



2010 IEAGHG International CCS Summer School Programme

Locally Hosted by the
Gas Technology Centre NTNU -SINTEF
Longyearbyen, Svalbard, Norway
22nd - 27th August 2010

Committee Details

Local Organising Committee

The members of the Local Organising Committee are responsible for arranging the overall logistics of the Summer School. Their roles cover arrangements for the venues, travel arrangements, and social programme.

For the 2010 Summer School the Local Organising Committee comprises of:

Tim Dixon, IEAGHG (Chair)	Maria Barrio, SINTEF (Vice Chair)
Olav Bolland, NTNU	Ameena Camps, IEAGHG
Jon Magne Johansen, SINTEF	Astrid Lilliestråle, NTNU
Arvid Nøttvedt, UiB	Nils Røkke, SINTEF
Gunnar Sand, UNIS	Sian Twinning, IEAGHG

International Organising Committee

The members of the International Organising Committee are responsible for organising the programme of the Summer School. Their roles cover arrangements for the speakers, mentors and development of the programme.

For the 2010 Summer School the International Organising Committee comprises the members of the Local Organising Committee and:

Jürgen-Friedrich Hake, GFZ (Chair)	Klaas van Alphen, GCCSI
Sallie Greenberg, ISGS	John Kaldi, CO2CRC

International Steering Committee

The members of the International Steering Committee are responsible for overseeing the continual progression and development of the Summer School. They organise the agreements between IEAGHG and the hosts of the Summer School, ensuring the long term continuation of the International CCS Summer School series.

The International Steering Committee comprises of:

Jürgen-Friedrich Hake, GFZ (Chair)	Tim Dixon, IEAGHG (Vice Chair)
Olav Bolland, NTNU	John Kaldi, CO2CRC
Isabelle Czernichowski, BRGM	Gardiner Hill, BP
Nick Otter, GCCSI	Philip Sharman, Alstom
Tore Torp, Statoil	Claude Roulet, Schlumberger
Tim Hill, E.ON	Ameena Camps, IEAGHG

Affiliations

The following is a full explanation of the affiliations used throughout this programme.

BIGCCS	International CCS Research Centre
CO2CRC	The Cooperative Research Centre for Greenhouse Gas Technologies
GFZ	Forschungszentrum Jülich
GTS	Gas Technology Centre
IEAGHG	IEA Greenhouse Gas R&D Programme
ISGS	Illinois State Geological Survey
NTNU	Norwegian University of Science and Technology
SUCCESS	Subsurface CO ₂ Storage; Critical Elements and Superior Strategy
UiB	University of Bergen
UNIS	The University Centre in Svalbard

Welcome

On behalf of IEAGHG I would like to welcome all the students, experts and student mentors to the 4th IEAGHG International CCS Summer School. I hope that you find the technical programme to be of value and that you enjoy the summer school atmosphere as a whole. We fully expect to see a considerable growth in the CCS industry in the years to come, and we hope that you will find this introductory programme to CCS encouraging and of great value when you look for a career in this industry in the near future.

I would like to take this opportunity to thank the commitment and significant support offered by the sponsors and hosts, without whom, this event would not be possible.

Finally, I would like to extend our thanks to the local organisers, the Gas Technology Centre NTNU-SINTEF, BIGCCS, UNIS and SUCCESS for all their assistance in helping to develop this event and in arranging the local logistics.

John Gale

General Manager
IEAGHG

Aims and Objectives

The IEAGHG CCS Summer School was initiated to provide students with diverse academic backgrounds a broad understanding of the issues surrounding CCS and encourage their active participation in this area. The inaugural Summer School was held in Kloster Seeon, Germany in 2007 and the success of this event prompted IEAGHG to commit to an annual series at different locations around the world. The second event was held at Tigh-Na-Mara on Vancouver Island, Canada in 2008, and the third event was held at Mantra Erskine Beach Resort, Lorne in Victoria, Australia in 2009.

