



IEA Greenhouse Gas R&D Programme - An Overview -

Jasmin Kemper
IEAGHG

Canmet, Ottawa, Ont., Canada
29 June 2015

IEA Greenhouse Gas R&D Programme (IEAGHG)



- A collaborative international research programme founded in 1991
- Aim: To provide information on the role that technology can play in reducing greenhouse gas emissions from use of fossil fuels.
- Focus is on carbon dioxide capture and storage (CCS)
- Producing information that is:
 - ✓ Objective, trustworthy, independent
 - ✓ Policy relevant but NOT policy prescriptive
 - ✓ Reviewed by external expert reviewers

Members as of April 2015



16 member countries, EC and OPEC
17 multi-national industrial sponsors

Technical studies



- Technical and economic evaluations of technology options with the potential to mitigate greenhouse gas emissions
- Available to individuals/organisations in all member countries and to all sponsor organisations upon publication
- Available to those from non-member countries after a six month period
- >250 in total on all aspects of CCS
- 12 – 15 technical reports each year

Technical studies



- Convenient yearly compilation of overviews of IEAGHG technical reports
- Overview structure
 - Key messages
 - Background
 - Scope of work
 - Findings
 - Expert review comments
 - Conclusions
 - Recommendations



http://www.ieaghg.org/docs/General_Docs/Publications/IEAGHG%20Technical%20Overview%20Book%202014.pdf

Recent reports



| Title | Contractor | Report number | Publication date |
|--|----------------------|---------------|------------------|
| Comparing Different Approaches to Managing CO ₂ Storage Resources in Mature CCS Futures | BGS (GCCSI) | 2014-01 | 19/03/2014 |
| Evaluation of Reclaimer Sludge Disposal from CO ₂ PCC Process | Trimeric Corporation | 2014-02 | 24/03/2014 |
| (Costs of) CO ₂ Capture at Coal-Based Power Plants | Foster Wheeler | 2014-03 | 03/07/2014 |
| Evaluation and Analysis of the Performance of Dehydration Units for CO ₂ Capture | AMEC | 2014-04 | 14/04/2014 |
| Biomass and CCS - Guidance for Accounting for Negative Emissions | Carbon Counts | 2014-05 | 03/07/2014 |
| Report of 5 th HTSLCN Meeting Cambridge | IEAGHG | 2014-06 | 09/07/2014 |
| Report of Iron and Steel Workshop Tokyo | IEAGHG | 2014-07 | 19/08/2014 |

Recent reports



| Title | Contractor | Report number | Publication date |
|---|--------------------|---------------|------------------|
| Techno-Economic Evaluation of Different PCC Process Flow Sheet Modifications | Hamburg University | 2014-08 | 22/09/14 |
| CO ₂ Storage Efficiency in Deep Saline Formations - A Comparison of Volumetric and Dynamic Storage Resource Estimation Methods | EERC | 2014-09 | 17/10/14 |
| Report of 4 th Social Research Network | IEAGHG | 2014-10 | 27/10/14 |
| IEAGHG 2013 Peer Review of US RCSP Projects – Public Summary Report | IEAGHG | 2014-TR2 | 21/05/14 |
| Assessment of Emerging CO ₂ Capture Technologies and Their Potential to Reduce Costs | IEAGHG | 2014-TR4 | 23/12/14 |
| Report of Monitoring Network and Modelling Network – Combined Meeting | IEAGHG | 2015-01 | 02/03/15 |
| CCS Cluster Projects: Review and Future Opportunities | Cofree | 2015-03 | 09/04/15 |
| Criteria of Fault Geomechanical Stability | Norges Geotekniske | 2015-04 | 17/04/15 |

