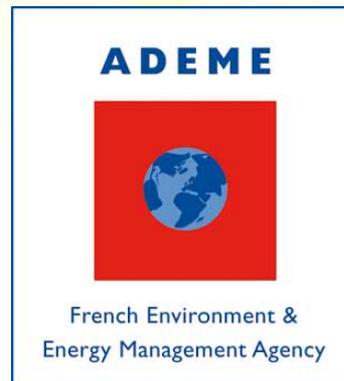


# 2<sup>nd</sup> CO<sub>2</sub> Reuse Seminar:

Conclusions of the Plenary Session.  
Presentation of the Workshops.





# CONCLUSIONS OF THE PLENARY SESSION

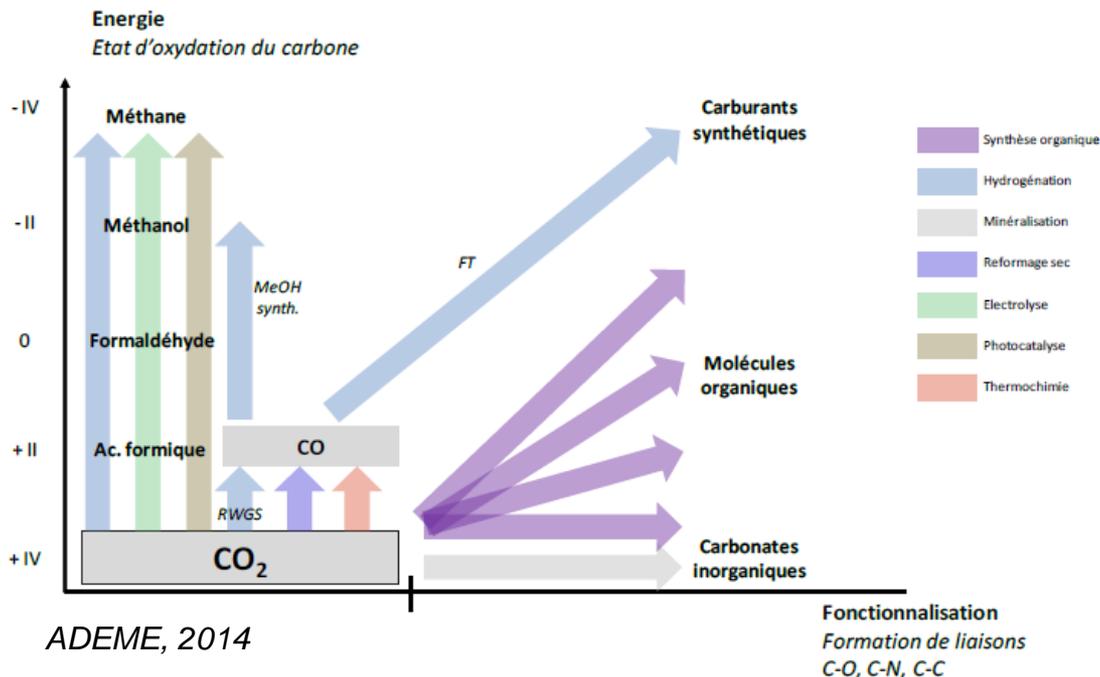
## Preamble: a quick overview of CO<sub>2</sub> reuse

- **What is CO<sub>2</sub> reuse? It is a portfolio of developed or developing technologies:**
  - Using many grades, from diluted « raw » CO<sub>2</sub> to captured and highly pure CO<sub>2</sub>
  - Giving a triple value to the CO<sub>2</sub>:
    1. Environmental: by avoiding CO<sub>2</sub> emissions, limiting fossil fuel and raw materials requirements and improving the carbon footprint of chemicals
    2. Economical: with relevant business models for existing chemicals in existing markets
    3. Societal: by protecting human health and developing employment.
  - Based on physical processes or by biological or chemical conversion
- **CO<sub>2</sub> reuse in the global mitigation initiatives and efforts:**
  - CO<sub>2</sub> emissions from fossil fuels and industry: 35.9±1.8 Gt CO<sub>2</sub>, 60% above 1990 emissions → Emissions are projected to decline by -0.6% in 2015 (range -1.6% to +0.5%) (*Global Carbon Project*)
  - If business models are relevant and regulations are in place: max **2 to 4% overall emissions** (0.5% today) could be reused → It is a way to deploy circular economy based on a robust EU industrial sector and infrastructure.
  - **It could act as a complement to other solutions** (efficiency, renewable energies,...) but it should not be exaggerated.

