



IEAGHG Update to CSLF

Tim Dixon

IEA GHG R&D Programme

CSLF Technical Group, 2 November 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

IEAGHG



- Flagship activities:
- **Technical Studies** >250 reports published on all aspects of CCS
- **International Research Networks**
 - Risk Assessment/Management
 - Monitoring
 - Modelling
 - Environmental Research
 - Social Research
 - Oxy-combustion
 - Post-combustion Capture
 - Solid Looping
- **GHGT conferences** – GHGT-13, Lausanne, Switzerland, 13-18 Nov 2016

IEAGHG



- Other activities include:
- International CCS Summer Schools - 2015 - Perth, Australia, 6-11 Dec 2015; 2016 - Regina, Canada
- Peer reviews, eg US DOE, US EPA; CO2CRC
- Active in international regulatory developments – UNFCCC, London Convention, ISO TC265
- Collaborations with IEA, CSLF, CCSA, EU ZEP, UT and others



ALSTOM

CIAB

EnBW

ExxonMobil

Masdar INSTITUTE



ieaghg



EPRI

JÜLICH FORSCHUNGSZENTRUM

DOOSAN Doosan Infracore

Statoil

BR PETROBRAS

INSTITUTO DE INVESTIGACIONES ELECTRICAS

JGC

RWE The energy to lead

Partner Organisations:





Update on CSLF and IEAGHG Collaboration

Arrangement between CSLF Technical Group and IEAGHG

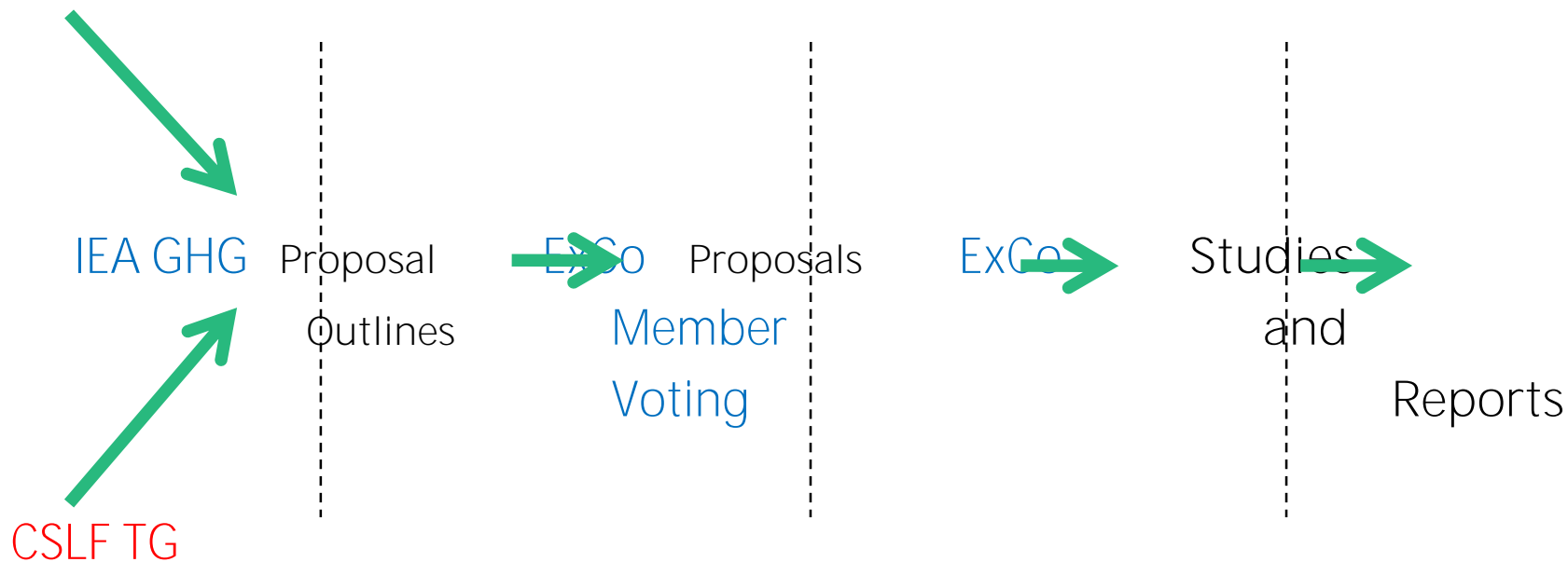


- How CSLF TG/PIRT and IEAGHG will interact for mutual benefit through increased co-operation
 - Mutual representation of each at CSLF TG and IEAGHG ExCo (no voting)
 - Liaison with PIRT co-chairs to discuss potential activities or projects – two way process
 - Activities would require approval by ExCo or TG
 - Due reference to org providing the resource
- Agreed by IEAGHG ExCo Oct 2007 and CSLF Technical Group Jan 2008



