and Social Progress Research Institute (GISPRI) for simultaneous translation of the plenary, keynote and closing sessions into Japanese.

This money has been donated specifically to fund this, and sits outside of the funding for the conference, and is not paid for in any way by delegate registration fees or sponsorship.

The organisers would like to take this opportunity to thank GISPRI for this facility, and explain a little about the organisation.

GISPRI was established as a public interest corporation on December 1, 1988, under the provisions of Article 34 of the Civil Code and the authorization of the Minister of International Trade and Industry.

Their objective is to conduct research in a broad spectrum of issues related to global resources, environment, international regimes, industry, economy, culture and society, based on its awareness that the role and responsibility of Japan in the international community has been mounting in tandem with Japan's increasing economic and social presence. GISPRI also seeks to present policy proposals based on its research and surveys for both domestic and international entities, while promoting exchange of information and ideas to help contribute to the prosperity of the global society.

More information is available at www.gispri.or.jp

Orizuru (Folded Crane)

This Orizuru created by Japanese traditional origami paper, is the same one seen flying in the short video screened at the Opening Session.
The production of the video is also specifically funded by GISPRI.

愛・地球博成果継承発展助成事業
一般財団法人 地球産業文化研究所

Chair & Presenter Guidelines

Information for Session Chairs

Please take a moment to identify the session you are chairing or co-chairing and identify its location using the conference centre map shown on page 19. Please ensure that you arrive at your session room before the session commences, to allow the technical assistants to explain any specific functionality of the room and to allow session speakers to make themselves known to you.

Information for Speakers in an Oral Session

Again, using the map shown on page 19, please ensure you arrive at your designated session room with plenty of time to spare to ensure that you are familiar with the presentation and AV equipment in the room, and make your presence known to the session chairs.

Each presentation in the technical parallel sessions is allocated 15 minutes for the presentation, and 5 minutes for subsequent questions. All presenters are asked to stick to their allocated time, as the smooth running of the conference relies on strict adherance to the time schedule. The session chair will notify you of how your allocated time is progressing, and will manage the time allocated to questions.

Presenters are asked to upload their presentations no later than the day before your scheduled talk; note that if you are due to present on Monday the 19th, you will be required to upload your presentation on Sunday the 18th at the registration and welcome reception.

Information for Poster Presenters

Presenters of posters are required to locate their allocated poster board and ensure that their poster is mounted by the end of Monday in preparation for the poster sessions on Tuesday and Wednesday.

The event hall will be open between 09.00-17.30 on Monday the 19th of November for presenters to mount their poster. You will be provided with push pins to allow you to mount your poster, and these will be available from the administration desk within the poster hall.

For confirmation of board numbers, please see poster board allocations in the poster session details on pages 42-79. The posters must remain on display until Thursday afternoon as the posters will be accessible during lunch and breaks as well as during the dedicated sessions.

To faciliate discussions and conversations with the poster authors, there are 2 poster sessions scheduled, for further information, please see the poster floorplan and session details from pages 40 onwards.

Posters should be removed during the lunch break on Thursday the 22nd of November. Any posters remaining after 14.00 on this day will be disposed of. Unfortunately the organisers are not able to accept any responsibility to store or return to authors posters that remain on display past this deadline.

Greenman Award, 2012

The GHGT conference series has a tradition of making an award to an individual whose vital contributions towards progressing the CCS technologies, and enhancing our understanding of the process of mitigating greenhouse gas emissions, is recognised.

The 2012 Greenman Award recipient has been identified, and the award will be made at the conference dinner on Wednesday the 21st.

Former recipients of this prestigious award are:

Meyer Steinberg; 1996

Wim Turkenburg; 1996

Yoichi Kaya; 1996

Olav Kårstad; 2006

William D. Gunter; 2008

Howard Herzog; 2010

Peter Cook; 2010

Social Programme

The GHGT-11 Steering Committee have organised a 2-part social programme for the conference, commencing with a Welcome Reception, and concluding with the Conference Dinner.

Welcome Reception, Sponsored by the Global CCS Institute

The Welcome Reception will run alongside the conference registration on the evening of Sunday the 18th of November, at the Hotel Granvia Kyoto.

The Hotel Granvia Kyoto, Registration & Welcome Reception, Sunday 18th November, 17.30 - 21.00

The Registration and Welcome Reception opens from 17.30 until 21.00 on the 18th of November. Any delegate who is unable to attend the reception can obtain their badge and delegate pack each morning at the conference venue.

The Welcome Reception gives delegates a chance to listen to a few select speakers, welcoming you all to the conference and to Kyoto itself. Delegates will also have ample opportunity for networking, to reaquaint with old contacts, and forge new relationships for the future.

The reception will include a welcome address by John Gale of IEAGHG. This will be followed by adresses by the Kyoto Prefectural Governor and the Kyoto City Mayor. Brad Page of the Global CCS Institute will then address the delegates which will be followed by a traditional Kagami-Biraki Ceremony. This involves a ceremonial mallet being used to break the seal of a Japanese Sake barrel.

The delegate pack will also include your 5-day Kyoto subway pass, so be sure to keep this safe as it will faciliate easy travel between the conference venue, your hotel and the beautiful city of Kyoto.

Conference Dinner

The Conference Dinner for GHGT-11 will be held in the Westin Miyako Hotel Kyoto, which stands on the Higashiyama Hills, to the East of the city, overlooking the beautiful ancient capital. Please use your subway pass to reach the hotel which is located close to the subway Keage (T09) station. The use of buses or taxi's is not recommended due to heavy traffic.

The Conference Dinner is traditionally the highlight of the social programme, and this year it promises to be no different. The relaxed evening provides ample opportunities to reflect on the previous 3 days of successful presentations, and to indulge in a spot of local culture. It also provides a relaxed environment in which to unwind a little and continue to network with colleagues and contacts old and new.

The Westin Miyako Hotel Kyoto, Conference Dinner, Wednesday 21st November, 19.00 - 22.00

There will be a few short presentations and speeches to accompany the dinner, and you are encouraged to come along and celebrate the sucess of the conference.

The Conference Dinner will also be the point at which the Greenman Award is presented for GHGT-11.

GHGT-11 Student Reception

As with previous GHGT events, the Student Reception enables students to meet and discuss what they have heard with their peers, as well as selected industry experts to help to build the blocks for their future careers within CCS and to forge new connections and business contacts.

The GHGT-11 Student Reception will be held in the Banquet Hall Swan of the Kyoto International Conference Center on the evening of the 20th of November, between 18.00 and 20.00.

Invitations to this event will be restricted to students of the GHGT-11 Student Mentoring Programme, IEAGHG International CCS Summer School Alumni, invited students registered for GHGT-11 and selected experts from industry and academia, chosen to encourage student-expert networking and collaborations.

The evening will include an informal introduction and welcome to the students on behalf of IEAGHG, a keynote presentation from an industry expert and further networking with refreshments available.

Plenary Sessions & Keynote Speakers

Monday 19th November, 09.00 - 11.00

Chair: Dr. Kelly Thambimuthu, Chair of IEAGHG ExCo

Welcome Addresses:

Professor Yoichi Kaya, President, RITE

Graduating from the University of Tokyo in 1957, Professor Kaya joined RITE in 1998 as Director General and became the President in 2011. He specialises in system engineering in the fields of energy and environment, and has a particular interest in global warming issues.

Mr Koichi Akaishi, METI

Mr Akaishi is the Deputy Director General for Global Environmental Affairs at METI. In a long and impressive career history, he has held several other Director level positions within METI, as well as for JETRO based in Brussels. He graduated with an LLB from the University of Tokyo, and will give a welcome address on behalf of the host government.

Keynote Talks:

'Aiming for True Harmony between Energy and the Environment'

Mr Atsutoshi Nishida, Chairman of the Board, TOSHIBA.

Mr. Nishida joined Toshiba Corporation in 1975, and following assignments that included serving as Senior Vice President of Toshiba Europe and President of Toshiba America Information Systems, he was appointed President and Chief Executive Officer of Toshiba in 2005.

'International Progress on CCS: Current Status and Recommendations for the Future'

Mr Brad Page, CEO, Global CCS Institute

Prior to his role at the Institute, Brad served as CEO of the Energy Supply Association of Australia, and also served as an active member of the Australian Government Business Roundtable on Climate Change, the CSIRO Energy Transformed Flagship Advisory Committee, and the Australian Government Energy White Paper High-Level Consultative Committee.

'CCS Projects are Becoming Reality - the USA Demonstration Program'

Dr Jay Braitsch, Senior Advisor,
Office of Fossil Energy USDOE.

Jay has worked in various program offices including fossil, renewable, nuclear and energy efficiency. Current activities focus on a variety of cost-reduction CO_2 capture/utilisation technologies, as well as safe and permanent CO_2 storage. Jay earned a BS in Electrical Engineering from Cornell University, and a PhD in Systems Engineering from Ohio State University.

Tuesday 20th November, 08.30 - 09.20

Chair: Mr. John Gale, General Manager, IEAGHG

Technical Plenary Speakers

'A Global Vision for CCS - Revisitng the IEA CCS Roadmap'

Mr. Juho Lipponen, Head of CCS Unit, IEA

Juho manages a team of six specialists analysing various aspects of CCS, from technical and economic issues to policies, incentives and regulatory frameworks. Prior to joining the IEA, Mr Lipponen worked for the European power industry federation, Eurelectric, as Head of the Energy Policy and Power Production Unit.

'The Global Gas Supply Revolution - Scale, Cost and the Implications for CCS'

Dr. Francis O'Sullivan, Executive Director, Energy Sustainability Challenge programme, MIT

Frank's research interests span a range of topics related to energy systems and energy economics. His current work is focused on the energy-water nexus, and on unconventional oil and gas resources, particularly the production dynamics and associated economics of North America shale plays. Prior to joining MIT, he acted as a consultant with McKinsey & Company.

Wednesday 21st November, 08.30 - 09.20

Chair: Mr. Tim Dixon, Manager: CCS & Regulatory Affairs, IEAGHG

Technical Plenary Speakers

'GHGT 101: Carbon Storage in Japan'

Dr. Kozo Sato, Director, Frontier Research Centre for Energy and Resources, The University of Tokyo

Studying at the University of Tokyo, and Stanford University, Dr. Sato gained first his B.E. degree, then a Ph.D. in the Petroleum Engineering Department. He went on to work for the Teikoku Oil Company, before joining the University of Tokyo, first as an associate professor, then a full professor, where he remains as Director of the Frontier Research Centre for Energy and Resources.

'Deployment of CO_2 Capture Technology in Energy Intensive Industry - Challenges Ahead: A Case Study for the Steel Industry'

Henk Reimink, Executive Director, Energy Sustainability Challenge Programme, World Steel Association

Henk joined the World Steel Association in November 2008 being accountable for all activities on Safety and Health, manufacturing processes and systems in the iron and steel industry value chain and Climate Change mitigation techniques as well as a global regulatory overview.

Thursday 22nd November, 08.30 - 09.20

Chair: Mr. John Gale, General Manager, IEAGHG

Technical Plenary Speakers

'Overview and Recent Developments on CO_2 Transport Infrastructure'

Chris Hendriks, Managing Consultant, Ecofys

Chris Hendriks is an international consultant on sustainable energy. He received his PhD in 1994, with a thesis on CO_2 removal from coal-fired power plants. He was an initiator of the ICCDR conference series which later merged to form the GHGT conference series. He works as an advisor in the field of CCS, renewables and energy efficiency for both government and private organisations.

'Beyond Kyoto - More Effective Framework for Climate Change'

Keigo Akimoto, Chief Researcher and Group Leader of the Systems Analysis Group, RITE

Keigo holds a Ph.D. and is a guest professor of the Graduate School of Art and Science, University of Tokyo, and a lead author of Working Group III of the Intergovernmental Panel on Climate Change (IPCC) for the 5th assessment reports. He is also a member of several advisory committees on energy and environmental policy for Japanese government.

Final Panel Discussion and Closing Session

Final Panel Discussion,

Thursday 22nd November, 14.00 - 15.30

'As a Countermeasure to Global Warming - Best Mix on Energy Portfolio and Enhancing International Cooperation'

The final panel discussion for GHGT-11 will be chaired by Professor Kenji Yamaji, and will address the topic above by discussion with a panel of leading experts.

Panelists:

- Juho Lipponen, Head of CCS Unit, IEA, France
- James Edmonds, Laboratory Fellow and Chief Scientist, Joint Global Change Research Institute, PNNL, USA
- Jiang Kejun, Director for Energy System Analysis and Market Analysis Center, Energy Research Institute, China
- Takeo Kikkawa, Professor, Graduate School of Commerce and Management, Hitotsubashi University, Japan
- Yoshiharu Tachibana, Research Advisor, Central Research Institute of Electric Power Industry, CRIEPI, Japan

Closing Session,

Thursday 22nd November, 15.30 - 16.00

This session will be co-chaired by Mr John Gale and Professor Yoichi Kaya, representing the co-hosts of the GHGT-11 conference.

The closing session of a GHGT conference traditionally consists of notes of thanks being presented, and a simple conclusion of key points and themes that have emerged over the past few days technical presentations.

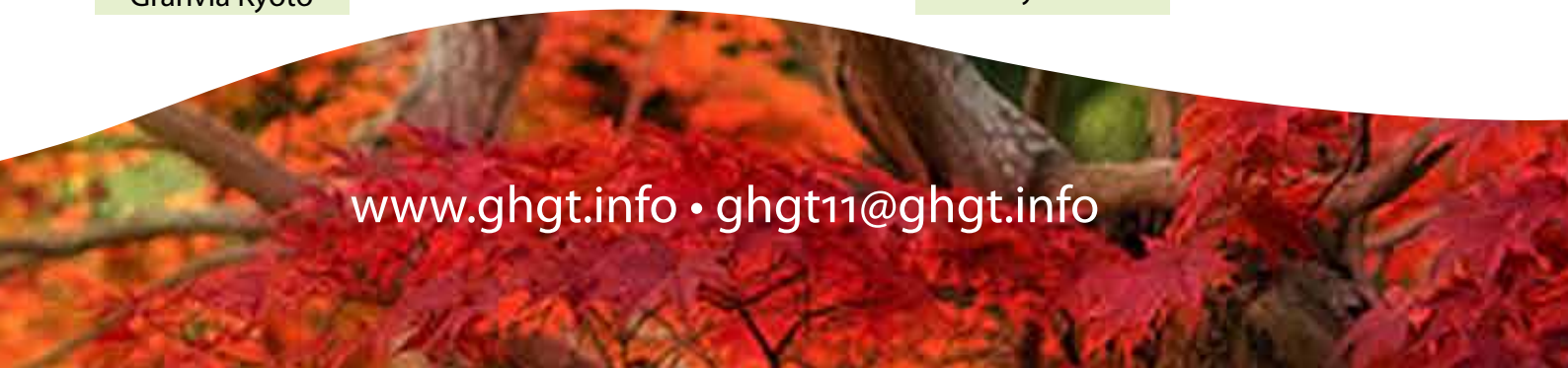
Reflections on advances, and developments will be highlighted, and the conference will be formally called to a close.

The last part of the closing session will comprise of an invitation, made by the hosts of GHGT-12 which will be held in 2014.

The new hosts will make a short presentation on their home venue, and invite delegates to return in 2 years to continue to maintain the strong name of the GHGT Conference Series. A short video will be shown, which will showcase the host city, and give delegtes a taste of what to expect in 2014.

Conference Programme at a Glance

Sunday 18th November	Monday 19th November	Tuesday 20th November	Wednesday 21st November	Thursday 22nd November
	07.45 - 09.00 Registration & Coffee	08.00 - 08.30 Registration & Coffee	08.00 - 08.30 Registration & Coffee	08.00 - 08.30 Registration & Coffee
	09.00 - 11.00 Welcome & Keynote Address	08.30 - 09.20 Plenary Session	08.30 - 09.20 Plenary Session	08.30 - 09.20 Plenary Session
		09.30 - 10.50 Technical Session 4	09.30 - 10.50 Technical Session 7	09.30 - 10.50 Technical Session 10
	11.00 - 11.30 Coffee Break	10.50 - 11.20 Coffee Break	10.50 - 11.20 Coffee Break	10.50 - 11.20 Coffee Break
	11.30 - 12.50 Technical Session 1	11.20 - 12.40 Technical Session 5	11.20 - 12.40 Technical Session 8	11.20 - 12.40 Technical Session 11
	12.50 - 14.10 Lunch	12.40 - 13.40 Lunch	12.40 - 13.40 Lunch	12.40 - 14.00 Lunch
	14.10 - 15.30 Technical Session 2	13.40 - 15.40 Poster Session A	13.40 - 15.40 Poster Session B	14.00 - 15.30 Final Panel Discussion
	15.30 - 16.00 Coffee break			15.30 - 16.00 Closing Session
	16.00 - 17.20 Technical Session 3	15.40 - 17.20 Technical Session 6	15.40 - 17.20 Technical Session 9	
17.30 - 21.00 Registration & Welcome Reception, Hotel Granvia Kyoto			19.00 - 22.00 Conference Dinner, Westin Miyako Kyoto	



Oral Sessions at a Glance

		Main Hall Stream A	Room A Stream B	Room B-1 Stream C
Monday Nov 19th	Technical Session 1 11.30 - 12.50	Storage Capacity	Post-Combustion: Solvent Pilots	Negative CO_2
	Technical Session 2 14.10 - 15.30	CO_2 Injectivity	Post-Combustion: Solvent Alternatives	Demonstration Projects: Storage
	Technical Session 3 16.00 - 17.20	Environmental Impacts of CO_2 Storage	Post-Combustion: Two-Phase Solvents	Demonstration Projects: USRCSP
Tuesday Nov 20th	Technical Session 4 09.30 - 10.50	Experiences and Case Studies	Post-Combustion: Environment Characterisation	Demonstration Projects: Policy Related Issues
	Technical Session 5 11.20 - 12.40	Monitoring: Demonstration & Pilot Projects	Post Combustion: Modelling	Demonstration Projects: Capture & Transport
	Technical Session 6 15.40 - 17.20	Site Characterisation & Selection	Sorbent Systems	Demonstration Projects: Post-Combustion Capture
Wednesday Nov 21st	Technical Session 7 09.30 - 10.50	Trapping Mechanisms: Case Studies	Post-Combustion: Environmental Aerosol	System Integration I: Power Systems
	Technical Session 8 11.20 - 12.40	Risk Assessment & Management I	Post-Combustion: Advanced Solvents	System Integration II: Infrastructure
	Technical Session 9 15.40 - 17.20	Reservoir Engineering: Pressure Management	Chemical Looping	Policy: Other
Thursday Nov 22nd	Technical Session 10 09.30 - 10.50	Risk Assessment & Management II	Post-Combustion: Design	Emerging Technologies
	Technical Session 11 11.20 - 12.40	Modelling: Reservoir Scale Flow & Transport	Post-Combustion: Solvent Fundamentals	CCS & Geothermal

Session Theme Key

Capture	Storage	Integrated Systems	Indsutrial Sources	Public Perception
Negative CO_2 Emissions	Panel Discussion	Demonstration	Utilisation of CO_2	Legal Issues
Policy	Commercial Issues	Transport	Education	Other Storage Options

Room D Stream D	Room B-2 Stream E	Room C1 Stream F	Room E Stream G
Tech. Assessment I: Cost & Risk	Techno-Economic Comparisons	Wellbore Integrity	Industrial Sources
Tech. Assessment II: Operational Flexibility	Membranes	Modelling: Nano Scale to Core Scale	Industrial Sources
Panel Discussion: CCS in Asia	Enhanced Hydrocarbon Recovery I	Modelling: Managing Uncertainty	Commercial Issues
Panel Discussion: Costs of CCS	Enhanced Hydrocarbon Recovery II	Monitoring: Pressure Methods	Retrofitting
Panel Discussion: Renewable Energy & CCS	Post-Combustion: Environmental Nitrosamine	Reservoir Engineering: Multi-Phase Flow of CO_2 & Brine	Transport & Infrastructure
Panel Discussion: Weyburn-Midale	Oxy-Combustion: Combustion Fundamentals	Legal & Regulatory	Transport & Infrastructure
Panel Discussion: CCS Demonstrations	Capture Pre-Combustion: Process	Monitoring: Geochemical Methods	Policy: Emissions Trading
Panel Discussion: Storage Capacity	Novel Systems	Monitoring: Geophysical Imaging	Education
Public Perception: Communication Activities & Experiences	Oxy-Combustion: CO_2 Processing Unit	Trapping Mechanisms: Geochemical	Transport & Infrastructure
Public Perception: Social Science Research	Pre-Combustion: Technology	Trapping Mechanisms: Capillarity & Heterogeneity	Other Underground Storage Options
Risk Management: Contingency Planning & Remediation	System Integration III: Other	Ex-Situ Mineralisation of CO_2	Oxy-Combustion: Large Scale Implementation

Exhibition Information

The GHGT-11 exhibition aims to facillitate networking between technology suppliers and researchers, and provides an opportunity for partnerships and agreements to be forged for the future. Sponsors are also allocated a booth in the exhibition hall.

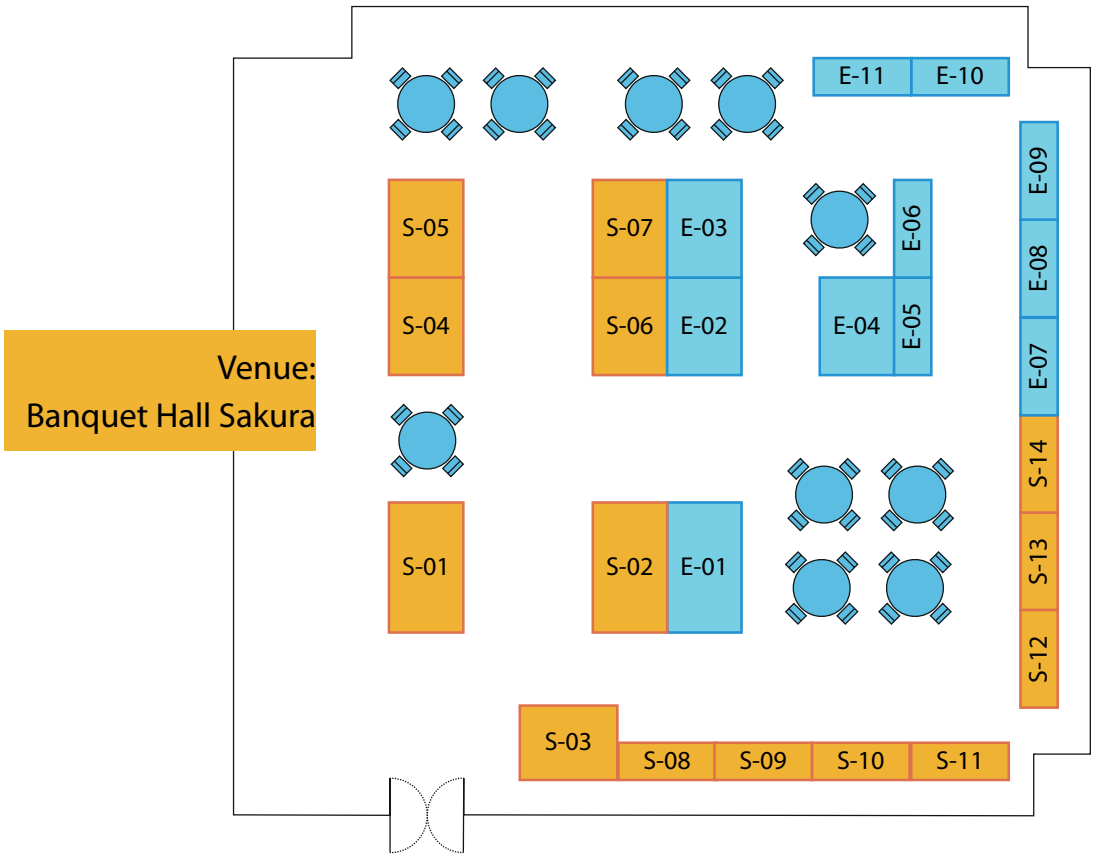
The Exhibition will be held in the Banquet Hall Sakura, located close to the main hall.

Sponsors, Supporters and Organisers Booths

- S-01 IEAGHG
- S-02 Research Institute of Innovative Technology for the Earth (RITE)
- S-03 GLOBAL CCS INSTITUTE
- S-04 Schlumberger Carbon Services
- S-05 Hitachi, Ltd.
- S-06 TOSHIBA CORPORATION
- S-07 MITSUBISHI HEAVY INDUSTRIES, LTD.
- S-08 Gassnova / TCM
- S-09 JX Nippon Oil & Energy Corporation
- S-10 JGC CORPORATION
- S-11 Japan Petroleum Exploration Co., Ltd. (JAPEX)
- S-12 CHIYODA CORPORATION
- S-13 IHI
- S-14 Supporters

Exhibiting Companies and Organisations Booths

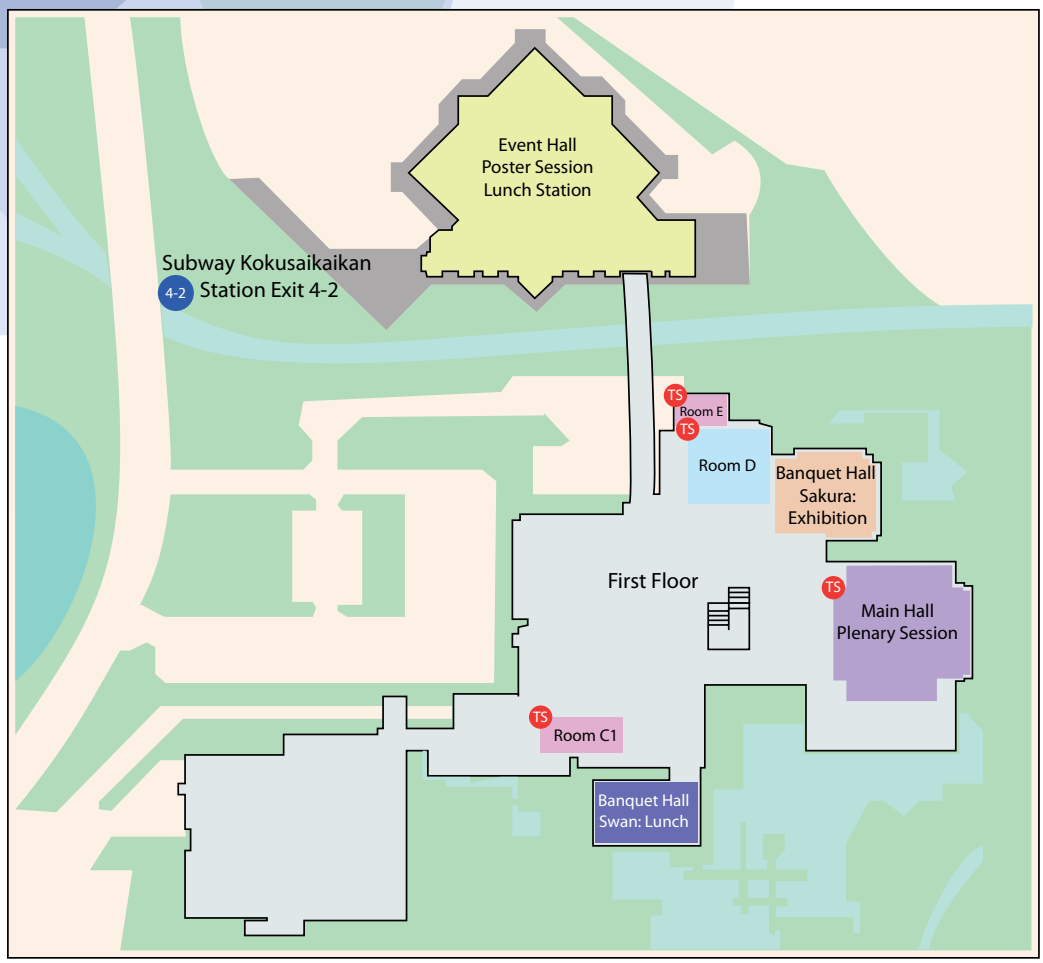
- E-01 Central Research Institute of Electric Power Industry (CRIEPI)
- E-02 Japan CCS Co., Ltd.
- E-03 KOREA ELECTRIC POWER CORPORATION (KEPCO)
- E-04 CO_2 Capture Project
- E-05 New Energy and Industrial Technology Development Organization (NEDO)
- E-06 Greenhouse Gases: Science and Technology
- E-07 CARBON MANAGEMENT CENTER (CMC)
- E-08 VATTENFALL
- E-09 International Institute for Carbon-Neutral Energy Research (I^2CNER), Kyushu University
- E-10 Petroleum Technology Research Centre
- E-11 Nordic CCS Competence Centre NORDICCS / International CCS Research Centre BIGCCS

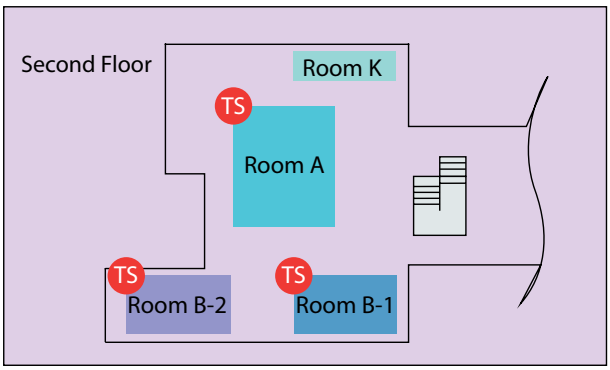


Conference Floorplan and Room Details

The GHGT-11 conference will utilise 7 different rooms for the parellel streams of the technical sessions, and the layout of the Kyoto international Conference Center can be seen on the maps below.

TS Indicates the location of Technical Sessions





Stream A	Main Hall, First Floor
Stream B	Room A, Second Floor
Stream C	Room B-1, Second Floor
Stream D	Room D, First Floor
Stream E	Room B-2, Second Floor
Stream F	Room C1, First Floor
Stream G	Room E, First Floor

Room K is the PC Preview Centre, where oral paper presenters can upload their presentations

Oral Session Details

Technical Session 1

Session 1A - Storage Capacity

Session Chairs: Sally Benson & Zique Xue

Estimating the Supply and Semand for Deep Geologic CO_2 Storage Capacity Over the Course of the 21st Century: A Meta-Analysis of the Literature
James Dooley, Joint Global Change Research Institute; Pacific Northwest National Laboratory

Comprehensive Assessment of Offshore Storage Options in The Netherlands
Filip Neele, Cor Hofstee, Rob Arts, Vincent, Vandeeweijer, Manuel Nepveu, Johan ten Veen, Frank Wilschut, TNO

Illustrating the Estimation of CO_2 Storage Capacity for a Hypothetical Injection Site
Guy Allinson, Wanwan Hou, Peter Neal, CO2CRC and University of New South Wales; John Kaldi, CO2CRC and University of Adelaide; Lincoln Paterson, CO2CRC and CSIRO

CCU&S via Stacked Storage—Case Studies from CO2EOR Basins of the United States
Susan Hovorka, David Carr, Stuart Coleman, Khandaka Zahid, Gordon Smith, Rebecca Smyth, Lesli Wood, The University of Texas at Austin

Session 1B - Post - Combustion: Solvent Pilots

Session Chairs: Prachi Singh & Takayuki Higashii

Solvent Development in Post Combustion CO_2 Capture-Selection Criteria and Optimization of Solvent Performance and Environmental Impact
Karl Anders Hoff, Eirik Falck da Silva, Inna Kim, Andreas Grimstvedt, SINTEF

A Guide to Evaluate Solvents and Processes for Post-Combustion CO_2 Capture
Paul Mathias, Satish Reddy, Arnold Smith, Kash Afshar, Fluor Corporation

Advances in Development of CO_2 Capture Solvent
Paul-Emmanuel Just, Cansolv Technologies Inc

Pilot Plant Results with Piperazine
Eric Chen, Tarun Madan, Paul Nielsen, Darschan Sachde, Lynn Li, Gary T. Rochelle, The University of Texas at Austin

Session 1C - Negative CO_2

Session Chairs: Debo Adams

Global Potential for Biogas Production with CCS
Joris Koorneef, Pieter van Breevoort, Paul Noothout, Chris Hendriks, Luchien Luning, Ecofys; Ameena Camps, IEAGHG

The Techno-Economic Potential of Integrated Gasification Co-Generation Facilities with CCS, Going from Coal to Biomass
Hans Meerman, Andrea Ramirez, Wim Turkenburg, Andre Faaij, Utrecht University

Incentivising BECCS in Indonesia
Florian Kraxner, Sabine Fuss, International Institute for Applied Systems Analysis; Wolfgang Heidug, International Energy Agency

Outdoor Prototype Results for Direct Atmospheric Capture of Carbon Dioxide
Geoffrey Holmes, Kenton Heidel, Matthew Henderson, Paul Klavins, Kevin Nold, Arvinder Singh, David Keith, Carbon Engineering

Session 1D - Technology Assessment I: Cost and Risk

Session Chairs: Kevin McCauley & Howard Herzog

Risk Assessment and Management for CO_2 Capture and Transport Facilities
Angunn Engebø, Jens Garstad, Hamish Holt, Nada Ahmed, DNV

Techno-Economics of CCS in Oil Sands Thermal Bitumen Extraction: Comparison of CO_2 Capture Integration Options
Irene Bolea, CIRCE; Guillermo Ordorica-Garcia, Mehr Nikko, Alberta Innovates - Technology Futures; Michiel Carbo, Energy Research Centre of the Netherlands

Examining CCS Deployment Potential in China via Application of an Integrated CCS Cost Curve
Robert Dahowski, Casie Davidson, Pacific Northwest National Laboratory; Xiaochun Li, Ning Wei, Chinese Academy of Sciences

Potential Cost of Leakage from Geologic Sequestration in the Michigan Basin
Melisa Pollak, Jeffrey Bielicki, Elizabeth Wilson, University of Minnesota; Catherine Peters, Princeton University; Jeffery Fitts, Brookhaven National Lab

Session 1E - Techno-Economic Comparisons

Session Chairs: Jay Braitsch & John Davison

Post Combustion Capture on Natural Gas Combined Cycle Plants: A Technical and Economic Evaluation of Retrofit, New Build and the Application of Exhaust Gas Recycle
Desmond Dillion, EPRI

Performance and Costs of CO_2 Capture at Gas Fired Power Plants
Neil Smith, Geoff Miller, Richard Gadsden, Indran Aandi, Parsons Brinckerhoff Ltd; John Davison, IEAGHG

Integrated Techno-Economic and Environmental Assessments of Amine-Based Capture for Different CO_2 Concentration Gases
Xiangping Zhang, Norwegian University of Science and Technology; Amy Brunsvold, Erik Hognes, Jana Jokobsen, Simon Roussanaly, SINTEF Energy Research

Comparison of Costs for Natural Gas Power Generation with CO_2 Capture
Philippe Mathieu, Olav Bolland, NTNU

Session 1F - Wellbore Integrity

Session Chairs: Stefan Bachu & Samantha Neades

Pre-Injection Baseline Data Collection to Establish Existing Wellbore Leakage Properties
Andrew Duguid, Robert Busch, Schlumberger Carbon Services; Willian Carey, Los Alamos National Laboratory; Michael A. Celia, James Wang, Princeton University; Nikita Chugunov, T.S. Ramakrishnan, Schlumberger-Doll Research; Viki Stamp, True Oil LLC; Sarah Gasda, Integrated Petroleum Research, Uni Research

Cement Sheath Integrity for CO_2 Storage – An Integrated Perspective
Axel-Pierre Bois, CurisTec; Siavash Ghabezloo, Jean Sulem, Ecole des Ponts; Manh-Huyen Vu, André Garnier, Jean-Benoît Laudet, Total

Geomechanical Behavior of Wells in Geologic Sequestration
William Carey, George Zyvoloski, Kayla Lewis, Sharad Kelkar, Los Alamos National Laboratory

Development of Reacted Channel during flow of CO_2-Rich Water along a Cement Fracture
Nicolas Huerta, The University of Texas at Austin and National Energy Technology Laboratory; Quinn Wenning, Marc Hesse, Christina Lopano, The University of Texas at Austin; Brian Strazisar, National Energy Technology Laboratory

Session 1G - Industrial Sources

Session Chairs: Stanley Santos & Eemeli Tsupari

Outline of Course 50
Shigeaki Tonomura, Nippon Steel & Sumitomo Metal Corporation

Application of Advanced Technologies for CO_2 Capture from Industrial Sources
Matteo Carmelo Romano, Politecnico di Milano; Rahul Anantharaman, SINTEF Energy Research; Antti Arasto, VTT; Hyungwoong Ahn, Maria-Chiara Ferarri, Imp-See, University of Edinburgh; Jan Wilco Dijkstra, ECN; Dulce Boavida, LNEG - Laboratório Nacional de Energia e Geologia

Techno-Economic Study of an Integrated Steelwork Equipped with Oxygen Blast Furnace (OBF) and CO_2 Capture
Lawrence Hooey, Swerea MEFOS; Andrew Tobiesen, SINTEF; Jeremy Johns, Tata Steel UK Consulting Ltd; Stanley Santos, IEAGHG

Temperature Dependence of Heat Integration Possibilities of an MEA Scrubber Plant at a Refinery
Viktor Andersson, Thore Bersntsson, Chalmers University of Technology; Per-Åke Franck, CIT Industriell Energi

Technical Session 2

Session 2A - CO_2 Injectivity

Session Chairs: Charles Gorecki & Karsten Michael

Snohvit CO_2 Storage Project: Assessment of CO_2 Injection Performance through History Matching of the Injection Well Pressure over a 32-Month Period
Ji Quan Shi, Claire Imrie, Caglar Sinayuc, Sevket Durucan, Anna Korre, Imperial College; Ola Eiken, Statoil

Experimental and Numerical Study of the Effects of Halite Scaling on Injectivity and Seal Performance during CO_2 Injection in Saline Aquifers
Giacomo Bacci, Anna Korre, Sevket Durucan, Imperial College London

A New Tool to Predict Injection Well Numbers for a Total Injection Rate and Given Formation Properties
Ehsan Azizi, Yildiray Cinar, Guy Allison, The University of New South Wales and CO2CRC, Karsten Michael, CO2CRC and CSIRO

Can We Overcome Thermo-Elastic Limits on CO_2 Injection Rates in Horizontal Wells?
Zhiyuan Luo, Steven Bryant, The University of Texas at Austin

Session 2B - Post-Combustion: Sovent Alternatives

Session Chairs: Peter Ragden & Bernd Schallert

Amine Blends Using Concentrated Piperazine
Le Li, Xe Chen, Yang Du, Stephanie Freeman, Okmar Namjoshi, Thu Nguyen, Alexander Voice, Qing Xu, Gary Rochelle, University of Texas at Austin; Han Li, Tsinghua University

Energy Efficient Solvents for CO_2 Absorption from Flue Gas: Vapour Liquid Equilibrium and Pilot Plant Study
Prachi Singh, IEAGHG; W. P. M. Van Swaaij, Wim Brilman, University of Twente

A Novel Reactive 4-Diethylamino-2-Butanol Solvent for Capturing CO_2 in the Aspect of Absorption Capacity, Cyclic Capacity, Mass Transfer, and Reaction Kinetics
Paitoon Tontiwachwuthikul, Zhiwu Liang, Raphael Idem, University of Regina and Hunan University; Teerawat Sema, Abdulaziz Naami, University of Regina, Canada

Amino Acids Salts for CO_2 Capture at Flue Gas Temperatures
Steven Chiao-Chien Wei, Graeme Puxty, Paul Feron, CSIRO Energy Technology

Session 2C - Demonstration Projects: Storage

Session Chairs: Sue Havorka & Ryozo Tanaka

CCS Large-Scale Demonstration in Japan
Masanori Abe, Shigeru Saito, Daiji Tanase, Yoshihiro Sawada, Yoshio Hirama, Yoshihiko Motoyama, Japan CCS Co., Ltd.