# CONCLUSIONS OF THE PLENARY SESSION

## Preamble: a quick overview of CO<sub>2</sub> reuse

- What are the current chemistry-based CO<sub>2</sub> reuse technologies under development?



- Conversion by reduction:**
  - C1-building blocks
- Conversion by fonctionnalization:**
  - Inorganic carbonates, concrete curing,
- Conversion by reduction & fonctionnalization:**
  - Synthetic fuels
  - Polymers, organic carbonates, urea,...
- CO<sub>2</sub> used (mainly captive, out of EOR): 180 Mt CO<sub>2</sub>/yr (Armstrong et al., 2015)**
- Among the challenges:**
  - No joint methodology to highlight environmental benefits
  - Most of the time, CO<sub>2</sub>-based chemicals aren't competitive vs fossil-fuel based chemicals
  - Except for fuels, lack of regulation



# CONCLUSIONS OF THE PLENARY SESSION

## Research insights

- **International :** CCUS (3rd axis) is part of the Mission Innovation
- **Europe:**
  - ERANET (ACT / Accelerating CCS technologies, ACT II...)
  - Energy Union and SET Plan action 9 CCUS; Horizon Price for CO2 reuse for 2019 for 1.5 M€ (ongoing process)
  - H2020: CCS and CCSU identified
- **National level:**
  - Stratégie Nationale de la Recherche : among 10 challenges : secure, clean and efficient energy / Industrial renewal → should be released by the end of the year.
  - Public funding: ANR, ADEME, BPI, perhaps not as visible as in Germany, but funding does exist
- **Collaboration and Network is a key**



# CONCLUSIONS OF THE PLENARY SESSION

## Regulation

- **WW : COP21 : accord de Paris has been ratified (74 parties; 59% GHG emissions)**
- **EU 28 is really committed in CO<sub>2</sub> Utilization**
- **France : Energy transition for green growth act: 2 tools**
  - SNBC: France low-carbon development strategy (eg: carbon footprint, CO<sub>2</sub>)
  - PPE: Energy strategy master plan (5 years)
- **CO<sub>2</sub>-based productt:** need to harmonized regulation within EU



# CONCLUSIONS OF THE PLENARY SESSION

## Environmental insights

- There is a potential for CO<sub>2</sub> Utilization to reduce some CO<sub>2</sub> emissions (not to exaggerate)
  - Reduce C footprint / Matter of efficiency
  - Perform environmental assessment / LCA at early stages of projects
  - Need of renewable energy
  - Importance of CO<sub>2</sub> storage time
- 
- A faint, light gray world map is visible in the background of the slide, centered behind the text.



# CONCLUSIONS OF THE PLENARY SESSION

## Economical insights

- **Worldwide: Carbon Pricing leadership:** fix one global price
- **European ETS :** today 4€/t ; prospects : France proposition: corridor to regulate
- **New initiatives:** Financial Stability Board, Institutional Investors Group on Climate Change, Portfolio Decarbonization Coalition...
- **France:** tax @ 56 €/t by 2020 ; 100 €/t by 2020.
- **Nice, but even if changing, our economy is still based on fossil fuels**
- **For a 2°C scenario: we need to invest 5 000 G\$/yr of public and private investment flows;**  
today, 391 G\$ of climate finance in 2015
- **Open question:** do we need economic incentives?
- Think of the services brought by CO<sub>2</sub> reuse not only of the chemicals
- CO<sub>2</sub> Utilization could be a **new opportunity of growth**



# CONCLUSIONS OF THE PLENARY SESSION

## Vision and Perspectives

- **CO<sub>2</sub> Utilization topic is growing due to CCS slow down**
- **Potential:**
  - 1.5 Gt CO<sub>2</sub>/yr could be utilized in the future
  - Many different uses: chemicals, fuels, aggregates
  - Not a massive game changer for GHG emissions; but potentially a growth engine
- **Mix together academia, corporate business, policy orienters**
- **We need to involve territories:** how to make them energetically independent? How to use synergies?
  - Le Havre Développement : unique opportunity of R&D tools from lab to demonstration units)
  - Marseille Fos authority: CO<sub>2</sub> Utilization as a new growth engine
- **European Association on CO<sub>2</sub> transformation**
  - Why ? to accelerate R&I and market development; to become a reference organization
  - Bring together a unique network and analyse the opportunity to build a large European PPP dedicated to CO<sub>2</sub> Utilisation



# CONCLUSIONS OF THE PLENARY SESSION

## Industrial insights





# METHODOLOGY OF UPCOMING WORKSHOPS

📍 Find the conditions for a successful emergence of CO<sub>2</sub> transformation technologies

## Principle :

- The participants will gather in 2 break-out groups
- Running the 2h-workshops in parallel
- Workshops are managed by Club CO<sub>2</sub> and CO<sub>2</sub> Forum team members :

### Workshop 1

"Can you grow your CO<sub>2</sub> Utilization business?"

