

# IEAGHG/CSLF Workshop “LCA in CCUS”

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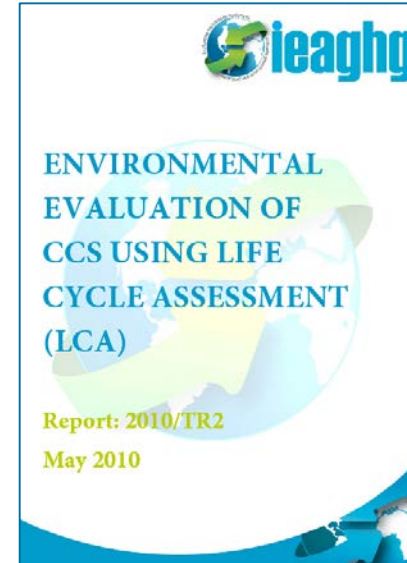
**CSLF Meeting**

28 June 2016, London

# Background



- IEAGHG “2010/TR2: Environmental Evaluation of CCS Using Life Cycle Assessment”



<http://www.ieaghg.org/docs/GeneralDocs/Reports/2010-TR2.pdf>

- Request from CSLF to IEAGHG for further work on this topic
- Workshop with experts instead of study
- Workshop took place 12-13 November 2015 in London
- 23 participants
  - From different backgrounds (academia, industry, NGOs)
  - With varying levels of LCA experience (LCA practitioners, users of the results)

# Scope of the workshop



- Explore need to set-up guidelines for benchmarking and transparency of LCAs for CCUS with respect to e.g.:
  - Description of reference system
  - Battery limits
  - Functional units
  - Time horizon
  - Climate and non-climate impacts
  - Inventories
  - Weighting methods



- Also discuss LCA for Bio-CCUS, LCC and SLCA
- Format: 5 sessions
  - Introductory presentations
  - Discussions in groups or plenary

# Session 1: Setting the scene

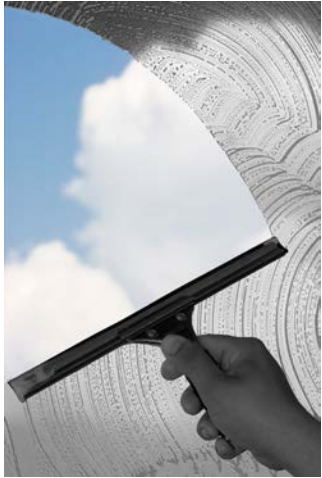


- LCA can be a useful tool to
  - Assess environmental sustainability
  - Identify the needs for environmental change
  - Look at trade-offs and possibilities for environmental improvements in product development
- Some users, policy makers in particular, do not fully understand what LCA is about
  - Results may be misused/misinterpreted

## ■ Further issues include:

- Need to ask the right questions
- Different suitability of attributional and consequential LCA
- LCA vs C/GHG accounting and footprinting
- Often lack of communicating uncertainties

# Session 2: Goal and scope



- Transparency is indispensable!
  - Transparency does not automatically infer the LCA is of high quality