The In Salah CO_2 Storage Project: Lessons Learned and Knowledge Transfer
Philip Ringrose, Statoil ASA; Allan S. Mathieson, Iain Wright, BP Alternative Energy; Faycal Selama, In Salah Gas

Gorgon CO_2 Injection Project - 2012 Update
John Frontczak, Gorgon Project

CO_2 Storage in the Depleted P18-4 Gas Field Offshore the Netherlands (the ROAD project)
Rob Arts, Cor Hofstee, Vincent Vandeweijer, Maarten Pluymaekers, Daniel Loeve, TNO; Andreas Kopp, E.ON Gas Storage GmbH; Willem-Jan Plug, TAQA Energy BV

Session 2D - Technology Assessment II: Operational Flexibilty

Session Chairs: Jim Dooley & Angunn Engebø

Operating Flexibilty of Power Plants with CCS
Luca Mancuso, Rosa Domenichini, Noemi Ferrari Foster Wheeler; John Davison, IEAGHG

CO_2 Sequestration at Material Rates: Inherent Limits and Engineering Solutions
Steven Bryant, The University of Texas at Austin

Optimal CO_2 Capture Operation in an Advanced Electric Grid
Stuart Cohen, Michael Webber, Gary Rochelle, The University of Texas at Austin

Composing the Whole CCS System Including CO_2 Buffer
Haruhiro Suzuki, Kyuro Sasaki, Yuichi Sugai, Kyushu University

Session 2E - Membranes

Session Chairs: Teruhiko Kai & May-Britt Hägg

CO_2 Capture by Sub-Ambient Membrane Operation
David Hasse, Sudhir Kulkarni, Ed Sanders, Elizabeth Corson, Air Liquide Delaware Research & Technology Center; Jean-Pierre Tranier, Air Liquide R&D-Centre de Recherche Claude Delorme

Theoretical and Experimental Investigations of N2-Selective Membranes
Jennifer Wilcox, Ekin Ozdogan, Panithita Rochana, Stanford University

Poly (Amidoamine) Dendrimer Containing Polymeric Membrane for Preferential CO_2 Separation over H_2 - Interplay Between CO_2 Separation Properties and Morphology
Ikuo Taniguchi, Teruhiko Kai, Shuhong, Dua, Shingo Kazama, Research Institute of Innovative Technology for the Earth

Pd-Membranes on Their Way Towards Application for CO_2 Capture
Frans van Berkel, Daniel Jansen, ECN; Andreas Goldbach, Hengyong Xu, DCIP; Chunnhai Jiang, Chuanyong Hao, IMR; John Morund, SINTEF; Etienne Soutif, TECHNIP; Bai Song, BP

Session 2F - Modelling: Nanoscale to Core Scale

Session Chairs: Anna Korre & Andrew Cavanagh

Nanosized CO_2 Droplets Injection for Stable Geological Storage
Suguru Uemura, Yohei Matsui, Atsuto Noda, Shohji Tsushima, Shuichiro Hirai, Tokyo Institute of Technology

Molecular Dynamics Simulations of the CO_2/Water/Silica Wettability at Different Pressures
Shinya Tsuji, Makoto Kunieda, Yungfeng Liang, Toshifumi Matsuoka, Kyoto University; Satoru Takahashi, Japan Oil, Gas and Metals National Corporation (JOGMEC)

Pore Scale Models for Imbibition of CO_2 Analogue Fluids in Etched Micro-Model Junctions using Micro-Fluidic Experiments and Direct Flow Calculations
Edo Boek, Emily Chapman, Jianhui Yang, John Cranshaw, Imperial College London

Prediction of CO_2-Brine-Quartz Contact Angles with Molecular Dynamics Computations
Stefan Iglauer, Curtin University; Manu Matthews, Fernando Bresme, Imperial College London

Session 2G - Industrial Sources

Session Chair: Wilfred Maas

Aqueous Ammonia Capture Integrated with Ex-Situ Mineralisation using Recyclable Salts for Industrial CCS
Xiaolong Wang China Huaneng Clean Energy Research Institute; Mercedes Maroto-Valer, University of Nottingham

The Calcium Looping Process for Low CO_2 Emission Cement and Power
Matteo Carmelo Romano, Maurizio Spinelle, Stefano Campanari, Stefano Consonni, Politecnico di Milano; Giovanni Ciniti, Maurizio Marchi, Natale Pimpinelli, CTG - Italcementi Group

CO_2 Recovery from Industrial Hydrogen Facilities and Steel Production to Comply with European Emission Regulations:
Bernd Holling, Christine Kandziora, Alfred Bolkart, Linde AG

Oxy-Fuel Retrofitting of Fuel Oil Fired Refinery Heaters – a Two-Step Experimental Approach
Morten Seljeskog, Mario Ditaranto, SINTEF Energy Research

Technical Session 3

Session 3A - Environmental Impacts of CO_2 Storage

Session Chairs: Jun Kita & Tim Hill

Evaluation of Dissolved CO_2-Induced Metals Mobilization in Groundwater using a Controlled Release Experiment
Robert Trautz, EPRI; Liange Zheng, Yuxin Wu, Charuleka Varadharajan, Nicolas Spycher, Susan Hubbard, Jens Birkholzer, Lawrence Berkeley National Laboratory; John Pugh, Southern Company Services; Dennis Newell, Los Alamos National Laboratory

Laboratory Experiments and Field-Study of a Marine Natural Analogue for Potential Seepage from CO_2 Storage Sites in Aquatic Environments
Giorgio Caramann, Mercedes Maroto-Valer, The University of Nottingham

Potential Environmental Impacts of CO_2 Leakage from Study of Natural Analogue Sites in Europe
Fotini Ziogou, Vasiliki Gemen, Nikolaos Koukouzas; Hellas Institute; Davide de Angelis, Simone Libertini, Stan Beaubien, Salvatore Lombardi, Universita di Roma 'La Sapienza'; Julie West, David Jones, Patricia Coombs, T.S. Barlow, British Geological Survey; M. Kruger, Bundesanstalt für Geowissenschaften und Rohstoffe

A Novel Experimental Release of CO_2 in the Marine Environment to Aid Monitoring and Impact Assessment
Jerry Blackford, Plymouth Marine Laboratory

Session 3B - Post-Combustion: Two-Phase Solvents

Session Chairs: Jasmin Kemper & Masaki Iijima

Selection and Characterization of Phase-Change Solvent for CO_2 Capture: Precipitating System
Inna Kim, Sholeh Ma'mum, SINTEF Materials and Chemistry

Overall Process Analysis and Optimization for CO_2 Capture from Coal Fired Power Plants Based on Phase Change Solvents Forming Two Liquid Phases
Ulrich Liebenthal, Alfons Kather, Hamburg University of Technology; Diego Pinto, Julianna Monteiro, Hallvard Svendsen, Norwegian University of Science and Technology

Precipitating Carbonate Solvent Process for CO_2 Capture
Geoff Stevens, Kathryn Mumford, Kohei Endo, Dimple Quyn, Hendy Thee, Kathryn Smith, Sandra Kentish, University of Melbourne; Clare Anderson, Barry Hooper, Abdul Qadar, CO2CRC

Precipitating Carbonate Process for Low-Energy Post-Combustion CO_2 Capture Technology Development and Pilot-Plant Operation
Robert Moene, Lodi Schoon, Frank Geuzenbroek, Shell Global Solutions International B.V; Jiri van Streel Shell (Petroleum Mining) Co. Ltd (NZ)

Session 3C - Demonstration Projects: US Regional Carbon Sequestration Partnerships

Session Chairs: John Litynski & Masanori Abe

Three Million Metric Ton Monitored Injection at the SECARB Cranfield Project - Project Update
Susan Hovorka, The University of Texas at Austin

Early Operational Experience at a One-Million Tonne CCS Demonstration Project, Decatur, Illinois, USA
Robert Finlay, Scott Frailey, Hannes Leetaru, Illinois State Geological Survey; Scott Marsteller, Schlumberger Carbon Services

Evaluating the Suitability for CO_2 Storage at the FutureGen 2.0 Site, Morgan County, Illinois, USA
Alain Bonneville, Tyler Gilmore, Vince Verneul, Delphine Appriou, Bruce Bjornstad, Jack Horner, Frank Spane, Battelle Pacific Northwest Laboratories; Mark Kelley, Jackie Gerst, Neeraj Gupta, Kaitlin McNeil, Mark Moody, FutureGen Industrial Alliance Inc.

Overview of the Bell Creek Combined CO_2 Storage and CO_2 Enhanced Oil Recovery Project
John Hamling, Charles Gorecki, Edward Steadman, John Harju, University of North Dakota EERC

Session 3D - Panel Discussion: CCS in Developing Asia

An overview of the Asian Development Bank's efforts to promote CCS in the PRC and Southeast Asia, as part of a comprehensive plan to promote clean energy deployment in the region. Highlighting the role of CCS within PRC's overall energy security and decarbonizing strategy, and presenting ADB's CCS project portfolio in PRC.

Chairman: Ashok Bhargava, Energy Division ADB

Panelists:

Annika Seiler, Finance Specialist, ADB
Pradeep Tharakan, Climate Change Specialist, ADB
Tong Yiying, Datang International Power Generation Corporation Limited,
Usman Pasarai, LEMIGAS,
Witsarut Thungsuntonkhun, Dept of Mineral and Fuels, Thailand,
Le Van Luc, Ministry of Industry and Trade, Vietnam

Session 3E - Enhanced Hydrocarbon Recovery I

Session Chairs: Sandeep Verma & Kozo Sato

Flue Gas Injection for CO_2 Storage and Enhanced Coalbed Methane Recovery: Mixed Gas Sorption and Swelling Characteristics of Coals
Amer Syed, Sevket Durucan, Ji-Quan Shi, Anna Korre, Imperial College London

Description of a CO_2 Enhanced Coalbed Methane Field Trial Using a Multi-Lateral Horizontal Well
Luke Connell, Zhejun Pan, Michael Camilleri, David Down, John Carras, Cameron Briggs, CSIRO; Shangzhi Meng, Wenzhong Zhang, Benguang Guo, CUCBM

The Altmark Natural Gas Field is Prepared for the Enhanced Gas Recovery Pilot Test with CO_2
Michael Kühn, Andrea Förster, Peter Pilz, Maja Tesmer, GFZ German Research Centre for Geosciences; Jochen Grossman, GICON Grossmann Ingenieur Consult GmbH; Jan Lille, GDF SUEZ E&P Deutschland GmbH; Kurt M. Reinicke, Technische Universität Clausthal; Dirk Schäfer, Christian-Albrechts-Universität Kiel

CO_2 Enhanced Oil Recovery and Geological Sequestration Potential in Northern Niagaran Pinnacle Reef Trend Reservoirs, Northern Lower Michigan, USA
David Barnes, Willian Harrison, Jason Asmus, Western Michigan University; G. Michael Grammer, Oklahoma State University

Session 3F - Modelling: Managing Uncertainty

Session Chairs: Bill Carey & Lingli Wei

Reducing Uncertainty in Reservoir Model Predictions: From Plume Evolution to Tool Responses
Nikita Chugunov, T.S. Ramakrishnan, Schlumberger-Doll Research; Ozgur Senel, Schlumberger Carbon Services

Model Comparison and Uncertainty Quantification for Geologic Carbon Storage: The Sim-SEQ Initiative
Sumit Mukhopadhyay, Christine Doughty, Jens Birkholzer, Lawrence Berkeley National Laboratory; Jean-Philippe Nicot, Seyyed Hoseini, University of Texas Austin; Diana Bacon, Luke Gosink, Guang Lin, Ramya Ramanathan, Pacific Nortwest National Laboratory; Sarah Gasda, Uni Research Norway

Capacity and Injectivity in the Surat/Bowen Basins, Queensland, Australia: Likelihood and Uncertainty Evaluation
Suzanne Hurter, Peter Probst, Sebastian Gonzalez, Sam Guiton, Schlumberger Carbon Services; Andrew Garnet, Formerly CEO & Project Director ZeroGen; Norhafiz Marmin, Schlumberger Carbon Services, Australia and Petroleum Development Oman

Maximum Uncertainty Reduction in Numerical Performance Assessments of Geological CO_2 Storage Sites: An Example from the Rock Springs Uplift, Greater Green River Basin, Wyoming, USA
Ronald Surdam, Zunsheng Jiao, Yuri Ganshin, Ramsey Bentley, Mario Garcia-Gonzalez, Scott Quillinan, Fred McLaughlin, University of Wyoming Carbon Management Institute; Philip Stauffer, Hailin Deng, Los Alamos National Laboratory

Session 3G - Commercial Issues

Session Chairs: Tony Booer & Richard Esposito

The Implications of the Global Financial Crisis for CCS
Geoff Rumble, Christopher Short, Klaas van Alphen, Gwendaline Jossec, Global CCS Institute

North West Redwater Partnership – Carbon Capture through Innovative Commercial Structuring in the Canadian Oil Sands
Terry Kemp, Kevin Heal, North West Redwater Partnership

A Real Options Analysis of Carbon Dioxide Sequestration for Trinidad and Tobago: A Case Study of the Mahogany Field
Steve Seetahal, David Alexander, The University of Trinidad and Tobago

Value Chain Analysis of CO_2 Storage by Using the ECCOTool: Storage Economics
Daniel Loeve, Christian Bos, Alin Chitu, TNO; Sigurd Weidemann Løvseth, Per Eilif Wahl, SINTEF; Paula Coussy, IFPEN; Charles Eickhoff, Progressive Energy Ltd 4A Experiences and Case Studies

Technical Session 4

Session 4A - Experiences and Case Studies

Session Chairs: Andy Chadwick & John Kaldi

Snøhvit: The History of Injecting and Storing 1 Mt CO_2 in the Fluvial Tubåen Fm
Ola Eiken, Douglas Gilding, Hilde Hansen, Olav Hansen, Bamshad Nazarian, Bård Osdal, Philip Ringrose, Hossein Mehdi Zadeh, Statoil

Calibration and Prediction of the Sleipner CO_2 Plume from 2006 to 2012
Andrew Cavanagh, Landmark-Halliburton

Investigations of Alleged CO_2 Leakage in Weyburn, Canada in the Context of Longer Term Surface Gas Monitoring
David Jones, Andrew Barkwith, Tom Barloe, Bob Lister, British Geological Survey; Stan Beaubien, Tiziana Bellomo, Aldo Annunziatellis, Stefano Graziani, Salvatore lombardi, Gilles Braibant, Università di Roma 'La Sapienza'

Inducing a CO_2 Leak into a Shallow Aquifer (CO_2FieldLab EUROGIA+ Project): Monitoring the CO_2 Plume in Groundwaters
Frédérick Gal, Eric Proust, Pauline Humez, Gilles Braibant, Michael Brach, Florian Kock, David Widory, Jean-François Girard, BRGM

Sessions 4B - Post-Combustion: Environmental Characterisation

Session Chairs: Phil Sharman & Yuichi Fujioka

Chemical Characterization of 30% MEA Degradation During Post-Combustion Capture of CO_2 from a Brown Coal-Fired Power Station
Alicia Reynolds, Vincent Verheyen, Samuel Adeloju, Alan Chafee, Monash University; Erik Meuleman, Paul Feron, CSIRO Energy Technology

Assessing Atmospheric Emissions from Amine-Based PCC Processes and Their Impacts on the Environment - A Case Study
Paul Feron, Merched Azzizi, Erik Meuleman, Brendan Halliburton, Dennys Angrove, CSIRO; Martin Oettinger, Global CCS Institute

Thermal Degradation on Already Oxidatively Degraded Solutions:
Solrun Johanne Velvestad, Hanna Knuutila, Hallvard Svendsen, NTNU; Andreas Grimstvedt, SINTEF Materials and Chemistry

Oxidative Degradation of Amines with High-Temperature Cycling
Alexander Voice, University of Texas and TNO; Fred Closmann, Gary Rochelle, University of Texas

Session 4C - Demonstration Projects: Policy Related Issues

Session Chairs: Brendan Beck & Chris Hendriks

Too Early or Too Late for CCS - What Needs to be Done to Overcome the Valley of Death for Carbon Capture and Storage in Europe?
Peter Radgen, E.ON New Build and Technology GmbH; Robin Irons, E.ON New Build and Technology Ltd.; Hans Schoenmakers, E.ON Benelux Holding B.V.

Key Messages from Active CO_2 Storage Sites
Ton Wildenborg, TNO; Andy Chadwick, BGS; Heleen de Coninck, ECN; Jean-Pierre Deflandre, IFPEN; Allan Mathieson, BP; Richard Metcalfe, Quintessa; Conny Schmidt-Hatteberger, GFZ

Establishment of Knowledge Base for Emission Regulation for the CO_2 Technology Centre Mongstad
Yolandi Maree, Sissel Nepstad, TCM DA; Gelin De Koeijer, Statoil

Industry Guidance on Safe Handling of CCS CO_2 – CO2RISKMAN JIP
Hamish Holt, Kaare Helle, Jorg Aarnes, DNV

Session 4D - Panel Discussion: Understanding the Costs of CCS

The literature reports a wide range of costs for CCS. Furthermore, these costs are reported in various forms, such as capture cost, avoided cost, levelized cost, etc. This can lead to confusion and misuse of the costing data. To help provide clarity to this subject, this panel will address several critical questions about CCS costs, including understanding costing methodologies, comparing real project costs to generic cost studies, and examining "first-of-a-kind" costs.

Chairman: Howard Herzog MIT

Panelists:
Chris Short, Global CCS Institute
Chris Greig, University of Queensland
Cheryl Wilson, Bloomberg

Session 4E - Enhanced Hydrocarbon Recovery II

Session Chairs: Kozo Sato & Steve Whittaker

Deploying Combined EOR and CCS Projects
Kurt House, Ernst van Neiro, Antonio Baclig, Shipeng Fu, Mark Henly, Charles Brankman, Kelly Bergman, Robert Selover, C12 Energy

Comparing Alternatives for Early CCS Projects in the United States via EOR
Eric Larson, Robert Wiliams, Princeton University; Guangjiang Liu, North China Electric Power University

Assessment of Factors Influencing CO_2 Storage Capacity and Injectivity in Eastern U.S. Gas Shales
Michael Godec, George Koperna, Robin Petrusak, Anne Oudinot, ARI Inc.

The Economics of CO_2 Sequestration Through Enhanced Oil Recovery
Klaas van 't Veld, Charles Mason, University of Wyoming; Andrew Leach, University of Alberta

Session 4F - Monitoring: Pressure Methods

Session Chairs: Millie Basava-Reddi & Randy Locke

Tracing Back the Pressure-Impact Zone of the CO_2 Geological Storage Through a Cyclic Injection Strategy
Jeremy Rohmer, BRGM

Leakage Fingerprints During Storage: Modeling Above-Zone Measurements of Pressure and Temperature
Qing Tao, Steven Bryant, Timothy Meckel, The University of Texas at Austin

Maximizing the Value of Pressure Monitoring Data from CO_2 Sequestration Projects
Srikanta Mishra, Mark Kelley, Evan Zeller, Nick Slee, Neeraj Gupta, Battelle Memorial Institute; Indra Bhattacharya, Mike Hammond, American Electric Power

Identifying Diagnostics for Reservoir Structure and CO_2 Plume Migration from Multilevel Pressure Measurements
Christin Strandli, Sally Benson, Stanford University

Session 4G - Retrofitting

Session Chairs: John Davison & Chris Satterley

Retrofitting CO_2 Capture to Existing Power Plants
Jon Gibbins, Hannah Chalmers, Mathieu Lucquiad, University of Edinburgh; John Davison, IEAGHG; Jia Li, Xi Liang, University of Exeter; Nial McGlashan, Imperial College London

Summary Results and Insight from EPRI's Engineering and Economic Study of Post Combustion Capture Retrofit Applied to Various North American Host Sites
Desmond Dillon, EPRI

Carbon Capture Retrofit Options with the On-Site Addition of Gas Turbine Combined Heat and Power Cycle
Mathieu Lucquiaud, Maria Sanchez, Laura Herraiz, Jon Gibbins, The University of Edinburgh

Enhancement and Long-Term Testing of Optimized Post-Combustion Capture Technology – Results from the Second Phase of the Testing Programme at the Pilot Plant Niederaussem
Peter Moser, Sandra Schmidt, Sarah Wallus, RWE Power AG; Georg Sieder, Javier Garcia-Palacios, BASF SE; Torsten Stoffregen, Linde-Engineering Dresden GmbH, Dieter Mihailowitsch, Linde AG

Technical Session 5

Session 5A - Monitoring: Demonstration and Pilot Projects

Session Chairs: Toshifumi Matsuoka & Susan Hovorka

Microseismic Monitoring and Interpretation with Associated Injection Data from the In Salah CO_2 Storage Site (Krechba), Algeria
Volker Oye, Daniela Kühn, NORSAR; Eyvind Aker, Bahman Bohloili, Norwegian Geotechnical Institute; Thomas M. Daley, Valeri Korneev, Lawrence Berkeley National Laboratory

Feasibility of Time-Lapse Seismic Methodology for Monitoring Injection of Small Quantities of CO_2 into a Saline Formation, CO2CRC Otway Project
Roman Pevzner, Milovan Urosevic, Eva Caspari, Mahair Maddi, Curtin University and CO2CRC; Tess Dance, Valeriya Shulakova, CSIRO; Boris Gurevich, Curtin University, CSIRO and CO2CRC; David Lumley, University of Western Australia; Vladimir Tcheverda, SB RAS; Yildiray Cinar, University of New South Wales and CO2CRC

Evaluation of CO_2 Saturation at Nagaoka Pilot-Scale Injection Site Derived from the Time-Lapse Well Logging Data
Takahiro Nakajima, Ziqiu Xue, Research Institute of Innovative Technology for the Earth

Assessment of Alleged CO_2 Leakage at the Kerr Farm Using a Simple Process-Based Soil Gas Technique: Implications for Carbon Capture, Utilization, and Storage (CCUS) Monitoring
Katherine Romanak, The University of Texas GCCC

Session 5B - Post-Combustion: Modelling

Session Chairs: John Topper & Hanne Kvamsdal

Dynamic Behaviour of the Solvent Regeneration Part of a CO_2 Capture Plant – Calidation of the CO2SIM Model
Finn Andrew Tobiesen, Hanne Kvamsdal, Olaf Trygve Berglihn, Thor Mejdell, SINTEF Materials & Chemistry; Nina Enaasen, Magen Hillestad, NTNU

Rate-Based Modeling of CO_2 Capture Pilot Plant with Aqueous Monoethanolamine Solution
Chau-Chyun Chen, Ying Zhang, Aspen Technology, Inc.

Energy Performance of Advanced Stripper Configurations
Peter Frailie, Tarun Madan, Brent Sherman, Gary Rochelle, The University of Texas at Austin

Design Parameters Affecting the Commercial Post Combustion CO_2 Capture Plants
Ahmed Aboudheir, Walid Elmoudir, HTC CO_2 Systems Corp.

Session 5C - Demonstration Projects: Capture and Transport

Session Chair: Klaus Schöffel

The Alberta Carbon Trunk Line
Susan Cole, Enhance Energy Inc.

ELCOGAS Pre-Combustion Carbon Capture Pilot. Real Experience of Commercial Technology
Pedro Casero Cabezón, Francisco García Peña, ELCOGAS, S.A.; Javier Trujillo Rivera, Universidad Castilla la Mancha

Oxy-Combustion Technology Development for Fluid Catalytic Crackers (FCC) – Large Pilot Scale Demonstration
Leonardo de Mello, Rodrigo Gobbo, Gustavo Moure, Petrobras; Ivano Miracca, ENI

30 MWth CIUDEN Oxy-CFB Boiler - First Experiences
Monica Lupion, Iñaki Alvarez, Pedro Otero, Vincente Cortes, CIUDEN; Reiji Kuivalainen, Jouni Lantto, Arto Hotta, Horst Hack, Foster Wheeler North America Corp.

Session 5D - Panel Discussion: The Intersection of Large Scale Renewable Energy and CCS Deployment within the Electricity Sector

There is a growing body of literature that sees large scale renewable energy generation as a hinderance to the large scale deployment of CCS technologies, and suggests the deployment of renewable electricity generation will place additional burdens on CCS-enabled power plants., e.g., needing flexible CCS power plants to compensate for intermittency from large wind power farms. On the other hand, there is near unanimity that if climate goals such as not exceeding a change of more than 2°C this century, the scale of CCS deployment will be driven by our ability to grow hundreds of exajoules of bioenergy per year and use this bioenergy in dedicated BECCS power plants. This session is designed to examine from macroeconomic and engineering perspectives the ways in which large scale renewable energy and large scale CCS deployments can, and perhaps must, work together.

Chairman: Jim Dooley, PNNL, USA

Panelists:
Toshihiko Masui, NIES, Japan
Jae Edmonds, PNNL, USA
Sean McCoy, IEA-Paris, France
Howard Herzog, MIT, USA

Session 5E - Post-Combustion: Environmental Nitrosamines

Session Chairs: Paul Feron & Helle Brit Mostad

Nitrosamine Management in Aqueous Piperazine for CO_2 Capture
Nathan Fine, Gary Rochelle, Mandana Ashouripashaki, Alexander Voice, Steven Fulk, Lynn Li, Omar Namjoshi, University of Texas, Austin

Ultra-Violet Treatment as a Strategy for Destruction of Degradation Products from Amine Based Post Combustion CO_2 Capture
Moetaz Attalla, Phil Jackson, CSIRO

Destruction of Nitrosoamines with UV-Light
Hanna Knuutila, Hallvard Svendsen, Naveed Asif, NTNU

Health and Environmental Impact of Amine Based Post Combustion CO_2 Capture
Eik Gjernes, Laila Iren Helgesen, Gassnova SF; Sissel Nepstad, TCM DA

Session 5F - Reservoir Engineering: Multi-Phase Flow of CO_2 and Brine

Session Chairs: Steve Bryant & Pascal Audigane

Stability Analysis of CO_2-Brine Immiscible Displacement
Holger Ott, Steffan Berg, Shell Global Solutions International

Drainage and Imbibition CO_2/Brine Relative Permeability Curves at In-Situ Conditions for Sandstone Formations in Western Canada
Stefan Bachu, Alberta Innovates - Technology Futures

Multiphase Flow Properties of the CO_2/Brine System for Carbon Sequestration
Sam Krevor, Imperial College London; Ronny Pini, Sally Benson, Stanford University

Influence of Heterogeneity on Relative Permeability for CO_2/Brine: CT Observations and Numerical Modeling
Yi Zhang, Testuya Kogure, Shun Chiyonobu, Ziqiu Xue, RITE; Xinglin Lei, Geological Survey of Japan, National Institute of Advanced Industrial Science and Technology

Session 5G - Transport and Infrastructure

Session Chairs: Wolfgang Böser & Chris Hendriks

The Influence of Impurities, Material Development and Changing Prices on the Costs of CO_2 Transport
Marlinde Knoope, Andrea Ramírez, André Faaij, University Utrecht

Cost of CO_2 Transportation Infrastuctures
Wim Mallon, Janneke van Wingerden, Han Lemmens, Luuk Buit, KEMA/Gasunie

Modelling Large-Scale CCS Development in Europe – Linking Techno-Economic Modelling to Transport and Storage Infrastructure
Jan Kjärstad, Mikael Odenberg, Filip Johnsson, Chalmers University of Technology; Joris Morbee, Evangelos Tzimas, European Commission

Economic CO_2 Network Optimization Model - COCATE European Project (2010-2013)
Paula Coussy, IFPEN Energies nouvelles; Simon Roussanal, SINTEF; Gaelle Bureau-Cauchois, GEOGREEN; Ton Wildenborg, TNO

TechnicalSession 6

Session 6A - Site Characterisation and Selection

Session Chairs: Rajesh Pawar & Jonathan Pearce

CO_2 Storage Atlas of the Norwegian Part of the North Sea
Eva Halland, Wenche T. Johansen, Ine T. Gjeldvik, Fridtjof Riis, Christian Magnus, Van T.H. Pham, Inge M. Tappel, Norwegian Petroleum Directorate

Depositional Environment as an Indicator of Favorable Regional Sequestration Targets: Examples from the USGS CO_2 Storage Resource Assessment
Matthew Merrill, U.S. Geological Survey

Effects of Geological Heterogeneity on CO_2 Distribution and Migration – A Case Study from the Johansen FormaStion, Norway
Anja Sundal, Johan Petter Nystuen, Henning Dypvik, Per Aagaard, University of Oslo

Evaluation of CO_2 Storage Potential in the Skagerrak/ Kattegat Area
Per Eirik Strand Bergmo, Szczepan Polak; SINTEF Petroleum Research, Per Aagaard, University of Oslo; Peter Frykman, Geological Survey of Denmark and Greenland; Hans Hasken Haugen, Dag Bjørnsen, Tel-Tek

Fault Stability Analysis Related to CO_2 Injection at Tomakomai, Hokkaido
Yuki Kano, Takahiro Funatsu, Shinsuke Nakao, Kinichiri Kusunose, Tsuneo Ishido, Xinglin Lei, Toshiyuki Tosha, Geological survey of Japan/AIST

Session 6B - Sorbent Systems

Session Chairs: Sven Unterberger & Mohammad Abu Zahra

Testing Post-Combustion CO_2 Capture with CaO in a 1.7 MWt Pilot Facility
Calros Adanades, Borja Arias, Spanish Research Council; CSIC-INCAR, Andrés Sánchez-Biezma, Jesús Paniagua, Endesa Generación; Luis Diaz, María Lorenzo, Grupo Hunosa, Javier Alvarez, Diego Martínez, Foster Wheeler Energía S.L.U

Progress in Calcium-Looping Post-Combustion CO_2 Capture: Successful Pilot Scale Demonstration
Heiko Dieter, Craig Hawthorn, Mariusz Zieba, Günter Scheffknecht, IFK University of Stuttgart

Assessment of Solid Sorbents as a Competitive Post-Combustion CO_2 Capture Technology
Justin Cole Gler, Edward Rubin, Carnegie Mellon University

Continuous CO_2 Capture from Flue Gases Using Dual Fluidized Bed Reactors with Supported Amine Sorbent
Zhen-shan Li, Wen-ying Zhao, Zhi Zhang, Li-xiang Wang, Ning-sheng Cai, Tsinghua University

The Role of Water in Adsorption-Based CO_2 Capture Systems
Dorian Marx, Lisa Joss, Max Hefti, Marco Mazzotti; ETH Zurich, Ronny Pini, Stanford University

Session 6C - Demonstration Projects: Post-Combustion Capture

Session Chairs: Howard Herzog & Richard Rhudy

Operational Experience and Initial Results from the First Test Period at the CO_2 Technology Centre Mongstad
Vibeke Andersson, Knut Sanden, Aker Clean Carbon; Kristina Wittmeyer, Yolandi Maree, TCM DA

Project Status and Research Plans of 500 TPD CO_2 Capture and Sequestration Demonstration at Alabama Power's Plant Barry
Michael Ivie, Nick Irvin, Chethan Acharya, Southern Company; Yasuo Kubota, Hiromitsu Nagayasu, Takuya Hirata, Paul Wood, Takahito Yonekawa, Tatsuya Tsujiuchi, MHI

Aqueous Ammonia Based Post-Combustion Capture: Results from Pilot Plant Operation, Challenges and Further Opportunities
Hai Yu, Paul Feron, CSIRO Energy Centre

Initial Results from Fluor's CO_2 Capture Demonstration Plant Using Econamine FG Plus Technology at E.ON Kraftwerke's Wilhelmshaven Power Plant
Satish Reddy, Jeff Scherffius, Fluor Corporation; Peter Ragden, Helmut Rode, E.ON New Build & Technology GmbH

CCPILOT100+ Operating Experience and Test Results
J. Carey, SSE, F.D. Fitzgerald, R.A Gardiner, Doosan Power Systems

Session 6D Panel Discussion: 24Mt of CO_2 and Counting: What Has Weyburn-Midale Taught Us About CCUS?

