Life Cycle Analysis (LCA)
The CSLF Perspective

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What is CSLF?

- CSLF – the Carbon Sequestration Leadership Form – is a ministerial-level international climate change initiative focused on development of technologies for capture and geologic storage of CO_2
- CSLF has 24 member states + the European Commission
- CSLF members have about 60% of the world's population
- CSLF members are accountable for roughly 70% of global CO_2 emissions

Some CSLF activities

- Identify key obstacles to achieving improved technological capacity;
- Identify potential areas of multilateral collaborations on carbon separation, capture, transport and storage technologies;
- Foster collaborative research, development, and demonstration (RD&D) projects reflecting Members' priorities
- Produce Technology Road Map (TRM), latest version from Nov. 2013 (http://www.cslforum.org/publications/documents/CSLF_Technology_Roadmap_2013.pdf)

CSLF organization and operations

- CSLF om three levels
  - The Policy Group (PG)
  - The Technical Group (TG)
  - Ministerial meeting
- TG uses Task Forces to
  - Identify key obstacles
  - Identify areas that need improvement
  - Identify potential areas for collaboration
  - Produce documents
  - Give recommendations to ministers

CSLF mini Task Force on LCA

- **Objective:**
  - **Make recommendations to the CSLF TG on possible further work**
- **Scope**
  - **Search literature on Life Cycle Assessments (LCA) related to CCS**
  - **Identify areas where additional knowledge should be sought**

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
- The majority of CCS LCA studies is on post-combustion
- Need for consistency between studies
- Impacts other than GWP show large variations (Toxicity potential, Eutrophication, Acidification, Resource depletion)
- Upstream/downstream (indirect) impacts important
- Impacts like water and land use and abiotic depletion seldom included
- Aggregation and end point results are very seldom included

Other aspects to ensure robustness

- Scale-up challenges
  - From lab to full scale to full systems
- Uncertainty management
  - Data, models, scanario
- Policy-making needs
  - Attributional vs. consequential LCA
- Market effects
  - Response by decison makers and others to market forces

Recommendations to CSL

A. Do ***not*** establish Task Force, requires too much resources to improve what is already out there, other initiatives exist, e.g.

B. Challenge IEAGHG to play a role, as suggested in their report 2010/TR

   – ”The programme could consider playing a role in setting up some reference points to allow benchmarking and hence proper comparison of LCA studies. Another area in which work could be done is in defining the environmental effects which are important to include in the scope of a CCS LCA and perhaps to suggest some standard way of making an aggregated comparison.”

1. Review report w/accompanying papers

- IEAGHG Report 2010/TR2 ”Environmental Evaluation of CCS Using Lice Cycle Assessment (LCA)”; May 2010
  - Marx, J., Schrieber, A., Zapp, P., Haines, M., Hake, J., Gale, J., 2011. Environmental evaluation of CCS using Life Cycle Assessment – a synthesis report. Energy Procedia 4 (2011) 2448 - 2456
  - Zapp, P., Schrieber, A., Marx, J., Haines, M., Hake, J., Gale, J., 2012. Overall environmental impacts of CCS technologies- a life cycle approach. Int. J. Greenhouse Gas Contr. 8, 12–21.
- Looked at 17 studies, only two after 2009, both from 2011 (referred to in Zapp et al., 2012)

2. Review paper

- Corsten, M., Ramirez, A., Shen, L., Koornneef, J., Faaij, A., 2013. Enviromental impact assessment of CCS chains – Lessons learned and limitations from LCA Literature. . Int. J. Greenhouse Gas Contr. 13, 59–71
  - 34 studies, including 13 from IEAGHG 2010/TR2
  - 12 studies from 2010 – 2012