



# Update and International Perspectives from IEAGHG

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General Manager IEAGHG

NETL Carbon Management Meeting  
Pittsburgh, 22 August 2022



## Who are we?

Our internationally recognised name is the IEA Greenhouse Gas R&D Programme (IEAGHG). We are a Technology Collaboration Programme (TCP) and are a part of the International Energy Agency's (IEA's) Energy Technology Network.

## Disclaimer

The IEA Greenhouse Gas R&D Programme (IEAGHG) is organised under the auspices of the International Energy Agency (IEA) but is functionally and legally autonomous. Views, findings and publications of the IEA Greenhouse Gas R&D Programme do not necessarily represent the views or policies of the IEA Secretariat or its individual member countries.

UNFCCC (United Nations Framework Convention on Climate Change) (1992) 197 Parties

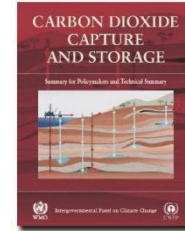
- COP – Conference of the Parties to the UNFCCC – COP1 Berlin 1995 to COP26 Glasgow
- Kyoto Protocol (1997)
  - 2008 - 2012 (KP 1<sup>st</sup> Period). 2013 - 2020 (KP 2<sup>nd</sup> Period)
  - Developed country emission commitments
  - Clean Development Mechanism (CDM) – Policy mechanism for rewarding CO<sub>2</sub> reduction in developing countries. Project-based carbon credits. > 7,500 projects, 1,500 CERs (Mt CO<sub>2</sub>e)
- Paris Agreement (2015) – based upon Nationally Determined Contributions (NDCs) to be updated every 5 years
- IEAGHG's role – providing information on CCUS

# CCS in UNFCCC and IEAGHG's role



United Nations  
Framework Convention on  
Climate Change

- Negotiations ➤ **2005 - IPCC SR on CCS**
- 2005– 2011 CCS in CDM?
  - 2011 – CCS CDM Abu Dhabi workshop
  - **2011 - COP-17 CCS in CDM**



## Awareness Raising

- 2014 - ADP TEM on CCS – project focussed
- 2014 - COP-20 – CCS projects Side Event
- 2015 - COP-21 – CCS projects Side Event
- 2016 – COP-22 – CCS in Africa Side Event
- 2017 – COP-23 – CCS, Oceans and SIDS
- 2018 – COP-24 - Decarbonise industry (IPCC)
- 2019 – COP-25 – CRR for South America and oceans (IPCC)



*Attitudes on Carbon Capture and Storage (CCS) as a Mitigation Technology within the UNFCCC.*  
Romanak, K.; Fridahl, M.; Dixon, T. *Energies* 2021, 14, 629. <https://doi.org/10.3390/en14030629>



UN CLIMATE  
CHANGE  
CONFERENCE  
UK 2021  
IN PARTNERSHIP WITH ITALY

# COP26



United Nations  
Framework Convention on  
Climate Change

COP26 hosted by the UK (with Italy) in Glasgow, 31<sup>st</sup> Oct to 12<sup>th</sup> Nov 2021

## UK Presidency Goals:

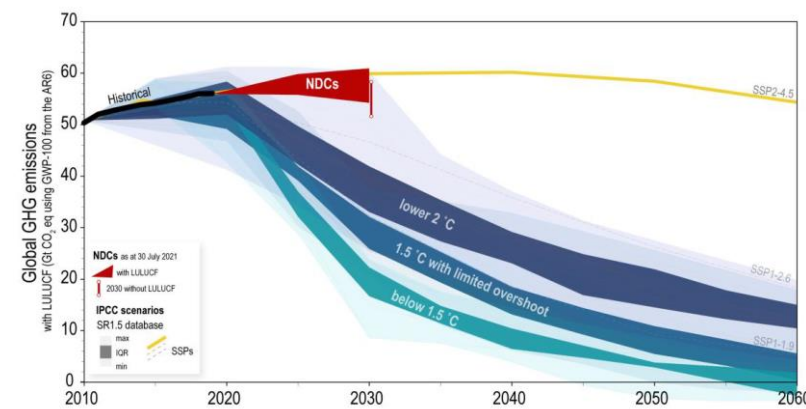
- Secure global net-zero by 2050 and keep 1.5°C within reach (by ambitious NDCs)
- Adaptation – including resilient infrastructure
- Mobilise climate finance - \$100bn pa
- Finalise Paris Rulebook (ie Article 6) and increase collaboration
  - Article 6
    - International cooperation among countries in the achievement of their NDCs
    - 6.2 - Cooperative Approaches using Internationally Transferrable Mitigation Outcomes (ITMOs and OIMP) (between countries)
    - 6.4 - Mechanism to encourage GHG mitigation (project-based, like CDM)
    - 6.8 – Non-market approaches





