



La Carbon Capture nell'evoluzione del quadro normativo sulle emissioni

27th November 2023

Our experience. Your growth.

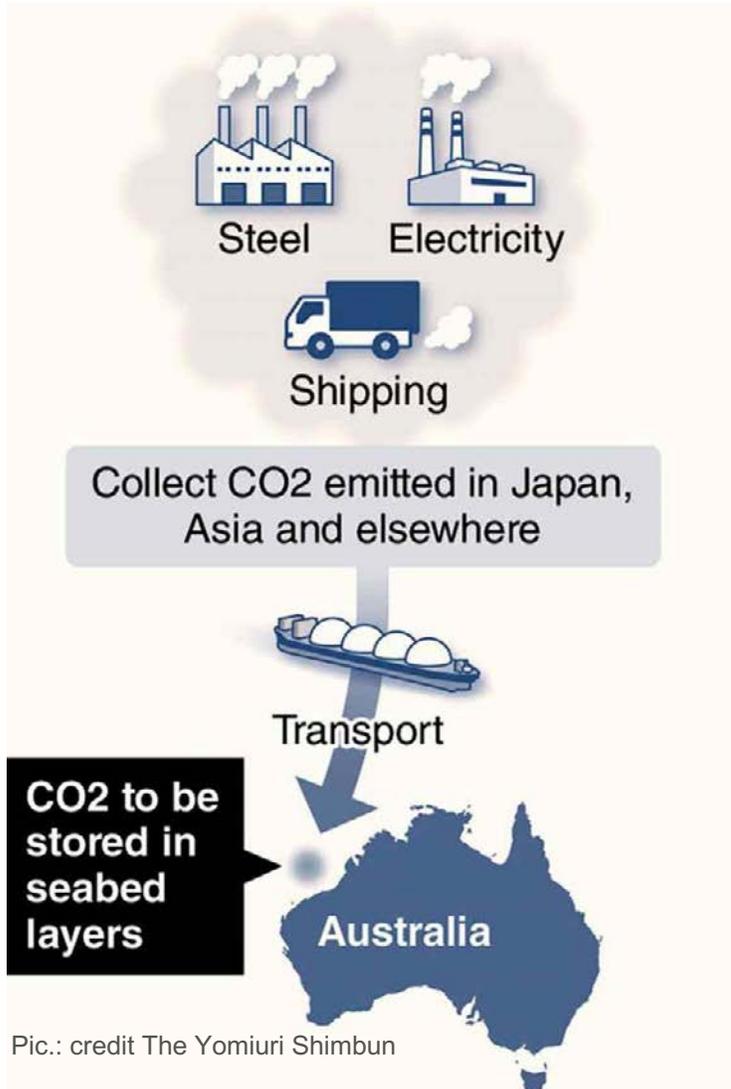
SUMMARY



- **Introduction**
- **IMO – submissions of documents on CCS**
- **EU (MRV, ETS & FEUM) regulations & CCS**

INTRODUCTION

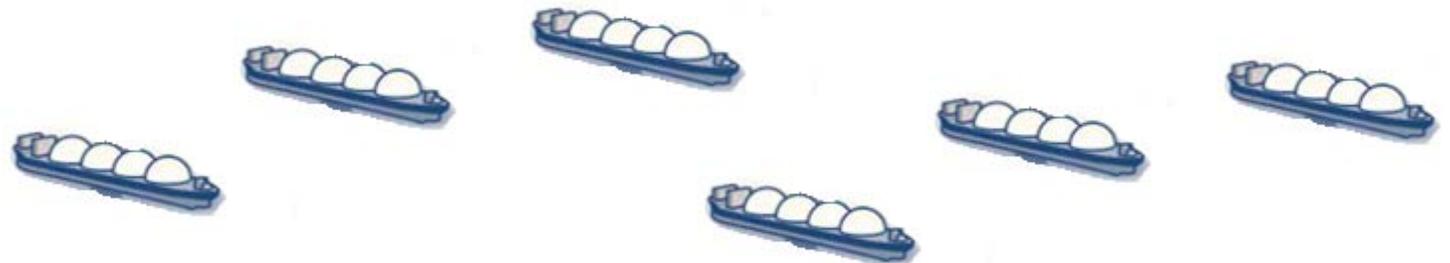
The chain: Emission, Capture, Transport, Storage



Carbon capture is a continuous process of CO₂ emission separation of from exhaust gases emission of industrial plants and transport means

Captured CO₂ is stored, and in almost all cases is to be shipped to the final storage location. A marine transportation system includes port temporary storage on land and loading-unloading facilities.