The summer school will be a week long exercise with presentations and discussion groups led by international experts in the field of CCS. In addition to the discussion programme, the students will be broken into teams to undertake short research activities on issues of importance within the CCS area, with a presentation to their peers at the end of the week. Time will also be allocated for networking and for informal discussions with the assembled experts. Students leaving at the end of the week will have developed a network of contacts in the field of CCS and will have gained a broad overview of the issues surrounding technology development and implementation in CCS.

For more information on the Summer Schools and IEAGHG's other activities, visit www.ieaghg.org.

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Sponsors & Supporters

About IEAGHG

IEAGHG is an international collaborative research programme set up under the auspices of the International Energy Agency. IEAGHG focusses its efforts on understanding and transferring technologies to reduce greenhouse gas emissions. IEAGHG was established in 1991 and aims to provide its members with high-level and detailed information on the role that technology can play in reducing greenhouse gas emissions. The Programme has three main activities which are:

- Evaluation of technologies aimed at reducing greenhouse gas emissions,
- Promotion and dissemination of results and data from its evaluation studies,
- Facilitating practical research, development and demonstration activities (R,D&D)

For more information, please visit www.ieaghg.org

About Gas Technology Centre NTNU-SINTEF

The Gas Technology Centre NTNU-SINTEF (GTS) was established in 2003 and is the largest centre for gas technology research and education in Norway. GTS provides new knowledge and technology which will contribute to efficient, environmentally friendly and profitable utilization of natural gas.

The GTS focuses on exploring and exploiting the synergism of multidisciplinary research based on NTNU and SINTEF's expertise that encompasses the entire value chain from the energy source to the end user.

The mission of GTS is to act as a common interface in gas technology R&D between NTNU/ SINTEF and the market.

The event is being locally hosted by the Gas Technology Centre NTNU-SINTEF.

For more information, please visit www.ntnu.no/gas

About Global CCS Institute

The Global Carbon Capture and Storage Institute (Global CCS Institute) is a bold new initiative aimed at accelerating the worldwide commercial deployment of at-scale CCS.

Announced by the Australian Government in September 2008, the Global CCS Institute was formally launched in April 2009 and became an independent legal entity in July 2009.

Its central objective is to accelerate the commercial deployment of carbon capture and storage (CCS) projects to ensure their valuable contribution in reducing carbon dioxide emissions.

The Global CCS Institute has more than 24 national governments and over 100 leading corporations, non-government bodies and research organisation as foundation members or collaborating participants.

For more information, please visit www.globalccsinstitute.com

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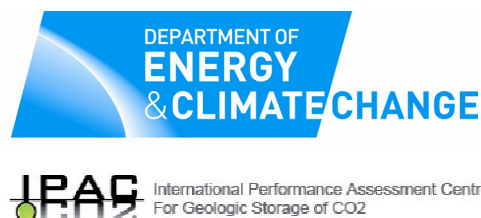
Local Organisers

Gas Technology Centre (GTS)

NTNU SINTEF



Summer School Supporters



Series Supporters

In addition to those sponsors and supporters listed above, there are further Series Sponsors who contributed to and support the ongoing work of the IEAGHG summer school programme, and these are shown on the back cover of this programme.

Programme at a Glance

Sun. 22nd August

Venue: UNIS

09.35 - 13.55
Travel from Oslo to
Longyearbyen

14.00
Check-in to Hotel

15.00 - 16.00
Lunch

16.00 - 16.15
Transfer to UNIS (walk)

