Carbon Sequestration Leadership Forum
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International Overview of CCU Symposium: conclusions and recommendations

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CSLF Annual Meeting / Technical Group Meeting

Melbourne, Australia

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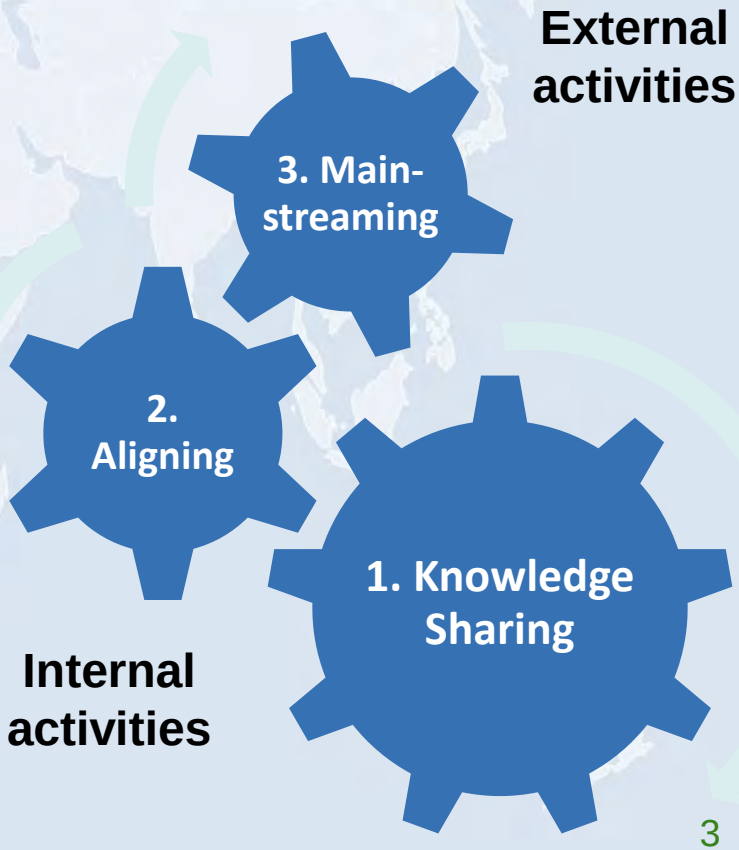
Agenda

1. Actions of French CO_2 Utilization Working Group (Club CO_2)
2. Lessons learnt from the “International Overview of CCU Symposium” (Paris, France, July 2nd 2018)
3. Final Conclusions of the Symposium

1. Actions of Club CO_2's French CO_2 Utilization Working Group

Stakeholders and Objectives:

- Working Group of Club CO_2
- 24 members: industries (Majors and SMEs), public bodies (national and regional-level), public research
- Started in 2013
- Objective:
  - **Sharing** on CO_2 utilization technologies and their potential
  - **Aligning** on key learnings
  - **Mainstreaming** recommendations on CO_2 Valorisation for France



1. Actions of Club CO_2's French CO_2 Utilization Working Group

11 actions completed or ongoing:

SWOT Analyses

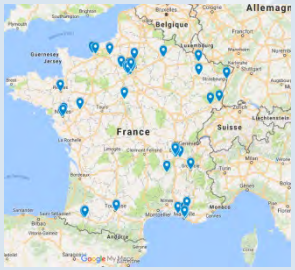
Recommendations for COP21

Task 10 – Assessment of Environmental benefits of CCU

→ Workshop in Paris, March 30th 2018

→ International CCU Symposium, Paris, July 2nd 2018

2 CO_2 Util^{on} Workshops (2015, 2016)



- **Mapping of French Stakeholders**
- **Brochure of labs activities**

Task 9 – Video on CCU

→ On-going

2. Lesson learned from the International CCU Symposium

Facts & Figures

- **Paris, July 2nd 2018; 150 attendees ;** Symposium held before ISO TC/265 Paris' meeting

- **Introduction:**
  - **European context and regulatory framework:** Implications for research and innovation, EC-DG RTD
  - **Potential global market of CCU**, Global CO_2 Initiative
- **1 plenary session with a review per country** of:
  - Policies in terms of GHG emissions reduction targets
  - Actors in CCUS
  - Key projects
  - Misc. Topics: international initiatives, questions,…
  - 11 countries: Australie, South Korea, China, India (not present but slide deck available), Germany, The Netherlands, Norway, France, UK, Mexico (webex), Canada
- **Conclusions by IEA**