Pending reports



| Title | Contractor |
|--|------------------|
| Impact of CO ₂ Impurity on Compression, Liquefaction and Transportation | Newcastle Uni |
| Oxy Gas Turbine Power Plants | Foster Wheeler |
| Operating Flexibility of CO ₂ Storage and Transport | EERC |
| Cost Components for Storage of CO ₂ in Association with EOR | TNO |
| Quantifying and Monitoring Emissions Reductions from CO ₂ -EOR | Carbon Counts |
| Review of Offshore Monitoring Techniques | BGS |
| Evaluation of CO ₂ Adsorption Process in Natural Gas Production | SINTEF |
| Process Control Strategies for Normal and Flexible Operation of PCC | Imperial College |
| Techno-Economic Evaluation of CO ₂ Capture for Pulp and Paper | VTT & AF |
| Value of Flexibility in CCS Power Plants | Imperial College |
| CCS Deployment in the Context of Regional Developments | Carbon Counts |
| Unburnable Carbon and CCS | SGI/ICON |

Studies in the books



| Title |
|---|
| Public Perception of CO ₂ Pipelines |
| Energy Storage and CCS |
| Incorporating Future Technological Upgrades in Existing PCC |
| Design and Costs of Full Scale Solid Looping CO ₂ Capture Plants: Part I Calcium Looping, Part II Chemical Looping |
| Regional Variation of Capture Costs |
| Application and Advances in Monitoring at Different Storage Sites |
| Geochemical Effects of Impurities in the CO ₂ Stream on Formation Rocks and Well Cements under In-situ Conditions |
| Techno-Economic Evaluation of CO ₂ Capture in LNG Process |
| Comparison of Accounting Protocols for CCS |
| CO ₂ Storage Efficiency |
| Leakage into the Overburden |

Information papers (IPs)



- Response to members' wishes for more timely information
- Covering CCS area but also wider topics
- 1 – 10 pages
- ~30/year
- Most free to access
- Recent topics:
 - CO₂ emissions in energy sector
 - Scientific debate on climate change
 - IEA webinar on heat recovery
 - Water / climate change nexus
 - Status of carbon trading
 - CH₄ emission reduction in US



IEAGHG Information Paper: 2015-IP11; Global Emissions of Carbon Dioxide from the Energy Sector Stalled in 2014 – A brief review of what the media have been saying

The International Energy Agency (IEA) recently published a statement¹ indicating that global emissions of carbon dioxide from the energy sector stalled in 2014, marking the first time in 40 years in which there was a halt or reduction in emissions of the greenhouse gas that was not tied to an economic downturn.

Global emissions of carbon dioxide stood at 32.3 billion tonnes in 2014, unchanged from the preceding year. The preliminary IEA data suggest that efforts to mitigate climate change may be having a more pronounced effect on emissions than had previously been thought.

The IEA has attributed the halt in emissions growth to changing patterns of energy consumption in China and OECD countries. In China, 2014 saw greater generation of electricity from renewable sources, such as hydropower, solar and wind, and less burning of coal. In OECD economies, recent efforts to improve energy efficiency, such as energy audits, energy efficiency programs and more research



IEAGHG Information Paper 2015-10; The Earth's Getting Hotter and So Does the Scientific Debate

A recent study published in *Nature Climate Change*¹ suggests that the rate of climate change we're experiencing now is faster than at any time in the last millennium. The research team from the Joint Global Change Research Institute, Pacific Northwest National Laboratory, USA, have compared how temperature has varied in blocks of 40-year periods over millennia from. Their main conclusion is that the Earth is entering a new phase what they refer to as rapid temperature change. One implication of this work is that 'we are already locked into fast-paced changes in the near future because of past emissions, which means we'll need to adapt to 'minimise the impacts of climate change, even if greenhouse gas emissions are cut substantially'.

By looking back at how the temperatures have changed over the past century, the researchers conclude that temperature rise of the Earth's surface has not been smooth. The peaks and troughs in the temperature data, they conclude, are in part caused by natural phenomena (volcanic eruptions and El Niño), which have yearly impacts on the Earth's climate. The figure below (taken from a Carbon Brief blog on the study) shows average global surface temperatures for every year back to the 1850s. It shows that the temperature changes from decade to decade vary which they suggest is due to the impact of natural cycles on the climate.