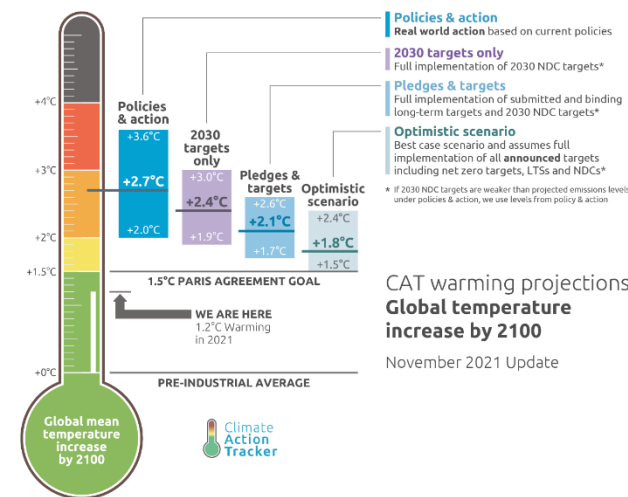
# Nationally Determined Contributions (NDCs) as of 30<sup>th</sup> July 2021 (UNFCCC) 2.7°C

Figure 9, UNFCCC/PA/CMA/2021/8



**Climate Action Tracker** based on latest NDCs **2.7°C** now **2.4°C**

**IEA** based on net zero pledges - **2.1°C** now **1.8°C**



**NDC updates:** As of 9<sup>th</sup> November 2021, **123** submitted, and just **16** include CCS (Norway, UAE, Australia, Iceland, USA, Canada, Malawi, Qatar, Tunisia, Pakistan, Kuwait, Togo, Bahrain, Saudi Arabia, China, Mongolia) and **3** that implicitly include CCS (UK, EU, Indonesia)

**Long-term GHG strategies** (mid-century): As of 9<sup>th</sup> November 2021, **43** countries have submitted these, and **33** contain CCS as a mitigation activity

# COP26 Glasgow Climate Pact



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- Science and Urgency
- “welcoming” the IPCC’s Working Group I report on the science of climate change
- Mitigation
  - NDCs, which were required to be updated every five years (ie 2020, 2025, 2030) now “requested” to be updated again by the **end of 2022** (still with the target year of 2030).
  - Clean energy technologies:
  - *36. Calls upon Parties to accelerate the development, deployment and dissemination of technologies, and the adoption of policies, to transition towards low-emission energy systems, including by rapidly scaling up the deployment of clean power generation and energy efficiency measures, including accelerating efforts towards the phasedown of unabated coal power and phase-out of inefficient fossil fuel subsidies, while providing targeted support to the poorest and most vulnerable in line with national circumstances and recognizing the need for support towards a just transition;”*

# COP26 Glasgow Climate Pact



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- Implementation - Article 6 – International Cooperation
  - Article 6.2 relates to emissions trading between countries (ITMOs and OIMPs)
  - Article 6.4 creates a new project-orientated crediting mechanism (like a new CDM).
  - **Both Decisions were finalised**, with provisions to ensure their integrity such as ‘corresponding adjustments’ to ensure no double-counting should take place. These set up frameworks for carbon markets to work in support of the Paris Agreement, will assist both countries and companies to achieve higher ambitions, and should be beneficial for multinational CCS projects.
  - **Both are overall technology neutral, implicitly including CCS, explicitly including “removals”**.
  - To note one ambiguity for CCS in 6.4, “taking a conservative approach that avoids locking in levels of emissions, technologies or carbon-intensive practices”, could include many activities which are carbon intensive but actually have very low emissions, such as CCS on fossil fuel use. Interpretation will be key.
  - In both in 6.2 and 6.4 Decisions, they ask Supervisory Body (6.4) and SBSTA (6.2) to produce further recommendations, eg on “removals”, so work is not finished yet.