The Weyburn and Midale oilfields in southern Saskatchewan, Canada, now store approximately 24 million tonnes of anthropogenic CO_2 – making these CO2-EOR operations the world`s largest CCUS project and allowing the allied IEAGHG Weyburn-Midale CO_2 Monitoring and Storage Project to provide over a decade of world class applied scientific research. The panel session will highlight numerous technical achievements including the successful application of 3D seismic surveys, characterisation of the storage complex and adjacent environment to allow comprehensive risk assessment, and development of new tools to aid in the assessment of wellbore integrity. The session will also describe how the research project helped the unequivocal disproval of leakage allegations made against the Weyburn site in 2011.

Chairman: Malcolm Wilson, PTRC

Panel Members:

Neil Wildgust, PTRC
Ben Rostron, University of Alberta
Chris Hawkes, University of Saskatchewan
Jim Johnson, Schlumberger-Doll Research
Rick Chalaturnyk, University of Alberta
Don White, NRCan

Session 6E - Oxy-Combustion: Combustion Fundamentals

Session Chairs: Takashu Kiga & Monica Lupion

Sulfur Oxide Emissions Under Dust-Fired Oxy-Fuel Combustion of Coal
Reinhold Spörl, Jörg Maier, Günter Scheffknecht; Universität Stuttgart

Development of Hitachi Oxy-Fuel Combustion Technologies
Toshihiko Mine, Takahiro Marumoto, Kenji Kiyama, Noriyuki Imada, Ken-Ichi Ochi,Hideaki Iwamoto, Babcock-Hitachi K.K. Kure Research Laboratory

Fireside Corrosion of Applied and Modern Superheater-Alloys Under Oxyfuel Conditions
Gosia (Malgorzata) Stein-Brzozowska, Jörg Maier, Günter Scheffknecht, IFK University of Stuttgart; Danila Cumbo, Silvia Masci, Enrico Tosi, Enel Engineering and Innovation; Giovanni Coraggio, Marco Faleni, Leonardo Biasci, International Flame Research Foundation (IFRF)

Technology Assessment of Oxy-Firing of Process Heater Burners
Cliff Lowe, Nick Brancaccio, Chevron Energy Technology Company; Jamal Jamaluddin, Shell Projects and Technology; Charles Baukal, Erwin Platvoet, Jaime Erazo, John Zink Co.

Evaluation of the Performance of a Power Plant Boiler Firing Coal, Biomass and a Blend Under Oxy-Fuel Conditions as a CO_2 Capture Technique
Alessandro Pranzitelli, Sandy Black, Penelope Edge, Janos Szuhánszki, Lin Ma, Mohamed Pourkashanian, University of Leeds

Session 6F - Legal and Regulatory

Session Chairs: Tim Dixon & Juho Lipponen

Liability for Sequestered CO_2; The Path Forward for Alberta
Michael Fernandez, Alberta Energy

Regulating Carbon Dioxide Storage Operations Near Oil and Gas Fields, Australia's Approach
Ian Walker, Steve Tantala, Willie Senanayake, Department of Resources, Energy and Tourism, Australian Government; Greg Leamon, Geoscience Australia, Australian Government

Implications of Alternative Post-Injection Regulatory Guidance Upon CO_2 Storage in Dipping Open Aquifers
Aaron Goater, Andy Chadwick, British Geological Survey

Carbon Capture and Storage and the London Protocol: Recent Efforts to Enable Transboundary CO_2 Transfer
Justine Garrett, Sean McCoy, International Energy Agency

CCS Directive Transposition into National Laws in Europe: Progress and Problems by the End of 2011
Alla Shogenova, Kazbulat Shoganova, Tallinn University of Technology; Kris Piessens, Geological Survey of Belgium; Sam Holloway, BGS; Roberto Martínez, IGME; Kristin M. Flornes, IRIS; Niels E. Poulsen, Geological Survey of Denmark and Greenland; Adam Wójcicki, Polish Geological Institute; Anlexandra Dudu, GeoEcoMar; Sergio Persoglia, OGS

Session 6G - Transport and Infrastructure

Session Chairs: Jim Dooley & Joris Koornneef

Regional Specific Challenges of a CO_2 Pipeline Infrastructure in the West Mediterranean Area
Machteld van den Broek, Niels Berhout, Ramírez, Utrecht University; Paulo Mesquita, Júlio Carneiro, José Rafael Silva, University of Évora; João Pedro Gouveia, Júlia Seixas, Universidade Nova de Lisboa; Helena Cabal, CIEMAT; Roberto Martinez, IGME; Abdelkrim Rimi, ISR; Mariana Sardinha, Dulce Boavida, LNEG; GianCarlo Tosato, Asatrem srl

Flow Assurance CCS Project ROAD
Wolfgang Boeser, Stefan Belfroid, E.ON Ruhrgas AG

Integration of Pipeline Operations Sourced with CO_2 Captured at a Coal-Fired Power Plant and Injected for Geologic Storage: SECARB Phase III CCS Demonstration
Richard Esposito, Southern Company Generation; Christina Harvick, Rusty Shaw, Denbury Resources, Inc.; Doug Mooneyham, Cardno Entrix; Jerry Hill, Southern State Energy Board; Robert Trautz, EPRI

Planning CCS Development in the West Mediterranean
Dulce Boavida, Laboratório Nacional de Energia e Geologia - LNEGl; Julio Carnerio, University of Évora; Roberto Martinez, IGME; Machteld van den Broek, Andrea Ramirez, Utrecht University; Abdelkrim Rimi, UM5A-ISR; Giancarlo Tosato, ASATREM; Marie Gastine, BRGM

The Study on Prospects and Early Opportunities for Carbon Capture and Storage in Guangdong Province, China
Ying Huang, Diaqing Zhao, Chinese Academy of Sciences; Hongxu Guo, Chinese Academy of Sciences and Graduate School of the Chinese Academy of Science

TechnicalSession 7

Session 7A - Trapping Mechanisms: Case Studies

Session Chairs: John Bradshaw & Charles Gorecki

Determining Residual CO_2 Saturation Through a Dissolution test - Results from a CO2CRC Field Experiment
Ralf Haese, Chris Boreham, CO2CRC/Geoscience; Jonathan Ennis-King, Lincoln Paterson, CO2CRC/CSIRO; Barry Freifeld, Lawrence Berkeley National Laboratory; Ulrike Schacht, University of Adelaide

Brine Geochemistry Changes Induced by CO_2 Injection Observed Over a 10 Year Period in the Weyburn Reservoir
Maurice Shevalier, Michael Nightingale, Berhard Mayer, Ian Hutcheon, University of Calgary

Assessment of the Contribution of CO_2 Trapping Mechanisms at the Ketzin Pilot Site
Thomas Kempka, Elisa Klein, Marco de Lucia, Elena Tillner, Michael Kühn, GFZ

Geochemical Trapping of CO_2 in Saline Aquifer Storage: Results of the Repeated Formation Fluid Sampling at the Nagaoka Site
Saeko Mito-Adachi, Ziqiu Xue, RITE

Session 7B - Post-Combustion: Environmental Aerosol

Session Chairs: Masami Onoda & Gary Rochelle

Emission Studies from a CO_2 Capture Pilot Plant
Eirik Falck da Silva, Herman Kolderup, Kai W. Hjarbo, Thor Mejdell, Kolbjørn Zahlsen, Hanne M. Kvamsdal, SINTEF Materials and Chemistry; Arjen Huizinga, Purvil Khakharia, Ilse Tuinman, TNO

Characterization of Piperazine/ Aminomethylpropanol
Han Li, Jian Chen, Tsinghua University; Le Li, Thu Nguyen, Peter Frailie, Gary Rochelle, The University of Texas at Austin

Novel Concept for Emission Control in Post-Combustion Capture
Jacob Nygaard Knudsen, Otto Mort Bade, Marie Anheden, Oddvar Gorset, Randi Bjorklund, Aker Clean Carbon AS

Volatile Contaminant Control in Amine-Based CO_2 Capture Systems
Steven Fulk, Gary Rochelle, The University of Texas at Austin

Session 7C - System Integration I: Power Systems

Session Chairs: Kevin McCauley & Kenji Yamaji

The Flexibility Requirements for Power Plants with CCS in a Future Energy System with a Large Share of Intermittent Renewable Energy Dources
Anne Sjoerd Brouwer, Utrecht University and Energy Research Centre of the Netherlands; Ad Seebregts, Energy Research Centre of the Netherlands; André Faaij, Utrecht University

Integration and Operation of Post-Combustion Capture System of Coal-Fired Power Generation: Load Following and Solvent Storage
Robert Brasington, Howard Herzog, Massachusetts Institute of Technology

Performance and Cost Impacts of Cycling Coal and Natural Gas-Fired Power Plants with CCS in a System with High Wind Penetration
Peter Versteeg, David Luke Oates, Edward Rubin, Carnegie Mellon University

The Value of CCS in Power Systems with High Levels of Renewables Penetration
Sean McCoy, Dennis Volk, International Energy Agency; Joachim Bertsch, Stefan Nagl, Christian Growitsch, University of Cologne; Mathias Finkenrath, University of Applied Sciences Kempten; John Davison, IEAGHG

Session 7D - Panel Discussion: Making CCS Demonstrations Happen: Lessons Learned

Fossil fuels, both coal and gas, are expected to dominate in the world power generation mix for the next several decades. The IEA estimates that methods to deal with emissions from these sources should make up about one fifth of the effort required to meet the 2 degree Celsius goal for avoiding dangerous climate change. Worldwide, a number of institutions and technology suppliers have invested considerable money in research and development of capture and storage methods for CO_2. Some $26 billion in support has been pledged by governments towards major demonstrations of the technology. Yet few of these demonstrations have gone ahead and, in the electricity sector, none are yet operational. What has gone wrong, and how can the situation be improved?

Chairman: Gwen Andrews, Alstom

Panel Members:

Tony Wood, Clinton Climate Foundation
Masanori Abe, Japan CCS Co.
Peter Radgen, E.On
Greg Everett, Delta Energy

Session 7E - Capture Pre-Combustion: Process

Session Chairs: Olav Bolland & Daan Jansen

A Step-Change Sour Shift Process for Improving the Efficiency of IGCC with CCS
Jonathan Forsyth, BP Alternative Energy International Limited

Application of Hydrogen Selective Membranes to Integrated Gasifier Combined Cycle
Giampaolo Manzolini, Matteo Gazzani, Davide Turi, Antonio Giuffrida, Ennio Macchi, Politecnico di Milano

High Efficiency IGCC with Carbon Capture via Technology Improvements, Improved Heat Integration and Reuse of Low Grade Heat
Suzanne Ferguson, Geoff Skinner, Jaco Schieke, Foster Wheeler; Eva van Dorst, Shell Global Solutions International B.V.

Simulation of the Cyclic Operation of a PSA-based SEWGS Process for Hydrogen Production with CO_2 Capture
Bita Najmi, Olav Bolland, Norwegian University of Science and Technology; Konrad Eichhorn Colombo, GE Global Research, Germany

Session 7F - Monitoring: Geochemical Methods

Session Chairs: Katherine Romanak & Linda Stalker

Strategies for Detection and Monitoring of CO_2 Leakage in Sub-Seabed CCS
Kiminori Shitashima, International Institute for Carbon-Neutral Energy Research, Kyushu University; Yosiaki Maeda, CERES, Inc; Takashi Ohsumi, Central Research Institute of Electric Power Industry

Development of an Offshore Monitoring Plan for a Commercial CO_2 Storage Pilot
Owain Tucker, Paul Garnham, Paul Wood, Shell Projects and Technology; Wilfred Berlang, Shell Projects and Technology

Design and Instrumentation of a High Controlled Experiment of CO_2 Injection at Heletz, Israel in the Frame of the EU-FP7 MUSTANG project
Jacob Bensabat, EWRE Ltd.; Auli Niemi, Uppsala University

Atmospheric Tomography as a Tool for Quantification of CO_2 Emissions from Potential Surface Leaks
Andrew Feitz, Tehani Kuske, Henry Berko, Geoscience Australia and CO2CRC; Charles Jenkins, CSIRO Energy Transformed Flagship; Steve Zegelin, CO2CRC and CSIRO Marine and Atmospheric Research; Mahabubur Mollah, Primary Industries Research Victoria

Session 7G - Policy: Emissions Trading

Session Chair: Ken-ichi Wada

Getting Science and Technology into International Climate Policy: Carbon Capture and Storage in the UNFCCC
Tim Dixon, Samantha Neades, IEAGHG; Katherine Romanak, Gulf Coast Carbon Center, Bureau of Economic Geology, The University of Texas at Austin; Andy Chadwick, British Geological Survey

CCS Projects as Kyoto Protocol CDM Activities
Greg Leamon, Australian Government; Tim Dixon, IEAGHG; Paul Zakkour, Carbon Counts; Luke Warren, Carbon Capture and Storage Association

CCS in Carbon Markets
Ellina Levina, Juho Lipponen, International Energy Agency

Deployment of CCS in Europe: an Assessment of the Effectiveness of the EU ETS
Arnold Mulder, University of Groningen

TechnicalSession 8

Session 8A - Risk Assessment and Management I

Session Chair: Kenneth Hnottavange-Telleen

Quantification of Risk Profiles and Impacts of Uncertainties as Part of US DOE's National Risk Assessment Partnership (NRAP)
Rajesh Pawar, Philip Staufer, Los Alamos National Laboratory; Grant Bromhal, Robert Dilmore, National Energy Technology Laboratory; Curt Oldenberg, Lawrence Berkeley National Laboratory; Bill Foxall, Edwin Jones, Lawrence Livermore National Laboratory; Stephen Unwin, Pacific Northwest National Laboratory

Quantifying Basin Scale Leakage Risk and Stakeholder Impacts
Jeffrey Bielicki, Melissa Pollak, Elizabeth Wilson, University of Minnesota; Catherine Peters, Jeffrey Fitts, Princeton University

Induced Seismicity; Observations, Risks and Mitigation Measures at CO_2 Storage Sites
Andy Nicol, Matt Gerstenberger, CO2CRC & GNS Science; Paul Viskovic, Chris Bromley, Susan Ellis, GNS Science; Charles Jenkins, CSIRO Canberra; Tony Siggins, CSIRO Melbourne

Key Site Abandonment Steps in CO_2 Storage
Michael Kühn, Mario Wipki, Stefan Lüth, GFZ German Research Centre for Geosciences; Sevket Durucan, Imperial College London; Jean-Pierre Deflandre, IFP Energies nouvelles; Jens Wollenweber, TNO - Nederlandse Organisatie voor; Andy Chadwick, British Geological Survey; Gualtiero Böhm, Istituto Nazionale di Oceanografia e Geofisica Sperimentale

Session 8B - Post-Combustion: Advanced Solvents

Session Chairs: Kazuya Goto & Gary Rochelle

Chemical Absorption Kinetics in MEA Solution with Fine Particles
Bo Zhao, Meng Cao, Shujuan Wang, Yuqun Zhuo, Changhe Chen, Key Laboratory for Thermal Science and Power Engineering of Ministry of Education

Optimization of CO_2 Capture from Flue Gas with Promoted Potassium Carbonate Solutions
Peter Behr, Andre Maun, Alexander Tunnat, Gerd Oeljeklaus, Randi Görner, University Duisburg-Essen

Alternative Layouts for the Carbon Capture with the Chilled Ammonia Process
Gianluca Valenti, Davide Bonalumi, Ennio Macchi, Dominicc Gatti, Politecnico di Milano; Philip Fosbøl, Kaj Thomsen, Technical University of Denmark

New Energy Efficient Processes and Newly Developed Absorbents for Flue Gas CO_2 Capture
Koji Kadono, Asao Suzuki, Kansai Electric Power; Masaki Iljima, Toyishi Ohishi, Mitsubushi Heavy Industries; Hiroshi Tanaka, Takuya Hirata, Masami Kondo, Mitsubushi Heavy Industries

Session 8C - System Integration II: Infrastructure

Session Chairs: Keigo Akimoto & Angunn Engebø

Infrastructure for CCS in the Skagerrak/Kattegat Region, Southern Scandinavia: A Feasibility Study
Hans Askel Haugan, Nils Eldrup, Ragnhild Skagestad, Anette Mathisen, Dag Bjørnsen, Tel-Tek; Per Aagaard, Thor Axel Thorsen, University of Oslo; Jan Kjärstad, Chalmers University of Technology; Per Bergmo, SINTEF Petroleum Research

Pathways for Deploying CCS at Australian Power Plants
Minh Ho, Dianne Wiley, UNSW and CO2CRC

CCS Infrastructure Development Scenarios for the Integrated Iberian Peninsula and Morocco Energy System
Amit Kanudia, KanORS EMR, India; Dulce Boavida, INETI; Mactheld van den Broek, Utrecht University; Helena Cabal, CIEMAT; Maurizio Gargiulo, E4SMA srl; João Pedro Gouveia, CENSE; Maryse Labriet, ENERIS; Gian Carlo Tosato, ASATREM srl

Basin-Scale Impacts of Industrial-Scale CO_2 Injection on Petroleum and Groundwater Resources in the Gippsland Basin, Australia
Karsten Michael, Sunil Varma, CSIRO Earth Science & Resource Engineering; Elise Bekele, CSIRO Land & Water; Monica Campi, Geoff O'Brien, GeoScience Victoria, Department of Primary Industries

Session 8D - Panel Discussion: Storage Capacity – What Do We Know and What Has Changed?

This panel will discuss the critical issue of storage capacity. How to we define it? How do we know how much is available? What progress has been made in the past few years in refining global, regional and local estimates? In addition we will address important issues such as, how might pressure buildup limit storage capacity and how could this be managed; and to what extent microseismicity and associated changes to the seal constrain the locations where CO2 is stored. Research leaders from around the world will provide a status report about these issues and insights about what more is needed to improve our confidence in storage capacity estimation.

Chairman: Sally Benson, Stanford University

Panelists:

Sam Holloway, BGS
Susan Hovorka, University of Texas at Austin
Sean Brennan, US Geological Survey
Stefan Bachu, Alberta Innovates - Technology Futures
Matt Gerstenberger, GNS Science

Session 8E - Novel Systems

Session Chairs: Katsunori Yogo & Rebecca Gardiner

Higher Efficiency and Lower Cost Electricity Generation from Fossil Fuels while Eliminating Atmospheric Emissions, Including Carbon Dioxide
Rodney Allam, Miles Palmer, G. William Brown, Jeremy Fetvedt, NET Power LLC; Hideo Nomoto, Nobuo Okita, Masao Itoh, Toshiba Corporation; Bo Jones, Shaw Power Group

Electrochemically-Mediated Gas Separation Processes for Carbon Abatement
Fritz Simeon, Mike Stern, Krisitn Vicari, Howard Herzog, T. Alan Hatton, Massachusetts Institute of Technology; Thomas Hammer, Harald Landed, Siemens Corporate Technology

Development of an Energy-Efficient CO_2 Capture Process using Thermomorphic Biphasic Solvents
Jiafei Zhang, Yu Qiao, Wanzhong Wang, Khuram Hussain, David Agar, Technical University of Dortmund

Low Temperature CO_2 Capture for Near-Term Applications
Nikolett Sipöcz, Alvaro Hernandes, Miguel A, Gonzalez-Salazar, GE Global Research; Roger Shisler, Vitali Lissianski, GE Global Research

Session 8F - Monitoring: Geophysical Imaging

Session Chairs: Pascal Audigane & Curtis Oldenburg

Geochemical Interactions Between CO_2 and Minerals within the Utsira Caprock: A 5-year Experimental Study
Keith Bateman, Chrisopher Rochelle, Gemma Purser, Simon Kemp, Doris Wagner, British Geological Survey

Geochemical Clogging in Fracture and Porous Rock for CO_2 Mineral Trapping
Seung Youl Yoo, Yoshitada Mito, Toshifumi Matsuoka, Kyoto University; Akira Ueda, University of Toyama

The Impact of Geomechanics on Monitoring Techniques for CO_2 Injection and Storage
Tom Lynch, Doug Angus, Quentin Fisher, Piroska Lorinczi, University of Leeds

Changes in Pore Structure and Connectivity Induced CO_2 Injection in Carbonates: a Combined Pore-Scale Approach
Oussama Gharbi, Branko Bijeljic, Martin Blunt, Imperial College London; Edo Boek, Imperial College London

Session 8G - Education

Session Chairs: Jurgen-Friedrich Hake & Malcolm Wilson

Scope, Characteristics and Quality of Education Materials on CCS for the School Sector Around the World: Addressing and Trialling the Gaps
Anne-Maree Dowd, Talia Jeanneret; CSIRO

Creating a Sequestration Capacity Building and Knowledge Sharing Center
Sallie Greenberg, Illinois State Geological Survey

Developing National CCS Capacity and Skills: Examples from the UK
Robin Cathcart, Elizabeth Van der Meer, UK CCS Community Network; Hannah Chalmers, Jon Gibbins, UK CCS Community Network and University of Edinburgh; Colin Snape, University of Nottingham

China-Australia Capacity Building Program on the Geological Storage of Carbon Dioxide - Results from Phase I
Richard Causebrook, Aleksandra Kalinowski, Jessica Gurney, Liuqi Wang, Geoscience Australia; Jiutian Zhang, Jia Li, Administrative Centre for China's Agenda 21

TechnicalSession 9

Session 9A - Reservoir Engineering: Pressure Management

Session Chairs: Chris Hawkes & Neil Wildgust

An Integrated Economic and Engineering Assessment of Opportunities for CO_2 Injection with Water Production in the South-East Queensland, Australia
Peter Neal, Yildiray cinar, Guy Allinson, CO2CRC, Australia and School of Petroleum Engineering, The University of New South Wales

Four-Site Case Study of Water Extraction from Carbon Dioxide Storage Reservoirs
Guoxiang Liu, Charles Gorecki, Jordan Bremer, Ryan Klapperich, Robert Cowan, Yevhen Holubnyak, Damion Knudsen, Dayanand Saini, EERC

Dissipation of Overpressure into Ambient Rocks During CO_2 Storage
Kyung Won Chang, Marc Hesse, The University of Texas at Austin; Jean-Philippe Nicot, The University of Texas

Reservoir Management of CO_2 Injection: Pressure Control and Capacity Enhancement
Bramshad Nazarian, Rudolf Held, Lars Høier, Philip Ringrose, NTNU

Magnitude and Duration of Temperature Changes in Geological Storage of Carbon Dioxide
Tara LaForce, Jonathan Ennis-King, Lincoln Paterson, CO2CRC/CSIRO Earth Science and Resource Engineering

Session 9B - Chemical Looping

Session Chairs: Olav Bolland & Jasmin Kemper

10 MW CLC Field Pilot
Song P. Sit, Alex Reed, Cenovus Energy Inc.; Ulrich Hohenwarter, Viktoria Horn, Andritz Energy & Envrionment; Tobias Proll, Marx Klemens, Vienna University of Technology

Chemical-Looping Combustion of Solid Fuels – Operational Experiences in 100 kW Dual Circulating Fluidized Bed System
Anders Lyngfelt, Pontus Markström, Carl Linderholm, Chalmers University of Technology

Next Scale Chemical Looping Combustion: Process Integration and Part Load Investigation for a 10MW Demonstration Unit
David Riestenberg, Shawna Cyphers, Karine Schepers, Geroge Koperna, BERTSCHenergy, Josef Bertsch Gesellschaft m.b.H. & Co. KG

Integration of Coal Gasification and Packed Bed CLC Process for High Efficiency and Near-Zero Emission Power Generation
Matteo Carmelo Romano, Paolo Chiesa, Vincenzo Spallina, Giovanni Lozza, Politecnico di Milano

Use of Chemical-Looping Processes for Coal Combustion with CO_2 Capture
Juan Adanez, Pilar Gayan, Iñaki Adanez-Rubio, Ana Cuadrat, Alberto Abad, Francisco Garcia-Labiano, Luis Francisco de Diego, Instituto de Carboquimica- CSIC

Session 9C - Policy: Other

Session Chairs: Tim Dixon & Helle Brit Mostad

Analysing Uncertainties for CCS: from Historical Analogues to Future Deployment Pathways in the UK
Jim Watson, University of Sussex; Florian Kern, Nils Markusson, Hannah Chalmers, Stuart Haszeldine, Jon Gibbins, Mark Winskel, University of Edinburgh; Rob Gross, Phil Heptonstall, Imperial College London; Peter Pearson, University of Cardiff

CCS, Nuclear Power and Biomass; an Assessment of Option Triangle under Global Warming Mitigation Policy by an Integrated Assessment Model MARIA-23
Shunsuke Mori, Keisuke Miyaji, Kazuhisa Kamgai, Tokyo University of Science

Prospects for CCS in the EU Energy Roadmap to 2050
Mikael Odenberg, Jan Kjärstad, Filip Johnsson, Chalmers University of Technology

Rethinking CCS – Developing Quantitative Tools for Designing Robust Policy in Face of Uncertainty
Jan Eide, Howard Herzog, Mort Webster, Massachusetts Institute of Technology

Actuarial Risk Assessment of Expected Fatalities Attributable to Carbon Capture and Storage in 2050
Min Ha-Duong, Rodica Loisel, CIRED, CNRS

Session 9D - Public Perception: Communication Activities and Experiences

Session Chairs: Peta Ashworth & Kenshi Itaoka

It's Not Only About Safety: Beliefs and Attitudes of 811 Local Residents Regarding a CCS project in Barendrecht
Bart Terwel, Emma ter Mors, Dancker Daamen, Leiden University

Lessons Learned from the Public Perception and Engagement Strategy - Experiences in CIUDEN's CCS Facilities in Spain
Monica Lupion, Andrea Pérez, Fernando Torrecilla, Fernando Torrecilla, CIUDEN

Application of Social Site Characterisation to Inform Public Engagement Efforts in Poland and the UK
Suzanne Brunsting, Mariëtte Pol, ECN; Marta Kaiser, Rene Zimmer, UfU; Simon Shackley, Leslie Mabon, The University of Edinburgh; Fiona Hepplewhite, Scottish Government; Marcin Mazurowski, Dorota Polak-Osiniak, PGNiG

The Evolution of Stakeholder Perceptions of Deploying CCS Technologies in China: Survey Results from Three Stakeholder Consultations in 2006, 2009 and 2012
Xi Liang, University of Edinburgh; David Rainer, University of Cambridge

Visual Message Mapping for CCS Outreach
Daniel Daly, EERC; Lydia Cumming, Pacific Northwest Laboratory; Gary Garrett, Southern States Energy Board; Marian Stone, Bevilacqua-Knight, Inc.; Mather Cather, New Mexico Tech; Lindsey Tollefson, Big Sky Carbon Sequestration Partnership; Sarah Wade, WADE, LLC

Session 9E - Oxy-Combustion: CO_2 Processing Unit

Session Chairs: Stanley Santos & Phil Sharman

Modelling the Fate of Sulphur During Pulverized Coal Combustion under Conventional and Oxyfuel Conditions
Michael Müller, Uwe Schnell, Günter Scheffknecht, University of Stuttgart

Optimized Multi-Pollutant Removal in Oxy-Fuel Power Plants with CO_2 Capture
Ahmed Shafeen, Kourosh Zanganeh, Ashkan Beigzadeh, Natural Resources Canada

Offgas Treatment After the Gas Processing Unit of a Coal-Fired Oxyfuel Power Plant with Polymeric Membranes and Pressure Swing Adsorption
Jens Dickmeis, Alfons Kather, Hamburg University of Technology

Optimization of Cryogenic CO_2 Purification for Oxy-Coal Combustion
Hailong Li, Mälardalens University; Yukun Hu, Royal Institute of Technology; Mario Ditaranto, SINTEF Energy; David Wilson, Stanbridge Capital; Jinyue Yan, Mälardalens University and Royal Institute of Technology

Simultaneous NOx and SOx Reduction from Oxyfuel Exhaust Gases using Acidic Solutions Containing Hydrogen Peroxide
Isabelle Liémans, Diane Thomas, Chemical Engineering Department, University of Mons

Session 9F - Trapping Mechanisms: Geochemical

Session Chairs: Toshiyuki Tosha & Don White

Thin Layer Detectability in a Growing CO_2 Plume; Testing the Limits of Time-Lapse Seismic Resolution
James White, Andy Chadwick, Gareth Williams, British Geological Survey

Tracing the Movement and the Fate of Injected CO_2 at the IEA Weyburn-Midale CO_2 Monitoring and Storage Project (Saskatchewan, Canada) using Isotopic Tracers
Bernhard Mayer, Michael Nightingale, Maurice Shevalier, Gareth Johnson, Ian Hutcheon, University of Calgary; Ernie Perkins, Alberta Innovates - Technology Futures

Introduction and Application of the Modified Patchy Saturation for Evaluating CO_2 Saturation by Seismic Velocity
Hiroyuki Azuma, OYO corporation; Chrisato Konishi, Stanford University; Zique Xue, RITE

Electrical Resistivity Tomography (ERT) for Monitoring CO_2 Migration - from Tool Development to Reservoir Surveillance at the Ketzin Pilot Site
Cornelia Schmidt-Hattenberger, Peter Bergmann, Tim Labitzke, Marcus Möller, Stephan Schröder, Florian Wagner, Helmholtz Centre Potsdam, GFZ German Research Centre for Geosciences; Harmut Schütt, Statoil ASA

Evaluating Wellbore Gravity for Time-Lapse CO_2 Plume Detection
Kevin Dodds, BP Alternative Energy; Richard Krahenbuhl, Yaoguo Li, Anya Reitz, Center for Gravity, Electrical & Magnetic Studies, Colorado School of Mines; Susan Hovorka, Gulf Coast Carbon Center, Bureau of Economic Geology

Session 9G - Transport and Infrastucture

Session Chair: Andrea Ramirez

Accurate Thermodynamic-Property Models for CO_2-Rich Mixtures
Roland Span, Johannes Gernert, Andreas Jäger, Ruhr-Universität Bochum

Combining Thermodynamic and Fluid Flow Modelling for CO_2 Flow Assurance
Svend Tol Munkejord, Mona Mølnvik, SINTEF Energy Research; Christian Bernstone, Vattenfall Research and Development AB; Sigmund Clausen, Gassco AS; Gelein de Koeijer, Statoil R&D

Heat Transfer Characteristics of a Pipeline for CO_2 Transport with Various Surrounding Substances
Michael Drescher, Øivind Wilhelmsen, Peder Aursand, SINTEF Energy Research; Gelein de Koeijer, Rudolf Held, Jan H. Borch, Statoil ASA

Corrosion in Dense Phase CO_2 – the Impact of Depressurisation and Accumulation of Impurities
Arne Dugstad, Bjørn Morland, Malgorzata Halseid, Anne Olaug Sivertsen, Institute for Energy Technology

Corrosion Mechanism and Impact Factor Analysis of Pipeline Steel in Supercritical CO_2 with Impurities
Yong Xiang, Zhe Wang, Zheng Li Weidou Ni, Tsinghua University

TechnicalSession 10

Session 10A - Risk Assessment and Management II

Session Chairs: Max Prins & Isabelle Czernichowski-Lauriol

Geomechanical Modeling of Fault Responses and the Potential for Notable Seismic Events During Underground CO_2 Injection
Jonny Rutqvist, Frederic Cappa, Alberto Mosaldi, Antonio Rinaldi, Lawrence Berkeley National Laboratory

Safety-Based Injection Strategy for Carbon Dioxide Geological Sequestration in a Deep Saline Aquifer with Complex Sandstone-Shale Sequences: A Case Study from Taiwan
Bieng-Zih Hsieh, Cheng-Yueh Wu, Zsay-Shing Lin, National Cheng Kung University; Ch-Chung Tseng, Ta-Lin Chen, CPC Corporation

Migration of CO_2 Through the Overburden and Potential Effects of Leakage on the Seafloor Environment: A Summary from QICS Work Package 1
Beil Burnside, Mark Naylor, University of Edinburgh; Karen Kirk, British Geological Survey; Simon Mathias, University of Durham; Fiona Whittaker, University of Bristol

The Bubble/Slug Flow Model for Methane Leakage from Natural Gas Wells as an Analogue for Shallow CO_2 Migration
Ian Duncan, BEG, University of Texas at Austin

Session 10B - Post-Combustion: Design

Session Chairs: John Topper & Mohammad Abu Zahra

Characterization of Novel Packings for Post Combustion Capture
Chao Wang, Micah Perry, Frank Seibert, Gary Rochelle, University of Texas at Austin

Numerical and Experimental Study on Liquid Film Flows on Packing Elements in Absorbers for Post-Combustion CO_2 Capture
Yoshiyuki Iso, Jian Huang, Mariko Kato, Shinsuke Matsuno, Kenji Takano, IHI Corporation

Novel Solvent-Gas Contactor for CO_2 Cost Reductions
Brandon Pavlish, Joel Downs, Nathan Fiala, EERC

Encapsulated Solvents for Carbon Dioxide Capture
Roger Aines, Christopher Spadaccini, Eric Duoss, Joshuah Stolaroff, Lawrence Livermore National Laboratory; John Vericella, Jennifer Lewis, University of Illinois Urbana/Champaign; George Farthing, Babcock and Wilcox Company

Session 10C - Emerging Technologies

Session Chair: Steve Goldthorpe

Enhanced Oil Recovery Method using Carbonated Water Flooding
Lin Zuo, Sally Benson, Energy Resources Engineering, Stanford University; Changyon Zhang, Environmental Molecular Sciences Laboratory, Richland

Utilization of Carbon Dioxide as a Cushion Gas for Compressed Air Energy Storage
Curtis Oldenburg, Lehua Pan, Lawrence Berkeley National Laboratory

Identification of New Microbial Mediators for Electromethanogenic Reduction of Geologically-Stored Carbon Dioxide
Qian Fu, Hajime Kobayashi, Hideo Kawaguchi, Javier Vilcáez, Kozo Sato, The University of Tokyo

CO_2 Utilization from "Next Generation" CO_2 Enhanced Oil Recovery
Vello Kuuskraa, Tyler Van Leeuwen, Advanced Resources International, Inc.; Phil Dipietro, U.S. DOE/ National Energy Technology Laboratory

Session 10D - Public Perception: Social Science Research

Session Chairs: Peta Ashworth & David Reiner

Relating Individual Perceptions of Carbon Dioxide to Perceptions of CCS: An International Comparative Study
Kenji Itaoka, Aya Saito, Mizuho Information & Research Institute; Anne-Marie Dowd, Peta Ashworth, CSIRO; Marjolein de Best-Waldhober, ECN