16.30 - 17.00
Welcome to
Summer School

17.00 - 17.30
Welcome to Svalbard

17.30 - 18.00
Coffee Break

18.00 - 19.00
Welcome to UNIS

19.00 - 20.00
Introduction to
Group Work

20.00
Dinner at UNIS

Mon. 23rd August

Venue: Spitsbergen Hotel

09.00 - 09.30
Climate Change
Overview

09.30 - 10.30
CCS Overview

10.30 - 11.00
Coffee Break

11.00 - 11.45
Capture Overview

11.45 - 12.30
Capture: Oxyfuel

12.30 - 13.45
Lunch

13.45 - 14.30
Capture:
Pre-Combustion

14.30 - 15.15
Capture:
Post Combustion

15.15 - 15.45
Coffee Break

15.45 - 16.30
Capture:
Industrial Sources

16.30 - 19.00
Group Work

20.30
Dinner at KROA,
sponsored by SNSK

Tues. 24th August

Venue: Spitsbergen Hotel

09.00 - 09.30
Storage Overview

09.30 - 11.00
Storage:
Site Selection, Capacity,
Injectivity, Containment

11.00 - 11.30
Coffee Break

11.30 - 12.15
Storage: EOR

12.15 - 13.00
Storage: Modelling

13.00 - 14.00
Lunch

14.00 - 15.15
Storage: MMV

15.15 - 15.45
Wellbore Integrity

15.45 - 16.15
Coffee Break

16.15 - 17.00
Field Trip Introduction

17.00 - 19.00
Group Work

19.00
Dinner at
Spitsbergen Hotel



Weds. 25th August	Thurs. 26th August	Fri. 27th August
Field Trip	Venue: Spitsbergen Hotel	Venue: UNIS
09.30 - 11.30 Field Trip Part I	09.00 - 09.45 Transport	09.00 - 09.30 Outline of Day
	09.45 - 10.15 Value Chain	09.30 - 10.00 Coffee & Final Preparations
	10.15 - 10.45 Risk & Uncertainty	10.00 - 13.00 Group Presentations
	10.45 - 11.15 Health & Safety	13.00 - 14.00 Lunch
11.30 - 18.30 Field Trip Part II	11.15 - 11.45 Coffee Break	14.00 - 15.00 Technical Writing
	11.45 - 12.30 Economics & Financing	15.00 - 15.30 Coffee Break
	12.30 - 14.00 Lunch	15.30 - 16.30 Awards
	14.00 - 15.00 Public Acceptance & Communication	16.30 - 17.00 Wrap-Up
18.30 - 20.00 Group Work	15.00 - 15.30 Political / Legal - Norway	19.00 Dinner at Radisson Blu Polar Hotel
	15.30 - 16.15 International Regulation	Sat. August 28th
	16.15 - 17.15 Coffee & Transfer	Depart Longyearbyen
20.00 Light Dinner at Spitsbergen Hotel	17.15 - 19.00 Group Work	
	19.00 Dinner at Spitsbergen Hotel	

Programme Details

Day 1 - Sunday 22nd August

16.30 - 17.00 Welcome to the IEAGHG Summer School
Tim Dixon, IEAGHG & Maria Barrio, SINTEF

17.00 - 17.30 Welcome to Svalbard
Per Kyrre Reimert, Environmental Department,
Governor at Svalbard

18.00 - 19.00 Welcome to UNIS
Gunnar Sand, UNIS

19.00 - 20.00 Group Work Introduction
Tim Dixon, IEAGHG, John Kaldi, CO2CRC & Ameena
Camps, IEAGHG

Day 2 - Monday 23rd August

09.00 - 09.30 Climate Change Overview
Ameena Camps, IEAGHG

**09.30 - 10.30 CCS Overview, including Steps to Large
Scale Deployment & Status of CCS Projects**
Nils Røkke, SINTEF & Klaas van Alphen, GCCSI