# Agreements outside UNFCCC

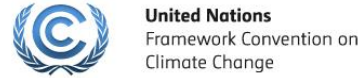


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- **Global Methane Pledge** - 105 countries to reduce methane emissions by 30% by 2030
- **Glasgow Financial Alliance for Net Zero (GFANZ)** - 450 banks, asset managers and insurers, to deliver \$130 trillion to transition global economies by 2050
- **US-China Joint Glasgow Declaration** – cooperation agreement including on CCUS and DAC, methane, China to phase down coal
- **Global Coal to Clean Power Transition Statement** - 46 countries, to rapidly scale up technologies and policies to achieve a transition away from unabated coal power generation.
- **International Just Energy Transition Partnership** - pledged \$8.5 billion to end South Africa's reliance on coal, France, Germany, UK, the US and EU (although no mention of unabated coal at this stage)
- **Beyond Oil and Gas Alliance (BOGA)** - Costa Rica, Denmark, France, Greenland, Ireland, Quebec, Sweden and Wales (UK), commit to ending oil and gas exploration and production. Does not consider abated end-use of gas and oil.
- **US** – CDR "Energy Earthshot" goal \$100/t by 2030; CDR Mission Innovation goal 100Mt pa by 2030; also "Net Zero World" to assist countries decarb energy systems, includes CCUS

# COP26 IEAGHG-organised Side-events and activities



## CCS – Decarbonisation of Industries (UNFCCC Side-event) (IEAGHG and UT, CCSA, International CCS Knowledge Centre, Bellona)

- Tim Dixon, IEAGHG – Moderator and **Scene-setting**
- Dr Jennifer Wilcox, Acting Assistant Secretary, **US DOE**
- Dr Katherine Romanak, UT – **Demonstrating storage and assistance for developing countries**
- Dr Victor Richard Osu, Nigeria Office of the Vice President – **Nigeria's strategy on CCUS**
- Eivind Berstad, Bellona – **Need for CCS Infrastructure**
- Beth Valiaho / Niall McDowell, International CCS Knowledge Centre – **Decarbonising Cement**



## CCS in Emerging Economies (IEAGHG and UT, Bellona Pavilion)

- Tim Dixon, IEAGHG – Moderator and **Scene-setting**
- Dr Katherine Romanak, University of Texas – **CCS Technology Transfer**
- Dr Victor Richard Osu, Nigeria Office of the Vice President – **Nigeria's strategy on CCS**
- Professor Raffie Hosein, University of the West Indies – **CCS progress in Trinidad and Tobago**
- Dr Rachmat Sule, Institute Technology Bandung, Indonesia – **CCS progress in Indonesia**
- Dr Vaibhav Chaturvedi, Council on Energy, Environment and Water, New Delhi – **CCS and India**

Link to recordings on [CCUS-related events at COP26 \(ieaghg.org\)](https://ieaghg.org)

Also spoke at:

- Global CCS Institute “Carbon Reduction and Removal Technologies”, EU Pavilion
- IPIECA “Contributing to a Net-Zero Future”, IETA Pavilion
- Global CCS Institute “Reaching Climate Neutrality: CCS in the Green Transition”, IETA
- **UNFCCC virtual Exhibit on CCUS (with UT, CCSA, International CCS Knowledge Centre)**
- **also tracked CCUS-relevant developments in Article 6, and wrote 5 blogs**

