



# **CSLF Task Force on Non-Enhanced Hydrocarbon (EHR) Utilization Options**

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# Background



**CSLF Conference of Ministers Key actions, “Exploring new utilization concepts beyond CO<sub>2</sub> enhanced oil recovery (CO<sub>2</sub>-EOR) that have the potential to add commercial value”**

**CSLF TG Meeting in April 2018 – Discussion on CO<sub>2</sub> mineralization and utilization and revisit non-EOR options; re-constitute the task force.**

**CSLF TG Meeting in October 2019 – Formalized membership: US (Chair), Australia, Brazil, China, Canada, France, the Netherlands, Saudi Arabia, and the IEAGHG.**

# Previous CSLF Task Force



## Timeline

- Beijing, P.R. China, September 2011: Utilization Options for CO<sub>2</sub> Task Force was created.
- Perth, Australia, October 2012: Phase 1 Report completed. Options for further evaluation in Phase 2 discussed and selected.
- Washington, DC, October/November 2013, Phase 2 report completed.

## Scope

- EHR, fuels and chemicals, building materials/aggregate, working fluid

## Key Messages

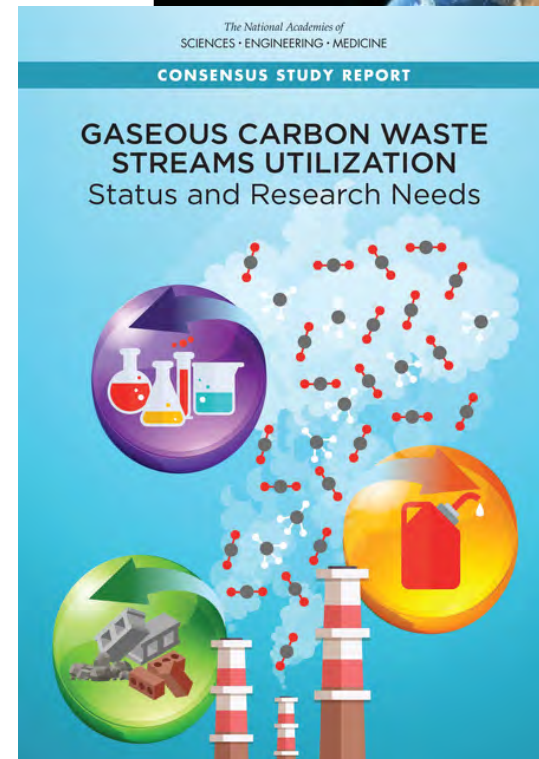
- Number of CO<sub>2</sub> utilization options available - mechanism for deployment and commercialization.
- EOR is the most near-term utilization option.
- Non-EOR CO<sub>2</sub> utilization options are at varying degrees of commercial readiness and technical maturity.
- Early R&D or pilot-scale activities should focus on: addressing key techno-economic challenges; independent tests to verify the performance; and support of small, pilot-scale tests of first generation technologies and designs.
- More detailed technical, economic, and environmental analyses should be conducted.



# Some efforts since then (not all-inclusive)...



- Carbon X-Prize – launched in September 2015, 10 finalists
- Oil and Gas Climate Initiative (OGCI) investments:
  - Solidia Technologies – CO<sub>2</sub> utilization in concrete (October 2017)
  - Econic – CO<sub>2</sub> into polyols (September 2018)
- Reports:
  - UK report (May 2017) by Imperial College and ECOFYS: *Assessing the Potential of CO<sub>2</sub> Utilisation in the UK*
  - Mission Innovation report (September 2017) on CCUS: *Accelerating Breakthrough Innovation in Carbon Capture, Utilization, and Storage*
  - US National Academy of Sciences – October 2018 – *Developing a Research Agenda for Utilization of Gaseous Carbon Waste Streams*
  - US National Petroleum Council report on CCUS – due 2019
- Policies:
  - US: 45Q tax credit revision (2018). \$35/ton for converting into fuels, chemicals, or other useful products (e.g., cement).