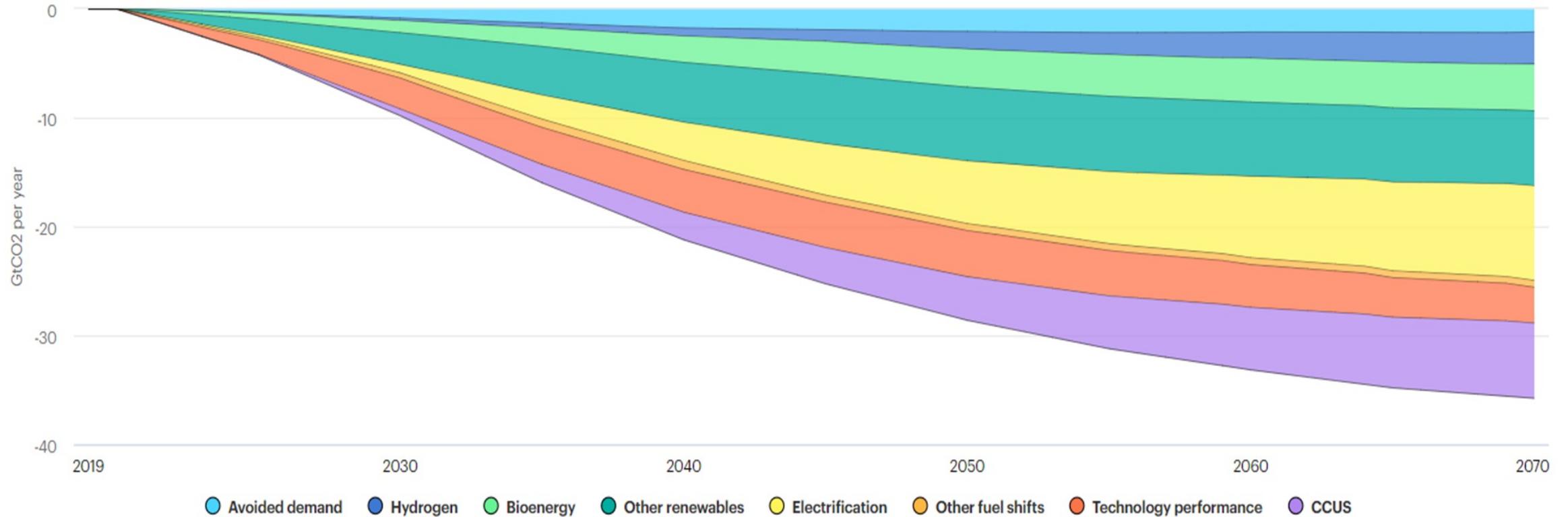
Quantity of captured CO₂, transport distance, and technical restrictions are parameter that will determine the capacity, the speed, and the number of ships the market will require



INTRODUCTION - Scenario according to IEA (International Energy Agency)



CO2 emissions reductions in the energy sector in the Sustainable Development Scenario relative to the Stated Policies Scenario



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Cumulative emissions reductions, 2020-2070

Source: <https://www.iea.org/reports/ccus-in-clean-energy-transitions/ccus-in-the-transition-to-net-zero-emissions>

IMO – Submission on CCS MEPC 79/7/4

Proposal for including carbon capture technologies in the IMO regulatory framework to reduce GHG emissions from ships:

- RINA Decarbonization Committees provided the first draft (including Ecospray contribution)
- Sponsored by Liberia and ICS
- Submitted to MEPC 79 as MEPC 79/7/4
- CCS in EEDI/EEXI, CII and CO₂ Receipt Note

IMO INTERNATIONAL MARITIME ORGANIZATION **E**

MARINE ENVIRONMENT PROTECTION COMMITTEE
79th session
Agenda item 7

MEPC 79/7/4
10 September 2022
Original: ENGLISH
Pre-session public release:

REDUCTION OF GHG EMISSIONS FROM SHIPS

Proposal for including carbon capture technologies in the IMO regulatory framework to reduce GHG emissions from ships

Submitted by Liberia and ICS

SUMMARY

Executive summary: This document proposes to consider the CO₂ reduction obtained from carbon capture technologies and regulate them in the EEDI/EEXI and CII frameworks.