Exploring Media Representation of Carbon Capture and Storage: An Analysis of Japanese Newspaper Coverage in 1990-2010
Shinichiro Asayma, Atsushi Ishii, Tohoku University

CO2CRC Otway Project Social Research: Assessing CCS Community Consultation
Tony Steeper, CO2CRC

The Potential of Host Community Compensation in Facility Siting
Emma ter Mors, Bart W. Terwel, Dancker Daamen, Leiden University

Session 10E - Pre-Combustion: Technology

Session Chairs: Daan Jansen & John Davison

A Novel Adsorbent Material (MOF/MCM-41) for Pre-Combustion CO_2 Capture by Pressure Swing Adsorption
Nathalie Cass, Johanna Schell, Lisa Joss, Marco Mazzotti, Institute of Process Engineering, ETH Zurich; Richard Blom, SINTEF Materials and Chemistry

Advanced CO_2 Seperation Technologies: Coal Gasification, Warm-Gas Cleanup, and Hydrogen Seperation Membranes
Joshua Stanislow, Scott Tolbert, Tyler Curran, EERC

High Performance CO_2 Capture by Autothermal AGR System
Yasushi Mori, Mitsubishi Heavy Industries Compressor Corporation; Jonathan Forsyth, BP Alternative Energy International Ltd

Coal-CO_2-Slurry Feed for Pressurised Gasifiers: Slurry Preparation System Characterisation and Economics
Cristina Botero, Howard Herzog, Ahmned Ghoniem, Massachusettes Institute of Technology

Session 10F - Trapping Mechanisms: Capillarity and Heterogeneity

Session Chairs: James Sorensen & Sam Holloway

Clay Hydration/Dehydration in Dry to Water-Saturated Supercritical CO_2: Implications for Caprock Integrity
John Loring, Todd Schaef, Chris Thompson, Quinn Miller, Jianzhi Hu, David Hoyt, Paul Martin, Eugene Ilton, Andrew Felmy, Kevin Rosso, Pacific Northwest National Laboratory

Capillary Heterogeneity in Sandstones Rocks During CO_2/Water Core-Flooding Experiments
Ronny Pini, Mike Krause, Sally Benson, Stanford University; Sam Krevor, Imperial College London

Seal Integrity of the Rousse Depleted Gas Field Impacted by CO_2 Injection (Lacq Industrial CCS Reference Project - France)
Dominique Pourtoy, Marc Lescanne, Sylvian Thibeau, Atef Onaisi, Calire Viaud, TOTAL E&P

Estimation of Local Capillary Trapping Capacity from Geologic Models
Eshan Saadatpoor, Steven Bryant, Kamy Sepehrnoori, The University of Texas at Austin

Session 10G - Other Underground Storage Options

Session Chairs: Malcolm Wilson & Alain Bonneville

Geochemical Aspects of In-Situ Mineralization of CO_2 in Seafloor Basalts in the Presence of Seawater
Dominic Wolff-Boenisch, Iwona Galeczka, Sigurdur Gislason, University of Iceland, Eric Oelkers, Université de Toulouse

Mineralization of Basalts in the CO_2-H_2O-H_2S System
H.T Schaef, B.P. McGrail, A.T Owen, Pacific Northwest National Laboratory

CO_2 Injectivity in a Multi-Lateral Horizontal Well in a Low Permeability Coal Seam: Results from a Field Trial
Zhejun Pan, Luke Connel, Michael Camilleri, Dave Down, John Carras, Meng Lu, CSIRO; Shangzhi Meng, Xiaokang Fu, Wenzhong Zhang, Benguang Guo, CUCBM

Feasibility Study on CO_2 Micro Bubble Storage (CMS)
Kenichirou Suzuki, Takashi Hitomi, Masato Shimoyama, Obayashi Corporation; Hideaki Miida, Hiroshi Wada, ENAA, Shigeo Horikawa, Suncoh Consultants Co. Ltd.; Takeyuki Ebi, Kajima Corporation, Kaoru Inaba, Takenaka Corporation

TechnicalSession 11

Session 11A - Modeling: Reservoir-Scale Flow and Transport

Session Chairs: Philip Ringrose & Jonathan Ennis King

Geochemical Reservoir Simulation of the Weyburn CO2-EOR Field
Stephen Talman, Ernie Perkins, Alireza Jafari, Alberta Innovates - Technology Futures; Maurice Shevalier, University of Calgary

The Effect of Geological Structure and Heterogeneity on CO_2 Storage in Simple 4-way Dip Structures; a Modelling Study from the UK Southern North Sea
John Williams, Michelle Bentham, British Geological Survey; Min Jin, Gillain Pickup, Eric Mackay, Heriot-Watt University; Dennis Gammer, Andrew Green, Energy Technologies Institute

Sensitivity of Long-Term CO_2 Sequestration Simulation Result to the Treatment of Capillary Entry Pressure
Baxiao Li, Hamdi Tchelepi, Sally Benson, Stanford University

Potential Subsurface Impacts of CO_2 Stream Impurities on Geologic Carbon Storage
Jean-Philippe Nicot, Katherine Romanak, Patrick Mickler, Silvia Solano, Changbing Yang, Jiemen Lu, Tongwei Zhang, Bureau of Economic Geology, The University of Texas at Austin

Session 11B - Post-Combustion: Solvent Fundamentals

Session Chairs: Takayuki Higashii & Prachi Singh

Corrosion Investigations in MEA Based Post-Combustion CO_2 Capture Pilot Plants
Séverine De Vroey, Pascale Absil, Marie-Laure Thielens, Laborelec

Corrosivity of Single and Blended Amines in CO_2 Capture Process
Prakashpathi Gunasekaran, Amornvadee (Amy) Veawab, Adisorn Aroonwilas, University of Regina

Prediction of N_2O Solubilities in Alkanolamine Solutions from the Excess Volume Property
Ardi Hartono, Emmanuel Mba, Hallvard Svendsen, NTNU

Solids Modelling and Capture Simulation of Piperazine in Potassium Solvents
Philip Loldrup Fosbøl, Bjørn Maribo-Mogensen, Kaj Thomsen, The Technical University of Denmark

Session 11C - CCS and Geothermal

Session Chairs: Gunter Sidiqi & Samantha Neades

Integrated Geothermal-CO_2 Reservoir Systems: Reducing Carbon Intensity Through Sustainable Energy Production and Secure CO_2 Storage
Thomas A. Buscheck, Mingjie Chen, Yunwei Sun, Yue Hao, Chuanhe Lu, Thomas J. Wolery, Roger D. Aines, Lawrence Livermore National Laboratory; Michael A. Celia, Princeton University

Geothermal Energy Production Coupled With CCS: Field Demonstration at the SECARB Cranfield Site, Cranfield, Mississippi, USA
Barry Friefeld, Christine Doughty, Lawrence Berkeley National Laboratory; Bruce Cutright, University of Texas; Steve Zakim, Ming Sheu, Timothy Held, Echogen Power Systems, LLC

From Competition to Synergy - Support Geothermal Exploitation by Geological CO_2 Storage
Elena Tillner, Thomas Kempka, Egbert Jolie, Michael Kühn, GFZ German Research Centre for Geosciences

Synergy Benefits in Combining CCS and Geothermal Energy Production
Carsten M. Nielson, Peter Frykman, Geological Survey of Denmark and Greenland; Finn Dalhoff, Vattenfall Research & Development AB

Session 11D - Risk Management: Contingency Planning and Remediation

Session Chairs: Bill Senior & Rajesh Pawar

CO_2 Storage Contingencies Initiative: Detection, Intervention and Remediation of Unexpected CO_2 Migration
Scott Imbus, Chevron Energy Technology Co.; Kevin Dodds, BP AlternativEnergy; Robert Trautz, Electric Power Research Institute; Claus Otto, Shell Global Solutions International; Charles Christopher, CO2Store; Sally Benson, Stanford University

How to Establish CO_2 Flow/Concentration Warning Levels Based on the Geochemical Monitoring Baseline: Specific Case of CO_2 Storage at Claye-Souilly (Paris Basin)
Natalia Quisel, Stéphane Thomas, VEOLIA Environnement Recherche & Innovation; Jacques Pironon, Philippe de Donato, Judith Saussea, Odile Barres, MAGES group, Université de Lorraine-CNRS; Zbigniew Pokryszka, INERIS, ParcTechnologique Alata

Natural Mitigation of CO_2 Leakage Accumulations:
Jean-Charles Manceau, Jérémy Rohmer, Arnaud Réveillère, BRGM

Estimating CO_2 Leakage Rate Along a Fault: Model and Field Application
Qing Tao, Steven Bryant, The University of Texas at Austin; David Alexander, The University of Trinidad and Tobago

Session 11E - System Integration III: Other

Session Chairs: Shunsuke Mori & Andrea Ramirez

Evaluation of CO_2 Post Combustion Capture Integration with Natural Gas Power Plant and Desalination Co-Generation Plant
Stephen Fadeyi, Hassan Fath, Mohammad Abu-Zahra, Masdar Institute of Science and Technology

Investigating Flexible Carbon Capture Opportunities in the Australian Electricity Market
Yuanfei Zhang, Monh Ho, Dianne Wiley, The University of New South Wales and CO2CRC

Climate Mitigation's Impact on Global and Regional Electric Power Sector Water Use in the 21st Century
Evan Davies, University of Alberta; Page Kyle, James Dooley, Pacific Northwest National Laboratory

CCS Feasibility Improvement in Industrial and Municipal Applications by Heat Utilisation
Janne Kärki, Eemeli Tsupari, Antti Arasto, VTT Technical research centre of Finland

Session 11F - Ex Situ Mineralisation of CO_2

Session Chair: Millie Basava-Reddi

Integrated Mineral Carbonation Reactor Technology for Sustainable Carbon Dioxide Sequestration: 'CO_2 Energy Reactor'
Rafael Santos, Wouter Verbeek, Jens van Bouwel, Tom Van Gerven, Yiannis Pontikes, KU Leuven; Pol Knops, Keesjan Rijnsburger, Innovation Concepts B.V.

Carbon Storage by Mineralisation (CSM): Serpentinite Rock Carbonation Via Mg(OH)2 Reaction Intermediate Without CO_2 Pre-Separation
Ron Zevenhoven, Johan Fagerlund, Experience Nduagu, Inês Romão, Åbo Akademi University; Jie Bu, James Highfield, ICES - A*STAR

Assessment of the Energy Requirements for CO_2 Storage by Carbonation of Industrial Residues
Renato Baciocchi, Giulia Costa, Daniela Zingaretti, University of Rome Tor Vergata

Carbonation of Activated Serpentine for Direct Flue Gas Mineralization
Mischa Werner, Subrahmaniam Hariharan, Marco Mazzotti, ETH Zurich; Renato Baciocchi, Daniela Zingaretti, University of Rome Tor Vergata

Session 11G - Oxy-Combustion: Large Scale Implementation

Session Chair: Olav Bolland

Initial Operation Results of Oxyfuel Power Plant in Callide Oxyfuel Project
Takahiro Gotou, Terutoshi Uchida Toshihiki Yamada, Tetsuya Hori, IHI Corporation; Chris Spero, CS Energy Ltd.

Young Dong Unit 1 Oxyfuel Feasibility Study and FEED
Michael Maloney, Konrad Kuczynski, Makesh Kaliyaperumal, Doosan Power Systems; H.P. Kim, Doosan Heavy Industries & Construction

The Air Products–Vattenfall Oxyfuel CO_2 Compression and Purification Pilot Plant at Schwarze Pumpe
Vince White, Andrew Wright, Air Products PLC, Stephanie Tappe, Vattenfall Europe Generation AG; Jinying Yan, Vattenfall Research & Development AB

Oxycombustion for Carbon Capture on Coal Power Plants: Advantages, Technical Challenges and Innovative Mitigation Solutions
Nicolas Perrin, Richard Dubettier, Jean-Pierre Tranier, Air Liquide

Poster Floorplan

The Poster Sessions will be held in the Event Hall, as indicated on the floorplan on page 19.

Posters shown here in **Blue** will be presented in Poster Session A on Tuesday the 20th of November, between 13.40 - 15.40.

Posters shown here in **Black**, will be presented in Poster Session B on Wednesday the 21st of November, between 13.40 - 15.40.

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Poster Desk

Entrance

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Poster Session Details

On the following pages you will find the details of all posters on display at GHGT-11.

Posters listed in **Blue** will be presented in Poster Session A, while those listed in **Black**, will be presented in Poster Session B.

Session A: Tuesday 20th November: 13.40 - 15.40

Session B: Wednesday 21st November: 13.40 - 15.40

Advances in CO_2 Capture Tecnology Development
Adsorption

1. **Studies of Ca-Based High Temperature Sorbents for CO_2 Capture**
   Bjørnar Arstad, Richard Blom, Joanna Prostak, SINTEF
2. **Carbon Dioxide Capture from Flue Gases by Solid Sorbents**
   Mustafa Abunowara, Libyan Petroleum Institute; Mohammed Elgarni, HTe Purenergy Inc.
3. **Optimizing Solid Sorbents for CCS**
   Adam Berger, Abhoyjit Bhown, SINTEF
4. **On the Development of Vacuum Swing Adsorption (VSA) Technology for Post-Combustion CO_2 Capture**
   Anne Anderson, Jasmina Hafizovic Cavka, Aud Spjelkavik, Richard Blom, SINTEF Materials & Chemistry; Amar N. Goswami, Anshu Nanoti; Indian Institute of Petroleum
5. **Efficient and Rapid Screening of Novel Adsorbents for Carbon Capture in the UK IGSCC Project**
   Stefano Brandani, Enzo Mangano, Maria-Chiara Ferarri, The University of Edinburgh; Magdalena Malgorzata Lozinka, Paul Anthony Wright, Juergen Kahr, Russell Morris, University of St. Andrews; Matthew Craod, Neil McKeown, Cardiff University; Peter Budd, The University of Manchester
6. **Characterisation of an Automated Dual Piston Pressure Swing Adsorption (DP-PSA) System**
   Daniel Friedrich, Wenli Dang, Stefano Brandani, Institute for Materials and Processes, University of Edinburgh
7. **Post-Combustion CO_2 Capture using Solid Sorbents: 1 MW Pilot Scale Evaluation**
   Holly Krutka, Sharon Sjostrom, Travis Starns, Cody Wilson, ADA Environmental Solutions
8. **Development of in-Situ CO_2 Capture Coal Utilization Technologies**
   Shiying Lin, Hironobu Oshima, Japan Coal Energy Center
9. **Performance Evaluation of Aqueous Carbonation for Steelmaking Slag: Process Chemistry**
   Shu-Yuan Pan, Pen-Chi Chiang, National Taiwan University, Yi-Hung Chen, National Taipei University of Technology; E-E Chang, Taipei Medical University
10. **The Status of the Development Project for the 10 MWe-Scale Dry-Sorbent Carbon Dioxide Capture System to the Real Coal-Fired Power Plant in Korea**
    Young Cheol Park, Sung-Ho Jo, Dong-Ho Lee, Chang-Keun Yi, Korea Institute of Energy Research; Chong Kul Ryu, Korea Electric Power Research Institute; Ki-Seok Kim,KEPCO Enginering & Construction Company, INC.; Chan Hyo You, Korea Southern Power Co., Ltd.; Ki Suh Park, KC Cottrell Co., Ltd.
11. **Dynamic Cyclic Performance of Phenol-Formaldehyde Resin-Derived Carbons for Pre-Combustion CO_2 Capture: An Experimental Study**
    Susana Garcia, Claudia F. Martín, Jose J. Pis, Fernando Rubiera, Cova Pevida, INCAR-CSIC
12. **Postcombution CO_2 Capture Adsorbents from Spent Coffee Grounds**
    Ana Silvia González, Marta G. Plaza, Jose, J. Pis, Fernando Rubiera, Cova Pevida, INCAR-CSIC
13. **Process Simulation of Ca-Looping Processes: Review and Guidelines**
    Matteo Carmelo Romano, Politecnico di Milano; Isabel Martínez, Ramón Murillo, Instituto de Carboquímica (ICB-CSIC); Dursun Can Ozcan, Hyungwoong Ahn, IMP-SEE, The University of Edinburgh, Richard Blom, SINTEF Material and Chemistry
14. **Alkylamine-Based Adsorbents Synthesized using High Internal Phase Emulsion Technique for Carbon Dioxide Adsorption**
    Chintana Saiwan, Pailin Muchan, Petroleum and Petrochemical College, Chulalongkorn University; David deMontigny, Petroleum and Petrochemical College, Chulalongkorn University

15. **Study of Carbon Dioxide (CO_2) Adsorption for Fossil Fuel Based Power Plant Flue Gas Application using Quaternized Biopolymer**
Chintana Saiwan, Nattida Sotthinirandorn, Petroleum and Petrochemical College, Chulalongkorn University; Raphael Idem, Paitoon Tontiwachwuthikul, Teeradet Supap, International Test Centre for CO2 Capture, University of Regina; Panya Wongpanit, Faculty of Agricultural Product Innovation and Technology, Srinakharinwirot University

16. **Effect of Polyethyleneimine Loading into High Internal Phase Emulsion Polymer for Carbon Dioxide Adsorption**
Chintana Saiwan, Pacharakhorn Dejburum, Petroleum and Petrochemical College, Chulalongkorn University; Petroleum and Petrochemical College, Chulalongkorn University

17. **Comparison of Commercial and New Adsorbent Materials for Pre-Combustion CO_2 Capture by Pressure Swing Adsorption**
Joanna, Schell, Nathalie Casas, Dorian Marx, Marco Mazzotti, Institute of Process Engineering ETH Zürich, Zürich, Switzerland; Richard Blom, SINTEF materials and chemistry, Oslo, Norway

18. **Nanoparticle-Supported Amine for High Capacity CO_2 Adsorbents**
Fritz Simeon, T. Alan Hatton, Massachusetts Institute of Technology

19. **CO_2 Capture by Mesoporous SBA-15 Grafted with 3-Aminopropyl Triethoxysilane in Supercritical Propane**
Chung-Sung Tan, Worasaung Klinthong, Chih-Hung Huang, Department of Chemical Engineering, National Tsing Hua University

20. **Qualification of the ALKASORB Sorbent for the Sorption-Enhanced Water-Gas Shift Process**
Edward Van Selow, Paul Cobden, Eric Van Dijk, Paul Verbraeken, Daniel Jansen, Energy Research Centre of the Netherlands

21. **Calcium Looping Process: Oxyfuel Sorbent Regeneration Experimental Validation of a Carbonator Model & Investigation of Sorbent Performance Regenerated under High CO_2 Partial Pressure**
Glykeria Varela, Ajay Ramesh Bidwe, Craig Hawthorn, Lucia Bernard, Mariusz Zeiba, Günter Scheffknecht, Uni. Stuttgart/ IFK

22. **Development of Amine-Modified Solid Sorbents for Post Combustion CO_2 Capture**
Katsunori Yogo, Shingo Kazama, Research Institute of Innovative Technology for the Earth (RITE), Chemical Research and Nara Institute of Science and Technology (NAIST); Tsuyoshi Watabe, Research Institute of Innovative Technology for the Earth (RITE), Chemical Research; Yosuke Nishizaka, Nara Institute of Science and Technology (NAIST)

23. **Enhancing Sorption Performance of Solid Amine Sorbents for CO_2 Capture by Additives**
Zhonghua Zhang, National Institute of Clean-and-Low-Carbon Energy, and China University of Mining and Technology; Boadong Wang, Qi Sun, National Institute of Clean-and-Low-Carbon Energy; Xiaoliang Ma, Kuwait Institute for Scientific Research and EMS Energy Institute; Yonggang Wang, China University of Mining and Technology

Advanced Solvents

24. **Evaluation of Amine-Blend Solvent Systems for Post-Combustion Capture Applications**
Adewale Adeson, Mohammad Abu Zahra, Masdar Institute of Science and Technology

25. **Developments in the CO2CRC UNO Mk 3 Process - a Multi-Component Solvent Process for Large Scale CO_2 Capture**
Calre Anderson, Trent Harkin, Abdul Qader, Narry Hooper, CO2CRC; Mihn Ho, The University of NSW

26. **Understanding Precipitation in Amino Acid Salts at Process Conditions**
Ugochukwu E. Aronu, Innas Kim, SINTEF Materials and Chemistry; Adri Hartono, Department of Chemical Engineering, Norwegian University of Science and Technology

27. **Strategic Vapor Suppressing Additives for Ammonia Based CO_2 Capture Solvent**
Moetaz Attalla, Stefan Salentinig, Phil Jackson, CSIRO; Ben Ballinger, University of Queensland

28. **Detailed Studies on the Absorption Kinetics of CO_2 in Aqueous Solutions for Small Superficial Liquid Loadings**
Peter Behr, Alexander Tunnat, Andre Maun, Klaus Görner, University Duisburg-Essen

29. **Solvent Selection for Post-Combustion CO_2 Capture**
Juan Salizer, Urmila, Diwekar, Vishwamitra Research Institute; Kevin Joback, Molecular Knowledge Systems; Adam Beger, Abhoyjit Bhown, Electric Power Research Institute

30. **Synthesis and Characterization of New Absorbents for CO_2 Capture**
Firoz Alam Chowdhury, Hidetaka Yamada, Takayuki Higashoo, Shingo Kazama, Research Institute of Innovative Technology for the Earth (RITE); Yoichi Matsuzaki, Nippon Steel Corporation

31. **CO_2-Binding Organic Liquids Gas Capture with Polarity-Swing-Assisted Regeneration**
David Heldebrand, Charles Freeman, Feng Zheng, Phillip Keoch, Mark Bearden, Michael Elliot, Pacific Northwest National Laboratory

32. **Screening and Characterization of Advanced Amine Based Solvent Systems for CO_2 Post-Combustion Capture**

Ali Imran, Adewalw Adeosun, Mohammad Abu Zahra, Masdar Institute of Science and Technology

33. **Oxidative Degradation of AMP/MEA Aqueous Blends**
Klaus-J Jens, Telemark University College; Teilin Wang, Telemark Technological R & D Institute and Telemark University College

34. **Evaluation of Carbon Dioxide Absorption by Amine Based Absorbent**
Yasuhiro Kato, Shinji Murai, Daigo Miraoka, Takehiko Muramatsu, Satoshi Saito, Toshiba Corporation

35. **Real Time Mechanistic Insights for CO_2 Capture with Liquid Amine Absorbents**
Pavel Kortunov, Lisa Baugh, David Calabro, Micahel Siskin, Jand Thomann, ExxonMobil Research and Engineering

36. **Absorption Rates and CO_2 Solubility in New Piperazine Blends**
Le Li, Yang Du, Omkar Namjoshi, Gary Rochelle, Department of Chemical Engineering, University of Texas at Austin; Han Li, State Key Laboratory of Chemical Engineering, Tsinghua University

37. **Modeling Pilot Plant Results for CO_2 Stripping using Piperazine in a Two Stage Flash**
Tarun Madan, David Van Wagener, Eric Chen, Gary Rochelle, University of Texas at Austin

38. **Ab Initio Study of CO_2 Capture Mechanisms in Monoethanolamine Aqueous Solution: Reaction Pathways from Carbamate to Bicarbonate**
Yoichi Matsuzaki, Masami Onoda, Nippon Steel Corporation; Firoz Alam Chowdhury, Takayuki Higashii, Shingo Kazama, Research Institute of Innovative Technology for the Earth (RITE)

39. **Location-Specific Technoeconomic Evaluation of a Novel Amine Technology**
Dale jones, Thomas McVey, Julio Friedmann, Lawrence Livermore National Laboratory

40. **Development of Hindered New Amine Absorbents for CO_2 Capture**
Shinji Murai, Yasuhiro Kato, Yukishige Maezawa, Takehiko Muramatsu, Satoshi Sato, TOSHIBA

41. **Promoting CO_2 Absorption in Aqueous Amines with Benzylamine**
Gilles Richner, CSIRO

42. **Lab-Scale Characterization of CO_2 Absorbents Containing Various Amine Species**
Hiroshi Sato, Kumiko Yoshihisa, Nobuhiko Kubota, Research Laboratory, IHI Corporation; Katsumi Takahashi, IHI Technology Solutions Inc.; Ario Matsumoto, Yasuro Yamanaka, Power Plant Division, IHI Corporation; Yukio Furukawa, Department of Chemistry and Biochemistry, Graduate School of Advanced Science and Engineering, Waseda University

43. **Aqueous 2-Methylpiperazine/Piperazine for Carbon Capture**
Brent Sherman, Xi Chen. Thu Nguyen, Stephanie Freeman, Gary Rochelle, University of Texas at Austin

44. **Mixed Alkanolamines with Low Regeneration Energy for CO_2 Capture in a Rotating Packed Bed**
Cheng-Hsiu Yu, Chung-Sung Tan, Department of Chemical Engineering, National Tsing Hua University

45. **Demonstration Test Result of High Pressure Acid-Gas Capture Technology (HiPACT)**
Koji Tanaka, Yasushi Fujimura, JGC Corporation; Takehiro Komi, INPEX CORPORATION; Torsten Katz, Oliver Spuhl, BASF SE; Erick Contreras, BASF East Asia Headquarters Ltd.

46. **Study on Potential Biphasic Solvents: Absorption Capacity, CO_2 Loading, and Reaction Rate**
Zhicheng Xu, Shujuan Wang, Changhe Chen, Tsinghua University

47. **Effect of Alcohol Chain Length on Carbon Dioxide Absorption into Aqueous Solutions of Alkanolamines**
Hidetaka Yamada, Firoz Chowdhury, Kazuya Goto, Takayuki Higashii, Shingo Kazama, Research Institute of Innovative Technology for the Earth; Yoichi Matsuzaki, Nippon Steel Corporation

48. **Development of Chemical CO_2 Solvent for High-Pressure CO_2 Capture**
Shin Yamamoto, Takayuki Higashii, Shingo Kazama, Chemical Research Group, Research Institute of Innovative Technology for the Earth; Hiroshi Machida, Department of Chemical Engineering, Graduate School of Engineering, Nagoya University; Yuicho Fujioka, Department of Environmental Sciences, International College of Arts and Sciences, Fukuoka Women's University

Capture from Power Plants, Gas Fields, Industrial Plants and Transportation Fuels and Technolgies.

49. **Unitied State National Carbon Capture Center Status**
Frank Morton, Roxann Laird, John Northington, Southern Company

Chemical Looping

50. **ZrO_2-Supported CuO Oxygen Carriers for Chemical-Looping with Oxygen Uncoupling (CLOU)**
Mehdi Arjmand, Henrik Leion, Chalmers University of Technology, Division of Environmental Inorganic Chemistry; Tobias Mattisson, Anders Lyngfelt, Chalmers University of Technology, Division of Energy Technology

51. **Characterization of Spray-Dried NO Oxygen Carrier Supported on Alpha Alumina**
Jeom-In Baek, Joong Beom Lee, Tae-Hyoung Eom, Kyeong-Sook Kim, Seug-Ran Yang, Chong Kul Ryu, KEPCO Research Institute

52. **Reactor Choices for Chemical Looping Combustion (CLC) – Dependencies on Materials Characteristics**
Erin Kimball, W.A.P. van den Bos, W.A.P. van den Bos, TNO; Arnold Lambert, Elodie Comte, IFPEN; Richard Blom, Anita Fossdal, Yngve Larring SINTEF

53. **3D Hydrodynamic Simulation of a Chemical Looping Combustion with Two Interconnected Fluidized Beds**
Jian Chang, Kai Zhang, Honggang Chen, Yongpin Yang, North China Electric Power University; Yanjun Guan, China University of Petroleum

54. **Operation and scale-Up of Fixed Bed Chemical Looping Combustion**
Erin Kimbal, Patricia van der Bos, Arthur Bezuijen, Judith Jahn, Aral Gootheer, Peter van den Broeke, TNO

55. **Evaluation of a Highly Reactive and Sulfur Resistant Synthetic Fe-Based Oxygen Carrier for CLC using Gaseous Fuels**
Pilar Gayan, Arturo Cabello, Francisco García-Labiano, Alberto Abad, Luis de Diego, Juan Adanez, Miguel Angel Pans, Cristina Dueso, Instituto de Carboquimica- CSIC

56. **Coal Chemical-Looping Combustion for Electricity Generation: Investigation for a 250 MWe Power Plant**
Yann Le Moullec, Olivier Authier, EDF R&D

57. **Chemical-Looping Combustion of Solid Fuels in a 10 kW Reactor System using Natural Minerals as Oxygen Carrier**
Carl Linderholm, Anders Lyngfelt, Chalmers tekniska högskola; Cristina Dueso, Instituto de Carboquímica (ICB-CSIC)

58. **Chemical Looping for Pre-Combustion CO_2 Capture – Performance and Cost Analysis**
Hari Mantripragada, Edward Rubin, Carnegie Mellon University

59. **Process Design of a Hydrogen Production Process for Power Generation Based on a Cu-Ca Chemical Loop**
Isabel Martinez, Ramon Murillo, Gemma Grasa, Instituto de Carboquimica (Consejo Superior de Investigaciones Científicas); Jose Ramon Fernandez, Juan Carlos Adanades, Instituto Nacional del Carbón

60. **Innovative Oxygen Carrier Materials for Chemical Looping Combustion**
Tobias Mattisson, Magnus Ryden, Peter Hallberg, Anders Lyngfelt, Dazheng Jing, Ali Hedayati, Chalmers University of Technology; Jasper Van Noyen, Frans Snijkers, VITO-Flemish Institute for Technological Research

61. **Chemical-Looping Combustion with Liquid Fuels**
Tobias Mattisson, Patrick Moldenhauer, Magnus Ryden, Anders Lyngfelt, Dazheng Jing, Ali Hedayati, Chalmers University of Technology; Bandat Fadhel, Jean-Pierre Ballaguet, Saudi Aramco

Costs (capture related)

62. **Cost Analysis for CO_2 Capture Process using Aqueous Ammonia at RIST**
Je Young Kim, Kunwo Han, Chi Kyu Ahn, Man Su Lee, Chang Houn Rhee, Hee Dong Chun, RIST

Environmental Impacts of CO_2 Capture

63. **Preliminary Studies into the Environmental Fate of Nitrosamine and Nitramine Compounds in Aquatic Systems**
Andy Booth, Eirik Falck da Silva, Odd Gunnar Brakstad, Kolbjørn Zahlsen, SINTEF Materials and Chemistry

64. **The Use of Amine Reclaimer Wastes as a NOx Reduction Agent**
Deshai Botheju, Lars-Andre Tokheim,Telemark University College, Norway; Peter Glarborg, Technical University of Denmark, Denmark

65. **Nitrosamine Degradation by UV Light Radiation in Post-Combustion CO_2 Capture: Demonstration**
Ferran de Miguel, Henk Trap, Earl Goetheer, TNO; Alexander Voice, University of Texas at Austin

66. **A New Test Rig for Studies of Degradation of CO_2 Absorption Solvents at Process Conditions; Comparison of Test Rig Results and Pilot Plant Data for Degradation of MEA (Mono-Ethanolamine)**
Aslak Einbu, Eirik Falck da Silva, Geir Haugen, Andreas Grimsstvedt, Kristin Lauritsen, Terje Vassbotn, SINTEF Materials and Chemistry

67. **Evaluation of Amine Emissions from the Post-Combustion CO_2 Capture Pilot Plant**
Koshito Fujita, Daigo Muraoka, Takashi Ogawa, Hideo Kitamura, Kensuke Suzuki, Satoshi Saito, Toshiba Corporation

68. **Potential Toxicological Effects of Amines Used for Carbon Capture and Storage and their Degradation Products**
Annette Rohr, Stephanie Shaw, Aladio Knipping, Electric Power Research Institute; Jacob McDonald, Melanie Doyle-Eisele, Dean Kracko, Lovelace Respiratory Research Institute

69. **Evaluation of Monoethanolamine-Based CO_2 Capture Processes By-Product Handling Approaches Considering Regulation in UAE**
Laila Nurrokhmah, Toufic Mezher, Mohammad Abu Zahra, Masdar Institute of Science and Technology

70. **EPRI Community Efforts on Health and Environment Impacts of Amines for Post-Combustion Carbon Capture**
Stephanie Shaw, Annette Rohr, Eladio Knipping, EPRI Environment Division; Moetaz Attalla, CSIRO Energy Technology; Karl ANders Hoff, SINTEF Materials and Chemistry

71. **Emissions from CO_2 Capture Plants; An Overview**
Eirik Falck da Silva, KArl Anders Hof, Andy Booth, SINTEF Materials and Chemistry

72. **Environmental Impacts of CO_2 Leakage: Recent Results from the ASGARD Facility, UK**
Karon Smith, Michael Steven, University of Nottingham; David Jones, Julia West, Neil Breward, Kay Green, Tom Barlow, British Geological Survey; Simone Gwosdz, Martin Kruger, Bundesanstalt für Geowissenschaften und Rohstoffe; Stan Beaubien, Università di Roma "La Sapienza"

73. **Potential Impact of CO_2 on Subsurface Microbial Ecosystems and Implications for the Performance of Storage Reservoirs**
Joanna Wragg, Julia West, Keith Bateman, Heather Harrison, Kay Green, Antonni Milodows, Jeremy Rushton, Gren Turner, Doris Wagner, David Jones, British Geological Survey

Experiences and Case Studies

74. **Effect of CO_2 Purity on Energy Requirement of CO_2 Capture Processes**
Kazuya Goto, Shingo Kazama, RITE; Atsuyoshi Furukawa, Masahiro Serizawa, Satoshi Aramaki, Kazuo Shoji, Japan CCS Ltd

75. **Result of the 60 tpd CO_2 Capture Pilot Plant in European Coal Power Plant with KS-1 Solvent**
Osamu Miyamoto, Takashi Kamijo, Yoshiki Sorimachi, Daisuke Shimada, Hiromitsu Nagayasu, Hiroshi Tanaka, Mitsubishi Heavy Industries, Ltd.; Angela Mangiaracina, ENEL Ingegneria e Innovazione, SpA

76. **Advanced Amine Process Technology Pilot Plant at Le Havre: First Operations and Results**
Tina Edvardsson, Barath Baburao, Larry Czarnecki, Alstom Power; Craig Shubert, The Dow Chemical Company; Olivier Déruelle, Islem Haji, Fabrice Chopin, Yann Le Moullec, Électricité de France

77. **Do We Underestimate the Impact of Particles in Coal-Derived Flue Gases in Amine Based CO_2 Capture Processes?**
Bern Schallert, Siegfries Neuhaus, Chris Satterley, E.ON New Build & Technology GmbH; Satish Reddy, Fluor Enterprises, Inc.