# IEAGHG Reports on GHG Accounting for CCU Technologies



## Scope

- Characterize CCU technologies and emissions reduction pathways
- Determining CCU facility-level GHG emissions
- Developing a composite life-cycle GHG emissions profile for CCU activities
- Assessing GHG accounting options
- Four different CCU case studies: renewable methanol, carbon aggregate, algae ethanol, CO<sub>2</sub>-EOR (All with NGCC capture)

## Conclusions

- Potential benefits for some are proven but are highly dependent on circumstances (how can those be scaled up/replicated?)
- Monitoring, reporting and verification (MRV) of CCU facility-level energy and carbon flows is well established
- GHG reduction policy is not yet major driver for CCU activities
- Near-term need for establishing consistent, transparent and comparable methodologies for CCU accounting
- CCU accounting guidelines v1.0 developed

**Outcomes published as IEAGHG Technical Review Trilogy. Work continuing with aim of producing an integrated accounting framework for CCS and CCU.**



# Conferences (not all-inclusive)



Title	Location	Dates	Participants
International Conference on Carbon Dioxide Utilization	Rio de Janeiro, Brazil (16 <sup>th</sup> )	August 27-30, 2018	Mostly Academia
	Aachen, Germany (17 <sup>th</sup> )	June 23-27, 2019	
Carbon Dioxide Utilisation Summit	Manchester, UK (11 <sup>th</sup> )	September 26-27, 2018	Industry focused
	Houston, Texas (12 <sup>th</sup> )	February 27-28, 2018	
International Overview of CO <sub>2</sub> Utilisation	Paris, France	July 2, 2018	Industry, government, research institutions
7 <sup>th</sup> Conference on Carbon Dioxide as Feedstock for Fuels, Chemistry, and Polymers	Cologne, Germany	March 20-21, 2019	Industry, associations, government
CO <sub>2</sub> Reuse Summit	Zurich, Switzerland	May 16-17, 2018	Industry, research institutions, university, academia
	Berlin, Germany	May 8-9, 2019	

Some Major Conferences with carbon/CO<sub>2</sub> utilization sessions: GHGT series (global, varying locations), Carbon Management Technology Conference (US), Annual CCUS Conference (US).

# CSLF-Recognized Project: SABIC CCU Project



- Recognized November 2015 Ministerial Meeting in Riyadh, KSA
- Located in Jubail, KSA at SABIC's affiliate UNITED, Jubail
- Up to 1,500 tonnes/day of CO<sub>2</sub> captured and transported via 25-km pipeline
- Used as feedstock for production of methanol, urea, oxy-alcohols, and polycarbonates



Photo of CO<sub>2</sub> capture and purification plant at SABIC's affiliate, UNITED, located in Jubail industrial city. courtesy of SABIC as presented at CSLF Ministerial meeting, November 2015.

**Only Non-EHR CO<sub>2</sub> Utilization Project Recognized by CSLF.**

# Proposed Action Plan for the Task Force



- Main Goal: Add value and not re-invent
- Status check on where we are today
  - Reports, projects, conferences, activities, projects and major players
  - Government initiatives
- Summarize and develop recommendations for next meeting



# Proposed Task Force Activities



Activity	Date
<b>Task 1. Reports</b>	
1a. Develop a catalog/library of reports over the past five years on CO <sub>2</sub> Utilization	June 2019
1b. Identify and summarize technical and policy barriers; potential market sizes/volumes; findings; and recommendations.	July 2019
<b>Task 2. Government Activities</b>	
2a. Prepare and release template to CSLF delegates	June 2019
2b. CSLF delegate responses returned	August 2019
2c. Responses consolidated and summarized	September 2019
<b>Task 3. Identify major conferences and activities</b>	<b>Complete</b>
<b>Task 4. Identify major CO<sub>2</sub> utilization demonstration or commercialization projects and key players</b>	July 2019
<b>Task 5. Prepare summary report and recommended next steps of task force or CSLF TG action</b>	CSLF fall meeting 2019 (November 2019)