Strategic direction, if applicable: 3

Output: 3.2

Action to be taken: Paragraph 15

Related documents: MEPC 78/17; Resolutions MEPC.304(72), MEPC.308(73), MEPC.328(76) and MEPC.352(78)

MEPC 79 OUTCOME:
The Committee invited Member States to submit other documents on this subject to MEPC 80 2023)

Other submissions on CCS MEPC 79

MEPC 79/7/6 Rep. of China

MEPC 79/7/7 Rep. of China

MEPC 79/7/7 Norway

MEPC 79/7/22 Rep. of Korea

IMO INTERNATIONAL MARITIME ORGANIZATION E

MARINE ENVIRONMENT PROTECTION COMMITTEE
79th session
Agenda item 7

MEPC 79/7/6
30 September 2022
Original: ENGLISH
Pre-session public release:

REDUCTION OF GHG EMISSIONS FROM SHIPS

Proposed amendments to EEDI calculation Guidelines to incorporate Carbon Capture system for Ship Exhaust gas (CCSE)

Submitted by China

SUMMARY

Executive summary: The document proposes amendments to the EEDI calculation Guidelines to incorporate the positive emission reduction effects by the installation of a Carbon Capture system for Ship Exhaust gas (CCSE).

Strategic direction, if applicable: 3

Output: 3.2

Action to be taken: Paragraph 10

Related documents: Resolution MEPC.304(72); resolution MEPC.308(73); resolution MEPC.322(74); resolution MEPC.332(76); MEPC 76/7/17; and MEPC 78/17

IMO INTERNATIONAL MARITIME ORGANIZATION E

MARINE ENVIRONMENT PROTECTION COMMITTEE
79th session
Agenda item 7

MEPC 79/7/7
30 September 2022
Original: ENGLISH
Pre-session public release:

REDUCTION OF GHG EMISSIONS FROM SHIPS

Proposed amendments to EEDI Survey and Certification Guidelines to incorporate a Carbon Capture system for Ship Exhaust gas (CCSE)

Submitted by China

SUMMARY

Executive summary: This document proposes amendments to the corresponding EEDI Survey and Certification Guidelines, taking into account the updated EEDI calculation Guidelines as proposed in document MEPC 79/7/6, which incorporates the positive emission reduction effects by the installation of a Carbon Capture system for Ship Exhaust gas (CCSE).

Strategic direction, if applicable: 3

Output: 3.2

Action to be taken: Paragraph 3

Related documents: Resolution MEPC.254(67); resolution MEPC.261(68); resolution MEPC.304(72); resolution MEPC.309(73); MEPC.1/Circ.855/Rev.2; MEPC 76/7/17 and MEPC 78/17

IMO INTERNATIONAL MARITIME ORGANIZATION E

MARINE ENVIRONMENT PROTECTION COMMITTEE
79th session
Agenda item 7

MEPC 79/7/7
7 October 2022
Original: ENGLISH
Pre-session public release:

REDUCTION OF GHG EMISSIONS FROM SHIPS

Carbon capture and storage on board ships

Submitted by Norway

SUMMARY

Executive summary: The document considers how carbon capture and storage can reduce GHG emissions from shipping, and what needs to be addressed by the Organization to enable the use of carbon capture technology on ships and ensure responsible handling and storage of the captured carbon dioxide. Finally, it proposes a process for how the Organization can work on this issue.

Strategic direction, if applicable: 3

Output: 3.2

Action to be taken: Paragraph 38

Related documents: MEPC 76/7/17, Resolution LP.1(1), Resolution LP.3(4), Resolution LP.5(14) and LC 34/15 annex 8

IMO INTERNATIONAL MARITIME ORGANIZATION E

MARINE ENVIRONMENT PROTECTION COMMITTEE
79th session
Agenda item 7

MEPC 79/7/22
7 October 2022
Original: ENGLISH
Pre-session public release:

REDUCTION OF GHG EMISSIONS FROM SHIPS

Proposal to include onboard CO₂ capture system in the IMO GHG regulatory framework

Submitted by Republic of Korea

SUMMARY

Executive summary: This document proposes to include the CO₂ reduction of onboard CO₂ capture system in the IMO GHG regulatory framework including EEDI, EEXI and CII to remove regulatory barriers to innovative technology and to provide a level playing-field and cost-effective opportunity for decarbonization of shipping industry.