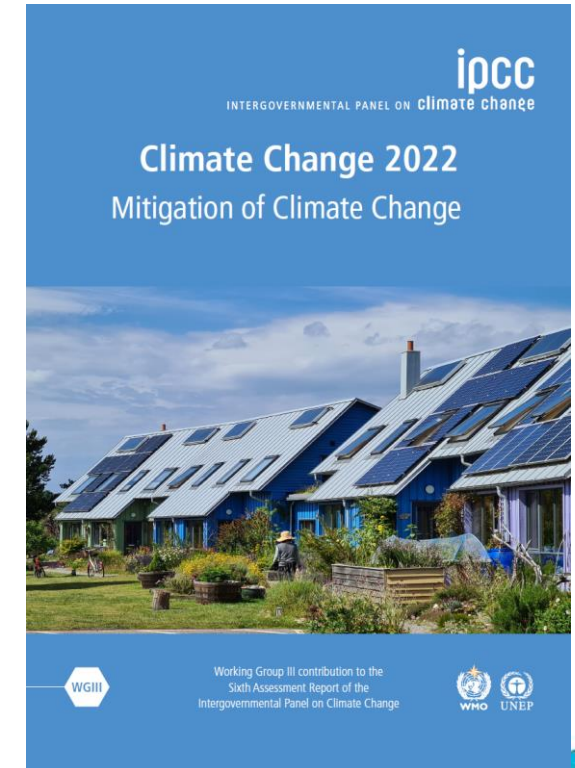
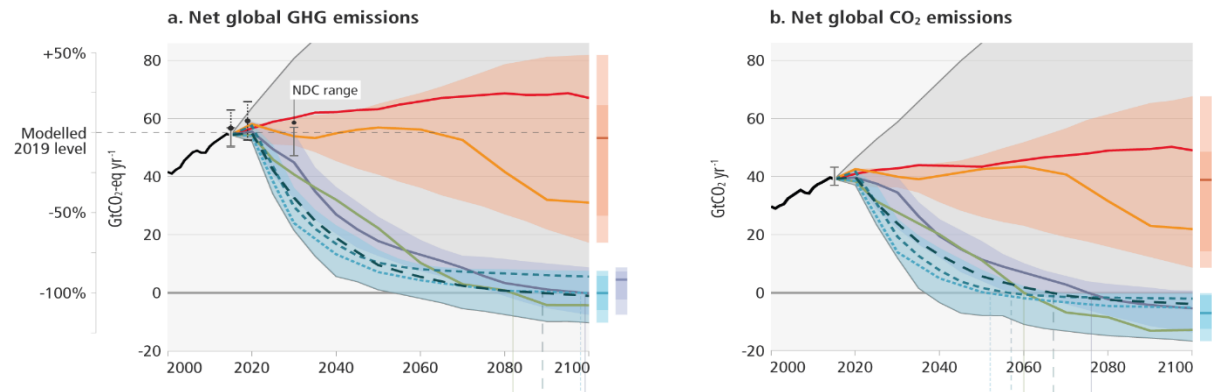


# IPCC AR6 reports



- WGI – Science of Climate Change (Aug 2021)
- WGII – Impacts of Climate Change and Adaptation (Feb 2022)
- WGIII – Mitigation of Climate Change (Apr 2022)

Modelled mitigation pathways that limit warming to 1.5°C, and 2°C, involve deep, rapid and sustained emissions reductions.