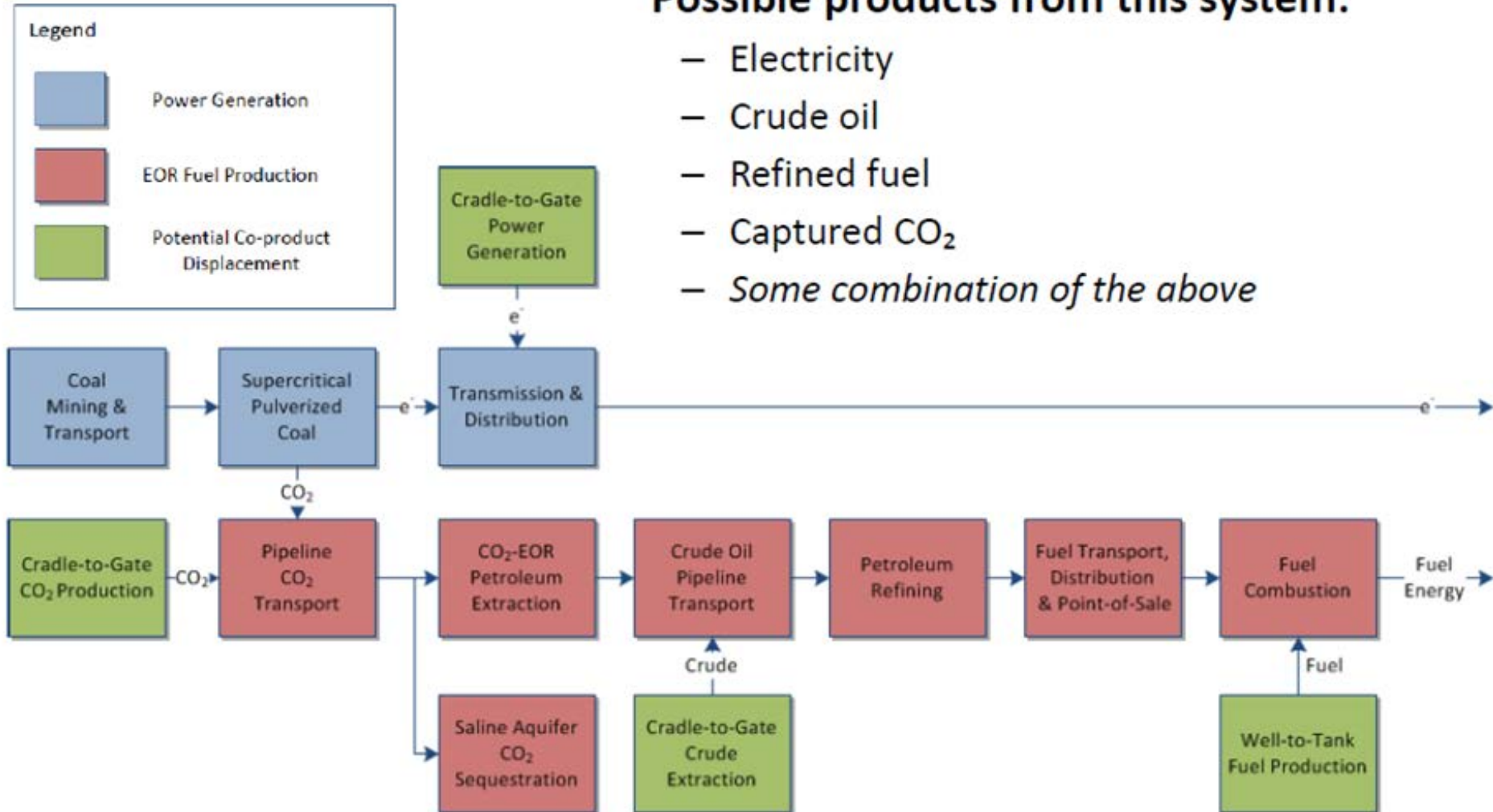
- LCA results are driven by the choice of boundaries and the desired outcome
  - Often dictated by policy and
  - Offers the possibility to tweak
- Crucial point is the quality of the process data
- Databases are usually five or more years behind
  - More data sharing, esp. from industry, is necessary

# CCUS create a very complex life cycle system to model - with varying objectives

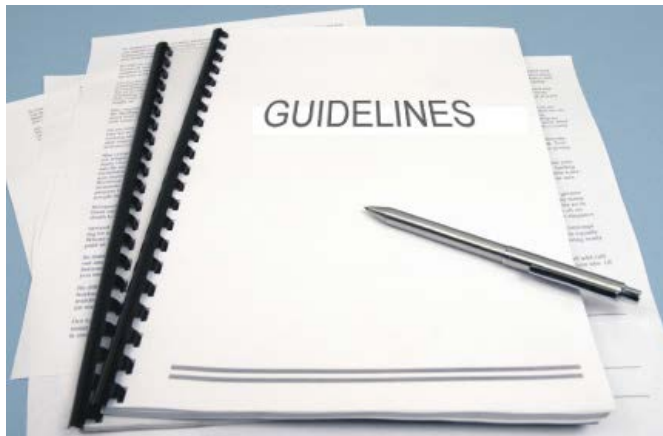


## Possible products from this system:

- Electricity
- Crude oil
- Refined fuel
- Captured CO<sub>2</sub>
- *Some combination of the above*