11.00 - 11.45 Capture Overview
Olav Bolland, NTNU

11.45 - 12.30 Capture 1: Oxyfuel
Mario Ditaranto, SINTEF

12.30 - 13.45 - Lunch, including SNSK Presentation

13.45 - 14.30 Capture 2: Pre-combustion
Monica Lupin, CIUDEN

14.30 - 15.15 Capture 3: Post-combustion
Thor Mejdell, SINTEF

15.45 - 16.30 Capture 4: Industrial Sources
Klaas van Alphen, GCCSI

16.30 - 19.00 Group Work

Day 3 - Tuesday 24th August

09.00 - 09.30 Storage Overview
Robert Finley, ISGS

**09.30 - 11.00 Storage 1: Site Selection, Capacity,
Injectivity, Containment**
John Kaldi, CO2CRC & Franz May, BGR

11.30 - 12.15 Storage 2: EOR
Malcolm Wilson, University of Regina & IPAC CO₂

12.15 - 13.00 Storage 3: Modelling
Phillip Ringrose, Statoil

14.00 - 15.15 Storage 4: MMV
Martin Landrø, NTNU, & David White, Schlumberger

15.15 - 15.45 Wellbore Integrity
Bill Carey, LANL

16.15 - 17.00 Field Trip Introduction
Gunnar Sand, UNIS & Snorre Olaussen, UNIS

17.00 - 19.00 Group Work

Day 4 - Wednesday 25th August

09.30 - 11.30 Field Trip Part I:
Bus leaves Spitsbergen Hotel for a presentation at the
CO₂ injection test site (Longyearbyen CO₂ lab).

11.30 - 18.30 Field Trip Part II:
Boat trip to Pyramiden in Billefjorden to view
geological structures relevant to CO₂ storage.
Barbeque dinner on board the boat.

18.30 - 20.00 Group Work

Day 5 - Thursday 26th August

09.00 - 09.45 Transport
Mona J. Mølnevik, SINTEF

09.45 - 10.15 Value Chain
Jana Jakobsen, SINTEF

10.15 - 10.45 Risk & Uncertainty
Claude Roulet, Schlumberger

10.45 - 11.15 Health & Safety
Rosemary Whitbread, HSE UK

11.45 - 12.30 Economics & Financing
Phillip Sharman, Alstom

14.00 - 15.00 Public Acceptance & Communication
Sallie Greenberg, ISGS & Lori Gauvreau, Schlumberger

15.00 - 15.30 Political / Legal - Norway
Age Stangeland, Norwegian Research Council

15.30 - 16.15 International Regulation
Tim Dixon, IEAGHG

17.15 - 19.00 Group Work

Day 6 - Friday 27th August

09.00 - 09.30 Outline of the Day
Tim Dixon, IEAGHG & John Kaldi, CO2CRC

10.00 - 13.00 Group Presentations

14.00 - 15.00 Technical Writing
Clare Lehane, Elsevier

15.30 - 16.30 Awards
Tim Dixon, IEAGHG & John Kaldi, CO2CRC

16.30 - 17.00 Wrap Up
Tim Dixon, IEAGHG & John Kaldi, CO2CRC

Day 7 - Saturday 28th August

03.30 Transfer by bus from Hotel

04.50 Depart Longyearbyen Airport

07.45 Arrival Oslo Airport

Experts & Mentors

Maria Barrio	SINTEF, Norway
Olav Bolland	NTNU, Norway
Ameena Camps	IEAGHG, UK
Bill Carey	Los Alamos National Laboratory, USA
Mario Ditaranto	SINTEF, Norway
Tim Dixon	IEAGHG, UK
Robert Finley	Illinois State Geological Survey, USA
Lori Gauvreau	Schlumberger Carbon Services, UK
Sallie Greenberg	Illinois State Geological Survey, USA
Fen He	Tsinghua University, China
Jana Jakobsen	SINTEF, Norway
Jon Magne Johansen	SINTEF, Norway
John Kaldi, CO2CRC	CO2CRC, Australia
Martin Landrø	NTNU, Norway
Clare Lehane	Elsevier, UK
Astrid Lilliestrålø	NTNU, Norway
Monica Lupion	CIUDEN, Spain
Franz May	BGR, Germany
Thor Mejdell	SINTEF, Norway
Mona Jacobsen Mølnvik	SINTEF, Norway
Arvid Nøttvedt	UiB, Norway
Philip Ringrose	Statoil, Norway
Nils Røkke	SINTEF, Norway
Claude Roulet	Schlumberger Carbon Services, USA
Gunnar Sand	UNIS, Norway
Philip Sharman	Alstom Power, UK
Aage Stangeland	The Research Council of Norway, Norway
Tore Torp, Statoil	Statoil, Norway
Klaas van Alphen	Global CCS Institute, Australia
Mischa Werner	ETH Zurich, Switzerland
Rosemary Whitbread	HSE, UK
David White	Schlumberger, UK
Malcolm Wilson	University of Regina & IPAC-CO ₂ , Canada