- Synthesis Report – due Sep 2022

# What next and gaps



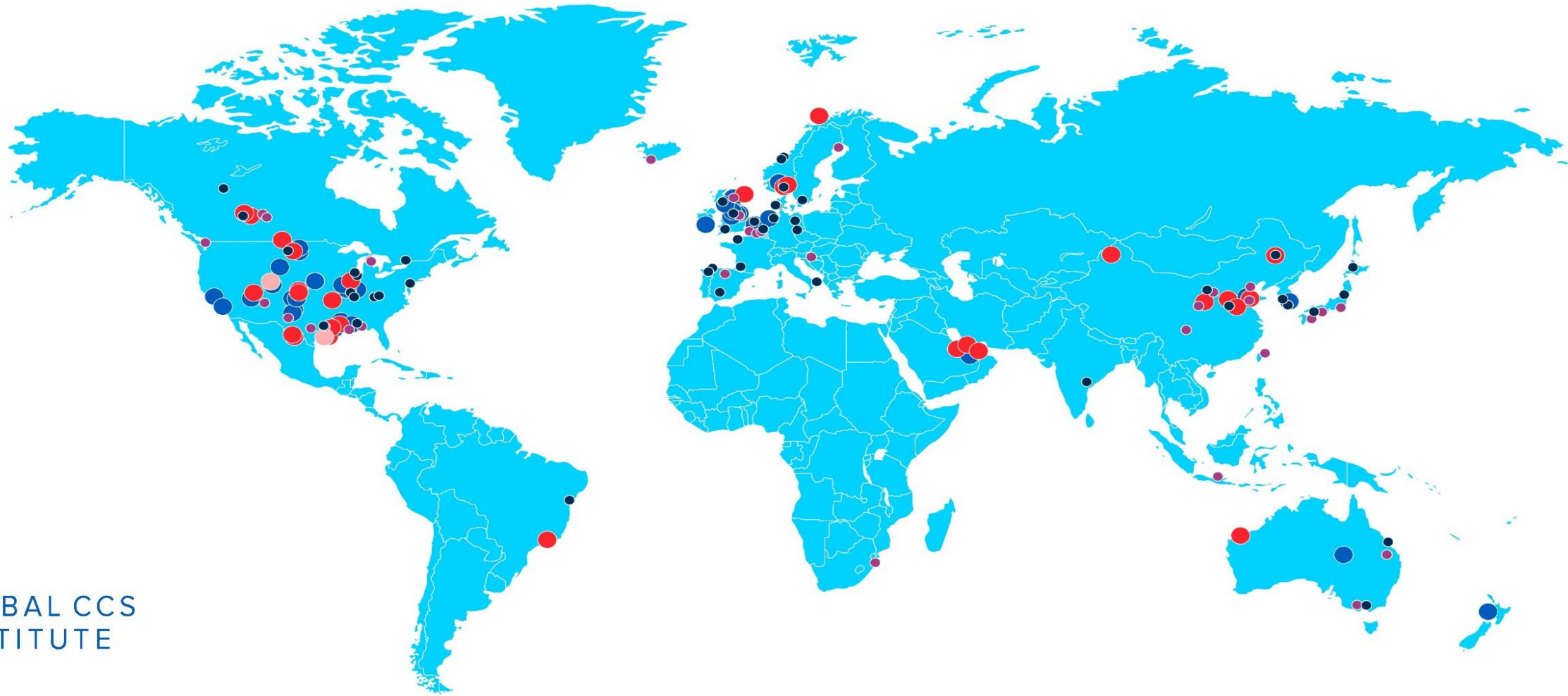
- Article 6
  - further work by SBSTA
  - 6.4 Supervisory Body just established and held first meeting
- Countries revising their NDCs for COP27 (Egypt)
- IPCC AR6 published in time for COP27 (Egypt)
- IPCC GHG Inventory Guidelines
  - DAC is not included