Blog



Latest
from
our



[HOME](#) [ABOUT US](#) [PUBLICATIONS](#) [NETWORKS](#) [CCS RESOURCES](#) [EDUCATION](#) [CONFERENCES](#)

[Home](#) / [PUBLICATIONS](#) / [Blog](#)

Blog

New Secretary of State speaks at CCSA Presidents Reception 2015

Written by Sian Twinning on 26 June 2015. Posted in [General](#)



A large number of the great and the good from the UK's CCS world gathered for the annual CCSA President's Reception on the 24 June at the House of Lords, hosted by their Honorary President Lord Oxburgh. This followed on from the CCSA's AGM. The highlight of the reception was the guest speaker was Amber Rudd, the new Secretary of State for Energy and Climate Change. I think this was her first CCS-related event in her new position. She gave a speech that recognised the importance of CCS in dealing with climate change, the UK's expertise and capabilities in this area, mentioning of course the two UK demonstration projects as well as the government's support for feasibility work at Teesside and for R&D. The two UK projects are expected to reach final investment decisions in late 2015, with the government's decision on support in early 2016. Amber Rudd began by offering her 'personal commitment' to commercialising CCS in the UK and concluded by emphasising the need to balance longer-term considerations around the cost of decarbonisation with short-term costs to consumers. Pleasingly, she invited questions afterwards, which covered uncertainty issues for the industry and timings. Overall, the new Secretary of State provided much to discuss among the gathering of 220.

26/06/2015 New Secretary of State speaks at CCSA Presidents Reception 2015

A large number of the great and the good from the UK's CCS world gathered for the annual CCSA President's Reception...

19/06/2015 UK targets CCS Phase 2

The UK is now thinking ahead past the first phase of CCS demonstration....

19/06/2015 Official Opening of SaskPower's Carbon Capture Test Facility

Today marked the official opening of the Carbon Capture Test Facility (CCTF).....

18/06/2015 The Popes Encyclical on the Environment and Climate Change

I was intrigued by the content of the Pope's message on Climate change. The Pope being the spiritual leader

[Full blog here](#)

Newsletter



- Circulation of >7,000 copies in 113 countries
- Free information on new developments in GHG mitigation
- **Details of IEAGHG's and member countries' activities**