Fundamentals of Scrubbing

78. **Measurement of Heat of CO_2 Absorption into 2-Amino-2-Methyl-1-Propanol (AMP)/ Piperazine Blends using Differential Reaction Calorimiter**
Qian Xie, Adisorn (Andy) Aroonwilas, Amornvadee Veawab, Energy Technology Laboratory, University Of Regina

79. **Experimentally Based Evaluation of Accuracy of Absorption Equilibrium Measurements**
Dag Eimer, Tel-Tek and Telemark University College; Anita B. Elverhøy, Chameera K. Jayarathna, Tel-Tek

80. **13C-NMR Spectroscopic Study on Chemical Species in Piperadine-Amine-CO_2-H_2O System Before and After Heating**
Miho Nitta, Masaki Hirose, Toru Abe, Yokio Furukawa, Waseda University; Hiroshi Sato, Yasuro Yamanaka, IHI Corporation

81. **Mass Transfer of CO_2 Absorption into Hybrid MEA-Methanol Solvents in Packed Column**
Paitoon Tontiwachwuthikul, Zhiwu Liang, Raphael Idem, University of Regina and Hunan University; Teerawat Sema, Abdulaziz Naami, University of Regina

82. **Low Toxic Organic Corrosion Inhibitors for Amine-Based CO_2 Capture Process**
Sureshkumar Srinivasan, Amy Veawab, Adisorn Aroonwilas, University of Regina

83. **Corosion Prediction of Carnon Steel in MEA-based CO_2 Capture Process**
Ameerudeen Najumudeen, Amy Veawab, Adisorn Aroonwilas, University of Regina

84. **SO_2 Effect on Degradation of MEA and Some Other Amines**
Shan Zhou, Shujuan Wang, Chenchen Sun, Shanghe Chen, Key Laboratory for Thermal Science and Power Engineering of Minister of Education

Membranes

85. **Natural Gas Upgrading Through Hydrogen Selective Membranes: Application in Carbon Free Combined Cycles**
Konstantinos Astonios, Kyriakos Panopoulos, Aggelos Doukelis, Antionos Koumanakos, Emmanouil Karakas, National Technical University of Athens

86. **Development of Poly(Amidoamine) Dendrimer/ Polyvinyl Alcohol Hybrid Membranes for CO_2 Capture at Elevated Pressures**
Shuhong Duan, Ikuo Taniguchi, Teruhiko Kai, Shingo Kazama, Research Institute of Innovative Technology for the Earth

87. **Modelling and Multi-Stage Design of Membrane Processes Applied to Carbon Capture in Coal-Fired Power Plants**
Davide Bocciardo, Maria-Chiara Ferrari, Setfano Brandani, Scottish Carbon Capture and Storage Centre

88. **CO_2 Removal from Multi-Component Gas Stream using Porous Ceramic Membranes Infiltrated with Molten Carbonates**
Marie-Laure Fontaine, Thijs Peters, Michael McCann, Partow P. Henriksen, Rune Bredesen, SINTEF Materials and Chemistry

89. **CO_2 Absorption with Membrane Contactors vs. Packed Absorbers-Challenges and Opportunities in Post Combustion Capture and Natural Gas Sweetening**
Karl Anders Hoff, SINTEF, Hallvard Svendsen, Norwegian University of Science and Technology

90. **Molecular Gate Membrane: Poly(Amidoamine) Dendrimer/Polymer Hybrid Membrane Modules for CO_2 Capture**
Teruhiko Kai, Ikuo Taniguchi Shuhong Duan, Shingo Kazama, Research Institute of Innovative Technology for the Earth (RITE)

91. **Optimization of CO_2 Concentration Captured by Membrane Technology - Possibility of Reduction in CO_2 Capture Energy and Cost**
Shingo Kazama, RITE; Kenji Haraya, AIST

92. **Membrane Systems Engineering for Post-Combustion Carbon Capture**
Rajab Khalilpour, Ali Abbas, University of Sydney

93. **The Effect of pH on CO_2-Separation from Post Combustion Gas by Polyvinylamine based Composite Membrane**
Taek-Joong Kim, Heléne Vrålstad, Marius Sandru, SINTEF Materials and Chemistry; May-Britt Hägg, NTNU

94. **Preparation of CO_2 Permselective Li4SiO4 Membranes by Using Mesoporous Silica as a Silica Source**
Mikihiro Nomura, Tesuya Saknishi, Youichiro Nishi, Keisuke Utsumi, Ryutaro Nakamura, Shibaura Institute of Technology

95. **Preparation of Thin Li4SiO4 Membranes by Using a CVD Method**
Mikihiro Nomura, Tesuya Saknishi, Youichiro Nishi, Keisuke Utsumi, Ryutaro Nakamura, Shibaura Institute of Technology

96. Benchmarking of Hydrogen Selective Membranes
JAZ Pieterse, D. Jansen, J. Boon, JW Dijkstra, ECN

97. **Dense Membranes for Efficient Oxygen and Hydrogen Separation (DEMOYS): Project Overview and First Results**
Pietro Pinacci, RSE; Jochen Haering, Sulzer Markets and Technology Ltd

98. **Membrane – Solvent Absorption Hybrid Processes for Pre- and Post-Combustion Capture from Brown Coal Plants**
Colin Scholes, Robyn Cuthbertson, Geoff Stevens, Sandra Kentish; CRC for Greenhouse Gas Technologies (CO2CRC)

99. **CACHET-II: Carbon Capture and Hydrogen Production with Membranes**
Bai Song, Jonathan Forsyth, BP Alternative Energy

100. **Effects of Membrane Properties on CO_2 Desorption from Chemical Absorbents using a Membrane Flash Process**
Nobuhide Takashi, Kei Matsuzaki, Tetsuya Funai, Takuya Wada, Hiroshi Fukunaga, Shinshu University; Toru Takatsuke, Hiroshi Mano, Research Institute of Innovative Technology for the Earth

101. **Comparison and Selection of Amine-Based Absorbents in Membrane Vacuum Regeneration Process for CO_2 Capture with Low Energy Cost**
Zhen Wang, Mengxian Fang, Yili Pan, Zhongyang Luo, Zhejiang University; Shuiping Yan, Huazhong Agricultural University

102. **Pore-Fill-Type Palladium-Porous Alumina Composite Membrane for Hydrogen Separation**
Katsunori Yogo, RITE, Chemical Research Group and NAIST; Hiromichi Takeyama, NAIST; Kensuke Nagata, RITE, Chemical Research Group

103. **CO_2/CH_4 Mixed Gas Separation Using Carbon Hollow Fiber Membranes**
Miki Yoshimune, Kenji Haraya, AIST

104. **The Effects of Membrane-Based CO_2 Capture System on Pulverized Coal Power Plant Performance and Cost**
Haibo Zhai, Edward Rubin, Carnegie Mellon University

105. **Investigation of Cascaded Membrane Process for Real Flue Gas Simulation in Post-Combustion Capture**
Li Zhao, Michael Weber, Detlef Stolten, Forschungzentrum Juelich, Germany

106. **Efficient Low CO_2 Emissions Power Generation by Mixed Conducting Membranes**
Paolo Chiesa, Matteom Romano, Vincenzo Spallina, David Turi, Politecnico di Milano; Luca Mancuso, Foster Wheeler

Novel Separation

107. **Carbon Dioxide Capture from Flue Gases by Solid Sorbents**
Mustafa Abunowara, Libyan Petroleum Institute; Mohammed Elgarni, HTC Purenergy Inc. Canada

108. **Combined SO_2-CO_2 Removal Towards Significant Investment Cuts**
Cristina Sanchez Sanchez, Katarzyna Misiak, Monique Oldenburg, Earl Goetheer, TNO; Erik Meuleman, CSIRO

109. **Development of New CO_2 Capture Processes Based on Phase Change Amino Acid Solvents**
Eva Sanchez Fernandez, Katarzyna Misiak, Earl Goetheer, Ferran de Miguel Mercader, TNO

110. **Conception of a Pulverized Coal Fired Power Plant with Carbon Capture around a Supercritical Carbon Dioxide Brayton Cycle**
Yann Le Moullec, EDF R&D

111. **Removal of Carbon Dioxide from Indoor Air Using a Cross-Flow Rotating Packed Bed**
Chia-Chang Lin, Chang Gung University

112. **CO_2 Capture System Using Lithium Silicate for Distributed Power Supply**
Mamoru Mizunuma, Masayuki Tsuda, Yasuko Maruo, NTT Energy and Environment Laboratories; Takao Makagaki, Waseda University

113. **Studies of Crosslinked Quaternized Biopolymer for Separation of Heat Stable Salts in Amine Absorption Solution for CO_2 Capture**
Chintana Saiwan, Chariya Seelarak, Chulalongkorn University; Teeradet Supap, Raphael Idem, Paitoon Tontiwachwuthikul, University of Regina; Panya Wongpanit, Srinakharinwirot University

114. **Carbon Dioxide Separation Technology from Biogas by Membrane/Absorption Hybrid Method**
Takafumi Tomiokasakai, Toru Sakai, TAIYO NIPPON SANSO CORPORATION; Hiroshi Mano, RITE

115. **Study of Heat Integration Between the Units of a Circulating Fluidized Bed Reactor Operating Sorption Enhanced Steam Methane Reforming**
Rafael Antonio Sanchez, Hugo Atle Jakobsen, Jannike Solsvik, Zhongxi Chao, Norwegian University of Science and Technology

116. **Application of Free Piston Stirling Cooler (SC) on CO_2 Capture Process**
Chun Feng Song, Yutaka Kitamura, University of Tsukuba; Wei Zhong Jiang, China Agricultural University

117. **Amine Sorbents for Use in the Electrochemically-Mediated Gas Scrubbing of Carbon Dioxide**
Michael Stern, Fritz Simeon, Howard Herzog, Alan Hatton, Massachusetts Institute of Technology

118. **Synthesis of Calcium Aluminates Granule with TiO_2 Binder for High-Temperature CO_2 Capture**
Ching Tsung Yu, WEiChin Chen, Yau Pin Chyou, Institute of Nuclear Energy Research; San Yaun Chen, National Chiao Tung University

Oxyfuel Technolgies

119. **Effect of Temperature and Flue Gas Recycle on the SO_2 and NO_x Emissions in a Oxyfuel Fluidised Bed Combustor**
Juan Adanez, Margarita de las Obras-Loscertales, Arancha Rufas, Luis Francisco de Diego, Francisco Garcia-Labiano, Pilar Gayan, Alberto Abad, Instituto de Carboquimica- CSIC

120. **Experimental Investigations on Deposit Formation on External Fluidized Bed Heat Exchanger Surfaces in Oxy-Fired CFB Boilers**
Theodor Beisheim, Mariusz Zieba, Günter Scheffknecht, IFK - University of Stuttgart

121. **Oxyfuel Combustion: Technical & Economic Considerations for the Development of Carbon Capture from Pulverized Coal Power Plants**
Kyle Borget, Edward Rubin, Carnegie Mellon University

122. **Retrofit of Bubbling Fluidized Boilers to Oxyfuel Combustion using Wood Wastes as Fuel**
Gabriel Faé Gomes, Liandro Dalla Zen, CIENTEC; Antônio Vilela, UFRGS

123. **Restrictions and Limitations for the Design of a Steam Generator for a Coal-Fired Oxyfuel Power Plant with Circulating Fluidised Bed Combustion**
Claas Guenther, Matthias Weng, Alfons Kather, Hamburg University of Technology

124. **Water Balance in Oxy-Combustion Compared with Post-Combustion Schemes**
Jens Hetland, SINTEF Energy Research

125. **Pathway for Advanced Architectures of Oxy-Pulverized Coal Power Plants: Minimization of the Global System Exergy Losses**
Yann Le Moullec, EDF R&D; Hayato Hagi, EDF R&D and Mines ParisTech CEP, Rodrigo Rivera-Tinoco, Chakib Bouallou, Mines ParisTech CEP

126. **Ignition and NO Emissions of Coal and Biomass Blends Under Different Oxyfuel Atmospheres**
Juan Riaza, Lucia Álvarez, Maria Victoria Gil, Cova Pevida, Jose J. Pis, Fernando Rubiera, INCAR-CSIC

127. **Predicting Behaviour of Coal Ignition in Oxyfuel Combustion**
Cahyadi Soeharto, University of Indonesia

128. **Impact of Oxyfuel Combustion on Fly Ash Transformations and Resulting Corrosive Behavior of Austenitic Superalloys**
Gosia (Malgorzata) Stein-Brzozowska, Hasbeidy Diaz Castro, Jörg Maier, Günter Scheffknecht, IFK, University of Stuttgart

129. **Flue Gas Concentrations and Efficiencies of a Coal-Fired Oxyfuel Power Plant with Circulating Fluidised Bed Combustion**
Matthias Weng, Claas Günther, Alfons Kather, Hamburg University of Technology / Institute of Energy Systems

Post Combustion

130. **Optimal Operation of Solvent-Based Post-Combustion Carbon Capture Processes**
Zhengxiong Li, Ali Abbas, Rajab Khalilpour, The University of Sydney

131. **Optimization of an Existing 130 Tonne per day CO_2 Capture Plant from a Flue Gas Slipstream of a Coal Power Plant**
Ahmed Aboudheir, Walid Elmoudir, HTC CO_2 Systems Corp.

132. **Process Simulation of Aqueous MEA Plants for Post-Combustion Capture from Coal-Fired Power Plants**
Hyungwoon Ahn, Stefano Brandani, Mauro Luberti, Zhengyi Liu, The University of Edinburgh

133. **Heat of Absorption of CO_2 in Aqueous Solutions of DEEA, MAPA and their Mixture**
Muhammad Arshad, Kaj Thomsen, Technical University of Denmark; Hallvard F. Svendsen, Norwegian University of Science and Technology

134. **Validation of a Process Model of CO_2 Capture in an Aqueous Solvent, using an Implicit Molecular Based Treatment of the Reactions**
Charles Brand, Javier Rodriguez, Amparo Galindo, George Jackson, Claire Adjiman, Imperial College London

135. **Selection of Amine Amino Acids Salt Systems for CO_2 Capture**
Arlinda Fejzo Ciftja, Adri Hartono, Hallvard F. Svendsen, NTNU

136. **Carbamate Formation in Aqueous - Diamine - CO_2 Systems with NMR Spectroscopy**
Arlinda Fejzo Ciftja, Adri Hartono, Hallvard F. Svendsen, NTNU

137. **eNRTL Parameter Fitting Procedure for Blended Amine Systems: MDEA-PZ Case Study**
Diego Di Domenico Pinto, Julianna, Garcia Moretz-Sohn Monteiro, Anita Bersås, Tore Haug-Warberg, Hallvard Fjøsne Svendsen, NTNU

138. **Aqueous Piperazine/Aminoethylpiperazine for CO_2 Capture**
Yang Du, Omkar Namjoshi, Le li, Thu Nguyen, Gary Rochelle, The University of Texas at Austin

139. **Study of the Post Combustion CO_2 Capture by Absorption into Amine(s) Based Solvents: Application to Cement Flue Gases**
Lionel Dubois, Diane Thomas, University of Mons

140. **Postcombustion CO_2 Capture by Chemical Absorption: Screening of Aqueous Amine(s)-Based Solvents**
Lionel Dubois, Diane Thomas, University of Mons

141. **A Numerical Solution Strategy for Dynamic Simulation of Post-Combustion CO_2 Capture**
Nina Enaasen, Andrew Tobiesen, Magne Hillestad, Norwegian University of Science and Technology; Hanne Kvamsdal, SINTEF Materials and Chemistry

142. **Thermal Decomposition of Nitrosamines in Aqueous Piperazine**
Nathan Fine, Mandana Ashouripashaki, Gary Rochelle, University of Texas, Austin

143. **Removal of Acid Gases and Metal Ion Contaminants from Power Plant Flue Gases with PostCapTM Technology**
Björn Fischer, Diego Andrés-Kuettel, markus Kinzl, Ralph Joh, Rüdiger Schneider, Siemens AG, Sector Energy

144. **Theoretical Study of Equilibrium Constants for CO_2 Capture Solvents**
Mayuri Gupta, Hallvard F. Svendsen, Norwegian University Of Science and Technology; Eirik Falck Da Silva, SINTEF Materials and Chemistry

145. **Mass Transfer Between Carbon Dioxide and Liquid Droplets formed by A Novel Experimental Set-Up**
Jingyi Han, Melaaen Morten, Eimer Dag, Tel-Tek

146. **Experimental and Modelling Study of the Binary and Ternary VLE of the AMP/Pz/H_2O System with Ebulliometer and NMR**
Ardi Hartono, Muhammad Saaed, Arlinda, Ciftja, Hallvard Svendsen, NTNU

147. **Development of a Dynamic Model of a Post Combustion CO_2 Capture Process**
Sanoja Jayarathna, Bernt Lie, Telemark University College, Morten Melaaen, Telemark University College and Tel-Tek

148. **Experimental Study on CO_2 Solubility in Aqueous Piperazine/Alkanolamines Solutions at Stripper Conditions**
Shota Inoue, Takuya Itakura, Takao Nakagaki, Yuki Furukawa, Waseda University; Hiroshi Sato, IHI Corporation; Yasuro Yamanaka, IHI Corporation

149. **Oxidative Degradation of Aqueous Amine Solutions of MEA, MDEA, AMP, PZ: A Review**
Klaus J. Jens, Telemark University College and Telemark Technological R & D Institute; Siw B. Fredriksen, Norner AS

150. **Advanced CO_2 Capture Process using MEA Scrubbing: Configuration of a Split Flow and Phase Separation Heat Exchanger**
Jaeheum Jung, Yeong Su Jong, Youngsub Lim, Chonghun Han, Seoul National University; Chi Seob Lee, KEPCO Engineering & Construction Company, INC

151. **SO_3 Impact on Amine Emission and Emission Reduction Technology**
Takashi Kamijo, Yoshinori Kajiya, Hiromitsu Nagayasu, Mitsubishi Heavy Industries, Ltd.; Takahito Yonekawa, Tatsuya Tsujiuchi, Mitsubishi Heavy Industries America, Inc.

152. **Demonstration of Hitachi's CO_2 Capture System for Flue Gas from Power Plants**
Terafumi Kawasaki, Yoshiro Inatsune, Kengo Sano, Hitachi Ltd.; Toshio Katsube, Jun Shimamura, Babcock-Hitachi K.K.

153. **Vacuum Regeneration of Amine Solvent for Post-Combustion Carbon Capture with Compression Train Integration: a Way Forward?**
Yann Le Moullec, EDF R&D

154. **Improved Flow Scheme and Operational Parameters for Amine-Based CO_2 Capture Processes: A Rigorous Optimization Approach**
Yann Le Moullec, Thibaut Neveux, EDF R&D; Jean Pierre Corriou, Eric Favre, LRGP

155. **Oxidative Degradation of Alkanolamines with Inhibitors in CO_2 Capture Process**
In-Young Lee, No-Sang Kwak, Ji-Hyun Lee, Jae-Goo Shim, Kyung-Ryung Jang, Korea Electric Power Corporation

156. **Rate Based Modeling of Chilled Ammonia Process (CAP) in Aspen Plus®**
Mu Li, Eddie Vuddagiri, Xi Chen, Rameshwar Hiwale, Frederic Vitse, Alstom Power Carbon Capture R&D Execution

157. **Experimental Study of Energy Requirement of CO_2 Desorption from Rich Solvent**
Xiaofei Li, Shujuan Wang, Changhe Chen, Tsinghua University

158. **Modelling, Simulation and Pilot-Plant Validation of CO_2 Capture Process Using Amine Absorbent for Coal Based Power Plant in South Korea**
Youngsub Kim, Ung Lee, Yeong Su Jeong, Seeyub Yang, Jeongnam Kim, Chonghun Han, Seoul National University; Chi Seob Lee, Jaehyoung Kim, KEPCO E&C

159. **Representation of Piperazine-CO_2-H_2O System Using Extended-UNIQUAC and Computational Chemistry**
Hamid Mehdizadeh, Mayuri Gupta, Hallvard F. Svendsen, Norwegian University of Science and Technology; Eirick Flack da Silva, SINTEF

160. **Activity-Based Kinetics of the Reaction of Carbon Dioxide with Aqueous Amine Systems. Case Studies: MAPA and MEA**
Juliana Monteiro, Diego Pinto, Xiaso Luo, Hanna Knuutila, Ardi Hartono, Saddam Hussain, Emmanuel Mba, Hallvard Svendsen, NTNU

161. **IHI's Amine-Based CO_2 Capture Technology for Coal Fired Power Plant**
Shiko Makamura, Yasuro Yamanaka, Toshiya Matsuyama, Shinya Okuno, Hiroshi Sato, IHI Corporation

162. **Thermal Degradation of Piperazine Blends with Diamines**
Omkar Namjoshi, Le Li, Yang Du, Gary Rochelle, The University of Texas at Austin

163. **Piperazine Degradation in Pilot Plants**
Paul Nielsen, Lynn Li, Gary Rochelle, The University of Texas at Austin

164. **Development of Carbon Dioxide Removal System from the Flue Gas of Coal Fired Power Plant**
Yukio Ohashi, Takashi Ogawa, Toshihisa Kiyokuni, Toshiba Corporation

165. **Laboratory Rig for Atmospheric CO_2 Absorption and Desorption Under Pressure**
Lars Erik Øi, Joachim Lundberg, Morten Pedersen, Per Morten Hansen, Morten Christian Melaaen, Telemark University College

166. **Babcock & Wilcox Power Generation Group's RSAT™ Process and Field Demonstration of the OptiCap™ Advanced Solvent at the National Carbon Capture Center**
Christopher Poling, Ted Parsons, Jeb Geyheart, Stephen Moorman, Babcock & Wilcox Power Generation Group

167. **Development of a Rate-Based Model for CO_2 Absorption Using Aqueous NH_3 in a Packed Column**
Guojie Qi, CSIRO and Tsinghua University; Hai Yu, Paul Feron, CSIRO; Shujuan Wang, Chnaghe Chen, Tsinghua University

168. **The Impact of Design Correlations on Rate-Based Modeling of a Large Scale CO_2 Capture with MEA**
Neda Razi, Hallvard Svendsen, Olav Bolland, Norwegian University of Science and Technology

169. **Modeling Pilot Plant Performance of an Absorber with Aqueous Piperazine**
Darshan Sachde, Jorge Plaza, Eric Chen, Gary Rochelle, The University of Texas at Austin

170. **Equilibrium of MEA, DEA, MDEA and AMP with Bicarbonate and Carbamate: A Raman Study**
Gamunu Lasantha Samarakoon Samarakoon Perumbuli Arachchige, Klaus Jens, Telemark University College; Niels Andersen, University of Oslo

171. **Multivariate Data Analysis for Parameters' Effect on CO_2 Removal Efficiency**
Udara Arachchige, Neelakantha Ayral, Pramod Ghimire, Maths Halstensen, Morten Melaaen, Telemark University College, Porsgrunn, Norway

172. **Vapour-Liquid Equilibrium for Novel Solvents for CO_2 Post Combustion Capture**
Anastasia Trollebø, Muhammad Saeed, Hallvard Svendsen, The Norwegian University of Science and Technology; Inna Kim, SINTEF Materials and Chemistry

173. **Measurement and Calculation of CO_2 Solubility and Absorption Kinetic Rate in Aqueous Solutions of TEDA and DMEA**
Chuan Tong, Carlos Cebamanos Perez, Yanmei Yu, Jian Chen, Tsinghua University; Jose Carlos Valle Marcos, EDF Beijing R&D Center, Yan Le Moullec, Fabrice Chopin, EDF R&D

174. **Post Combustion CO_2 Capture Using Supportec Amine Sorbents: High Pressure Regeneration**
Rens Veneman, Sascha Kersten, Eim Brilman, University of Twente

175. **Process Control Strategies for CO_2 Regeneration in a 2-Stage Flash**
Matthew Walters, Ricardo Dunia, Thomas Edgar, Gary Rochelle, University of Texas at Austin; Christopher Hundham, Technische Universität München

176. **A Hybrid Separation Process for the Recovery of Carbon Dioxide from Flue Gases**
Krzysztof Warmuzinski, Marek Tanczyk, Manfred Jaschik, Aleksandra Janusz-Cygan, Polish Academy of Sciences

177. **Dynamic Simulation of Post-Combustion Capture System**
Zhaofeng Xu, Yali Xue, Zheng Li, Tsinghua University; Yongqi Lu, University of Illinois at Urbana-Champaign

178. **CO_2 Absorption by Using a Low-Cost Solvent: Biogas Slurry Produced by Anaerobic Digestion of Biomass**
Shuiping Yan, Liqiang Zhang, Ping Ai, Yuanyuan Wang, Yanlin Zhang, Huazhong Agricultural University

179. **A Study of Mass Transfer Kinetics of Carbon Dioxide in (Monoethanolamine + Water) by Stirred Cell**
Jiru Ying, Telemark Technological R&D Institute; Dag A. Eimer, Telemark University College

180. **Hitachi's Carbon Dioxide Scrubbing Technology with H3-1 Absorbent for Coal Fired Power Plants**
Koichi Yokoyamma, Miho Honoki, Eiji Miyamoto, Shigehito Takamoto, Hirofumi Kikkawa, Babcock-Hitachi K. K. Kure Research Laboratory; Brandon Pavlish, EERC; Takanori Nakamoto, Toshio Katsube, Babcock-Hitachi K. K. Kure Division; Terufumi Kawasaki, Hitachi Ltd; Song Wu, Hitachi Power Systems America, Ltd

181. **Improved Hydrotalcite-Type Compounds for Post-Combustion CO_2 Abatement**
Emiliana Dvininov, Hazel Stephenson, MEL Chemicals; Holly Krutka, ADA Environmental Solutions

Pre Combustion

182. **Detailed Process Simulation of Pre-Combustion IGCC Plants using Coal-Slurry and Dry Coal Gasifiers**
Hyungwoong Ahn, Stefano Brandani, Zoe Kapetaki, The University of Edinburgh

183. **Low-Temperature CCS from an IGCC Power Plant and Comparison with Physical Solvents**
David Berstad, Rahul Anantharaman, Petter Nekså, SINTEF Energy Research

184. **Elevated Temperature Adsorption Characteristics of K-Promoted Hydrotalcites for Pre-Combustion Capture of Carbon Dioxide**
Shuang Li, Yixiang Shi, Ningsheng Cai, Tsinghua University

185. **Overview of, and Experimental Methology for, Sorption Enhanced Hydrogen Production**
Alissa Cotton, Kumar Patchigolla, John E. Oakley, Cranfield University

186. **SEWGS Knocks Down Capture Costs by 40%;Technology is Now Ready for Scale-Up**
Daniel Jansen, Edward van Selow, Paul Cobden, ECN; Giampaolo Manzolini, Ennio Macchi, Matteo Gazzani, Politecnico di Milano; Richard Blom, Partow Henriksen, SINTEF; Rich Beavis, BP; Andrew Wright, Air Products PLC

187. **Solubility of Carbon Dioxide in 1-Butyl-3-Methylimidazolium Phenolate**
Ki Tae Park, Jung Hoon Park, Soo Hyun Choi, Seong-Pil Kang, Il-Hyun Baek, Korea Institute of Energy Research

188. **Multi-Level Dynamic Simulation of Elevated Temperature Pressure Swing Adsorption System for Pre-Combustion CO_2 Capture**
Yan Zheng, Yixiang Shi, Ningsheng Cai, Shuang Li, Tsinghua University

189. **Improving a Pre-Combustion CCS Concept in Gas Turbine Combined Cycle for CHP Production**
Marjut Suomalainen, Antti Arasto, VTT Technical Research Centre of Finland; Sari Siitonen, Gasum Oy

190. **Fundamental Modelling of a Membrane Reactor with in situ Hydrogen Separation and Combustion**
Torleif Weydahl, Andrea Gruber, SINTEF Energy Research; Prashant S. Samilath, NTNU

Retrofitting

191. **The Techno-Economic Prospect of Retrofitting Natural Gas Combined Cycle Power Plants in China: a Case Study of CCGT Power Plants in Huizhou and Shenzhen, Guangdong**
Jia Li, Jon Gibbins, University of Exeter; Mathieu Lucquiaud, University of Edinburgh; David Reiner, University of Cambridge; Di Zhou, Chinese Academy of Sciences

Techno-Economic Comparisons

192. **Evaluation of CO_2 Purification Requirements and the Selection of Processes for Impurities Deep Removal from the CO_2 Product Stream**
Zeina Abbas, Mohammad Abu Zahra, Toufic Mezher, Masdar Institute of Science and Technology

193. **Evaluation of Performance and Cost of Combustion Based Power Plants with CO_2 Capture in the UK**
Elena Catalanotti, Kevin Hughes, Richard Porter, Mohamed Pourkashanian, University of Leeds; John Price, Centre for Low Carbon Futures

194. **Evaluation and Comparison of the Part Load Behaviour of the CO_2 Capture Technologies Oxyfuel and Post-Combustion**
Volker Roeder, Christopher Hasenbein, Alfons Kather, Hamburg University of Technology

195. **Techno-Economic Evaluation of an Advanced Solid Sorbent-Based CO_2 Capture Process for Natural Gas Combined Cycle Power Plants**
Adel Seif El Nasr, Mohammad Abu Zahra, Masdar Institute of Science and Technology; Thomas Nelson, RTI International

Other

196. **Addressing Technology Uncertainties in Power Plants with Post-Combustion Capture**
Mathieu Lucquiaud, Hannah Chalmers, Olivia Errey, Jon Gibbins, The University of Edinburgh; Xi Liang, University of Exeter

197. **The Role of SO_x in the Chemistry of Amine-Based CO_2 Capture in PCC**
Yaser Beyad, Robert Burns, Marcel Maeder, University of Newcastle; Graeme Puxty, CSIRO Energy Technology

198. **Dynamic Measurements of CO_2 Flow in Water Saturated Porous Medium at Low Temperature Using MRI**
Mingjun Yang, Yongchen Song, Ningjun Zhu, Yuechao Zhao, Dalian University of Technology

CO_2 Utilisation Options

CO_2 for Enhanced Geothermal

199. **CO_2 Utilization for Enhanced Geothermal Energy Recovery: Effects of Salt Precipitation in a Fractured Reservoir**
Andrea Borgia, Karsten Pruess, Timothy Kneafsey, Lehua Panm Curtis Oldenburg, Lawrence Berkeley National Laboratory

200. **Geothermal Energy Production at Geologic CO_2 Sequestration Sites: Expanding Opportunities for Renewable Power and CCS**
Jimmy Ranpolph, University of Minnesota and Heat Mining Company, LLC; Ben Adams, Thomas Kuehn, Martin Saar, Jeffrey Bielicki, Melissa Pollak, Nathan Paine, University of Minnesota, Steven Taff, Geological Storage Consultants, LLC

201. **Numerical Investigation of Enhanced Geothermal System with CO_2 as Working Fluid**
Feng luo, Ruina Xu, Peixue Jiang, Beijing Key Laboratory of CO_2 Utilization and Reduction Technology and Tsinghua University

202. **Potential Global Implications of Gas Production from Shales and Coal for CO_2 Geological Storage**
Michael Godec, Hunter Jonsson, Advanced Resources International, Inc.; Ludmilla Basava-Reddi, IEAGHG

CO_2 Use for Production of Algae or Chemicals

203. **Valorization of CO_2 by Co-Electrolysis of CO_2/H_2O at High Temperature for Syngas Production**
Chakib Bouallou, Youness El Fouih, Youssef Redissi, ARMINES MINES ParisTech, CEP

204. **Recycling of Carbon Dioxide to Produce Ethanol**
Chakib Bouallou, Youness El Fouih, ARMINES MINES ParisTech, CEP

205. **New Methodologies for the Integration of Power Plants with Algae Ponds**
Earl Goetheer, Peter Van den Broeke, Sven Van der Gijp, Rob Van de Stel, TNO

206. **Development of a Process for Aqueous Mineral Carbonation on Municipal Solid Waste Incinerator Bottom Ash with Recovery of Useful Chemicals**
Shuji Hamano, Satoshi Okumura, Tsunehira Yamamoto, Mamoru Kondo, Hitachi Zosen Corporation

207. **Turning CO_2 into Valuable Chemicals**
Oluwafunmilola Ola, Mercedes Moroto-Valer, Sarah Mackintosh, NCCCS, CICCS, University of Nottingham

208. **A Study of Carbonate Synthesis from CO_2 in Combustion Exhaust Gas**
Hideki Shintaku, Tetsuya Takemoto, Shinichi Kwawasak, OSAKA GAS CO., LTD.; Fumihiro Hanasak, KRI, Inc.

ECBM

209. **Geo-Sequestration of CO_2 in the Coal Seams, with Special References to the Effects of Coal Swelling on the Permeability**
Ferian Anggara, Kyushu University and Gadjah Mada University; Kyuro Sasaki, Yuichi Sugai, Kyushu University

210. **Two Phase Relative Permeability of Gas and Water in Coal for Enhanced Coalbed Methane Recovery and CO_2 Storage**
Sevket Durucan, Mustafa Ahsan, Amer Syed, Ji-Quan Shi, Anna korre, Imperial College London

211. **Coal-Seq III Consortium: Advancing the Science of CO_2 Sequestration in Coal Seam and Gas Shale Reservoirs**
George Koperna, Anne Oudinot, Advanced Resources International, Inc.; Satya Harpalani, Southern Illinois University; Khaled Gasem, Oklahoma State University, Ian Palmer, Higgs-Palmer Technologies

212. **Adsorption Model Equation for Multi-Component Gas on Coalbed and its Assessment**
Kei Tanaka, Sohei Shimada, The University of Tokyo; Naito Sakimoto, National Institute of Advanced Industrial Science and Technology

EOR

213. **Monitoring and Modeling CO_2 Behavior in Multiple Oil Bearing Carbonate Reefs for a Large Scale Demonstration in Northern Lower Michigan**
Neeraj Gupta, Lydia Cumming, Mark Kelley, Darrell Paul, Srikanta Mishra, Jaqueline Gerst, Matt Place,Battelle; Rick APrdini, Allen Modroo, Robert Mannes, Core Energy LLC

214. **Geologic Carbon Sequestration through Enhanced Oil Recovery**
Bruce Hill, Clean Air Task Force; Susan Hovorka, University of Texas, Texas Bureau of Economic Geology; Steve Melzer, Melzer Consulting

215. **Densities and Excess Volumes of CO_2 Decane Solution from 12 to 18MPa and 313 to 343K**
Wei-wei Jian, Yi Zhang, Yong-Chen Song, Key Dalian University of Technology

216. **A Feasibility Study of the Integration of Enhanced Oil Recovery (CO_2 Flooding) with CO_2 Storage in the Depleted Oil Fields of the Ordos Basin, China**
Zunsheng Jiao, Ronald Surdam, University of Wyoming Carbon Management Institute; Ruimin Gao, Research Institute of the Yanchang Petroleum (Group) Co., LTD; Lifa Zhou, Yajun Wang, Tingting Luo, Shaanxi Provincial Institute of Energy Resources and Chemical Engineering

217. **Simulation of CO_2-Oil Minimum Miscibility Pressure (MMP) for CO_2 Enhance Oil Recovery (EOR) and CO_2 Storage using Neural Networks**
Zhiwu Liang, Paitoon Tontiwachwuthikul, Teerawat sema, Peng Luo, Hunan University and University of Regina; Ruimin Gao, Research Institute of the Yanchang Petroleum (Group) Co., LTD; Fanhua Zeng, University of Regina; Xiangzeng Wang, Shaanxi Yanchang Petroleum (Group) Corp. Ltd.