GLOBAL CCS  
INSTITUTE

2020

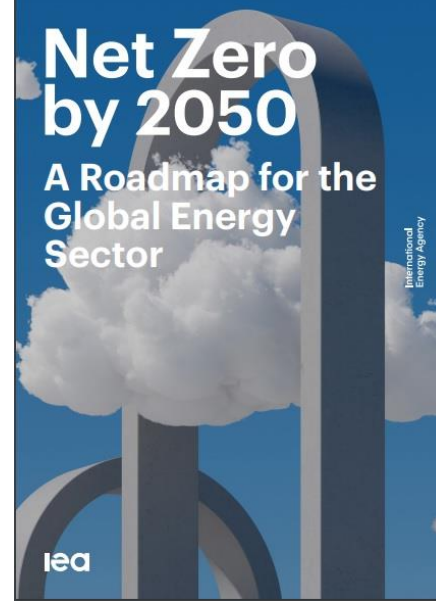


- COMMERCIAL CCS FACILITIES IN OPERATION & CONSTRUCTION
- COMMERCIAL CCS FACILITIES IN DEVELOPMENT
- OPERATION SUSPENDED

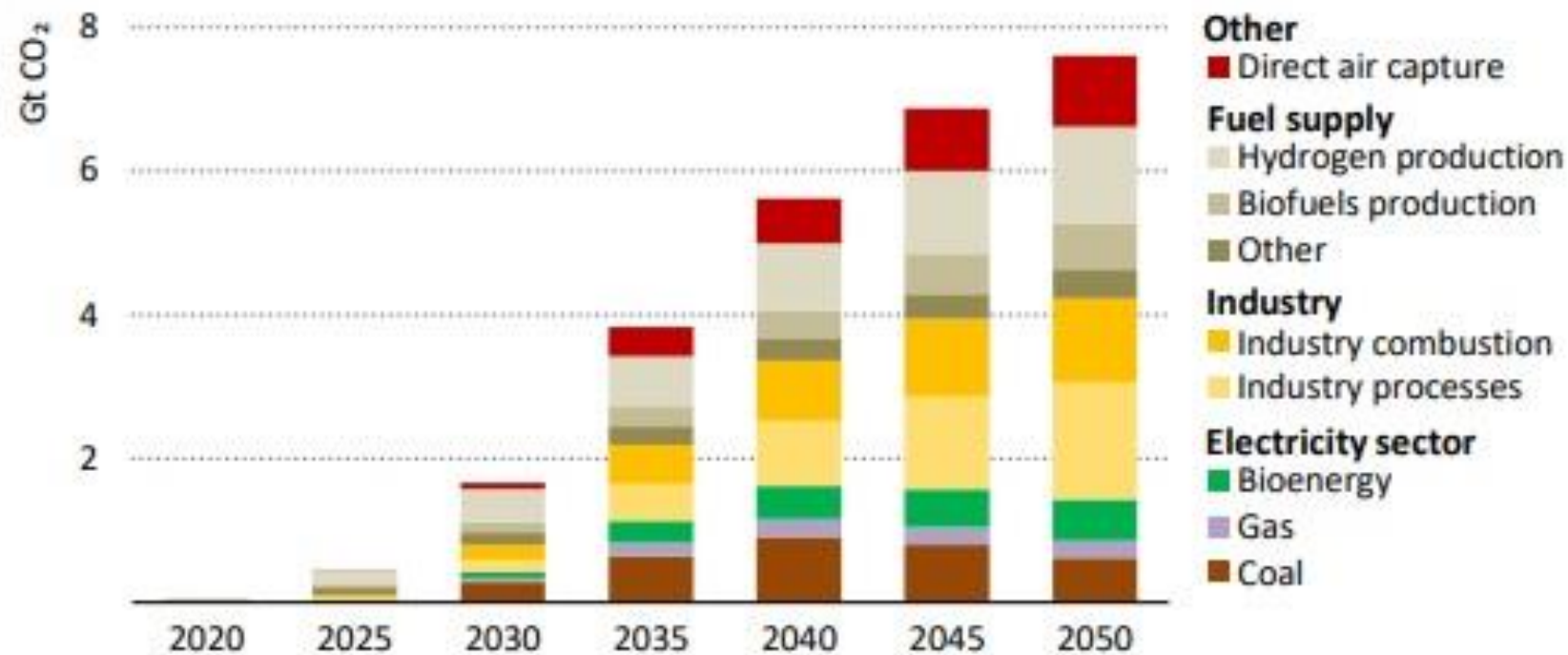
- PILOT & DEMONSTRATION FACILITIES IN OPERATION & DEVELOPMENT
- PILOT & DEMONSTRATION FACILITIES COMPLETED



# IEA Net Zero by 2050 - role of CCS



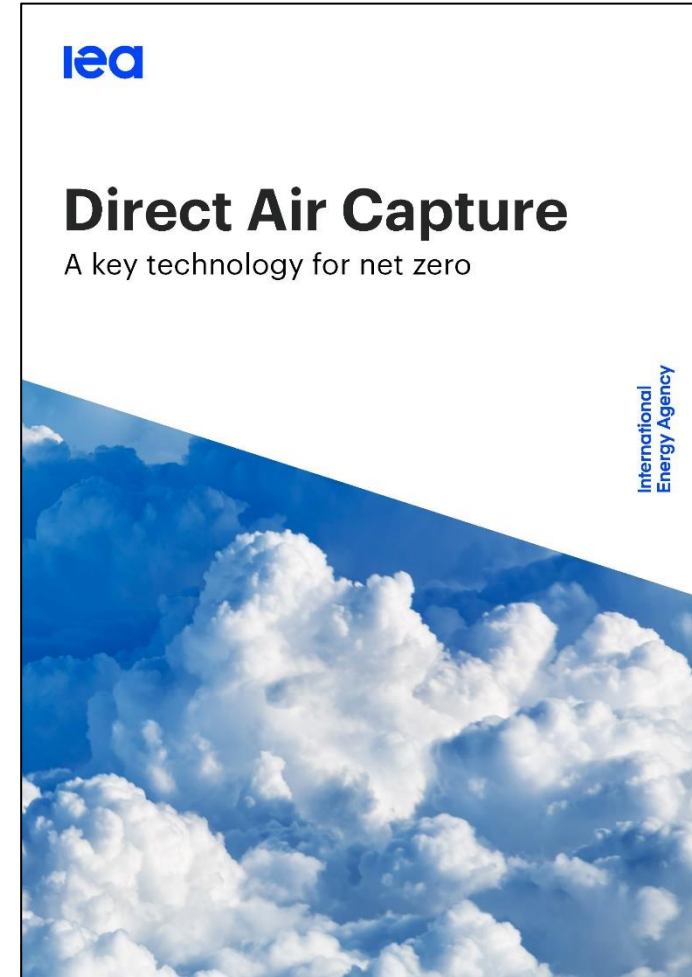
**Figure 2.21** ▶ Global CO<sub>2</sub> capture by source in the NZE



IEA. All rights reserved.