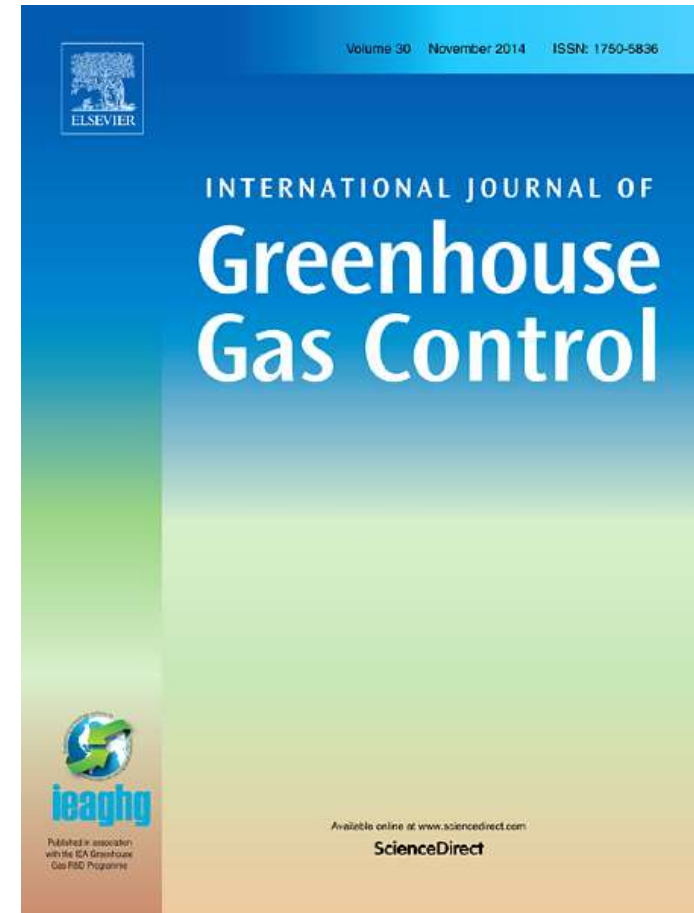
New: webinars

- On both individual studies and compilations of similar reports
- First webinar on 29 June, 14:00 BST, on **“Industry CCS Challenges”**
- Other topics to follow:
 - Status of biomass and CCS
 - Update on developments in offshore monitoring
 - Oxy gas turbine power plants
 - Assessing future capture cost reductions
- Recordings will be available on website

IJGGC



- 2011 Special Issue on oxyfuel combustion
- **Upcoming Special Issue: 10 years since IPCC's Special Report on CCS**
 - Post combustion capture
 - **Oxyfuel combustion**
 - Pre combustion capture
 - Emerging technologies
 - Storage systems
 - **Biomass and CCS**
 - Public perception
 - **Legal / regulatory developments**
 - **Costs of CCS**
- Publication Sep 2015
- Other Special Issues in planning
 - Water-CCS nexus (deadline: 17 July 2015)
 - Flexible carbon capture plants
 - Low carbon fuels

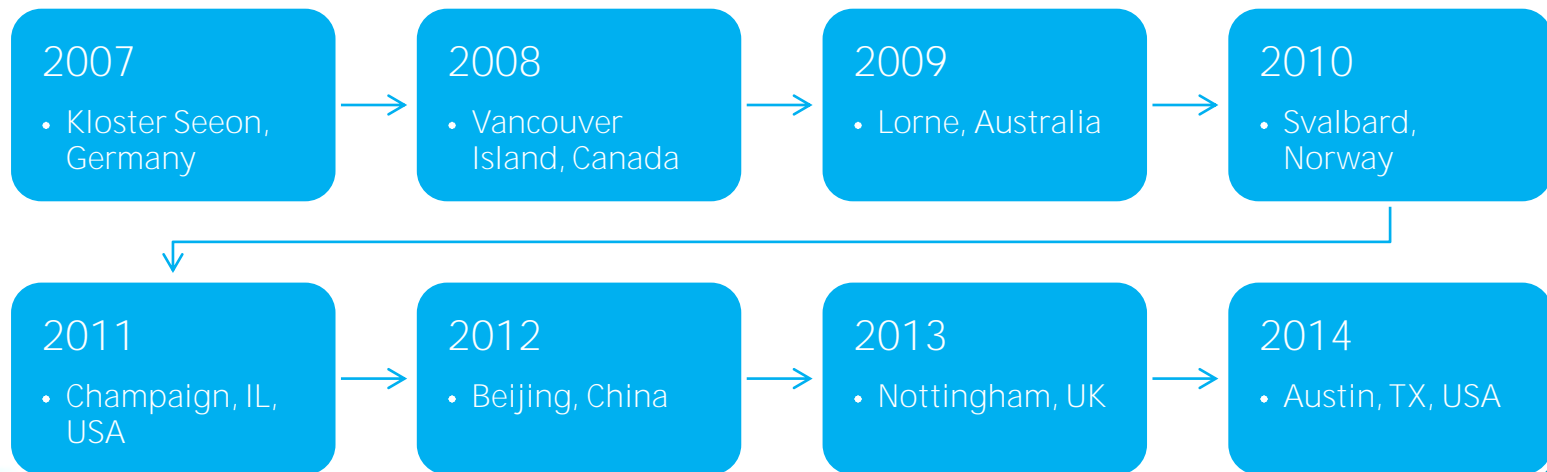


<http://www.journals.elsevier.com/international-journal-of-greenhouse-gas-control/>

IEAGHG Summer School



- Aims to provide students with a broad understanding of CCS and the issues around it
- Target group young scientists / PhD students
- Usually ~60 students from both developed and developing countries
- ~20 experts from industry and academia lecturing and mentoring
- Next: 6 – 12 Dec 2015, University of Western Australia, Perth, Australia