Workshop 1.1 and 1.2 MERGED (in French) –

**Amphitheater**

Laurent FORTI, IFPEN

Frederick BERNARD, Le Havre Développement

Salvatore BERTUCCI, ARCELOR MITTAL

### Workshop 2

"Deploy CO<sub>2</sub> Utilization in a regional area"

Workshop 2.1 and 2.2 MERGED (in French) –

**ROOM F002**

Solène VALENTIN, AIR LIQUIDE

Sylvain PICHON, Grand Port Maritime de Marseille



# METHODOLOGY OF UPCOMING WORKSHOPS

📍 Find the conditions for a successful emergence of CO<sub>2</sub> transformation technologies

## Agenda :

Start	End	Titre
14:15	14:30	Conclusions of the Plenary Session Presentation of the Workshop Session <i>David SAVARY, SOLVAY</i>
14:30	14:40	Transfer to Workshops Locations
14:40	16:40	Workshops : <b>Sharing and building together.</b>
16:40	16:45	Transfer to amphitheatre
16:45	17:05	Conclusions of the Workshops
17:05	17:20	Closing remarks <i>Daniel CLEMENT, ADEME</i>

## Deliverables :

1. Find levers that can be implemented within an industrial park into a territory to make business with CO<sub>2</sub>-based chemicals.
2. Make recommendations or even build an action Plan to roll out this new sector.



# METHODOLOGY OF UPCOMING WORKSHOPS

## Workshop 1: "Can you grow your CO<sub>2</sub> Utilization business?"

Timing	Description	Deliverable
13h55-14h05	<p><u>Phase 0 (10 min):</u></p> <p><b>Detailed presentation of the workshop by the moderator(s)</b></p>	n/a
14h05-14h35	<p><u>Phase 1 (30 min) :</u></p> <p><b>Analysis of levers and hurdles for the 4 following CO<sub>2</sub>-based chemicals: Methanol, formic acid, polymers, mineral aggregates</b></p> <p>Levers and hurdles: technological, economic, regulatory, financial, politic, societal, environmental...</p>	Levers and Hurdles per chemical
14h35-15h05	<p><u>Phase 2 (30 min) :</u></p> <p><b>Based on a simple block diagram or chemical reaction, find how to unlock hurdles defined in Phase 1 so that you deploy your plant and your business (think for instance of local synergies).</b></p>	One strategy per chemical
15h05-15h55	<p><u>Phase 3 (50 min) :</u></p> <p><b>How to unlock the remaining hurdles by integrating the 4 strategies within an industrial park?</b></p> <p>Some ideas:</p> <ul style="list-style-type: none"> <li>• Think CO<sub>2</sub> purification, conversion and utilization of CO<sub>2</sub>-based chemicals</li> <li>• Think out of the local synergies: what do you need at national, EU scale?</li> <li>• Think integration (materials, energy, services, transportation...</li> <li>• How could be designed the ideal territory?</li> </ul>	One integrated strategy for the 4 chemicals



# METHODOLOGY OF UPCOMING WORKSHOPS

## Workshop 2: "Deploy CO<sub>2</sub> Utilization in a regional area"

Timing	Description	Deliverable
13h55-14h05	<p><u>Phase 0 (10 min):</u></p> <p><b>Detailed presentation of the workshop by the moderator(s)</b></p>	n/a
14h05-14h35	<p><u>Phase 1 (30 min):</u></p> <p><b>Future search: Describe past and present and imagine the future on 4 areas at different scales</b></p> <ul style="list-style-type: none"> <li>• Home/Residential → Energy independency</li> <li>• Rural → biomass valorisation</li> <li>• Urban → zero waste</li> <li>• Industrial Harbour → Carbon-free transportation</li> </ul>	4 diagrams or description of future scenario
14h35-15h05	<p><u>Phase 2 (30 min):</u></p> <p><b>Enrich and strengthen each future scenario by collective intelligence</b></p>	Improvement of previous scenario
15h05-15h55	<p><u>Phase 3 (50 min):</u></p> <p><b>Merge and integrate the 4 future scenarios in one scenario at regional level</b></p>	One presentation of a global future scenario in front of regional institutional



**Thank you for your attention.**