Fig 2.21 IEA NZE 2021

# DAC Reports



# IEAGHG Primary Activities

- Funding research into development and deployment of CCUS technologies
- Technical Reports >356 reports published on all aspects of CCUS
- International Expert Networks Risk Management; Monitoring; Modelling; Environmental Research; High Temperature Solid Looping; Costs; Social Research
- Conferences
  - GHGT conferences (the largest global conference on CCS)
    - GHGT16 – 23-27 Oct 2022, Lyon France.
  - PCCC conferences – PCCC6, UKCCSRC, virtual, 19-21 Oct 2021
  - Negative CO<sub>2</sub> Emissions conference – 14-17 June 2022 Gothenburg
  - International CCS Summer Schools







LYON, FRANCE



# ghgt-16

16<sup>TH</sup> GREENHOUSE GAS CONTROL  
TECHNOLOGIES CONFERENCE

**23 - 27 OCTOBER 2022**



Hosted by **Club CO<sub>2</sub>**

With



- The leading conference for CCUS for more than 30 years returns for an 'in person' attendance. Hosted by Club CO<sub>2</sub> in Lyon, France.
- Over 700 presentations in 71 sessions, 7 parallel streams, panel sessions, keynotes, plus social events
- Over 800 abstracts received.
- Refer to [www.ghgt.info](http://www.ghgt.info)



# Reports published (1)



Title	Contractor	Report number	Publication date
CO <sub>2</sub> as a Feedstock: Comparison of CCU Pathways	Element Energy	2021-02	23/11/21
CO <sub>2</sub> Utilisation: Hydrogenation Pathways	Element Energy	2021-03	16/11/2021
Techno-economic Performance, Opportunities, and Challenges of NETs	Imperial Consultants (ICON)	2021-04	02/02/22
Global Assessment of DAC	Element Energy	2021-05	19/01/22
Criteria for Depleted Reservoirs to be Developed for CO <sub>2</sub> Storage	BEG, UoTX	2022-01	17/01/22



# Reports published (2)



Title	Contractor	Report number	Proposed by	Publication date
Current State of Knowledge Regarding the Risk of Induced Seismicity at CO2 Storage Projects	BEG at U.Texas	2022-02	IEAGHG	01/02/22
Prime Solvent candidates for next generation of PCC plants	Khalifa Uni.	2022-03		28/02/22
From CO2 to Building Materials - Improving Process Efficiency	Imperial College	2022-04	UK	02/03/22
Feasibility study on achieving deep decarbonization in worldwide fertilizer production	Wood	2022-05	UK	03/03/22
(Hydrogen from Oil)		2022-06		
{Hydrogen from Natural Gas)		2022-07		
Start-up and Shut-down of capture plant		2022-08		

# Technical Reviews published (1)



Title	Author	Report number	Publication date
Global Storage Capacity Workshop 2021	Sam Neades	2022-TR01	18/02/22
IEAGHG Risk Management Network "The Road to CCS Project Permitting – Operators' Experiences With Risk Management During the Permitting Process" Webinar & Panel Discussion.	Sam Neades	2022-TR02	31/03/22
Socio-economic Value of CCS	IC	2022-TR03	
CSLF CDR Workshop		2022-TR04	

# Webinar series (recent)



- Established June 2015, 38 webinars to date

Webinar title	Date	Presenter	No. attendees	No. YouTube views to date
The Road to CCS Project Permitting – Operators' Experiences With Risk Management During the Permitting Process	18/01/2022	IEAGHG RMN Network	138	n/a, not public
IEAGHG/IETS iCCUS Workshop: CCUS Technologies in Industrial Systems	01/03/2022	Various		134
Criteria for Depleted Reservoirs to be Developed for CO2 Storage	04/03/2022	IEAGHG & BEG at U.Texas		215
Study on Global Assessment of Direct Air Capture Cost	23/03/2022	IEAGHG, Element Energy & Imperial College		203
Current State of Knowledge Regarding the Risk of Induced Seismicity at CO2 Storage Projects	13/04/2022	IEAGHG & BEG at U.Texas		167
Feasibility Study on Achieving Deep Decarbonization in Worldwide Fertilizer Production	24/05/2022	IEAGHG, Wood & Ergo		54

# IEAGHG Information Papers (recent)



Information Paper Title	IP No.	Issue Date	Author
Hydrogen for net zero	2021-IP28	13/12/2021	AA
OGCI Gulf Countries CCUS White Paper External Stakeholder Workshop	2022-IP01	31/01/2022	JWC
IPCC Climate Change 2022 Impacts, Adaptation and Vulnerability	2022-IP02	10/03/2022	JK
IPCC approves the Summary for Policymakers for Working Group III Mitigation of Climate Change	2022-IP03	05/04/2022	AL, Chevron
IPCC WGIII Report	2022-IP05	04/05/2022	JK