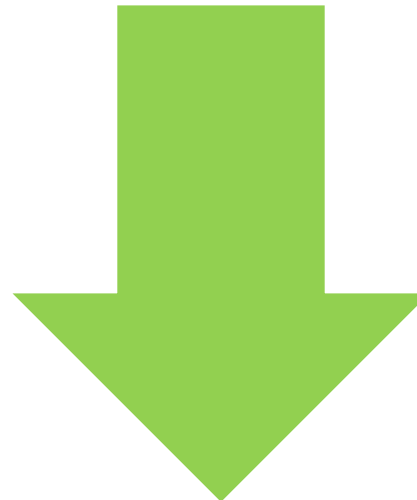


# Session 2: Goal and scope



## Pro guidelines

- Useful for educating non-experts
- Might help improve consistency and comparability
- Ensure transparent reporting



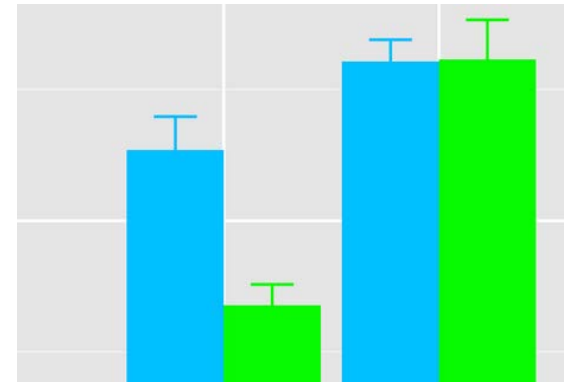
## Contra guidelines

- Already in ISO TC265
- Mix for different CCUS technologies
- Transparency more important



# Session 3: Inventory analysis

- Session reinforced several points from Session 1 & 2
- Additional points
  - Variability/uncertainty in natural systems is larger than in human engineered systems
  - Report error bars reflecting the uncertainty range instead of single numbers
  - Crucial to have both high quality data and models
    - Lots of data from lab/small-scale systems, not representative of full-scale system
- LCA also a powerful tool for process optimisation





# Session 4: Impact assessment



## ■ Bio-CCUS:

- Ongoing debate about carbon neutrality of biomass
- LUC very relevant but difficult to address
- Might need specific “GWP<sub>bio</sub>” factors for different biomass feedstocks



## ■ Weighting and aggregation

- LCA practitioners vs end users
  - Often not transparent
- Agree on weighting upfront
- No weighting = equal weights
- Dilemma:
  - Workshop participants clearly prefer mid-point
  - End users/decision makers often demand end-point

# Session 5: Life cycle costing



- Suitable for comparing sites but not technologies in general
- Cost implications of CO<sub>2</sub> storage liability still unclear
- LCC will only give change from a baseline
  - High natural variability in the fuels and technical details of the processes
  - LCC methods for CCUS are relatively immature

# Session 5: Social LCA



- Involves a certain degree of subjectivity

- Complexities/sensitivities:

- Child labour
- Discrimination
- Health and safety

- Qualitative nature

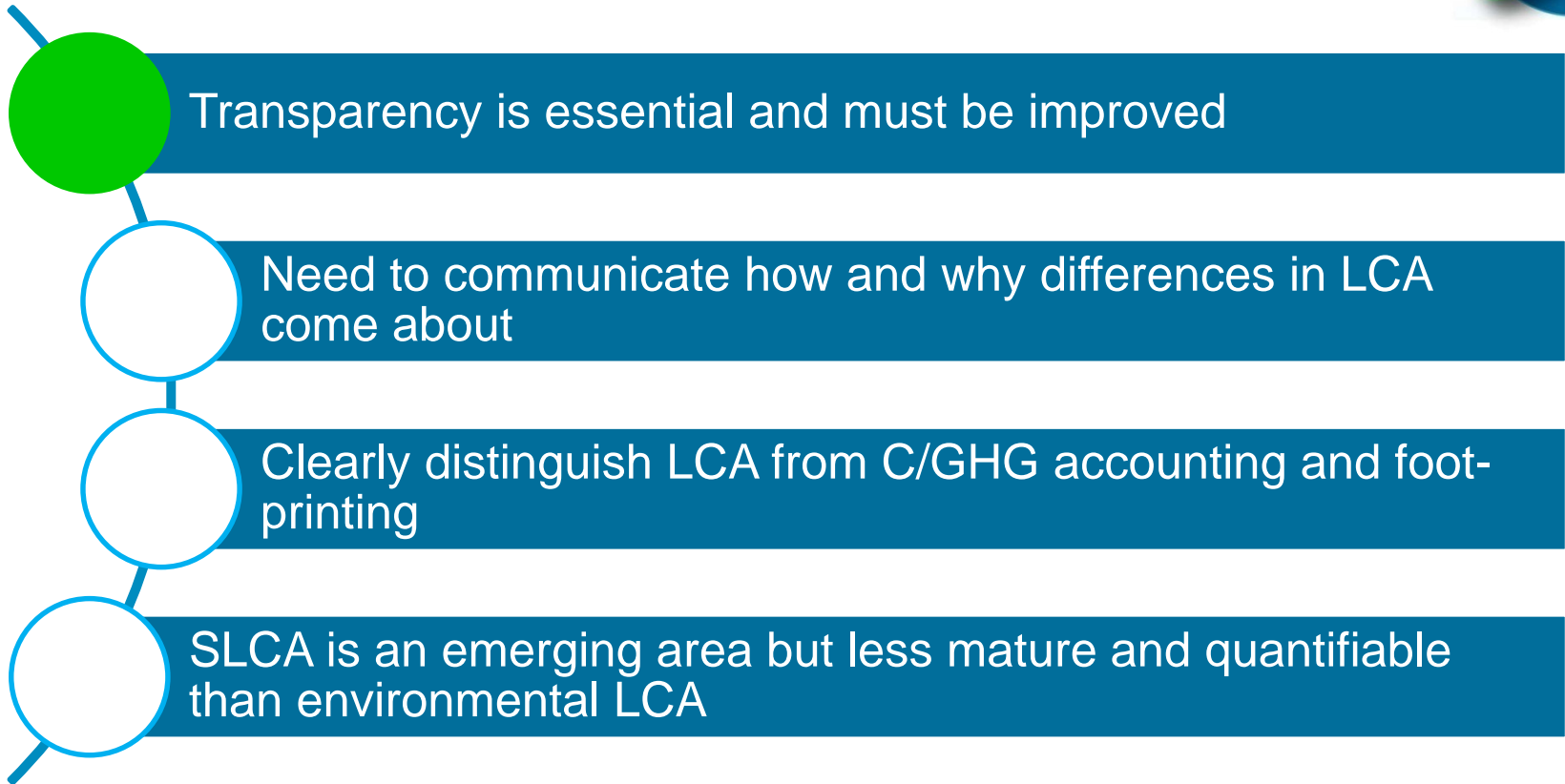
- Need to do SLCA and environmental LCA separately

- Conflicts with demand for end-point results
- Different levels of maturity
- SLCA might never reach same level of quantification as LCA

- Regarding CCUS

- CCUS activities in deprived areas
- SLCA does not work well on plant level

# Conclusions



No formal guidelines but useful to have:

1. Check list on how to document LCA and communicate results
2. Guidance on how to read and interpret LCA studies for non-experts and end users.

# Recommendations



No need to update IEAGHG  
2010/TR2 report

Keynote or plenary presentation at  
conferences to raise awareness of  
the topic

Consider development of a  
guidance/good practice document  
in collaboration with experts

Organise another LCA workshop  
after a reasonable amount of time

# Report published



summary of the ieaghg / csf workshop on lca in ccus 12<sup>th</sup> - 13<sup>th</sup> November 2015, London, UK in collaboration with carbon production research centre IEA GREENHOUSE GAS R&D PROGRAMME

Session 3: Inventory Analysis

Life Cycle Inventory (LCI)

1. Goal & Scope Definition 2. Life Cycle Inventory (LCI) 3. Life Cycle Impact Assessment 4. Interpretation

Life cycle cash flow for individual storage sites

Conclusions and Recommendations

IEAGHG Research Networks www.ieaghg.org

[http://www.ieaghg.org/docs/General\\_Docs/Reports/2016-03.pdf](http://www.ieaghg.org/docs/General_Docs/Reports/2016-03.pdf)  
<http://www.ieaghg.org/ccs-resources/technical-workshops/19-ccs-resources/technical-workshops/620-lca-in-ccus-workshop>



# Thank you, any questions?

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# List of abbreviations



Abbreviation	Explanation
Bio-CCUS	Bioenergy with CCUS
C	Carbon
CCS	Carbon capture and storage
CCUS	Carbon capture, utilisation and storage
CSLF	Carbon Sequestration Leadership Forum
GHG	Greenhouse gas
GWP	Global warming potential
IEAGHG	IEA Greenhouse Gas R&D Programme
LCA	Life cycle assessment
LCC	Life cycle costing
LUC	Land use change
NGO	Non-governmental organisation
SLCA	Social LCA