

# LCA in CCUS Workshop

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IEA Greenhouse Gas R&D Programme

12 – 13 November 2015

BMA House, London

# 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

# Current membership

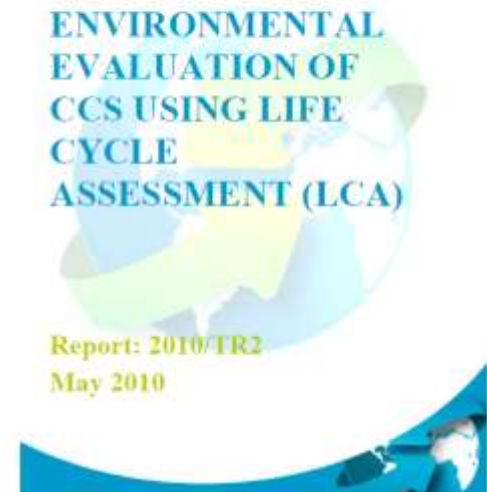


16 member countries, EC and OPEC  
17 multi-national industrial sponsors

# Previous IEAGHG work



- IEAGHG 2010/TR2 looked at 17 LCA studies
- Identified 14 papers that represented relevance and significance in terms of CCS
- Examined these papers in more detail to compare scoped, methods and outcomes



[http://www.ieaghg.org/docs/General\\_Docs/Reports/2010-TR2.pdf](http://www.ieaghg.org/docs/General_Docs/Reports/2010-TR2.pdf)

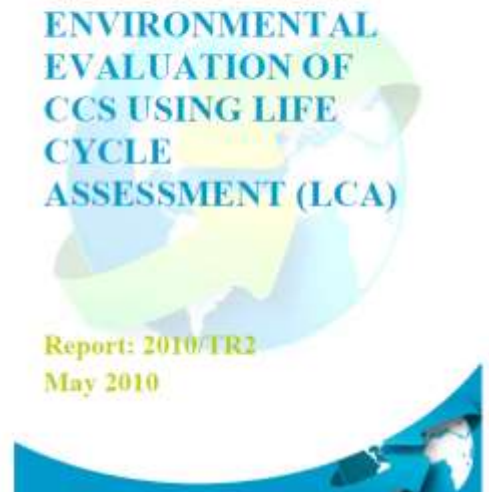
# Previous IEAGHG work



- Key IEAGHG 2010/TR2 conclusion:

*„IEAGHG could consider playing a role in setting up some reference points to allow benchmarking and hence proper comparison of LCA studies.“*

- Similar survey by CSLF in spring 2014 included several more recent LCA studies of CCS but came to same conclusions



[http://www.ieaghg.org/docs/General\\_Docs/Reports/2010-TR2.pdf](http://www.ieaghg.org/docs/General_Docs/Reports/2010-TR2.pdf)

# General findings from IEAGHG



## Summary of literature survey of CCS LCA:

- Many LCA studies on CCS available but lack of transparency
- LCA must be used with care when comparing different CCS technologies and CCS with e.g. renewables
- LCAs are time consuming and expensive
- Majority of CCS LCA studies are on post-combustion
- LCA can be useful in design and operation of single technology



# General findings from others



- Global Warming Potential (GWP) robust across studies
- Other impacts show large variations
- Upstream/downstream (indirect) impacts important
- Impacts like water, land use, abiotic depletion seldom included
- CCS gives decrease in global warming potential but increases other impacts
- Aggregation and end point results are rarely included
- Benefit from reducing GWP > increase in other categories

# Consistency of LCAs



Need for consistency between studies with respect to:

- Reference system
- Functional unit
- System boundaries
- Energy efficiency and penalty
- CO<sub>2</sub> purity
- Fuel
- Benchmarks
- Time frame
- Technology improvements
- Carbon leakage and seepage
- Direct vs indirect emissions
- Inventories
- Impact categories and impact assessment methods



# Identified gaps



- Guidelines for boundary conditions, units, time horizon, impacts, etc.
- Standardised performance data from pilot and demonstration project
- Definition of environmental effects that are important for comparing LCA studies, both within CCS and between CCS and other low carbon energy technologies
- Further use and development of aggregated indicators across impacts → weighting

# Scope of workshop I



- Identify and address issues that are important for comparability of LCA studies
  - Environmental impacts, such as land use, water use, abiotic depletion
  - CCS and non-CCS technologies, e.g. renewables
  - Climate and non-climate impacts
- Review and comment on inventories and weighting methods
- Role of standardised performance data from pilot and demonstration projects
  - Might require extensive time and resources

# Scope of workshop II



- Explore possibility to set-up guidelines for benchmarking and transparency of CCUS LCA
  - Description of reference systems
  - Boundary limits
  - Functional units
  - Time horizon
  - Fuels
  - Efficiencies and energy penalties
  - CO<sub>2</sub> specifications
- Consider CCS, bio-CCS, CO<sub>2</sub>-EOR, other CO<sub>2</sub> utilisation (fuels, chemicals, materials)

# Agenda – Thursday 12 Nov

## Murrell Room



09.00 - 09.20 Registration

09.20 - 09.30 Welcome, *Lars Ingolf Eide (RCN/CSLF) & Jasmin Kemper (IEAGHG)*

### Setting the scene

09.30 - 10.00 Keynote "State-of-the-art and current developments in LCA in CCUS", *Bhawna Singh (NTNU)*

10.00 - 10.30 Stakeholder Perspectives

10.30 - 10.40 Explanation/approach to workshop, *Lars Ingolf Eide (RCN/CSLF) & Jasmin Kemper (IEAGHG)*

10.40 - 11.00 Coffee Break

### Goal and scope definition

11.00 - 11.15 Introductory presentation

11.15 - 11.45 Discussion in groups

11.45 - 12.15 Plenary discussion

12.15 - 13.15 Lunch

### Inventory analysis

13.15 - 13.30 Introductory presentation

13.30 - 14.10 Discussion in groups

14.10 - 14.40 Plenary discussion

14.40 - 15.00 Coffee break

### Impact assessment and interpretation

15.00 - 15.15 Introductory presentation

15.15 - 16.15 Plenary discussion

15.15 - 17.00 Conclusions from Day 1

# Agenda – Friday 13 Nov

## Prince's Room



09.00 - 09.15 Registration and welcome

Beyond environmental LCA: LCC and social LCA

09.15 - 09.30 Introductory presentation

09.30 - 10.30 Discussion in groups

10.30 - 11.30 Plenary discussion

11.30 - 11.50 Coffee break

11.50 - 12.45 Conclusions – lessons learnt – steps forward

12.45 - 13.45 Networking lunch



Thank you, any questions?



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**13<sup>th</sup> Conference on Greenhouse Gas Control Technologies**  
**14 – 18 November 2016, Lausanne, Switzerland**

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