218. **Pore Level Visualisation and Simulation of CO_2 Miscible Injection with Gravity Domination**
Zeeshan Mohiuddin, The University of Adelaide

219. **Integrated CCS Aspect into CO_2 EOR Project Under High Range of Reservoir Properties and Operating Plans**
Vitsarut Attavitkamthorn, Javier Vilcáez, Kozo Sato, The University of Tokyo

220. **Measurement of Immiscible CO_2 Flooding Processes and Permeability Reduction due to Asphaltene Precipitation by X-ray CT Imaging**
Tonglei, Wang, Yongchen Song, Yuechao Zhao, Yu Liu, Ningjun Zhu, Key Laboratory of Ocean Energy Utilization and Energy Conservation of the Ministry of Education

221. **Research Progress of the Interfacial Tension in Supercritical CO_2-Water/Oil System**
Wanli Xing, Yi Zhang, Yongchen Song, Dalian University of Technology

222. **CO_2 Miscible Simulation for Magnetic Resonance Imaging Coreflood Tests**
Wenzhe Yang, Yongchen Song, Yu Liu, Wei-Haur Lam, Yuechao Zhao, Ningjun Zhu, Lanlan Jiang, Dalian University of Technology

223. **Visualisation of Water Flooding and Subsequent Supercritical CO_2 Flooding in Fractured Porous Media with Permeability Heterogeneity Using MRI**
Yuechao Zhao, Tonglei Wang, Yongchen Song Yu Liu, Min Hao, Ningjun Zhu, Dalian University of Technology

224. **Experiment Study on CO_2/Water Two Phase Flow in Porous Medium Using Magnetic Resonance Imaging**
Lanlan Jiang, Yongchen Song, Mingjun Yang, Yu Liu, Ningjun Zhu, Dalian University of Technology

225. **Magnetic Resonance Imaging Study of the Miscibility of Supercritical CO_2 and n-decane in Porous Media**
Ningjun Zhu, Yongchen Song, Yu Liu, Yuechao Zhao,Lanlan Jiang, Tonglei Wang, Hongfei Zheng, Dalian University of Technology

Other

226. **Supercritical Carbon Dioxide as Green Product for Effective Environmental Remediation**
Abdulla Elhenshir, Libyan Petroleum Institute; Abeer Subkha, National Oil Corporation

227. **Carbon Utilization to meet California's Climate Change Goals**
Elizabeth Burton, John Henry Beyer, Lawrence Berkeley National Laboratory; William Bourcier, Lawrence Livermore National Laboratory; Kevin O'Brien, Energy Commercialization, LLC; Niall Mateer, University of California; John Reed, Kiverdi, Inc.

228. **Economic and Market Analysis of CO_2 Utilisation Technologies - Focus on CO_2 Derived from North Dakota lignite**
Jason Laumb, Robert Cowan, Alexander Azenkeng, Loreal Heebink, Sheila Hanson, Melanie Jensen, Peter Letvin, Laura Raymond, EERC

229. **Mineral Carbonation for Carbon Sequestration with Industrial Waste**
Myoungwook Mun, Heechan Cho, Seoul National University

230. **Electromethanogenic CO_2 Conversion by Subsurface-Reservoir Microorganisms**
Yoshihiro Kuramochi, Qian Fu, Hajime Kobayashi, Hideao Kawaguchi, Javier Vilcáez, Kozo Sato, Masayuki Ikarashi, Tatsuki Wakayama, Haruo Maeda, The University of Tokyo

231. **Mechanism of Electromethanogenic Reduction of CO_2 by a Thermophilic Methanogen**
Yutaka Onaka, Masahiro Hara, Haijime Kobayashi, Qian Fu, Hideo Kawaguchi, Javier Vilcáez, Kozo Sato, The University of Tokyo

Commercial Issues

Commercial Relationships

232. **Optimal Contracts for Integrated CCS-EOR Projects**
Anna Agarwal, Massachusetts Institute of Technology

Finance

233. **Develop a Decision-Framework for Managing CCS Investment Flexibilities in Fossil Fuel Power Plants through Stochastic System Dynamic Programming**
Xi Liang, Mathieu Lucquiaud, Jon Gibbins, University of Edinburgh; Jia Li, College of Engineering, Mathematics, Physical Sciences

234. **Investment Decisions Under Uncertainty: CCS Competing Green Energy Technologies**
Wilko Rohlfs, RWTH Aachen University; Reinhard Madlener, E.ON Energy Research Center and RWTH Aachen University

Value Chain

235. **Value Chain Analysis of CO_2 Storage by using the ECCOTool: A Case Study of the Dutch Offshore**
Daniel Loevre, Filip Neele, TNO, Chris Hendriks, Joris Koorrnneef, Ecofys

Other

236. **Selection of Optimal CO_2 Capture Plant Capacity for Better Investment Decisions**
Rahul Anantharaman, Simon Rousannaly, Snorre Westman, Jo Husebye, SINTEF Energy Research

Demonstration Projects and Major International and Natioanl CCS Research, Developemnt and Demonstration Programs

Development of Best Practice Guidelines

237. **U.S. DOE's Efforts to Promote Knowledge Sharing Opportunities from the R&D Efforts: Development of the U.S. National Atlas and Carbon Storage Best Practice Manuals**
John Litynski, Andrea Mcnemar, Traci Rodosta, Dawn Deel, U.S. DOE NETL; Derek Vikara, Ram Srivastava, Keylogic Systems; Larry Meyer, Robert Kane, Leonardo Technologies, Inc.

Experiences

238. **Overview of the CO2CRC Otway Residual Saturation and Dissolution Test**
Lincoln Paterson, Tess Dance, Jonathan Ennis-King, Charles Jenkins, Linda Stalker, CO2CRC/CSIRO Earth Science and Resource Engineering; Chris Boreham, Ralf Haese, CO2CRC/Geoscience Australia; Mark bunch, CO2CRC/University of Adelaide; Barry Freifeld, Yinqi Zhang, Lawrence Berkeley National Laboratory; Matthias Raab, Rajindar Singh, CO2CRC

239. **Development of Conceptual Design for Commercial-Scale Geologic Storage and Monitoring System at American Electric Power Mountaineer Plant**
Neeraj Gupta, Mark Kelley, Rodney Osborne, Mark Moody, Srikanta Mishra, Jacqueline Gerst, Erica Howat, Battelle; Charlotte Sullivan, Battelle Pacific Northwest Division; Gary Spitznogle, Indra Bhattacharya, Mike Hammond, American Electric Power

240. **Regulating Pilot CCS Projects in Parallel to Developing Legislation Based on the CO2CRC Otway Project Experience**
Namiko Ranasinghe, Department of Primary Industries

241. **Project Update of 500 TPD Demonstration Plant for Coal-Fired Power Plant**
Takuya Hirata, Hiromitsu Nagayasu, Takashi Kamijo, Yasuo Kubota, Mitsubishi Heavy Industries, Ltd; Tatsuya Tsujiuchi, Takahito Yonekawa, Paul Wood, Mitsubishi Heavy Industries America, Inc; Michael Ivie, Nick Irvin, Southern Company Services, Inc

Lessons Learnt

242. **Aspects of the Storage Permit Application for CO_2 Storage in the Depleted P18-4 Gas Field Offshore The Netherlands**
Andreas Kopp, ROAD, Maasvlakte CCS Project C.V. and E.ON Gas Storage GmbH; Menno Ross, Tom Jonker, ROAD, Maasvlakte CCS Project C.V.; Chris Gittins, Willem-Jan Plug, TAQA Energy BV

243. **The SECARB Anthropogenic Test: Status from the Field**
George Koperna, Vello Kuuskraa, David Reisenberg, Advanced Resources International, Inc.; Richard Rhudy, Robert Trautz, EPRI; Jerry Hill, Southern States Energy Board; Richard Esposito, Southern Company

244. **What Have We Learnt from Operational CCS Demonstrations - Phase 1b**
Samantha Neades, Tim Dixon, IEAGHG; Michael Haines, COFree Technologies

245. **Lacq-Rousse CO_2 Capture and Storage Demonstration Pilot: Lessons Learnt from Reservoir Modeling Studies**
Sylvian Thibeau, Daniel Avila, Pierre Chiquet, Catherine Prinet, Marc Lescanne, TOTAL

246. **How to Monitor Subsurface CO_2: Lessons from the IEAGHG Weyburn-Midale CO_2 Monitoring and Storage Project**
Donald White, Geological Survey of Canada

Program Overviews

247. **The South African Centre for Carbon Capture and Storage – Delivering CCS in the Developing World**
Brendan Beck, Tony Surridge, Sibbele Hietkamp, South African Centre for CCS

248. **The CLIMIT Programme and its Strategy for Norweigian Research, Development and Demonstration of CCS Technology**
Svein G. Bekken, Klaus Schöffel, Ståle Aakenes, Torre Hatlen, Gassnova SF; Åse Slagtern, Research Council of Norway; Lars Erik Øi, Telemark University College

249. **Latest CO_2 Transport, Storage and Monitoring R&D Progress in Republic of Korea: Offshore Geologic Storage**
Cheol Huh, Seong-Gil Kang, Korea Ocean Research and Development Institute; Myong-Ho Park, Korea National Oil Corporation; Jung-Seok Lee, NeoEnBiz Co

250. **U.S. DOE's R&D Program to Develop Infrastructure for Carbon Storage: Overview of the Regional Carbon Seqeustration Partnerships and Other R&D Field Projects**
John Litynski, Traci Rodosta, U.S. DOE NETL; Derek Vikara, Ram Srivastava, Keylogic Systems

251. **The CO_2 Capture Project – Status and Prospects of the Capture Program**
Ivano Miracca, Saipem S.p.A. (Eni); Mark Crombie, Jonathan Forsyth, BP Alternative Energy International Ltd.; Cliff Lowe, Chevron Energy Technology Company; Gustavo Torres Moure, Petrobras - CENPES; Mahesh Iyer, Shell International Exploration & Production Inc.; Mark Bohm, Suncor Energy Services Inc.

252. **BIGCCS Centre - Supporting Large-Scale CCS Implementation**
Mona J. Mølnvik, SINTEF Energy Research

253. **Large-Scale CO_2 Capture Demonstration Plant Using Fluor's Econamine FG Plus(sm) Technology at NRG's WA Parish Electric Generating Station**
Jeffrey Scherffius, Satish Reddy, Fluor Enterprises, Inc.; john Klumpyan, Anthony Armpriester, NRG Energy, Inc.

254. **Developing CCS into a Realistic Option in a Country's Energy Strategy**
Daniel Sutter, Mischa Werner, Alba Zappone, Marco Mazotti, Institute of Process Engineering, ETH Zurich

255. **Tomakomai CCS Demonstration Project in Japan**
Daiji Tanase, Takashi Sasaki, Toru Yoshii, Satoshi Motohashi, Yoshihiro Sawada, Satoshi Aramake, Yoshinori Yamanouchi, Tomoyuki Tanaka, Shiro Ohkawa, Ryuichi Inowaka, Japan CCS Co., Ltd.

256. **Innovative Zero-Emission Coal Gasification Power Generation Project**
Tasuhiro Yamauchi, Katsuya Akiyama, New Energy and Indusrial Technology Development Organaization

257. **Chilled Ammonia Process Installed at the Technology Center Mongstad**
Staffan Jönsson, Vauhini Telikapalli, Alstom

Public-Private Partnerships

258. **Amine Thermal Reclamation; Technology Development from Lab to Large-Scale Pilot Testing**
Oddvar gorset, Vibeke Andersson, Aker Clean Carbon

259. **OCTAVIUS: A New FP7 Project Demonstrating CO_2 Capture Technologies**
Paul Broutin, IFPEN; Hanne Kvamsdal, SINTEF Materials and Chemistry; Cristiana La Marca, ENEL; Peter van Os, TNO; Nick Booth, E-ON New Building and Technology

260. **Geochemical Assessment of the Injection of CO_2 into Rousse Depleted Gas Reservoir Part I: Initial Mineralogical and Geochemical Conditions in the Mano Reservoir**
Sylvain Thibeau, Pierre Chiquet, Marc Lescanne, Catherine Prinet, TOTAL

261. **Geochemical Assessment of the Injection of CO_2 into Rousse Depleted Gas Reservoir Part II: Geochemical Impact of the CO_2 Injection**
Jean-Pierre Girard, Sylvain Thibeau, Pierre Chiquet, Marc Lescanne, Catherine Prinet, TOTAL

262. **Preinjection Reservoir Fluid Characterization at a CCS Demonstration Site: Illinois Basin – Decatur Project, USA**
Randall Locke II, Bracken Wimmer, Abbas Iranmenesh, Ivan Krapac, Illinois State Geological Survey, David Larssen, Walter Salden, Christopher Patterson, Schlumberger Water Services; Jim Kirksey, Schlumberger Carbon Services

263. **CO_2 Storage at the Ketzin Pilot Site, Germany: Fourth Year of Injection, Monitoring, Modelling and Verification**
Sonja Martens, Axel Liebscher, Fabian Möller, Jan Henninges, Thomas Kempka, Stefan Lüth, Ben Norden, Bernhard Prevedel, Martin Zimmer, Michael Kühn, A. Szizybalski, GFZ German Research Centre for Geosciences

264. **The Lacq Industrial CCS Reference Project (France)**
Jacques Monne, Marc Lescanne, Samuel Lethier, Catherine Prinet, TOTAL E&P

265. **On Potential Showstoppers for Carbon Capture and Storage (CCS) in South Africa**
Ronald Munyai, Brendan Beck, Tony Surridge, South African Centre for Carbon Capture and Storage

266. **EnBW's Post-Combustion Capture Pilot Plant at Heilbronn – Results of the First Year's Testing Programme**
Alexander Rieder, Sven Unterberger, EnBW Kraftwerke AG

267. **Pilot Scale Testing of Polymeric Membranes for CO_2 Capture from Coal Fired Power Plants**
Marius Sandru, Taek-Joon Kim, SINTEF Materials and Chemistry; Weislaw Capala, ICHP Research Institute; Martin Huijbers, KEMA; May-Britt Hägg, NTNU

268. **Doosan Power Systems OxyCoal™ Burner Technology Development**
David Sturgeon, Jim Rogerson, Gerry Hesselmann, Doosan Power Systems

269. **The Proposed CO_2 Test Injection Project in South Africa**
Ceri Vincent, Sam Holloway, British Geological Survey; David van der Spuy, Petroleum Agency South Africa; Jurie Viljoen, Magda Roos, Martinus Cloete, Council for Geoscience; Robert Tippmann, Climatekos; Andrew Gilder, IMBEWU Sustainability Legal Specialists (Pty) Ltd; Brendan Beck, South African Centre for Carbon Capture and Storage; Frank van Bergen, TNO

Education

Experiences

270. **CO_2 Injection for Geological Storage: A Series of Activities for Training Professionals and Educating Students in Geological Carbon Storage**
Hilary Olson, Steven L. Bryant, Jon E. Olson, Iona Williams, The University of Texas at Austin

271. **Meeting the Grand Challenge for Future Carbon Management Engineers and Scientists: Stimulating Workforce Capacity through Teacher Professional Development**
Hilary Olson, Steven L. Bryant, Jon E. Olson, Larry Lake, The University of Texas at Austin

272. **A Showcase for Geological CO_2 Storage – Replacing Misconceptions by Visual Explanations**
Mischa Werner, Daniel Sutter, Andreas Krättli, Özkan Lafci, Robin Mutschler, Pascal Oehler, jan Winkler, Marco Mazzotti, ETH Zurich

Reviews

273. **NMR Studies on Amine-CO_2-H_2O Systems in PCC: A Review**
Cristina Perinu, Klaus-Joachim Jens, Telemark University College; Bjørnar Arstad, SINTEF

Develpments in Geological Storage

CO_2 Injectivity

274. **Determination of Stress Dependent CO_2-Brine Relative Permeabilities of Low Permeable Rocks**
Ardy Arsyad, Yasuhiro Mitano, Hiro Ikemi, Civil and Structural Engineering Department; Tayfun Babadagli, School of Petroleum Eng. University of Alberta Canada; Kyuro Sasaki, School of Petroleum Eng. Kyushu University Japan

275. **A New Mathematical Model for Predicting CO_2 Injectivity**
Ehsan Azizi, Yildiray Cinar, The University of New South Wales and CO2CRC

276. **Thermal Modeling in and Around a CO_2 Injector**
Binglu Ruan, Ruina Xu, Peixue Jiang, Tsinghua University; Lingli Wei, Shell (China) Limited

277. **A Unified Formula for Determination of Wellhead Pressure and Bottom-Hole Pressure**
Mingze Liu, Bing Bai, Xiaochun Li, Chinese Academy of Sciences

278. **Evaluation of CO_2 Underground Behavior from Injectors Time-Lapse Pressure Fall Off Analysis: a Case Study of CO_2 Aquifer Storage Project**
Mayu Otake, INPEX Corporation

279. **CO_2 Injection for EOR in a Middle-East Carbonate Reservoir: Potential Impairment of Injectivity due to Salt Precipitation**
Holger Ott, Jeroen Snippe, Kees de Kloe, Shell Global Solutions International; Hisham Husain, Ali Abri, PDO

280. **Precipitation of Salt in Bentheimer Sandstone Induced by CO2 Injection: MicroCT study**
Aptrick van Hemert, Saskia Roels, Pacelli Zitha, Delft University of Technology

281. **Numerical Investigation for Enhancing CO_2 Injectivity for the Shenhua Erdos CCS Demonstration Project**
Keni Zhang, Yaqin Xu, Lulu Ling, Yang Wang, Litang Hu, Beijing Normal University

282. **Experimental Study of the Injection System for Demonstration Project of CO_2 Geologic Storage**
Byoung-Woo Yum, KIGAM; Soek Ho Yoon, Kong Hoon Lee, Jungho Lee, Young Kim, KIMM

283. **Injection pump for CCS**
Shigeru Yoshikawa, EBARA Corporation

Costs - Storage Related

284. **Cost Estimates for the CO_2 Geological Storage in Deep Saline Aquifers Offshore Japan: a Case Study**
Masato Takagi, Kazuo Koide, Junichi Shimizu, RITE; Chikara Iwamoto, Nippon Steel Engineering Co. Ltd.; Masao Ohoka, Seiichi Ikeda, Hiroyuki Azuma, Oyo Corporation

Environmental Impacts of CO_2 Storage

285. **Modelling Dispersion of CO_2 Plumes in Seawater as an Aid to Monitoring and Understanding Ecological Impact**
Jerry Blackford, Ricardo Torres, Plymouth Marine Laboratory

286. **Systems Analysis of Field and Laboratory Experiments Considering Impacts of CO_2 Leakage in Terrestrial Systems**
Alexander Bond, Richard Metcalfe, Philip Maul, Paul Suckling, Kate Thatcher, Russell Wlake, Quintessa Ltd, Karon Smith, Mike Steven, University of Nottingham; Daniel Rasse, Norwegian Institute for Agricultural and Environmental Sciences; Dave Jones, British Geological Survey

287. **Simulation of the Near Field Physiochemical Impact of a CO_2 Leakage Field Experiment in Loch Linnhe – Scotland**
Marius Dewar, Wei Wei, Jinhai Yang, Baixin Chen, Bahman Tohidi, Heriot-Watt University

288. **Effects of Elevated CO_2 on the Nitrification Activity of Microorganisms in Marine Sediment**
Masatoshi Hayashi, Yuji Watanabe, Akifumi Shimamoto, KANSO Technos; Jun Kita, RITE

289. **A Numerical Study on CO_2 Seepage from Offshore Geologic Storage Site**
Cheul Huh, Jung-Yeul Jung, Meang-Ik Cho, Seong-Gil Kang, Korea Ocean Research and Development Institute

290. **Assessing Model Uncertainties Through Proper Experimental Design**
Hilde Kristine Hvidevold, Guttorn Alendal, Truls Jahannessen, Trond Mannseth, University of Bergen

291. **Effects of Impurities in CO_2 Stream on Marine Organisms**
Jun Kita, RITE; Hideaki Kinoshita, MERI

292. **Werkendam, The Dutch Natural Analogue for CO_2 Storage – Long-Term Mineral Reactions**
Marielle Koenen, Laura J. Wasch, Marit E. van Zalinge, Susanne Nelskamp, TNO

293. **Estimation of Mass Transfer Coefficient of Contaminant Migration Across CO_2 - Brine Interface in CO_2 Geological Sequestration**
Yong Yang, Yongzhong Liu, Xiaoli Zhang, Xi'an Jiaotong University

294. **Monitoring the Safety of CO_2 Sequestration in Jingbian Field, China**
Jinfeng Ma, Xiaoli Zhang, Yimmao Wei, Zhenliang Wang, Junjie Ma, Shaojing Jiang, Lin Li, Northwest University; Xiangzeng Wang, Ruimin Gao, Chunxia Huang, Shaanxi Yanchang Petroleum Co. Ltd.

295. **Simulated CO_2 Leakage Experiment in Terrestrial Environment: Monitoring and Detecting the Effect on a Cover Crop Using 13C Analysis**
Christophe Moni, Daniel Rasse, Bioforsk

296. **Simulations of Upward Leakage of CO_2 in Long-Column Flow Experiments: The Impact of Boundary Conditions and Three-Phase Relative Permeability**
Curtis Oldenburg, Cristine Doughty, Patrick Dobson, Lawrence Berkeley National Laboratory; Catherine Peters, Princeton University

297. **Hypothetical Impact Scenarios for CO_2 Leakage from Storage Sites**
Alan Paulley, Richard Metcalfe, Michael Egan, Philip Maul, Quintessa Ltd; Laura Limer, Limer Scientific Consulting Ltd; Alv-Arne Grimstad, SINTEF Petroleum Research

298. **Numerical Prediction of the Diffusion of CO_2 Seeping from Seabed in Ardmuchnish Bay**
Chaki Mori, Toru Sato, Yuki Kano, University of Tokyo; Dmitry Aleynik, Scottish Association for Marine Science

299. **Mixing Gas Migration in Fractured Rock Through Unsaturated and Water-Saturated Layer: Result of a Pneumatic Gas Injection Test**
Very Susanto, Kyuro sasaki, Yuichi Sudai, Teruhisa Yamashiro, Kyushu University

300. **An Experimental Study of the Effects of Potential CO_2 Seepage in Sediments**
Yang Wei, CICCS and NCCCS and University of Nottingham; Giorgio Caramann, Mercedes Maroto-Valer, CICCS and NCCCS; Paul Nathanial, Michael Steven, University of Nottingham

Experiences

301. **Assessing Field Pressure and Plume Migration in CO_2 Storages: Application of Case-Specific Workflows at In Salah and Sleipner**
Jean-Pierre, Deflandre, Audrey Estublier, Axelle Baroni, Alexander Fornel, Vincent Clochard, Nicolas Delepine, IFP Energies Nouvelles

302. **Effect of Reservoir Heterogeneity of Haizume Formation, Nagaoka Pilot Site, based on High-Resolution Sedimentological Analysis**
Shun Chiyonobu, Takahiro Nakajima, Yi Zhang, Zique Xue: RITE; Takeshi Tsuji, Kyoto University

303. **Sensitivity Study of the Reactive Transport Model for CO_2 Injection into the Utsira Saline Aquifer Using 3D Fluid Flow Model History Matched with 4D Seismic Data**
Audrey Estublier, Alexander Fornel, Teddy Parra, Jean-Pierre Defalndre, IFP Energies Nouvelles

304. **The Site Monitoring of the Lacq Industrial CCS Demonstration Project (France). Lessons Learned after Two Years and a Half of CO_2 Injection**
Marc Lescanne, Catherine Prinet, Daniel Avila, Jean-Claude Miqueu, Jacques Monne, TOTAL

305. **Multi-Phase Equilibrium in a CO_2-Filled Observation Well at the Ketzin Pilot Site**
Matteo Loizzo, Actys BEE; Jan Hennings, Martin Zimmer, Axel Liebscher, GFZ German Research Center for Geosciences

306. **Overview, Status and Future of the Fort Nelson CCS Project**
James Sorensen, Charles Gorecki, Lisa Botnen, Edward Steadman, John Harju, EERC

307. **Role of Impurities on CO_2 Injection: Experimental and Numerical Simulation of Thermodynamic Properties of Water-Salt-Gas Mixtures (CO_2 + Co-Injected Gases) Under Geological Storage Conditions**
Jerome Sterpenich, Jean-Noel Jaubert, Eric Favre, Université de Lorraine; Mohamed Azarouel, BRGM; Veroniquie Lachet, IFPEN; Christophe Coquelet, Vincent Lagneau, ARMINES; Pierre Chiquet, Total

308. **Lessons in the Development of Storage Projects from the Global CCS Institute Project Support Program**
Steve Whittaker, Kathy Hill, Angeline Kneppers, Global CCS Institute

Modelling Tools & Approaches

309. **Development of TOUGH-FrontISTR, a Numerical Simulator for Environmental Impact Assessment of CO_2 Geological Storage**
Ryosuke Aoyagi, Ryuta Imai, Hiroyuki Kobayashi, Osamu Kitamura, Nobuhisa Goto, Mizuho Information and Research Institute, Inc; Jonny Rutqvist, Lawrence Berkeley National Laboratory

310. **New Developments from the Coupled Simulator ECLIPSE–OpenGeoSys for Simulation of CO_2 Storage – Geomechanical Feedback on the Fluid Flow**
Katharina Benisch, Sebastian Bauer, University of Kiel; Bastian Graupner, Swiss Federal Nuclear Safety Inspectorate ENSI

311. **Prediction of Plume Migration Using Injection Data and a Model Selection Approach**
Sayantan Bhowmik, Sanjay Srinivasan, Steven Bryant, University of Texas at Austin

312. **A High Resolution Approach to Simulating Regional Migration and Well Risk at the IEAGHG Weyburn-Midale CO_2 Storage Project**
Andrew Cavanagh, Landmark-Halliburton; Benjamin Rostron, University of Alberta

313. **Impact of Co-Injected Gases on CO_2 Storage Sites: Geochemical Modeling of Experimental Results**
Jerome Corvisier, Anne-Flore Bovalot, Vincent Lagneau, MINES ParisTech, Geosciences Center; Pierre Chiquet, TOTAL, CSTJF; Stephane Renard, Universite de Lorraine, G2R Laboratory and IFP Energies Nouvelles; Jerome Sterpenich, Jacques Pironon, Universite de Lorraine, G2R Laboratory

314. **A Methodology to Assess Increased Storage Capacity Provided by Fracture Networks at CO_2 Storage Sites: Application to In Salah Storage Site**
James Smith, Sevket Durucan, Anna Korre, Ji-Quan Shi, Imperial College London

315. **A Coupled Reservoir Simulation-Geomechanical Modelling Study of the CO_2 Injection-Induced Ground Surface Uplift Observed at Krechba, In Salah**
Ji-Quan Shi, James Smith, Sevket Durucan, Anna Korre, Imperial College London

316. **Effect of CO_2 Injection Temperature on Caprock Stability**
Gennady Gor, Jean-Herve Prevost, Princeton University

317. **The Role of Static and Dynamic Modelling in the Fort Nelson CCS Project**
Charles Gorecki, Terry Bailey, Guoxiang Liu, James Sorensen, Edward Steadman, EERC

318. **Stochastic Predictions on CO_2 Leakage Potentials Based on Geostatistical Simulations in Heterogeneous Fields**
Weon Shik Han, Ozlem Acar, Eungyu Park, Kyungpook National University; Kue-Young Kim, Korea Institute of Geoscience and Mineral Resources

319. **On Uncertainties in Modeling CO_2-Brine-Caprock Interactions**
Dag Wessel-Berg, University of Oslo

320. **Dynamic Models of CO_2 Injection in the Surat and Bowen Basins, Queensland, Australia**
Suzanne Hurter, Peter Probst, Yusuf Pamucku, Sebastian Gonzalez, Schlumberger Carbon Services; Andrew Garnett, Formerly CEO & Project Director ZeroGen, Australia

321. **Accelerating of the Reservoir Simulator TOUGH2 by GPU**
Yusuke Ishizawa, Keita Matsumoto, Progress Technologies, Inc; Kozo Sato, The University of Tokyo; Komei Okatsu, Yuji Miyake, Japan Oil, Gas and Metals National Corporation

322. **Uncertainty Quantification of CO_2 Plume Migration Using Static Connectivity of Geologic Features**
Hooyoung Jeong, Sanjay Srinivasan, Steven Bryant, The University of Texas at Austin

323. **Development of a SAFT Equation of State for the H_2S-CO_2-H_2O-NaCl System for CO_2 Geological Storage with Co-Injection of H_2S**
Xiaoyan Ji, Lulea University of Technology; Chen Zhu, Indiana University and University of Oslo

324. **Investigation of Potential Far Field Impacts on Freshwater Resources Related to CO_2 Storage: a Case Study of the HARP Project Site in Alberta, Canada**
Jon Jones, Alberta Innovates - Technology Futures and University of Waterloo; James Brydie, Ernie Perkins, Alberta Innovates - Technology Futures

325. **Effects of Heterogeneous Seal Layer Property on The Long-Term Behaviour of CO_2 Injected into Deep Saline Aquifers**
Yuki Kano, Tsuneo Ishido, Geological Survey of Japan/AIST

326. **CO_2-Brine-Mineral Interfacial Reactions Coupled with Fluid Phase Flow**
Dedong Li, Christof Beyer, Sebastian Bauer, University of Kiel

327. **Modeling of Carbon Dioxide Plume Migration for Saline Aquifer in Northern Taiwan**
Neng Chuan Tien, Chi Wen Liao, Lun Tao Tong, Industrial Technology Research Institute

328. **Investigating Stress Path Hysteresis in a CO_2 Injection Scenario using Coupled Geomechanical-Fluid Flow Modelling**
Tom Lynch, Doug Angus, Quentin Fisher, Piroska Lorinczi, University of Leeds

329. **Simulating CO_2 Injection and Storage with Limited Site Data: Utility of a Variably Complex Modeling Approach**
Walt McNab, Jeff Wagoner, Lawrence Livermore National Laboratory; John Rupp, Kevin Ellet, Indiana Geological Survey

330. **Development of a Basin-Scale Model for CO_2 Sequestration in the Basal Sandstone Reservoir of the Illinois Basin— Issues, Approach and Preliminary Results**
Edward Menhert, James Damico, Scott Frailey, Hannes Leetaru, Roland Okwen, Illinois State Geological Survey; Yu-Feng Lin, Illinois State Water Survey; Nathaniel Adams, Brynne Storsved, Albert Valocchi, University of Illinois

331. **Whole-System Process Modelling of CO_2 Storage and its Application to The In Salah CO_2 Storage Site, Algeria**
Richard Metcalfe, Alex Bond, Philip Maul, Alan Paulley, Quintessa Limited

332. **Asessing the Geomechanical Responses of Storage System in Geological CO_2 Storage: An Introduction of Research Program in the National Institute for Advanced industrial Science and technokogy (AIST)**
Yasuko Okuyama, Takahiro Funatsu, Xinglin Lei, Takashi Fuji, Shinsuke Nakao, Institute for Geo-Resources and Environment, GSJ, AIST; Shinichi Uehara, Toho University

333. **Large-Scale Impact of CO_2 Storage Operations: Dealing with Computationally Intensive Simulations for Global Sensitivity Analysis**
Jeremy Rohmer, Benoit Issautier, Christophe Chiaberge, Pascal Audigane, BRGM

334. **A Simulation Study of Simultaneous Acid Gas EOR and CO_2 Storage at Apache's Zama F Pool**
Dayanand Saini, Charles Gorecki, Damion Knudsen, James Sorensen, Edward Steadman, EERC

335. **Systematic Benchmark Development for Geological CO_2 Storage**
Ashok Singh, Joshua Taron, Wenqiung Wang, Uwe-Jens Görake, Helmholtz Centre for Environmental Research - UFZ; Norbert Böttcher, University of Technology Dresden; Olaf Kolditz, Helmholtz Centre for Environmental Research - UFZ; University of Technology Dresden

336. **Optimizing CO_2 Storage in a Deep Saline Aquifer with the Capacitance-Resistive Model**
Qing Tao, Steven Bryant, The University of Texas at Austin

337. **Modeling of Temperature Effects in CO_2 Injection Wells**
Arron Alie Tchouka Singhe, Guenter Pusch, Leonhard Ganzer, Clausthal University of Technology; Jann Rune Ursin, University of Stavanger; Jan Henninges, German Research Center for Geosciences

338. **Best Practices for Reservoir Modeling of Geologic CO_2 Storage**
Gary Teletzke, Pengbo Lu, ExxonMobil Upstream Research

339. **Mechanistic Modelling of CO_2 Storage in Weyburn CO_2-EOR Field - Numerical History Match and Prediction**
Mafiz Uddin, Alireza Jafari, Ernie Perkins, Alberta Innovates - Technology Futures

340. **Influence of Capillary Pressure and CO_2 Injection Rate as well as Heterogeneous and Anisotropic Permeability on Transport and Geologic Storage Efficiency of CO_2 in Saline Aquifer**
Dayong Wang, Mingloing Zhao, Yongchen Song, School of Energy and Power Engineering

341. **Numerical Studies on Field Scale Aquifer Storage of CO_2 Containing N_2**
Ning Wei, Xiaochun Li, Yan Wang, Ying Wang, Weizhong Kong, Chinese Academy of Sciences

342. **Fully Coupled Well Models for Fluid Injection and Production**
Mark White, Diana Bacon, Signe White, Fred Zhang, Pacific Northwest National Laboratory

343. **Implementations of a Flexible Framework for Managing Geologic Sequestration Modeling Projects**
Singe White, Luke Gosink, Chadrika Sivaramakrishnan, Gary Black, Sumit Purohit, Diana Bacon, Guang Lin, Ian Gorton, Alain Bonneville, Pacific Northwest National Laboratory

344. **High-Performance Supercomputing as a Risk Evaluation Tool for Geological Carbon Dioxide Storage**
Hajime Yamamoto, Shinichi Nanai, Taisei Corporation; Keni Zhang, Beijing Normal University; Pascal Audigane, Christophe Chiaberge, BRGM; Ryusei Ogata, NEC Corporation; Noriaki Nishikawa, Yuichi Hirokawa, Satoru Shingo, Japan Agency for Marine-Earth Science and Technology; Kengo Nakjima, The University of Tokyo

345. **Study on Geomechanical Stability of the Aquifer-Caprock System During CO_2 Sequestration by Coupled Hydromechanical Modelling**
Shuichi Yamamoto, Satoru Miyoshi, Kenichiro Suzuki,Obayashi Corporation

Monitoring Technologies and Techniques

346. **Methodology for Evaluating Technical Risks and Monitoring Methods Selection for CO_2 Geological Storage in Oltenia Region**
Sorin Anghel, Constantin Sava, Alexandra Dudu, GeoEcoMar - National Institute of Marine Geology and Geoecology

347. **Experiences with a Permanently Installed Seismic Monitoring Array at the CO_2 Storage Site at Ketzin (Germany)**
Rob Arts, Mei Zhang Arie Verdel, Sjef Meekes, Vincent Vandeweijer, TNO; Dario Santonico; R.P Noorlandt, Delft Technical University and Deltares; B.F Paap, TNO and Deltares

348. **Multifunctional Sensor for Monitoring of CO_2 Underground Storage by Comprehensive and Spatially Resolved Measuring of Gas Concentrations, Temperature and Structural Changes**
Matthias Bartholmai, Patrick Neumann, BAM Federal Institute for Materials Research and Testing

349. **The Laboratory Simulation and Field Verification of Seasonal Soil-Respired CO_2 Flux at a Proposed CCS Project Site**
James Brydie, Robert Faught, Mark Olson, Andrew Underwood, Bonnie Drozdowski, Alberta Innovates - Technology Futures

350. **Applicability of Long-Range Seismic Noise Correlation for CO_2 Geological Storage Monitoring**
Mickael, Delatre, Jean-Charles Manceau, BRGM

351. **Application of an Unsupervised Methodology for the Indirect Detection of CO_2 Leakages Around the Laacher See Lake in Germany Using Remote Sensing Data**
Rajesh Givinda, Anna Korre, Sevket Durucan, Imperial College London

352. **Monitoring Underground Migration of Sequestered CO_2 using Self-Potential Methods**
Tsuneo Ishido, Toshiyuki Tosha, Yuji Nishi, Geological Survey of Japan, AIST; John Pritchett, Science Applications International Corporation; Shigetaka Naknishi, J-Power

353. **Real Time Imaging of CO_2 Storage Zone by Very Accurate-Stable-Long-Term Seismic Source**
Junzo Kasahara, Ryoya Ituka, Naoyuki Fujii, Shizoka University; Shinji Ito, Tomohiro Fujiwara, NTT-data-CCS Co. Ltd; Yoko Hasada, Daiwa Exploration and Consulting Co. Ltd; Kayoko Tsuruga, Tokyo University; Koshunm Yamaoka, Nagoya University; Kiyoshi Ito, Kinya Nishigami, DPRE, Kyoto University

354. **Experimental and Numerical Study of Residual CO_2 Trapping in Porous Sandstone**
Keigo Kitamura, RITE and Kyushu University; Tetsuya Kogure, Osamu Nishizawa, Ziqiu Xue, RITE

355. **The Synergistic Pursuit of Advances in MMV Technologies for CO_2–Enhanced Recovery and CO_2 Storage**
Vello Kuuskraa, Tyler Van Leeuwen, Advanced Resources International, Inc.; Phil Dipietro, John Litynski, U.S. DOE/NETL

356. **Experimental Laboratory Study on the Acoustic Response of Sandstones During Injection of Supercritical CO_2 on CRC2 sample from Otway Basin Australia**
Maxim Lebedev, Vassili Mikhaltsevitch, CO2CRC/Curtin University; Olga Bilenko, Curtin University; Tess Dance, CO2CRC/CSIRO; Marina Pervukhina, CSIRO; Boris Gurevich, CO2CRC/Curtin University/CSIRO

357. **U.S. Department of Energy Efforts to Advance Remote Sensing Technologies for Monitoring Geologic Storage Operations**
John Litynski, U.S. DOE NETL; Ram Srivastava, Derek Vikara, Malcolm Webster, Keylogic, Inc

358. **Application of Improved Injection Well Temperature Model to Cranfield Measurements**
Zhiyuan Luo, Steven Bryant, The University of Texas at Austin; Tip Meckel, Bureau of Economic Geology, The University of Texas at Austin

359. **Feasibility Study for Using 2D Surface Seismic Surveys as a Monitoring Tool for Large Scale CO_2 Storage in the Gippsland Basin, Victoria, Australia**
Norzita Mat Fiah, L. Pekot, F. Poupeau, Aline Gendrin, Schlumberger Carbon Services; Andrew Garnett, Carbon Geostore Management Pty Ltd

360. **Development of a Permanent OBC System for CCS Monitoring in Shallow Marine Environments**
Akihisa Takashi, Naoshi Aoki, JGI, Inc.; Ziqiu Xue, RITE

361. **Monitoring of CCS Areas Using MUAVs**
Patrick Neumann, M. Bartholmai, BAM Federal Institute for Materials Research and Testing; Sahar Asadi, Victor Hernandez Bennetts, Achim J. Lilienthal, Center for Applied Autonomous Sensor Systems

362. **CSEM Sensitivity Study for Sleipner CO_2-Injection Reservoir Monitoring**
Joonsang Park, Manzar Fawad, Inge Viken, Eyvind Aker, Tore Ingvald Bjørnarå, Norwegian Geotechnical Institute

363. **A Sensitivity Study of Pressure Monitoring to Detect Fluid Leakage from Geological CO_2 Storage Site**
Yong-Chan Park, Dae-Gee Huh, Chan-Hee Park, Korea Institute of Geoscience & Mineral Resources

364. **Metagenomics in CO_2 Monitoring**
Anne Gunn Rike, NGI; Othilde Elise Håvelsrud, NGI and University of Oslo; Thomas H.A. Haverkamp, Kjetill S Jocobsen, CEES and University of Oslo; Tom Kristensen, MERG and University of Oslo

365. **Applications of Non-Linear Elastic Wavefield Inversion for 4D Seismic Data to Characterize the Injected Carbon Dioxide**
Akio Sakai, Japan Petroleum Exploration Co.,Ltd.