Students

Estevao Frederico Nascimento de Souza	Universidade Estaciodesa, Brazil
Amanda Boyd	University of Calgary, Canada
Peter Crockford	University of Victoria, Canada
Warren Riemer	University of Regina, Canada
Yongjia Han	Jiangsu Polytechnic University, China
Guojie Qi	Tsinghua University, China
Lucie Hausmannova	CTU in Prague, Czech Republic
Diego Regalado	Universidad San Francisco de Quito, Ecuador
Maxime Wang	INSA Rouen, France
Johannes Kremer	Germany
Ulrich Liebenthal	Hamburg University of Technology, Germany
Addisalem Bitew Mitiku	Christian Albrechts University of Kiel, Germany
Malgorzata (Gosia) Stein-Brzozowska	IFK, Univ. of Stuttgart, Germany
Chetana Chaudhuri	Jawaharlal Nehru University, India
Claudio Monsagrati	La Sapienza University, Italy
Yukihiro Yazaki	RITE, Japan
Marijn Holwerda	University of Groningen, The Netherlands
Olusegun Akin Omisakin	University of Ibadan, Nigeria
Audrey Hope Gaspillo	De La Salle University, Philippines
Ramona-Mihaela Nego	Politehnica University of Bucharest, Romania
Renitia Arenz	University of the Western Cape, South Africa
Yoo Byeongyong	DSME, South Korea
Paloma Cortes Munoz	Univerisidad de Sevilla, Spain
Manuel Marquez Carrillo	Institut de Ciencies de la Terra Jaume Almera, Spain
Mar Pérez-Fortes	Universitat Politècnica de Catalunya, Spain
Laura Moya Rodriguez de Tudanca	CUIDEN, SPAIN
Mikael Larsson	Swerea MEFOS, Sweden
Jia Yan	Paul Scherrer Institut, Switzerland

Phurida Yoddee	The Petroleum and Petrochemical College, Thailand
Donnie Boodlal	The University of Trinidad and Tobago, Trinidad & Tobago
Chantsalmaa Dalkhaa	Department of Petroleum and Natural Gas Engineering, Turkey
Sati Asli Gundogar	Middle East Technical University Turkey
Vijo Varkey Theeyattuparampil	The Masdar Institute of Science and Technology, UAE
Ahmed Alhajaj	Imperial College London, UK
Oladotun Ayeni	University of Dun, UK
Alastair Clarke	Department of Chemical Engineering and Biotechnology, UK
Briony Daw	DECC, UK
Cristina Botero	Massachusetts Institute of Technology, USA
Gabriel Chan	Harvard Kennedy School of Government, USA
Andrew North	University of California - Berkeley, USA
Yan Zhang	Carnegie Mellon University, USA
Frank Cabrera	Central University of Venezuela, Venezuela
Binyam Lema Alemu	University of Oslo, Norway
Anastasia Trolleboe	NTNU, Norway
Zeinab Amrollahi	NTNU, Norway
Anwar Hossain Bhuiyan	NTNU, Norway
Raheleh Farokhpour	NTNU-SINTEF, Norway
Chao Fu	NTNU, Norway
Jo Husebye	SINTEF, Norway
Halvor Lund	SINTEF, Norway
Hamid Mehdizadeh	NTNU, Norway
Alexandre Morin	NTNU, Norway
Jo-Kristian Stræte Røttereng	NTNU, Norway
Mohammad Washim Uddin	NTNU, Norway
Nicla Vicinanza	NTNU, Norway
Mari Voldsund	NTNU, Norway

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IEA Greenhouse Gas R&D Programme

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