IEA GHG – Study generation

IEAGHG ExCo members





CSLF-proposed studies

- 'Development of Storage Coefficients for CO₂ Storage in Deep Saline Formations'. IEAGHG Report 2009/13. Presentation at CSLF TG Mar 2010
- 'Geological Storage of CO₂ in Basalts', IEAGHG Report 2011/TR2. Presentation at CSLF TG Sep 2011
- Potential Implications of Gas Production from Shales and Coal for CO₂ Geological Storage. ARI. Report published 2013. IEAGHG Report 2013/10. Presentation at CSLF TG Nov 2013
- **'LCA of CCUS – Benchmarking'. Proposed to 46th ExCo.** To be developed as round-table/workshop: 11-12 Nov 2015 London. CSLF on Steering Committee
- Additional new study ideas invited from CSLF TG/PIRT
- Outline required by 01 February 2016



Update on IEAGHG activities

Reports published



	Contractor	Report number	Publication date
Review of Offshore Monitoring for CCS Projects	BGS, NOC, PML, UoS (UK)	2015-02	July 2015
CCS Deployment in the Context of Regional Developments in Meeting Long-Term Climate Change Objectives	Carbon Counts, (UK)	2015-TR3	July 2015
Oxy-Combustion Turbine Power Plants	Foster Wheeler (Italy)	2015-05	August 2015
Integrated Carbon Capture and Storage Project at SaskPower's Boundary Dam Power Station	CKP & Associates Consulting, (Canada)	2015-06	August 2015
U.S. DOE Carbon Storage Program: 2015 Project Peer Review Summary Report	IEAGHG	2015-TR2	October 2015

Reports in progress to be published



Title	Contractor	Publication date
Impact of CO ₂ Impurity on CO ₂ Compression and Transportation	Newcastle University (UK)	December 2015
CO ₂ -EOR Emissions Accounting	Carbon Counts (UK)	November 2015
Emerging Capture Technologies and Cost Reduction Potential	COFREE/IEAGHG (UK)	January 2016 (TR4- Dec 2014)

Studies being reported



Title	Contractor	Publication date
CO ₂ -EOR Emissions Accounting - Background	Carbon Counts (UK)	August 2015
Hydrogen Production with CO ₂ Capture – Techno—economic assessment	AMEC/Foster Wheeler (Italy)	November 2015
CCS and Unburnable Carbon	SGL/Imperial (UK)	November 2015

Studies underway



Title	Contractor	Draft Report date
Cost components for storage of CO ₂ in association with enhanced oil recovery	TNO (NL)	December 2015
Evaluation of Various Process Control Strategy for Normal and Flexible Operation of PCC	Imperial College (UK)	October 2015
CO ₂ Capture in Natural Gas Production by Adsorption	SINTEF (Norway)	September 2015
Understanding the Cost of Retrofitting CO ₂ Capture in Oil Refineries	Consortium led by SINTEF, cofounded by CLIMIT (Norway)	2016
Techno-economic evaluation of CO ₂ capture for Pulp and Paper	VTT and AF Engineering (Finland)	May 2016
Value of Flexibility in CCS Power Plants	Imperial College (UK)	March 2016
Fault Permeability	GNS (New Zealand)	November 2015
Criteria for Depleted Oil and Gas Fields to be Considered for CO ₂ Storage	BGS (UK) and BEG (USA)	March 2015

Studies awaiting start



Title	Expected start
Design and Costs of Full Scale Solid Looping CO ₂ Capture Plants	2016
Regional Variation of Capture Costs	Q4 2015
Techno-Economic Evaluation of CO ₂ Capture in LNG Process	Q3 2015.
Leakage into the Overburden	Q1 2016
CO ₂ Storage Efficiency – Stage 2	Q1 2016
Comparison of Accounting Protocols for CCS	Q1 2016

IJGGC Special Issue No. 40



- Updates IPCC SR on CCS
- 17 technical papers on CCS progress
- Take away message:
“Considerable progress made in all areas in the last ten years”
- <http://www.sciencedirect.com/science/journal/17505836/40>
- Papers free to download until 31st Dec 2015

IJGGC Special Issue No. 40



Practical experience in post-combustion CO₂ capture using reactive solvents in large pilot and demonstration plants

R. Idem, T. Sopap, H. Shi et al.

Recent progress and new developments in post-combustion carbon-capture technology with amine based solvents

Z. (Henry) Liang, W. Rongwong, H. Liu et al.

Oxyfuel combustion for CO₂ capture in power plants

R. Stanger, T. Wall, R. Spörl et al.

Emerging CO₂ capture systems

J.C. Abanades, B. Arias, A. Lyngfelt et al.