366. **An Integrative Hierarchic Monitoring Approach for Detecting and Characterizing CO2 Releases**
Uta Sauer, Claudia Schütze, Peter Dietrich, Helmholtz Centre for Environmental Research (UFZ); Carsten Leven, University of Tübingen; Stefan Schlömer

367. **CO_2 Rock Physics: Laboratory Measurements of the Seismic Properties of Weyburn Project Carbonate Rocks**
Douglas Schmitt, Gauier Njiekak, Helen Yam, Randy Kofman, Mizan Chowdhury, University of Alberta

368. **Ground-Based Remote Sensing with Open-Path Fourier Transform Infrared (OP-FTIR) Spectrometry for Large-Scale Monitoring of Greenhouse Gases**
Claudia Schütze, Steffen Lau, Nils Reiche, Uta Sauer, Helkp Borsdorf, Peter Dietrich, Helmholtz Centre for Environmental Research (UFZ)

369. **Continuous Gravity Monitoring for CO_2 Geo-Sequestration**
Mituhiko Sugihara, Kazunari Nawa, Yuji Nishi, Tsuneo Ishido, Nobukazu Soma, AIST/GSJ

370. **Reservoir Fluid Monitoring in Carbon Dioxide Sequestration at Cranfield**
Sandeep Verma, Charles Oakes, T.S. Ramakrishnan, Schlumberger Doll Research, Seyyed Hosseini, Sue Hovorka, GCCC, BEG, University of Texas

371. **Geochemical Study on CO_2-Rich Waters of Daepyeong Area, Korea: Monitoring Implication for CO_2 Geologic Storage**
Byoung-Woo Yum, Gi-Tak, Chae, Minki Jo, Jeong-Chan Kim, KIGAM

372. **Correlation Analysis for Online CO_2 Leakage Monitoring in Geological Sequestration**
Zaoxiao Zhang, Denglong Ma, Jianqiang Deng, Xi'an Jiaotong University

Remediation and Contingency Planning

373. **From Geochemical Baseline Studies to Characterization and Remediation of Gas Leaks: Experiences and Case Studies of the French Institute for Risk Management (INERIS)**
Stéphane Lafortune, Zbigniew Pokryszka, Gaëtan Bentivenga, Régis Farret, INERIS

Reservoir Engineering

374. **Mass Transfer Coefficient for Carbon Dioxide Dissolution into Brine**
Christopher Blyton, Steven Bryant, The University of Texas at Austin

375. **Influence of Heterogeneities and Upscaling on CO_2 Storage Prediction at Large Scale in Deep Saline Aquifer**
Sarah Bouquet, Dominique Bruel, Chantal De Fouquet, Mines ParisTech

376. **Does Injected CO_2 Affect Reservoir System Integrity? A Comprehensive Experimental Approach**
Sebastian Fischer, Helmholtz Centre Potsdam, GFZ German Research Centre for Geosciences and Berlin Institute of Technology; Axel Liebscher, Kornelia Zemke, Marco De Lucia, Helmholtz Centre Potsdam, GFZ German Research Centre for Geosciences

377. **Core Analyses as Tools for Modeling Saline Aquifers**
Hiroshi Kameya, Hiroyuki Azuma, Shinichi Hiramatsu, Oyo Corporation; Chi-Wen Yu, Sinotech Engineering Consultants, Inc.; Chung-Hui Chiao, Taiwan Power Company / National Taiwan University; Ming-Wei Yang, Taiwan Power Company

378. **Effect of Sub-Core Scale Heterogeneity on Relative Permeability Curves of Porous Sandstone in Water-Supercritical CO_2 System**
Tetsuya Kogure, Osamu Nishizawa, Shun Chiyonobu, Yukihiro Yazaki, Seiji Shibatani, Ziqiu Xue, RITE

379. **Ground Heaving and Leakage Analysis for Sequestration of CO_2 in Geological Media Considering Fractures in Caprock**
Jaewon Lee, Ki-Bok, Seoul National University; Jonny Rutqvist, Lawrence Berkeley National Laboratory

380. **Feasibility of the Combination of CO_2 Storage and Saline Water Development in Sedimentary Basins of China**
Qi Li, Guizhen Liu, Bing Bai, Xiaochun Li, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences; Xuehao Liu, Miao Jing, The Graduate University of Chinese Academy of Sciences

381. **Offshore CCS in the Northern Gulf of Mexico and the Significance of Regional Structural Compartmentalization**
Timothy Meckel, Ramon Trevino, David Carr, Andrew Nicholson, Kersten Wallace, Gulf Coast Carbon Center, Texas Bureau of Economic Geology

382. **Evaluation of CO_2 Storage Potential, Injectivity and Uncertainly by the Numerical Analysis on Feasibility Study Sites**
Seiichi Ikeda, Masao Ohoka, Satoshi Tomimori, Shouchi Hishida, Mariko Seguchi, Jyunya Takeshima, Hiroyuki Azuma, OYO Corporation; Masato Takagi, Kazuo Koide, Jyunich Shimizu, RITE

383. **Dehydration of Gypsum under Dry CO_2 Injection**
Jacques Pironon, Jean Dubessy, Jérôme Sterpenich, Pascal Robert, Khadija Andjar, Aurélien Randi,CNRS-Université de Lorraine; Marc Parmentier, Arnaud Lassin, BRGM; Stéphane Renard, CNRS-Université de Lorraine and IFPEN

384. **Global Optimization of Injection Well Placement Toward Higher Safety of CO_2 Geological Storage**
Takashi Goda, Kozo Sato, The University of Tokyo

385. **Improvement of CO_2 Geological Storage Efficiency by Injection and Production Well Design**
Key Tanaka, Javier Vilcáez, Kozo Sato, The University of Tokyo

386. **CO_2 Injection in a Saline Formation: Pre-Injection Reservoir Modeling and Uncertainty Study for Illinois Basin-Decatur Project**
Ozgur Senel, Schlumberger Carbon Services; Nikita Chugunov, Schlumberger-Doll Research

387. **Effective Storage Capacity Study in a Deep Saline Aquifer within a Young Sedimentary Basin**
Chung-Hui Chiao, National Taiwan University and Taiwan Power Company; Kuo Shih Shao, Yi-Rui Lee, Chi-Wen Yu, Sinotech Engineering Consultants, Inc.; Lian-Tong Hwang, Taiwan Power Company; Chai-Yu Lu, National Taiwan University

388. **Optimization of Injection/Extraction Rates for Surface Dissolution Process**
Qing Tao, Steven Bryant, The University of Texas at Austin

389. **Development of Carbon Dioxide Microbubble Sequestration into Saline Aquifer and CO_2-EOR Reservoirs**
Ziqiu Xue, RITE; Shinya Tsuji, Toshifumi Matsuoka, Kyoto University; Hiromichi Kameyama, Susumu Nishio, Technology Research Institute, Tokyo Gas Co., Ltd

390. **Simulation Study of CO_2 Micro-Bubble Generation though Porous Media**
Hirotatsu Yamabe, Toshifumi Matsuoka, Kyoto University; Kenichi Nakaoka, INPEX Cooperation; Ziqiu Xue, RITE; Hiromichi Kameyama, Susumu Nishio, Tokyo Gas Co., Ltd

Risk Assessment and Management

391. **ULTimateCO_2 : A FP7 European Project Dedicated to the Understanding of the Long Term Fate of Geologically Stored CO_2**
Pascal Audigane, BRGM; Steven Brown, CO2SENSE; Alain Dimier, EIFER; Peter Frykman, GEUS; Fabrizio Gherardi, IGG-CNR; Yan Le Gallo, GEOGreen; Nicolas Maurand, IFPEN; Anne Marie Muntendam, TNO; Heie Rüters, BGR; Jonathan Pearce, BGS Chris Spiers, University of Utrecht; Thierry Yalamas, PHI-MECA Engineering

392. **Particle Image Velocimetry for Quantificaton of High Pressure CO_2 Release**
Arjen de Jong, Mark Spruijt, TNO

393. **Small Scale Jet-Release Studies of High Pressure and Supercritical CO_2 for Release and Dispersion Model Validation**
Corina Hulsbosch, Mark Spruijt, Arjen de Jong, Jacco Moorhoff, Henny Veerman, John Zevenbergen; TNO

394. **An Experimental Investigation of Liquid CO_2 Release through a Capillary Tube**
Jooil Kim, Daejun Chang, Sang Heon Han, KAIST

395. **A Tool for Integrating and Communicating Performance-Relevant Information in CO_2 Storage Projects: Description and Application to In Salah**
Richard Metcalfe, Alan Paulley, Paul Suckling, Claire Watson, Quintessa Limited

396. **Risk Assessment and Management Associated with CCS using Fault Tree Analysis**
Behdeen Oraee-Mirzamani, Tim Cockerill, Zen Makuch, Imperial College London

397. **Numerical Study on Flow Behaviour of CO_2 Around Injected Well for Risk Assessment of Carbon Capture and Storage**
Yasuhide Sakamoto, Atsuko Tanaka, Norio Tenma Takeshi Komai, National Institute of Advanced Industrial Science (AIST)

398. **Technical Work Processes for Qualifying Geological CO_2 Storage**
Gøril Tjetland, Espen Erichsen, Ross Offshore; Hallvard Høydalsvik, Gassnova SF; Fredrik Gillebo, Deloitte

399. **Containment Risk Management for CO_2 Storage in the Goldeneye Depleted Gas Field, UK North Sea**
Owain Tucker, Martin Holley, Shell Projects and Technology

400. **Experimental Data from CO_2 Releases from a Saturated Liquid Reservoir using High Speed Camera and Laser Illumination**
Knut Vaagsaether, Sindre Toesse, Joachim Lundberg, Andre Gaathaug, Dag Bjerketvedt, Telemark University College; Sandra Nilsen, Statoil ASA

401. **Integrated Carbon Risk Assessment (ICARAS)**
Ton Wildenborg, Jens Wollenweber, Danijela Sijacic, Manuel Nepveu, Ingrid Raben, TNO; Daniel Busby, Dan Bossie Codreanu, IFP Energies Nouvelles; Dag Wessel-Berg, Alve Arne Grimstad, Ane Lothe, SINTEF, Norway

402. **Features Events and Processes (FEPs) and Scenario Analysis in the Field of CO_2 Storage**
Kohei Yamaguchi, Koichi Takizawa, Hironobu Komaki, Ziqiu Xue, RITE; Richard Metcalfe, Quintessa Limited; Masaaki Yamaguchi, Quintessa Japan; Hiroyasu Kato, Shinzo Ueta, Mitsubishi Materials Corporation

403. **Comparison of CO_2 and Natural Gas Recovery from a Storage Site**
Yueng Yip, Antonio Baclig, Ernst van Niero, Mark Henle, Shipeng Fu, C12 Energy

Site Characterisation and Selection

404. **Evaluating Seal Quality for Potential Storage Site in the North Sea**
Matthiue Angeli, Roy Gabrielsen, Jan Inge Faleide, University of Oslo

405. **Integrated Approach to CO_2 Storage Assessment in the Offshore South Perth Basin, Australia**
Irina Borissova, John Kennard, Danielle Robertson, Megan Lech, Liuqi Wang, Chris Lewis, Chris Southby, Geoscience Australia

406. **New Certification Framework for CO_2 Storage Sites**
Mike Carpenter, Jørg Aarnes, Todd Flach, Elisabeth Rose, DNV

407. **Monitoring Approaches for Detecting and Evaluating CO_2 and Formation Water Leakages into Near-Surface Aquifers**
Frank Dethlefsen, Ralf Kober, Dirk Schafer, Andreas Dahmnke, Said Attia al Hagrey, Jochen Grossman, Matthias Beyerb,University of Kiel

408. **Development of Key Performance Indicators for CO_2 Storage Operability and Efficiency Assessment: Application to the Southern North Sea Rotliegend Group**
Anna Korre, Sevket Durucan, Ji-Qian Shi, Amer Syed, Rajesh Govindan, Imperial College London; Sarah Hannis, John Williams, Gary Kirby, Martyn Quinn, British Geological Survey

409. **To a Dynamic Update of the Sleipner CO_2 Storage Geological Model**
Alexandre Fornel, Audrey Estublier, IFP Energies Nouvelles

410. **Preliminary Containment Evaluation in the Surat and Bowen Basins, Queensland, Australia**
Sebastian Gonzalez, Suzanne Hurter, Schlumberger Carbon Services; Andrew Garnett, Formerly CEO & Project Director ZeroGen

411. **Cross-International Boundary Effects of CO_2 Injection**
Sarah Hannis, Stephanie Bricker, Aaron Goater, Sam Holloway, Jeremy Rushton, Gareth Williams, British Geological Survey

412. **Reservoir Evaluation for the Moebetsu Formation at Tomakomai Candidate Site for CCS Demonstration Project in Japan**
Daisuke Ito, Jun Mikami, Mitsuru Kamon, Koji Kawada, Mizue Nishimura, Satoru Tomita, Kohei Akaku, Tatsuhiko Matsuura, Japan Petroleum Exploration Co., Ltd; Takao Inamori, JGI, Inc.; Yoshiniri Yamanouchi, Japan CCS Co., Ltd

413. **Refinement Of The Weyburn-Midale Geological and Hydrogeological Model: Develop a Better Understanding of the Heterogeneity Present to Determine Reservoir Response to Injected CO_2 and Subsequent CO_2 Movement**
Gavin Jensen, Saskatchewan Geological Survey; Erik Nickel, Petroleum Technology Research Centre; Ben Rostron, University of Alberta

414. **Seismic Reflection Survey to Allocate 3000m Deep Target Formation in a Preferred Carbon Sequestration Site**
Wen-Chung Ko, Chi-Wen Yu, Sinotech Engineering Consultants, Inc; Chung-Hui Chiao, Lian-Tong Hwang, Ming-Wei Yang, Taiwan Power Company

415. **Planning a Pilot Injection Test for a 3000m Deep Saline Aquifer in a Preferred Carbon Sequestration Site**
Chi-Wen Yu, Wen-Chung Ko, Sinotech Engineering Consultants, Inc; Chung-Hui Chiao, Lian-Tong Hwang, Ming-Wei Yang, Taiwan Power Company

416. **Pre-Competitive Data Acquisition Program for CO_2 Storage in Australia**
Robert Langford, Irina Borissova, Alfredo Chirinos, Paul Henson, Andrew Heap, Geoscience Australia

417. **Reservoir Evaluation for the T1 Member of the Takinoue Formation at Tomakomai Candidate Site for CCS Demonstration Project in Japan**
Jun Mikami, Daisuke Ito, Mitsuru Kamon, Arata Katoh, Sinjiro Kuroki, Kohei Akaku, Tatsuhiko Matsuura, Japan Petroleum Exploration Co. Ltd; Takuya Maeda, Takao Inamori, JGI, Inc; Yoshinori Yamanouchi, Japan CCS Co. Ltd.

418. **Progress Report of AIST's Research Programs for CO_2 Geological Storage**
Shinsuke Nakao, Toshiyuki Tosha, Geological Survey of Japan, AIST

419. **Site Characterisation for CO_2 Storage: a Workflow Aligned with the EU Storage Directive**
Filip Neele, Manuel Nepveu, Cor Hoftsee, Jens Wolleneber; TNO; Florence Delprat-Jannaud, Olivier Vincke, IFPEN; Valentina Volpi, OGS; Ane Lothe, SINTEF; Suzanne Brunsting, ECN; Jonathan Pearce, BGS

420. **Evaluation of CO_2 Storage Potential for Feasibility Study Sites on Innovative Zero-Emission Coal Gasification Power Generation**
Masao Ohoka, Tadashi Araya, Masaru Nakamura, Syoichi Nishiyama, Chisato Konishi, Mio Shimoyama, OYO Corporation; Kazuo Koide, Jyunich Shimizu, Chikara Iwamoto, RITE

421. **Experimental Investigations in CO_2 Sequestration and Shale Caprock Integrity**
Abiola Olabode, Mileva Radonjic, Craft & Hawkins Louisiana State University

422. **Challenges with Qualification of Storage Sites for CCS in Deep Aquifers Exemplified by the Mongstad Storage Site Study, Norway**
Kari-Lise Rørvik, Lise Horntvedt, Espen Erichsen, Trude Ravn, Per Ola Andfossen Hallvard Høydalsvik, Eirik Harding Hansen, Gassnova SF

423. **Petrophysical Properties and Capacity of Prospective for CO_2 Geological Storage Baltic Offshore and Onshore Structures**
Kazbulat Shogenov, Alla Shogenova, Tallinn University of Technology; Vizika-Kavvadias Olga, IFP Energies Nouvelles

424. **Core Scale and Pore Scale Characterization of Liujiagou Sandstone, Ordos Basin, China for CO_2 Aquifer Storage**
Yan Wang, Ning We, Ying Wang, Xiaochun Li, Chinese Academy of Sciences; Kathy Bruner, Dustin Crandall, URS Corporation; Igor Haljasmaa, Grant Bromhal, U. S. DOE, NETL

425. **Portfolio Analysis of Carbon Sequestration Technologies and Barriers to Adoption: General Methodology and Application to Geological Storage**
Jillian Young-Lorenz, David Lumley, University of Western Australia

Storage Capacities

426. **CO_2 Storage Potential in the Nordic Region**
Karen L. Anthonsen, Geological Survey of Denmark and Greenland; Per Aagaard, University of Oslo; Per E.S. Bergmo, SINTEF Petroleum Research; Mikael Erlström, Geological Survey of Sweden; Sigudur R. Gidlason, University of Iceland; Ane Lothe, SINTEF Petroleum Research

427. **CO_2 Geological Storage in the Province of Québec, Canada – Basin-Scale Prospectivity Assessment and Capacity Evaluation**
Karine Bédard, Michel Malo, Félix-Antoine Comeau, Institut National de la Recherche Scientifique

428. **The Occurrence of Faults in the Bunter Sandstone Formation of the UK Sector of the Southern North Sea and the Potential Impact on Storage Capacity**
Michelle Bentham, BGS; Andrew Green, Dennis Gammer, ETI

429. **Towards International Guidelines for CO_2 Storage Resource Estimation**
Sean Brennan, Peter Warwick,USGS; Rick Causebrook, Geoscience Australia; Peter Gerling, BGR; Wolf Heidug, Juho Lipponen, Sean McCoy, IEA; Sam Holloway, BGS; Henk Pagnier, TNO; Don White, GSC

430. **CO_2 Storage Capacity Assessment in the Deep Saline Aquifers of Southern Israel**
Ran Calvo, Zohar Gvirtzman, Geological Survey of Israel

431. **CO_2 Storage Capacity of Campos Basin's Oil Fields, Brazil**
Gabriela Camboim Rockett, Joao Marcello Medina Ketzer, PUCRS / CEPAC; Ramirez Ramirez, Machteld van den Broek, Utrecht University / Copernicus Institute

432. **CO_2 Sequestration Potential of Unmineable Coal; State of Knowledge**
Margo Corum, Kevin Jones, Peter Warwick, U.S. Geological Survey

433. **Uncertainty in Regional-Scale Evaluation of CO_2 Geologic Storage Resources-Comparison of the Illinois Basin (USA) and the Ordos Basin (China)**
Kevin Ellet, Cristian Medina, John Rupp, Indiana Geological Survey, Indiana University; Guochang Wang, Timothy Carr, West Virginia University

434. **Ranking of Indonesia Sedimentary Basins and Storage Capacity Estimates for CO_2 Geological Storage**
Utomo Pratama Iskander, Usman, Sudaraman Sofyan, R&D Centre for Oil and Gas Technology 'LEMIGAS'

435. **Modelling of CO_2 Injection in Fluvial Sedimentary Heterogeneous Reservoirs to Assess the Impact of Geological Heterogeneities on CO_2 Storage Capacity and Performance**
Benoit Issautier, Pascal Audigane, BRGM; Simon Fillacier, Yann Le Gallo, Geogreen

436. **Potential of Sub-Seafloor CO_2 Geological Storage in Northern South China Sea and its Importance for CCS Development in South China**
Pengchun Li, Di Zhou, Zhongxiang Zhao, Cuimei Zhang, Yufan Zhang, Chinese Academy of Sciences

437. **The Ordos Basin: a Premier Basin for Integrating Geological CO_2 Storage with Enhanced Oil Recovery Projects in China**
Tingting Luo, Yajun Wang, Lifa Zhou, Shaanxi Provincial Institute of Energy Resources and Chemical Engineering; Ronald Surdam, Zhunsheng Jiao, University of Wyoming Carbon Management Institute

438. **Storage Capacity Evaluation for Development of CO_2 Infrastructure in the West Mediterranean**
Roberto Martínez, Isabel Suárez, IGME; Júlio Carneiro, Fátima Cardoso, University of Évora; Tiago Cunha, LNEG; Yassine Zarhoule,University Mohammed Premiere; Yves-Michel Le-Nindre, BRGM

439. **CO_2 Storage Resource Potential of the Cambro-Ordovician Saline System in the Western Interior of North America**
Wesley Peck, Damion Knudsen, Chad Crotty, Charles Gorecki, James Sorensen, EERC; Stefan Bachu, Tyler Hauck, Stephen Talman, Jesse Peterson, Anatoly Melink, Alberta Innovates – Technology Futures

440. **Long-Term Behaviour of CO_2 Stored in a Large Scale in the Utsira Formation, North Sea, Norwegian Continental Shelf**
Van Pham, Inge Tappel, Eva Hallandm Ine Gjeldvik, Tor Eidvin, Rita Rød, Christian Magnus, Wenche Johansen, Fridjof Riis, Norwegian Petroleum Directorate

441. **Sub-Seafloor Carbon Dioxide Storage Potential on the Juan de Fuca Plate, Western North America**
Jerry Fairley, Center for Advanced Energy Studies and University of Idaho; Robert Podgorney, Center for Advanced Energy Studies and Idaho National Laboratory

442. **Characterizing Buoyant Plume Migration Through Domains with Fine-Scale Heterogeneity**
Priya Ravi Ganesh, Steven Bryant, Timothy Meckel, University of Texas at Austin

443. **The Impact of Mineralogy and Oil:Water Ratios on Estimates of CO_2 Storage at the IEA Weyburn-Midale CO_2 Monitoring and Storage Project**
Ian Hutcheon, Maurice Shevalier, Kyle Durocher, Bernhard Meyer, University of Calgary; John Bloch, Casa Gausalupita

444. **Numerical Investigation of the Storage Efficiency Factor for CO_2 Geological Sequestration in Saline Formations**
Yang Wang, Keni Zhang, Beijing Normal University

445. **U.S. Geological Survey Geologic Carbon Dioxide Storage Resource Assessment of the United States**
Peter D. Warwick, Madalyn S. Blondes, Sean T. Brennan, Margo D. Corum, Matthew Merril, U.S. Geological Survey

446. **Quantification of Practical and Matched CO_2 Storage Capacity for Insufficiently Known Reservoirs**
Kris Welkenhuysen, Kris Piessens, Geological Survey of Belgium - Royal Belgian Institute of Natural Sciences

447. **The First North American Carbon Storage Atlas**
Frank Mourits, Natural Resources Canada; Leonardo Beltran, Secretariat of Energy, Mexico; Moises Davila, Federal Commission of Electricity, Mexico; Robert Wright, U.S. Department of Energy,

448. **Probabilistic Aggregation of Individual Assessment Units in the U.S. Geological Survey National CO_2 Sequestration Assessment**
Madalyn Blondes, Ricardo Olea, Lawrence Drew, Peter Warwick, U.S. Geological Survey, Energy Resources Science Center; John Schuenemeyer, Southwest Statistical Consulting

449. **Estimation of CO_2 Storage Capacity in Porous Media by using X-ray Micro-CT**
Yu Liu, Yongchen Song, Hongfei Zheng, Zijian Shen, Bo Su, Dalian University of Technology

Trapping Mechanisms

450. **CO_2 Leakage Prevention by Introducing Engineered Nanoparticles to the In-Situ Brine**
Behdad Aminzadeh, Doo Chung, David DiCarlo, Steven Bryant, Chun Huh, The University of Texas at Austin

451. **Potential Triassic and Jurassic CO_2 Storage Reservoirs in the Skagerrak-Kattegat Area**
Irfan Baig, Per Aagaard, Caroline Sassier, Jan Inge Faleide, Jens Jahren, Roy H. Gabrielsen, University of Oslo; Manzar Fawad, Norwegian Geotechnical Institute; Lars Henrik Nielsen, Lars Kristensen, Geological Survey of Denmark and Greenland; Per E.S Bergmo, SINTEF Petroleum

452. **CO_2 Storage from Blast Furnace in the Triassic Sandstones of Lorraine, (Eastern Paris Basin, France): An Experimental Study**
Clément Belgodere, Université de Lorraine, CNRS, G2R Laboratory / CREGU; Jérôme Sterpenich, Jacques Pironon, Université de Lorraine, CNRS, G2R laboratory; Jean-Pierre Birat, ArcelorMittal

453. **Experimental and Numerical Studies of Density-Driven Natural Convection in Saturated Porous Media with Application to CO2 Geological Storage**
Sylvie Chevalier, Tilty Farhana Faisel, Mohamed Sassi, Masdar Institute of Science and Technology

454. **2-D Reactive Transport Modeling of the Fate of CO_2 Injected into a Saline Aquifer in the Wabamum Lake Area (Alberta, Canada)**
Chantsalmaa Dalkhaa, Maurice Shevalier, Bernhard Mayer, Michael Nightingale, University of Calgary

455. **Wettability Behavior of CO_2 at Sequestration Conditions**
Raheleh Farokhpoor, Ole Torsæter, Norwegian University of Science and Technology; Bård J.A. Bjørkvik; Erik Lindeberg, SINTEF Petroleum Research

456. **Trapping Effects of Small Scale Sedimentary Heterogeneities**
Peter Frykman, Carsten Nielsen, Niels Bech, GEUS

457. **Examination of Methods to Measure Capillary Threshold Pressures of Pelitic Rock Samples**
Kei Kawaura, Kohei Akaku, Masanori Nakano, Takashi Takahashi, Shinichi Kiriakehata, JAPEX Technical Division Research Center, Japan Petroleum Exploration Co. Ltd.; Daisuke Ito, Japan Petroleum Exploration Co., Ltd; Hitoshi Suzuki, Japan CCS Co, Ltd.

458. **Ex-Situ Dissolution of CO_2 for Carbon Sequestration**
Yuri Leonenko, University of Waterloo

459. **Clay Hydration / Dehydration in Dry to Water-Saturated Supercritical CO_2: Implications for Caprock Integrity**
John Loring, Todd Schaef, Chris Thompson, Quinn Miller, Jianzhi Hu, David Hoyt, Paul Martin, Eugene Ilton, Andrew Felmy, Kevin Rosso, Pacific Northwest National Laboratory

460. **Experimentally Measurements of Threshold Pressure for Modeling Saline Aquifers in Japan**
Masaki Ono, Hiroshi Kameya, Kohichi Hosoda, Yotsuo Kamidozono, Hiroyuki Azuma, Oyo Corporation

461. **Core Scale Modelling of CO_2 Flowing: Identifying Key Parameters and Experiment Fitting**
Desiree Petrilli, Pascal Audigane, BRGM; Ruina Xu, Luo Shu, Tsinghua University

462. **Precipitation Kinetics of Sulfate-Bearing Minerals Under Environmental Condition of CO_2 Geological Storage**
Peter (Pedro) Rendel, Jiwchar Ganor, Ben-Gurion University of the Negev; Domenik Wolff-Boenisch, University of Iceland; Ittai Gavrieli, Geological Survey of Israel

463. **Experimental and Numerical Studies of CO_2 Injection into Saturated Porous Media: Capillary to Viscous to Fracture Fingering Phenomenon**
Mohamed Sassi, Amima Islam, Sylvie Chevalier, Masdar Institute of Science and Technology

464. **Density Measurement of CO_2 + Deionized Water in Warm Formations by a Magnetic Suspension Balance**
Yong Shen, Yi Zhang, Yongchen Song, Weiwei Jian, Yangchun Zhan, Cheng Hu, Dalian University of Technology

465. **Containment Impact of Calcite Pathways in the Primary Caprock of CO_2 Storage in a Depleted North Sea Gas Field**
Jeroen Snippe, Shell Projects and Technology; Lingli Wei, Shell China Limited; Owain Tucker, Shell Projects and Technology

466. **Carbonate Reaction Experiments at Carbonated and Bicarbonated Springs as a Natural Analogue Field of CO_2 Geological Sequestration**
Masao Sorai, Munetake Sasaki, National Institute of Advanced Industrial Science and Technology

467. **Gas Injection in a Water Saturated Porous Medium: Effect of Capillarity, Buoyancy, and Viscosity Ratio**
Tetsuya Suekane, Katuhiro Okada, University of Tokushima

468. **Observation of Buoyant Plumes in Countercurrent Displacement: Influence of Local Capillary Trapping –a Bench Scale Experiment**
Yuhao Sun, Angelica Hernandes, Steven Bryant, The University of Texas at Austin

469. **Simulation Study of Density-Driven Natural Convection Mechanism in Isotropic and Anisotropic Brine Aquifers using a Black Oil Reservoir Simulator**
Amir Taheri, Ole Torsæter, NTNU; Dag Wessel-Berg, Sintef Petroleum Research

470. **Geochemical Effects of Storing CO_2 in the Basal Aquifer that Underlies the Prairie Region in Canada**
Stephan Talman, Ernie Perkins, Stephan Bachu, Alberta Innovates Technology Futures; Andrew Wigston, David Ryan, CanmetENERGY

471. **Mineral Migration and Regeneration Reactions in the Two Phase Flow Experiment**
Cheng-Hsien Tsai, Chih-Hau Yung, Sinotech Engineering Consultants, Inc; Yuh-Ruey Wang, National Taipei University of Technology, Chung-Hu Chiao, Taiwan Power Company

472. **How Rock Mechanical Properties Affect Fault Permeability in Neogene Mudstone?**
Shin-Ichi Uehara, Toho University; Miki Takahashi, Geological Survey of Japan, AIST

473. **Mineralogical Alterations During Laboratory-Scale Carbon Sequestration Experiments for the Illinois Basin**
Lois E. Yoksouilan, Jared T. Freiburg, Shane K, Butler, Peter M. Berger, William R. Roy, University of Illinois (Urbana-Champaign), Prairie Research Institute, Illinois State Geological Survey

474. **Density Measurements and SAFT EOS of Supercritical CO_2-H_2O System for CO_2 Geological Storage**
Yi Zhang, Yongchen Song, Yong Shen, Weiwei Jian, Yangchun Zhan, Wanli Xing, Cheng Hu, Dalian University of Technology

475. **Containment of CO_2 in CCS: Role of Caprocks and Faults**
John Kaldi, Ric Daniel, Ulrike Schacht, Guilliaume Backe, CO2CRC@University of Adelaide; Eric Tenthorey, CO2CRC@Geoscience Australia; Karsten Michael, Jim Underschulz, CO2CRC@CSIRO; Andy Nicol, CO2CRC@GNS

Wellbore Integrity

476. **Towards a Frequency Distribution of Effective Permeabilities of Leaky Wellbores**
Dean Checkai, Qing Tao, Steven Bryant, University of Texas at Austin

477. **Wellbore Permeability Estimates from Vertical Interference Testing of Existing Wells**
Sarah Gasda, Uni CIPR; Michael Celia, James Wang, Princeton University; Andrew Duguid, Schlumberger Carbon Services

478. **Analysis of Interfacial De-Bonding of Geopolymer Annular Sealing in CO_2 Geo-Sequestration Wellbore**
Giasuddin Haider, Jay Sanjayan, Swinburne University of Technology; P.Ranjith, Monash University

479. **Advanced Cement Integrity Evaluation of an Old Well in the Rousse Field**
Matteo Loizzo, Actys BEE; Ulrike Miersemann, Schlumberger Carbon Services; Patrik Lamy, Andre Garnier, Total S.A.