Conference series



International Conference on
Greenhouse Gas Control Technologies
(GHGT)



PCCC3
Post Combustion Capture Conference

Post Combustion Capture Conference
(PCCC)



**Oxyfuel
Combustion
Conference 3**

Oxyfuel Combustion Conference (OCC)



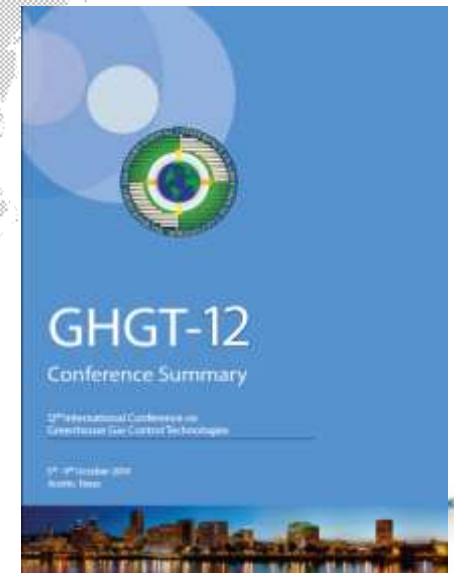
www.GHGT.info

October 5 – 9
TWO THOUSAND FOURTEEN
AUSTIN, TX – USA



- 1159 Delegates/35 Countries
- 870 published papers in Energy Procedia – open access
- Summary report on-line

AUSTIN TX



<http://www.sciencedirect.com/science/journal/18766102>

http://www.ieaghg.org/docs/General_Docs/GHGT-12%20Summary%20Brochure.pdf



GHGT-13



- 14 – 18 Nov 2016, Lausanne, Switzerland
- <http://www.ghgt.info/index.php/Content-GHGT13/invitation.html>



PCCC



- 8 – 11 Sep 2015, Regina, Canada
- Two day conference on PCC developments
- Special session showcasing first year Boundary Dam operational experience
- Site visits to Boundary Dam and Shand power stations
- Third day Sask Power Symposium



U.S. DEPARTMENT OF
ENERGY

Fossil
Energy

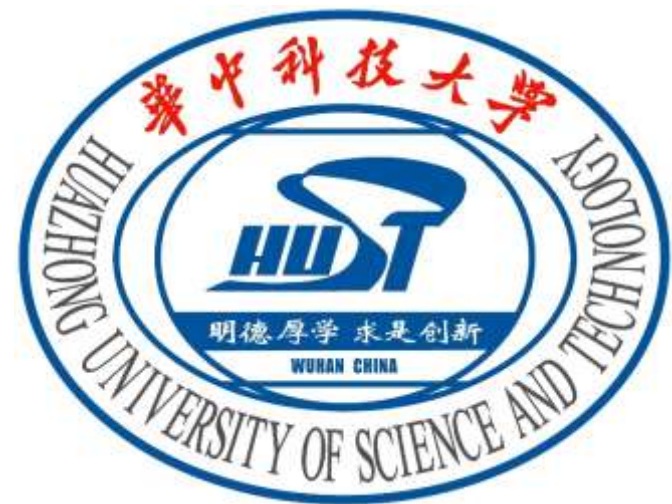


 **SaskPower**

OCC



- No OCC4 in 2015, workshop instead
- 27 – 30 Oct 2015, Wuhan, China



Int'l research networks



- Environmental impacts
- High temperature solid looping cycles
- Joint network
 - Environmental impacts of CO₂ storage
 - Modelling
 - Monitoring
 - Risk management
- Oxyfuel combustion
- Post combustion
- Social research
- Wellbore integrity



Int'l research networks



High temperature solid looping cycles network (HTSLCN)

- Covering the following topics:
 - Calcium looping
 - Chemical looping
 - Combustion / gasification / reforming
 - Fundamentals / modelling / testing
- Constantly >50 attendees, focus on academia
- Moving to a 2-year format to align with the International Conference on Chemical Looping
- Next meeting 1-2 Sep 2015 at Politecnico Di Milano, Italy