Pre-combustion CO₂ capture

D. Jansen, M. Gazzari, G. Manzolini et al.

Review of CO₂ storage efficiency in deep saline aquifers

S. Bachu

CO₂ migration and pressure evolution in deep saline aquifers

J.T. Birkholzer, C.M. Oldenburg, Q. Zhou

Capillary trapping for geologic carbon dioxide storage - From pore scale physics to field scale implications

S. Krevor, M.J. Blunt, S.M. Benson et al.

Convective dissolution of CO₂ in saline aquifers: Progress in modeling and experiments

H. Emami-Meybodi, H. Hassanzadeh, C.P. Green, J. Ennis-King

Subsurface geochemical fate and effects of impurities contained in a CO₂ stream injected into a deepsaline aquifer: What is known

S. Talman

Recent advances in risk assessment and risk management of geologic CO₂ storage

R.J. Pawar, G.S. Bromhal, J.W. Carey et al.

The state of the art in monitoring and verification-Ten years on

C. Jenkins, A. Chadwick, S.D. Hovorka

Developments since 2005 in understanding potential environmental impacts of CO₂ leakage from geological storage

D.G. Jones, S.E. Beaubien, J.C. Blackford et al.

The cost of CO₂ capture and storage

E.S. Rubin, J.E. Davison, H.J. Herzog

Biomass and carbon dioxide capture and storage: A review

J. Kemper

Legal and Regulatory Developments on CCS

T. Dixon, S.T. McCoy, L. Havercroft

Developments in public communications on CCS

P. Ashworth, S. Wade, D. Reiner, X. Liang



IJGGC Special Issue No. 40



- PCC (2 papers)
- Oxyfuel
- Emerging capture processes
- Pre-combustion Capture
- Storage efficiency in deep saline aquifers
- Migration and pressure in deep saline aquifers
- Capillary trapping
- Convective dissolution of CO₂ in saline aquifers
- Geochemical fate and effects of impurities
- Risk assessment and management
- Monitoring and verification
- Environmental impacts of leakage
- Costs of CCS
- Biomass and CCS
- Legal and regulatory developments
- Public communications

Meetings and events



2015

- Social Research Network. University of Cambridge, UK. 6 July 2015
- High Temperature Solid Looping Network. Milan, Italy. 1-3 Sep 2015
- PCCC3, Regina, Canada. 8-11 Sep 2015
- Risk Management Network and Environmental Research Network. National Oceanography Centre, UK. 30 Sep – 2 Oct 15
- 5th Oxyfuel Combustion Network Meeting, Wuhan, China, 27-30 Oct 2015
- Joint CCSA / IEAGHG / UKCCSRC event - Pathways from Demonstration to Commercialisation. 9 Nov 2015, London
- LCA workshop. 12-13 November 2015
- COP-21 UNFCCC Side-**event: 'Carbon Capture and Storage (CCS): Achievements and Opportunities for Developing Country Involvement'**, in collaboration with BEG University of Texas, CCSA, and CO2GeoNet - with SaskPower, Statoil and UNFCCC's CTCN. 1 Dec 2016, Paris



Meetings and events



2016

- Monitoring Network and Modelling Network. BGS, Edinburgh, UK, tbc
- International Workshop on Sub-seabed Geological Storage of CO₂. BEG University of Texas. Oct 2016 tbc (recommendation in CSLF Offshore Task Force report)

More information and meeting reports on <http://www.ieaghg.org>



ghgt-13



- Lausanne, Switzerland, 14-18 Nov 2016

Timeline

- Call for abstracts opened 1st September 2015
- Deadline for submission 10th February 2016
- Registration opens 6th April 2016
- Draft technical programme 1st June 2016
- Early bird registration closes 13th July 2016

www.ghgt.info



ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Swiss Federal Office of Energy SFOE


KEEP
CALM
AND
CAPTURE
ON





Thank you

Any questions?