2. Lesson learned from the International CCU Symposium

Facts & Figures

- **Status of LCA guidelines for CCU:**
  - EU-Methodology for quantifying GHG for fuels from CCU (JRC)
  - US-LCA Guidelines for CCU (NETL, webex)
  - International-LCA guidelines from CO2 Global Initiative (Aachen University)
- **1 Workshop session:**
  - 4 teams working on LCA barriers for CO_2-to-fuels, chemicals, mineralization, bioconversion
  - 1 team working on standardization

- More : **Zone poster of French CCU projects** + **Brochure of French labs working on CO_2 utilization**

- 88% of attendees satisfied or very satisfied by the symposium

2. Lesson learned from the International CCU Symposium

Review of Countries (Examples)

Country	Key fact / project about CCU
France	**VALORCO**: CO_2 conversion technologies with direct flue gases or CO_2 captured from steel plant **JUPITER1000**: Demonstration of massive renewable energy storage into the transmission gas grid via production of gas via electrolysis of H_2O and an industrial source of CO_2 **CRYOCAP**: cryogenic CO_2 capture into a Steam Methane Reformer Several CCU projects at pilot scale with industrial symbiosis (eg: VASCO2,…)
UK	**CCUS Programme:** 20M£ for Demo-scale projects, 15M£ for open call, 4.4 M£+6.5 M£ for ERANET Call 1 & 2
Mexico	In 2018, the Department of Energy launched the **Mexican CCUS Centre**. Among other projects: **Carbon Capture Pilot Project (CCPP)** on Poza Rica NGCC plant

2. Lesson learned from the International CCU Symposium

Reco #1	**Define application and local market before LCA to serve as a basis for the definition of the "Goal and Scope"** (System boundaries, function, functional unit).
Reco #2	**Use LCA at the beginning of the development of technologies to screen opportunities** and provide solutions. It is not the final analysis to perform after technology development at TRL9.
Reco #3	**Assess two different references** (to be compared with the CCU-scenario): 1. The current, most available process/technology, 2. And an environmentally competitive solution even if it's currently not economically viable.
Reco #4	**Make available more specific & reliable data:** eg: CO_2 captured, data of CO_2 utilization processes, hydrogen,…
Reco #5	**Do not focus only on global warming potential when assessing impacts but take into account others** (eg : land use, human toxivity, resource depletion, etc.) because transfer of impact may occur. This assessment will be communicated to **scientific community**. Specifically regarding CO_2, there is a need to figure out : 1. The amount of CO_2 utilized into the process 2. The CO_2 avoided into the process 3. The GWP (considering upstream).

2. Lesson learned from the International CCU Symposium

Reco #6	**Agree on an aggregation method of impacts** or, at least, agree on methodologies of aggregation This assessment will be used for **policy makers to make arbitrages between technologies.**
Reco #7	**Allocate impacts over the whole value chain** from the emitter to the actor utilizing CO_2: there is a need to **define economic value/penalty and environmental benefits/burdens**, and to **share these values.** **Make integrated assessments (economic and environmental)** even for low-TRL technologies.
Reco #8	**Define ISO technical prescriptions** of processes, properties and performances of products.
Reco #9	**Define ISO standard addressing goal and scope**. Technical prescriptions and standards may help to **create a label for CO_2-based products/services**.

3. Conclusions of the Symposium

- **CCUS plays a key role** in achieving global climate targets: 15% to achieve 2°C, 32% to be below 2°C.
- The **amount of CO_2 utilised and geologically stored is limited** compared to global anthropogenic CO_2 emissions.
- **CO_2 utilization is a subject for many countries** linked to climate policies ; most of them plan to **support research and demonstration** projects in order to encourage new technologies and to improve their performances
- Eg : EU involvments:
  1. Horizon **H2020** (240 M€ EU contribution), **Horizon Europe** (35G€ for tackling climate change)
  2. Inputs of **SAM** (EC Scientific Advisory Mechanism) based on existing research on the climate mitigation potential of CCU technologies
  3. **ERANET ACT CCUS** : international initiative to facilitate innovation, coordinated by Norway
  4. Initiative **Phoenix** on CCU: main goal is to link national and European RD&I activities
  5. **ECCSEL** gathers world-class research infrastructure in Europe for developing CCS technologies.
  6. **Mission Innovation**

3. Conclusions of the Symposium

- **No CO_2 utilisation options** are available today that **meet the 3 criteria** proposed by IEA (emission reduction, economic viability, market)
- However, according to Global CO_2 Initiative, **market insights are promising**:
  - By 2030 potential to utilize over 6 billion metric tons of CO_2 per year / generate $1US trillion/year.
  - Significant progress towards scalable technologies is needed.
  - Building materials, chemical intermediaries, fuels and polymers represent the biggest markets.
- **CO_2 utilization addresses political and public acceptance drawbacks of CCS**.
- Technologies of **utilization and storage must be developed and deployed in parallel** and not opposed.

Questions ?

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