# IEAGHG Information Papers (recent)



Information Paper Title	IP No.	Issue Date	Author
CSLF 2021 Technology Road Map	2021-IP16	21/09/2021	JC
Nature article on CDR	2021-IP17	11/10/2021	JK
UK Net Zero Strategy: Build Back Greener: Synopsis on hydrogen and CCUS	2021-IP19	29/10/2021	AA
Net Zero Strategy and GGRs	2021-IP20	29/10/2021	JK
IEA Global Hydrogen Review 2021	2021-IP21	02/11/2021	AA
IEA: An Energy Sector Roadmap to Carbon Neutrality in China	2021-IP22	05/11/2021	KB
The Global Methane Pledge	2021-IP23	05/11/2021	SN
Net zero electricity in G7	2021-IP24	05/11/2021	KB
Next Generation Capture Technologies	2021-IP25	22/11/2021	AA
NETL Well Integrity Workshop: Identifying Well Integrity Research Needs for Subsurface Energy Infrastructure	2021-IP26	29/11/2021	JC





Input to WPFE



United Nations  
Framework Convention on  
Climate Change

CCS Side Events at COP20, COP21,  
COP22, COP23, COP24, COP25, COP26

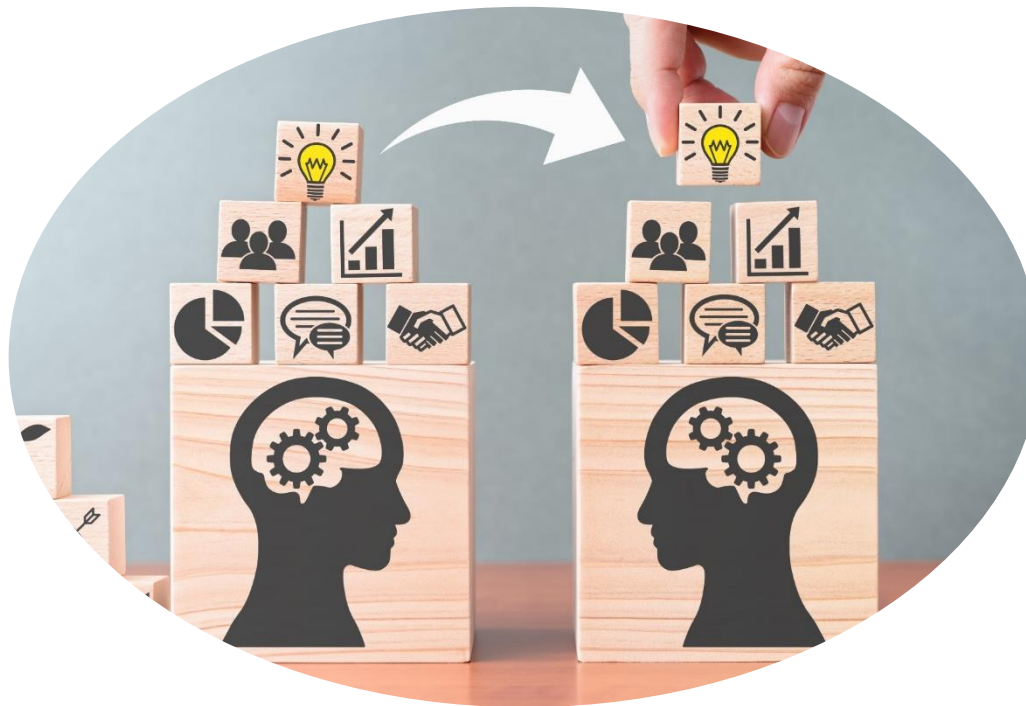


CSLF Technical Group  
IEAGHG inputs



CCUS Initiative  
IEAGHG inputs

## Knowledge Transfer



Expert Reviewers,  
Accredited Observer  
**AR6 reviews**  
AR6 – 98 comments  
provided



London Convention:  
Regular updates on CCS:  
ROAD permit assessment, Offshore workshops  
**CO<sub>2</sub> Export Resolution 2019**

ISO TC-265  
IEAGHG inputs





# Update and International Perspectives from IEAGHG

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