2009



Oviedo

2010



Petten

2011



Vienna

2012



Beijing

2013



Cambridge

2015



Milan

Upcoming conferences and meetings



- **Social Research Network.** University of Cambridge and Tyndall Centre, UK. 6 Jul 2015
- **High Temperature Solid Looping Cycles Network.** Politecnico Di Milano, Italy. 1-2 Sep 2015
- **PCCC3.** Regina, Canada. 8-11 Sep 2015
- **4th Conference on Carbon Dioxide as Feedstock for Fuels, Chemistry and Polymers.** Essen, Germany. 29-30 Sep 2015
- **Risk Management Network and Environmental Research Network.** National Oceanography Centre, UK. 30 Sep – 2 Oct 2015
- **5th Oxyfuel Combustion Network Meeting.** Wuhan, China, 27-30 Oct 2015
- **LCA workshop.** Fall 2015 tbc

Collaborations



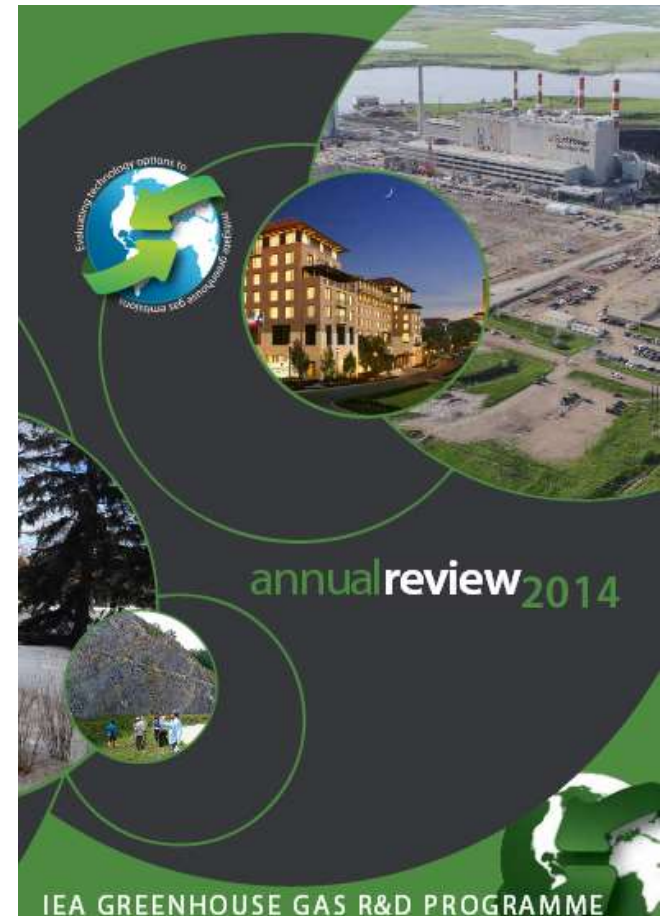
- Peer reviews
 - US DOE
 - US EPA
 - CO2CRC
- International regulatory developments
 - London Convention
 - UNFCCC/COP/CTCN
 - ISO TC265
- Others, i.a.
 - IEA
 - CSLF
 - CCSA
 - EU ZEP



Annual review



- Summarises IEAGHG's activities
 - Programme overview
 - Conferences
 - Networks
 - Social media
 - Summer School
 - Technical report & reviews
 - Information papers
 - Staff presentations
 - Members



http://www.ieaghg.org/docs/General_Docs/Publications/Annual_Review_2014_Low_Res.pdf



Thank you, any questions?

Contact me at: jasmin.kemper@ieaghg.org



Website: www.ieaghg.org



LinkedIn: www.linkedin.com/groups/IEAGHG-4841998



Twitter: <https://twitter.com/IEAGHG>



Facebook: www.facebook.com/pages/IEA-Greenhouse-Gas-RD-Programme/112541615461568?ref=hl