480. **Analysis on the Chemical and Mechanical Stability of the Grouting Cement for CO_2 Injection Well**
Taehee Kim, Gi-Tak Chae, Hee-Kwon Lee, Seung-Woo Lee, Byung-Woo Yum, Korean Institute of Geoscience and Mineral Resources

481. **ULTimateCO_2 Project: Field Experiment in an Underground Rock Laboratory to Study the Well Sealing Integrity in the Context of CO_2 Geological Storage**
Jean-Charles Manceau, Pascal Audigane, Francis Claret, Marc Parmentier, BRGM; Tim J. Tambach, TNO; Fabrizio Gherardi, IGG; Alain Dimier, Olaf Ukelis, Elodie Jeandel, Francis Cladt, EIFER; Thierry Yalamas, PHIMECA; Christophe Nussbaum, SWISSTOPO

482. **Thermodynamic Modeling of Carbonation of Cementitious Materials in Contact with Supercritical CO_2**
Hiroaki Minoo, Tetsuya Ishida, Yuya Takahashi, University of TOKYO

483. **Chemical Impacts of CO_2 Flooding on Well Composite Samples: Experimental Assessment of Well Integrity for CO_2 Sequestration**
Yuki Asahara, Saeko Mito, Ziqiu Xue, RITE; Yuji Yamashita, Kazutoshi Miyashiro, Japan CCS Co, Ltd.

484. **Assessment of Well Integrity at Nagaoka CO_2 Injection Site Using Ultrasonic Logging and Cement Bond Log Data**
Takahiro Nakjima, Ziqiu Xue, RITE; Jiro Watanabe, Yoshihiro Ito, Susumu Sakashita, Geophysical Surveying Co, Ltd

485. **Influence of Pressure, CO_2 and Chromium-Content of Injection Pipe Steels on the Reliability of a Saline Aquifer Water CCS-Site in the Northern German Basin**
Anja Pfennig, Sabrina Sultz, HTW Applied University of Berlin; Axel Kranzmann, BAM Federal Institute of Materials Research and Testing Berlin

486. **Corrosion Fatigue Behavior and S-N-curve of AISI 420 Exposed to CCS-Environment Obtained from Laboratory In-Situ-Experiments**
Anja Pfennig, Reiner Weigand, Marcus Wolf, HTW Applied University of Berlin; Axel Kranzmann, Claus-Peter Bork, BAM Federal Institute of Materials Research and Testing Berlin

487. **Reactive Flow Channelization in Fractured Cement- Implications for Wellbore Integrity**
Quinn Wenning, Marc Hesse, Steven Bryant, The University of Texas at Austin; Nicolas Huerta, The University of Texas at Austin and US DOE NETL

488. **The Long-Term Corrosion Behavior of Abandoned Wells at CO_2 Geological Storage Conditions: (1) Experimental Results for Cement Alteration**
Hisao Satoh, Satoko Shimoda, Kohei Yamaguchi, Hiroyasu Kato, Mitsubishi Materials Corporation; YujiYamashita, Kazutoshi Miyashiro, Shigeru Saito, Japan CCS Co., Ltd

489. **The Long-Term Corrosion Behavior of Abandoned Wells at CO_2 Geological Storage Conditions: (2) Experimental Results for Casing Steel Corrosion**
Shigeki Azuma, Hiroyasu Kato, Mitsubishi Materials Corporation; Kazutoshi Miyashiro, Shigeru Saito, Japan CCS Co., Ltd

490. **The Long-Term Corrosion Behavior of Abandoned Wells at CO_2 Geological Storage Conditions: (3) Assessment of Long-Term (1,000-Year) Performance of Abandoned Wells for Geological CO_2 Storage**
Kohei Yamaguchi, Hiroyasu Kato, Satoko Shimoda, Mitsubishi Materials Corporation; Michael Stenhouse, Wei Zhou, Alexandro Papafotiou, INTERA Incorporated; Yuji Yamashita, Kazutoshi Miyashiro, Shigeru Saito, Japan CCS Co., Ltd.

491. **Corrosion Studies on Casing Steel in CO_2 Storage Environments**
Xiaolong Zhang, John Zevenbergen, Tjirk Benedictus, TNO

Other

492. **IEAGHG Research Networks, Past Achievements and Future Focus**
Toby Aiken, Ameena Camps, Samanatha Neades, Ludmilla Basava-Reddi, Tim Dixon, IEAGHG

Developments in Other Storage Options for CO_2

Basalts and other Low Permeability Reservoirs

493. **Experimental Studies on In-Situ CO_2 Mineral Storage: Presentation of a Novel Plug Flow Reactor**
Iwona Galeczka, Domenik Wolff-Boenish, Sigurdur Gilason, University of Iceland

Coal Beds

494. **Safety Assessment of CO_2 Storage in Coal-Bearing Formation**
Sohei Shimada, Yukiya Sakou, The University of Tokyo

Mineralisation

495. **Impact of Alkalinity Sources on the Life-Cycle Energy Efficiency of Mineral Carbonation Technologies**
Abigail Kirchofer, Jeniifer Wilcox, Adam Brandt, Stanford University; Sam Krevor, Imperial College; Valentina Prigiobbe, University of Texas at Austin

496. **Experimental Studies on Mineral Sequestration of CO_2 with Buffer Solution and Fly Ash in Brines**
Qi Liu, Mercedes Maroto-Valer, University of Nottingham

497. **Density Functional Theory Calculations of the Interaction of Olivine with Water**
Valentina Prigiobbe, University of Texas at Austin; Dong-Hee Lim, Ana Suarez-Negreira, Jennifer Wilcox, Stanford University

498. **Silicate Carbonation in Supercritical CO_2 Containing Dissolved H_2O: an In-Situ High Pressure X-Ray Diffraction Study**
HT Schaef, QRS Miller, CJ Thompson, JS Loring, ME Bowden, BW Arey, BP McGrail, KM Rosso, Pacific Northwest National Laboratory

499. **Tracing Carbon: Natural Mineral Carbonation and the Incorporation of Atmospheric vs. Recycled CO_2**
Amy Stephen, Gawen Jenkin, Daniel Smith, University of Leicester; Mike Styles, Jon Naden, BGS; Adrian Boyce, Scottish Universities Environmental Research Centre; Melanie Leng, University of Leicester and NERC Isotope Geosciences Laboratory; Ian Millar, NERC Isotope Geosciences Laboratory

500. **Transformations of Sulfides During Aqueous Carbonation of Oil Shale Ash**
Kadriann Tamm, Rein Kuusik, Mai Uibu, Juha Kallas, Tallinn University of Technology

501. **Carbon Capture and Fixation using Lime-Containing Wastes: The Influence of Aqueous Phase Composition on Ca Dissolution from Oil Shale Ash**
Mai Uibu, Rein Kuusik, Tallinn University of Technology

502. **CO_2 Mineralisation: Concept for Co-Utilization of Oil Shale Energetics Waste Streams in $CaCO_3$ Production**
Olga Velts, Mai Uibu, Juha Kallas, Rein Kuusik, Tallinn University of Technology

503. **Dissolution of Activated Serpentine for Direct Flue Gas Mineralization**
Subrahamanian Hariharan, Mischa Werner, Marco Mazzotti, ETH Zurich; Daniela Zingaretti, Renato Baciocchi, University of Rome Tor Vergata

Ocean Storage

504. **Exposure Experiments of Geochemical Reference Samples to Carbon Dioxide**
Nobuo Tsurushima, Namiha Yamada, Masahiro Suzumura, National Institute of Advanced Industrial Science and Technology(AIST)

505. **Effects of Seawater Acidification Induced by CO_2 on Microbial Processes on Dissolved Organic Matter**
Namiha Yamada, Nobuo Tsurushima, Masahiro Suzumura, National Institute of Advanced Industrial Science and Technology (AIST)

Other

506. **Numerical Analysis of Storage Potentials for CO_2 Micro-Bubble Storage (CMS)**
Takashi Hitomi, Kenichiro Suzuki, Obayashi Co; Takumi Shidahara, NEWJEC Inc.; Masayuki Yamaura, Dia Consultants Co.; Masanori Tozawa, Asano Taiseikiso Engineering Co.; Masahiko Tagami, Kawasaki Geological Engineering Co.; Hiroshi Wada, Engineering Advancement Association of Japan

507. **Numerical Study on Field-Scale Behavior of Carbon in CO_2 Micro Bubble Storage (CMS)**
Satoru Miyoshi, Takashi Hitomi, Obayashi Corporation; Hiroshi Wada, Engineering Advancement Association of Japan; Kaoru Inaba, Takenaka Corporation; Masayuki Yamaura, Dia Consultant

508. **Numerical Modelling of Hydrate Formation in Sand Sediment Simulating Sub-Seabed CO_2 Storage in the Form of Gas Hydrate**
Takuya Nakashima, Toru Sato, University of Tokyo; Masayuki Inui, Mitsubishi Heavy Industries, Ltd

509. **Storage Potential and Economic Feasibility for CO_2 Micro-Bubble Storage (CMS) in Japan**
Takumi Shidahara, NEWJEC Inc; Tadahiko Okumura, Hideaki Miida, Engineering Advancement Association of Japan (ENAA); Masato Shimoyama, Ohbayashi Corporation; Norifumi Matsushita, Oyo Corporation; Takashi Yamamoto, Kawasaki Geological Engineering Co. Ltd; Takeshi Sasakura, Kajima Corporation; Toyokazu Ogawa, Taisei Corporation

510. **A Numerical Simulation Study for the Distributed CCS**
Toshiyuki Tosha, GSJ/AIST

511. **The Newly Ecological Concrete Reducing CO_2 Emissions Below Zero Level**
Ichiro Yoshioka, Daisaku Obata, Hideo Nanjo, The Chugoku Electric Power Co,Inc; Kosuke Yokozeki, Takeshi Torichigai, Kajima Corporation; Minoru Morioka, Takayuki Higuchi, Denki Kagaku Kogyo Co.,Ltd

CCS for Industrial Sources (Non Power)

Cement

512. **Exergy Comparison of CO_2 Capture by Oxy-Combustion and by Antisublimation on a Cement Plant**
Denind Clodic, EReIE-SAS

513. **Integrating Calcium Looping CO_2 Capture with the Manufacture of Cement**
Charles Dean, Nick Florin, Paul Fennell, Thomas Hills, Imperial College London

Iron and Steel

514. **Experimental Studies of Ammonia Solution with Additives for Suppression of Ammonia Vaporization in the Ammonia Based CO_2 Capture Process**
Chi-Kyu Ahn, Kunwoo Han, Man Su Lee, Je Young Kim, Hee Dong Chun, RIST; Yoori Kim, Jong Moon Park, POSTECH

515. **Costs and Potential of Carbon Capture and Storage at an Integrated Steel Mill**
Antii Arasto, Eemeli Tsupari, Janne Kärki, VTT Technical Research Centre of Finland; Miika Sihvonen Jarmo Lilja, Ruukki Metals Oy

516. **Application of Sorption Enhanced Water Gas Shift for Carbon Capture in Integrated Steelworks**
Matteo Gazzani, Giampaolo Manzolini, Matteo Romano, Politecnico di Milano

517. **Steel Industries in Japan Achieve Most Efficient Energy Cut-Off Chemical Absorption Process for Carbon Dioxide Capture from Blast Furnace Gas**
Mikihiro Hayashi, Tomohiro Mimura, NIPPON Steel Engineering Co,Ltd

518. **Development of PSA System for the Recovery of Carbon Dioxide and Carbon Monoxide from Blast Furnace Gas in Steel Works**
Hitoshi Saima, Yasuhiro Mogi, Takashi Haraoka, JFE Steel Corp.

Refineries

519. **Performance and NOx Emissions of Refinery Fired Heaters Retrofitted to Hydrogen Combustion**
Mario Ditarantom Rahul Anantharaman, Torleif Weydahl, SINTEF Energy Research

520. **CO_2 Capture from Oil and Gas Operations**
Karl Gerdes, Cliff Lowe, Babatunde Oyenekan, Chevron Energy Technology Co.

Other

521. **Investigation into Optimal CO_2 Concentration for CO_2 Capture from Aluminium Production**
Anette Mathisen Morten C. Melaaen, Tel-Tek and Telemark University College; Henriette Sørensen, Tel-Tek

522. **Deployment of CCS in Industrial Applications in the EU – Timing, Scope and Coordination**
Johan Rootzén, Filip Johnsson, Chalmers University of Technology

523. **Techno-Economic Performance of CO_2 Capture-Network Configurations in the Industry: A Case Study for the Dutch Botlek Area**
Niels Berghout, Takeshi Kuranochi, Machteld van den Broek, Andrea Ramírez

CCS Technology Assessment and System Integration

CCS and Water Use

524. **Techno-Economic Evaluation of Processes for Oxygen and Water Deep Removal from the CO_2 Product Stream**
Zeina Abbas, Mohammad Abu Zahra, Toufic Mezher, Masdar Institute of Science and Technology

525. **IEAGHG Investigation of Extraction of Formation Water from CO_2 Storage**
Ryan Klapperich, Robert Cowan, Charles Gorecki, Guoxiang Liu, Jordan Bremer, Yevhen Holubnyad, Nicholas Kalenze, Damion Knudsen, EERC; Ludmilla Basava-Reddi, IEAGHG; Andrea McNemar, U.S. Department of Energy

Costs

526. **Making CCS Pay for Itself: Storage Strategies in Geopressured/Geothermal Aquifers**
Reza Ganjdanesh, Steven bryant, Gary Pope, Kamy Sepehrnoori, The University of Texas at Austin

527. **Economic Evaluation of Ship-Based CCS with Availability**
Youngkyun Seo, Daejun Chang, Korea Advanced Institute of Science of Technology; Jung-Yuel Jung, Cheol Huh, Seong-Gil Kang, Korea Ocean Research & Development Institute

528. **Costs and Performance of Advanced Zero Emission Systems of IGCC with CCS in Japan**
Koji Tokimatsu, Shigeki Tsuboi, Junichi iritani, Masaki Onozaki, The Institute of Applied Energy

529. **Optimization and Cost Evaluation of Integrated Aqueous Ammonia Capture with Mineralisation using Recyclable Salts for Distributed CCS**
Xiaolong Wang, Mercedes Maroto-Valer, University of Nottingham

Energy Efficiency in CCS Systems

530. **CO_2 Capture Processes: Novel Approach to Benchmarking and Evaluation of Improvement Potentials**
Rahul Anantharam, Kristin Jordal, SINTEF Energy Research; Truls Gundersen, NTNU

531. **Exergy Analysis for Ulta-Supercritical Power Plant**
Sandhya Hasti, Andy Aroonwilas, Amornvadee Veawab, University Of Regina

Integrated CCS Systems

532. **Design and Analysis of CO_2 Networks**
Ahmed Alhajaj, Nilay Shah, Imperial College London

Integration of CCS in Present and Future Energy Systems

533. **On Methods for Maturity Assessment of CO_2 Capture Technologies**
Hamidreza Bakhtiary-Davijany, DNV

534. **Perspectives of CO_2 Value Chains on Distributed Energy Systems for Gas Industry**
Susumu Nishio, Takuto Isshiki, Hiromichi Kameyama, Tokyo Gas Co, Ltd; Ziqiu Xue, RITE

535. **Assessment of Low Carbon Energy Technologies: Fossil Fuels and CCS**
Andrea Ramirez, Utrecht University; Bhavik Bakashi, Ohio State University; Edgar Hertwich, NTNU

Need for Flexibility

536. **Dynamic Modelling and Validation of Post Combustion CO_2 Capture Plants in Australian Coal-Fired Power Stations**
Mai Bui, Indra Gunawan, Vincent Verheyen, Monash University; Erik Meuleman, Paul Feron, CSIRO

537. **Market Driven Operation: Flexible Operating Mechanisms for Post Combustion Capture**
Earl Goetheer, Robert de Kler, TNO

538. **Optimal Heat Management in an Integrated Fossil-Renewable Energy System with CO_2 Capture**
Charles Kang, Adam Brandt, Louis Durlofsky, Stanford University

Risk Assessment

539. **Integrated Risk Assessment for CCS**
Matt Gerstenberger, Rob Buxton, Annemarie Christopherson, Andy Nicol, GNS Science and CO2CRC; Guy Allinson, Wanwan Hou, CO2CRC and University of New South Wales; Greg Leamon, CO2CRC and Geoscience Australia

540. **Common Themes in Risk Evaluation Among Eight Geosequestration Projects**
Ken Hnottavange-Telleen, Schlumberger Carbon Services

541. **Risk Based Qualification and Verification of Large-Scale CO_2 Absorption Processes**
Tore Myhrvold, Erik T. Hessen, Hamidreza Bakhtiary-Davijany, Det Norske Veritas AS

542. **Identification of Hazards and Environmental Impact Assessment for an Integrated Approach to Emerging Risks of CO_2 Capture Installations**
Nicola Paltrinieri, Valerio Cozzani, University of Bologna; Leo Breedveld, 2B Consulenza Ambientale; Jill Wilday, Health and Safety Laboratory

543. **Development of Risk Assessment Tool for CO_2 Geological Storage 'GERAS-CO2GS'**
Atsuko Tanaka, Yasuhide Sakamoto, Takeshi Komai, National Institute of Advanced Industrial Science (AIST)

Whole System LCA Studies

544. **Full Chain Analysis and Comparison of Alternative Gas-Fired Power Plants with CO_2 Capture and Storage with Clean Coal Alternatives**
Zhenggang Nie, Anna Korre, Sevket Durucan, Imperial College London

545. **Life-Cycle GHG Emission Factors of Final Energy in China**
Lixue Jiang, Xunmin Ou, Linwei Ma, Zheng Li, Weidou Ni, Tsinghua Univeristy

546. **Environmental Performance Tool for CCS Chains**
Joris Koornneef, Anouk Florentinus, Ruut Brandsma, Ecofys; Arjan van Horssen, Toon van Harmelen, Utrecht University; Andrea Remirez, Alireza Talaei, TNO; Arjan Plomp, Jeroen van Deurzen, Koen Smekens, ECN

547. **Environmental Assessment of Coal-Fired Oxyfuel Power Plants - Cryogenic vs. Membrane-Oxygen Production**
Peter Markewitz, Andrea Schreiber, Petra Zappm Josefine Marx, Research Centre Juelich

Other

548. **Developing Framework for Multi-Criteria Analysis of CCS A Standardized Approach to the Assessment of CCS Projects**
Jana Jakobsen, Mona Mølnvik, Grethe Tangen, SINTEF Energy Research

Transport and Infratructure Developement

CO_2 Quality Issues

549. **Effect of SO_2 and NO_2 on Corrosion and Solid Formation in Dense Phase CO_2 Pipelines**
Arne Dugstad, Bjørn Morland, Malgorzata Halseid, Institute for Energy Technology

550. **CO_2Mix Project: Experimental Determination of Thermo-Physical Properties of CO_2-Rich Mixtures**
Sigurd Weidemann Løvseth, Geir Skaugen, H.G. Jacob Stang, Jana P. Jakobsen, Øivind Wilhelmsen, SINTEF Energy Research; Roland Span, Robin Wegge, Ruhr-Universität Bochum

551. **Accurate Measurements of CO_2-Rich Mixture Phase Equilibria Relevant for CCS Transport and Conditioning**
H.G. Jacob Stang, Sigurd Weidemann Løvseth, Sigmund Ø. Størset, Bjarne Malvik, Håvard Reksted, SINTEF Energy Research

Hubs and Transport Networks

552. **An Integrated Approach for Risk Assessment of CO_2 Infrastructure in COCATE Project**
Todd Flach, Knut Kvien, Semere Solomon, Det Norske Veritas; Oswaldo Morales Napoles, Corina Hulsbosch-Dam; Mark Spruijt, TNO

553. **CO_2 Transport Solutions in the Skagerrak / Kattegat Region**
Ragenhild Skagestad, Anette Mathisen, Hils Henrik Eldrup, Hans Aksel Haugen, Tel-Tek

554. **Dynamics of Carbon Dioxide Transport in a Multiple Sink Network**
Jérémy Veltin, Stefan Belfroid, TNO

Pipelines

555. **Experimental Investigation of CO_2 Outflow from High Pressure Reservoirs**
Mohammad Ahmad, Luuk Buit, DNV-KEMA; Corina Hulsbosch-Dam, Mark Spruijt, TNO

556. **PVTx Properties of a Two-Phase CO_2 Jet from Ruptured Pipeline**
Helle Augdal Botnen, Guttorm Alendal, Ivar Aavatsmark, University of Bergen; Abdirahman Omar, Uni-Bjerknes and Uni-Researchs and Bjerknes Centre for Climate Research;
Trul Johanessen, Geophysical Institute, University of Bergen and Uni-Bjerknes

557. **Experimental Study of N_2 Impurity Effect on the Steady and Unsteady CO_2 Pipeline Flow**
Meang-Ik Cho, Cheol Huh, Jung-Yeul Jung, Seong-Gil Kang, KORDI

558. **Optimal Pipeline Design with Increasing CO_2 Flow Rates**
Zikai Wang, Gustavo Fimbres Weihs, Dianne Wiley, CO2CRC and The University of New South Wales; Gina Cardenas, CO2CRC

559. **A Phased Approach to Building a Pipeline Network for CO_2 Transport During CCS**
Melanie Jensen, Peng Pei, Peter A. Letvin, Anthony Snyder, Robert Cowan, Charles Gorecki, Edward Steadman, EERC

560. **CO_2 Pipeline Integrity: A Coupled Fluid-Structure Model Using a Reference Equation of State for CO_2**
Eskil Aursand, Peder Aursand, Morten Hammer, Svend Tollak Munkejord, SINTEF Energy Research; Torodd Berstad, Cato Dørum, Håkon Nordhagen, SINTEF Materials and Chemistry

561. **Engineering and Material Challenges for High Pressure Dense Phase CO_2 Pipeline Transport in Flow Mode**
Kumar Patchigolla, John Oakley, Cranfield University

562. **Corrosion Effects in Pressurized CO_2 Containing Impurities**
Aki Sebastian Ruhl, Axel Kranzmann, BAM Federal Institute for Materials Research and Testing

563. **Corrosion of Pipe Steel in CO_2 with Impurities and Possible Solutions**
Xiaolong Zhang, John Zevenbergen, Mark Spruijt, TNO; Marta Borys, Accoat

Shipping

564. **Ships Versus Pipeline Transport**
Chris Hendriks, Pieter van Breevoort; Andrea Ramirez, Utrecht University

565. **Cargo Conditions of CO_2 in Shuttle Transport by Ships**
Noriyuki Kokubun, Chiyoda Corpolation; Kiyohiko Ko, Sasebo Heavy Industries Co, Ltd; Masahiko Ozaki, The University of Tokyo; Holger Bietz, Global CCS Institute

566. **Offshore Operational Availability of Onboard Direct Injection of CO_2 into Sub-Seabed Geological Formations**
Tsuyoshi Miyazaki, Hiroyuki Osawa, Masami Matsuura, Japan Agency for Marine-Earth Science and Technology; Makoto Ohta, Mitsubishi Heavy Industries, Ltd; Masahiko Ozaki, The University of Tokyo; Holger Bietz, Global CCS Institute

567. **Onboard CO_2 Injection to Sub-Seabed Geological Formations via Picked-Up Flexible Pipe**
Naoki Nakazawa, Systems Engineering Associates, Inc; Kyozo Kikuchi, SEMTEC, Inc; Kenichi Ishii, Yakumu Yamaguti, Furukawa Electric Co, Ltd; Makoto Ohta, Mitsubishi Heavy Industries, Ltd; Masahiko Ozaki, The University of Tokyo; Holger Bietz, Global CCS Institute

568. **Ship-Based Offshore CCS Featuring CO_2 Shuttle Ships Equipped with Injection Facilities**
Masahiko Ozaki, The University of Tokyo; Takashi Ohsumi, Central Research Institute of Electric Power Industry; Ryuichiro Kajiyama, Central Research Institute of Electric Power Industry; Holger Bietz, Global CCS Institute

569. **Regulations on Ship Transport and Onboard Direct Injection of CO_2 into Sub-Seabed Geological Formations**
Satoshi Suzuki, Takashi Nakamura, Japan NUS Co, Ltd; Motoshi Muraoka, Shintaro Higashi, NTT Data Institute of Management Consulting, Inc; Takashi Ohsumi, Central Research Institute of Electric Power Industry; Holger Bietz, Global CCS Institute

570. **A Feasibility Study on CO_2 Marine Transportation in South Korea**
Byeong-Yong Yoo, Seung-Bae Kim, Il-Guk Woo, Yeong-tae Oh, Sung-Geun Lee, DSME

Source Sink Matching

571. **CO_2 Transport Strategy for the Offshore CCS in Korea**
Jung-Yuel Jung, Cheol Huh, Seong-Gil Kang, Korea Ocean Research & Development Institute; Youngkyun Seo, DaeJun Chang; Korea Advanced Institute of Science and Technology

572. **Source-Sink Matching for Carbon Capture and Storage in Eastern India and its Economic Aspects**
Priyank Jain, Khanindra Pathak, Swarup Tripathy, Indian Institute of Technology

Other

588. **A Study on Regulatory Requirements of CCS Technology Development in Taiwan**
Ju-Hsiu Cheng, Joey Lu, Tseng-Hsiang Chieh, Chun-Yu Chen, Industrial Technology Research Institute

589. **Carbon Capture Regulation for Three Industrial Sectors in the UAE: An Empirical Analysis**
I-Tsung Tsai, Sanaa El Waddi, Masdar Institute of Science and Technology; Othman Zarzour, Masdar Carbon Unit

590. **Interaction of CO_2 with Subsurface Resources**
Brad Field, Robb Funnell, CO2CRC; Stephan Bachu, John Faltison, Alberta Innovates – Technology Futures; Ludmilla Basava-Reddi, IEAGHG; Mark Bunch, CO2CRC and University of Adelaide; Sam Holloway, BGS; Rick Richardson, CanZealand Geoscience Ltd

Energy and Climate Change Policies and CCS

Beyond Kyoto

591. **Comprehensive Analysis of Measures Towards Sustainable Development and Climate Stabilization: ALPS Scenarios**
Miyuki Nagashima, Fuminori Sano, Ayami Hayashi, Takashi Homma, Junichiro Oda, Kenichi Wada, Kohko Tokushige, Toshimasa Tomoda, RITE; Kiego Akimoto, RITE and The University of Tokyo

The Role of CCS in Future Energy Systems: Scenario Studies

592. **Evaluating the Role of Carbon Capture and Storage as a Remedial Solution for Climate Change Issue in the Future of Iran's Energy System**
Zoya Banan, Abbas Maleki, Sharif University of Technology

593. **Role of CCS in a New International Climate Regime**
Fenjun Duan, Tetsuo Yuhara, The Canon Institute for Global Studies; Hiroshi Ujita, Tokyo Institute of Technology; Kauhiro Tsuzuki, Toshikazu Shindou, The Institute of Applied Energy

594. **Technical and Financial Assessment of Large-Scale Deployment of CCS Under Current U.S. Regulations: Role of CO_2 Interim Storage and Enhanced Oil Recovery**
Karim Farhat, Josh Coplin, Daniel Lewis, Sebastian Peterlin, Ramon Simms, Stanford University

595. **Cost Development and Economic Value of Implementing CCS in the United Kingdom**
Chris Hendriks, Joris Koornneef, Ecofys; Jason Eis, Mathew Billson, Carbon Trust, DECC

596. **A Sensitivity Analysis of the Global and Regional Deployment of CCS to the Cost of Storage**
Barbara Koebl, Machteld van den Broek, André Faaij, Utrecht University; Bas van Ruijven, NCAR; Detlef van Vuuren, Netherlands Environmental Assessment Agency

597. **Determining the Potential for Carbon Capture and Storage in Southeast Asia**
Pradeep Thakaran, Jia Li, University of Exeter; Douglas Macdonald, Xiaodong Pei, Rick Hasselback, Bishal Thapa, Karthik Ganesan, Maria Christina Pascaul, Independent Consultant; Bill Gunter, G BACH Enterprises Inc; Craig Hart, Johns Hopkins University

598. **Analysis of the CCS Considering Environment Co-Benefit of Air Pollutants in China**
Jianguo Liang, Akinobu Murata, National Institute of Advanced Industrial Science and Technology

599. **The Role of CCS in Meeting Emissions Reductions Goals in a 2°C Scenario**
Sean McCoy, Justine Garrett, Uwe Remme, Nathalie Trudeau, Antonia Gawel, International Energy Agency

600. **Forecast of Advanced Technology for Coal Power Generation Towards the Year of 2050 in CO_2 Reduction Model of Japan**
Takashi Makamura, Keiji Makino, Japan Coal Energy Center

601. **Analysis of CCS Impacts on Asian Energy Security**
Junichiro Oda, Fuminori Sano, Miyuki Nagashima, Kenichi Wada, Toshimasa Tomoda, RITE; Keigo Akimoto, RITE and The University of Tokyo

602. **Cost of Delaying Carbon Capture and Utilization / Sequestration (CCS) Development**
Sadia Raveendran, Howard Herzog, Massachusetts Institute of Technology

603. **Analysis of CCS Diffusion for CO_2 Emission Reduction Considering Technology Diffusion Barriers in the Real World**
Fuminori Sano, Keigo Akimoto, Kenichi Wada, Miyuki Nagashima, RITE

Policy Approaches

604. **California's Policy Approach to Develop Carbon Capture, Utilization and Sequestration as a Mitigation Technology**
Elizabeth Burton, Lawrence Berkeley National Laboratory; Niall Mateer, California Institute for Energy & Environment; John Henry Beyer, Lawrence Berkeley National Laboratory

605. **Restriction of Carbon Intensity Reduction and its Implications for Policymakers in Guangdong Province, China**
Bing Bai, Xiaochun Li, Qi Li, Lu Shi, Institute of Rock and Soil Mechanics

Other

606. **Development of Strategies for CO_2 Value Chain Deployment: ECCO - European Value Chain for CO_2**
Kristin Jordal, Jana P. Jakobsen, Petter Røkke, SINTEF Energy Research; Laetitia Birkeland, The Bellona Foundation; Charles Eikhoff, Progressive Energy Limited; Joris Morbee, European Commission, DG JRC

607. **The State of Development of the UK CCS Industry: An Expert Questionnaire and Systems-Based Approach**
Sam Pickard, Timothy Foxon, University of Leeds

608. **Preliminary Assessment on Deployment of Carbon Capture and Storage in Nigeria**
Abubakar Usman, Newcastle University, UK

609. **The GDCCSR Project Promoting Regional CCS-Readiness in the Guangdong Province, South China**
Di Zhou, Diaqing Zhao, Xiaochun Li, Guangzhou Chinese Academy of Sciences; Qiang Liu, Chinese National Development Committee; Jia Li, LinksChina Investment Advisory Ltd; Jon Gibbins, Edinburgh University; Xi Liang, Cambridge University

Public Perception and Acceptance of CCS and Communication on CCS

Public Perception

610. **Communicating CCS: Effects of Text-Only and Text-and-Visual Depictions of CO_2 Storage on Risk Perceptions and Attitudes**
Suzanne Brunsting, Marjolein De Best-Waldhober, ECN; Hauke Riesch, David Reiner,Cambridge University

611. **CO_2 Capture Project's CCS Stakeholder Issues Review and Analysis**
Ioannis Chrysostomidis, Shahila Perumalpillai, ERM; Mark Bohm, Suncor Energy; Mark Crombie, Suncor Energy/ICO2N Initiiitative; Eric Beynon, Arthur Lee, Chevron

Communication Activites and Experiences

612. **Engaging the Community with a "Green Town" Concept**
Ning Chen, The University of Western Australia; Mirjam Fürth, R.Ajit Shenoi, Philip A. Wilson, University of Southampton; Michael C. Johnson, Lloyd's Register; Zhi Yung Tay, National University of Singapore

613. **Stakeholder Perceptions on Carbon Capture and Storage Technologies in Finland – Economic, Technological, Political and Societal Uncertainties**
Laura Kainiemi, Arho Toikka, Carl- Johan Fogelholm, Helsinki University

614. **Public Engagement of Carbon Capture and Storage (CCS) in South Africa**
Sharon Mashau, Brendan Beck, South African Centre for Carbon Capture and Storage (SACCCS)

615. **Emergency Response Planning: An Example of International Collaboration in CCS Community Outreach and Project Development**
Norman Sacuta, Petroleum Technology Research Centre; Lori Gauvreau, Schlumberger Carbon Services; Sallie Greenberg, Illinois State Geological Survey

Knowledge Sharing

616. **Developing a CCS Communication Framework for Japan**
Hidemitsu Shimada, Tsukasa Kumagai, JGC Corporation; Hiroyasu Takase, Quintessa Japan; Ian Mckinley, McKinley Consulting; Satoshi Someya, National Institute of Advanced Industrial Science and Technology; Angus Henderson, Sean McClowry, Toshihiki Miyagawa, Global CCS Institute

Social Science Research

617. **Public Preferences to CCS: How Does it Change Across Countries?**
Peta Ashworth, Naomi Boughen, Talia Jeanneret, Karen Stenner, CSIRO; Edna Edna Einsiedel, Amanda Boyd, University of Calgary; Rhys Howell, Simon Shackley, University of Edinburgh; Suzanne Brunsting, Bas Van Bree, ECN

618. **Awareness, Knowledge and Perceptions of Carbon Capture and Storage: Trends in Public Opinion Development**
Suzanne Brunsting, Mia Paukovic, Marjolein de Best-Waldhober, Koen Straver, ECN

619. **Developing an Interactive Survey Game for Informing Opinions About CCS**
Anne-Marie Dowd, Peta Ashworth, CSIRO; Mia Paukovic, Marjolein de Best-Waldhober Koen Straver, ECN

620. **'Tell Me What You Think About The Geological Storage of Carbon Dioxide': Towards a Fuller Understanding of Public Perceptions of CCS**
Leslie Mabon, Simon Shackley, University of Edinburgh; Samuela Vercelli, Barbara Cordella, Jonathan Anderlucci, Università di Roma 'La Sapienza',; Kelvin Boot, Plymouth Marine Laboratory

621. **An Interactive Physical Model for the CCS Chain**
Sam Pickard, Tom Lynch, James McKay, Sandy Black, University of Leeds

622. **'Not In My Back Yard' (NIMBY) Sentiments and the Structure of Initial Local Attitudes Toward CO_2 Storage Plans**
Bart W. Terwel, Dancker Daamen, Emma Ter Mors, Leiden University

623. **Informing People About CCS: A Review of Social Research Studies**
Samuela Vercelli, Jonathan Anderlucci, Salvatore Lombardi, Nadia Battisti, Barbara Cordella, Rosanne Memoli, Università di Roma 'La Sapienza'; Leslie Mabon, Scottish Carbon Capture and Storage, University of Edinburgh

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