Strategic direction, if applicable: 3

Output: 3.2

Action to be taken: Paragraph 23

Related documents: Resolutions MEPC.304(72), MEPC.328(76), MEPC.332(76), MEPC.350(78), MEPC.352(78), MEPC.355(78); MEPC 76/7/17, MEPC 76/7/44, MEPC 78/17, MEPC.1/Circ.896 and ISWG-GHG 11/2/3

Other proposals on CCS:

- Sponsored by China, Norway, Korea
- CCS in EEDI/EEXI, CII, verification, working group

Informal Group on CCS MEPC 80/7/7



Proposal to establish a WG on CCS: not yet passed



Informal group (China, Japan, Liberia, Norway, Republic of Korea, who submitted proposal at MEPC 79 + ASEF) prepared a joint submission for MEPC 80

- **The concept:** CCS as technology able to facilitate the transition period and contribute to the climate target achievement
- CCS to be assessed and subject to agreement included within the regulatory framework
- MEPC 80/7/7 The use of onboard carbon capture systems within IMO's regulatory framework

Proposed terms of reference

- undertake a regulatory scoping exercise for the use of onboard CO₂ capture;
- develop a work plan to accommodate onboard CO₂ capture within the IMO's regulatory framework; and
- submit a written report to MEPC 81.

All submissions on CCS

MEPC 80



MEPC 80/7 (RINA) MEPC 80/INF.14

- analysis of **technical and economic** aspects of onboard carbon capture (OCC) technology applied to different ship types and sizes (container, bulk and tanker), main carbon-based fuels and full and partial application as part of a retrofit or newbuild;

MEPC 80/7/7 (China et al.)

- **dedicated work stream on onboard CO₂ capture** and that, as the first step, a structured review of the current IMO regulatory framework should be undertaken as part of the development of a work plan to accommodate onboard CO₂ capture within IMO's regulatory framework

MEPC 80/7/10 (IBIA)

- identification of requirements for **preparation of marine diesel engine exhaust gases for shipboard carbon capture (SBCC)** technologies

MEPC 80/INF.31 (Korea)

- preliminary **assessment of zero and negative emissions depending on the origin of carbon** in fuel and the fate of CO₂

MEPC 80/INF.32 (India)

- initiation of **policy action to limit GHG emissions from engine exhausts through carbon capture, storage, utilization/sequestration (CCUS)**

MEPC 80 OUTCOME:

Following consideration, the Committee agreed to instruct ISWG-GHG 16, **if time permitted**, to consider the proposals related to onboard CO₂ capture, using document MEPC 80/7/7 (China et al.) as a basis and taking into account documents MEPC 80/7 (RINA), MEPC 80/7/10 (IBIA), MEPC 80/INF.14 (RINA), MEPC 80/INF.31 (Republic of Korea), MEPC 80/INF.32 (India), MEPC 79/7/4 (Liberia and ICS), MEPC 79/7/6 (China), MEPC 79/7/7 (China), MEPC 79/7/16 (Norway), MEPC 79/7/22 (Republic of Korea) and MEPC 79/INF.27 (Republic of Korea), **and advise the Committee on a way forward**

Work in progress on CCS

Submission to MEPC 80



How to incorporate onboard carbon capture in the Organization's regulatory framework

- Chapter 4 of MARPOL Annex VI
- London Protocol on geological storage of CO₂
- The legal classification of CO₂ / status of the captured CO₂ which is temporarily stored onboard (waste, a pollutant/harmful substance or a cargo)
- Classification and possible implications on transboundary movement of carbon dioxide
- Ownership of CO₂ delivered to a CO₂-terminal for onward transport and storage
- Certification of the onboard CCS system itself in respect of e.g. CO₂ capture rate and monitoring of key parameters during operation
- Comparison with EGCS
- Attained EEDI/EEXI (i.e. subtracting the quantity of CO₂ captured per hour of operation taking into account the CO₂ storage capacity)
- Attained CII through the reduction of the total mass of CO₂ emitted on the basis of the CO₂ emission in the air

CCS & IMO

Current status



- Currently, **onboard CO₂ capture is not incorporated** in the IMO's regulatory framework of short terms measures (EEDI, EEXI, SEEMP, CII) even if several proposals have been submitted to MEPC 79 and 80
- Likely, before next MEPC 81, **ISWG-GHG 16 will not consider the proposals** related to onboard CO₂ capture due to time constraints
- **LCA guidelines**, approved at MEPC 80, but still in discussion in the Correspondence Group on the Further Development of the LCA , **is taking into account carbon capture, both for fuel production and onboard capture**

CCS and LCA Guidelines



$$GHG_{TtW} = \frac{1}{LCV} \left(\left(1 - \frac{1}{100} (C_{slip_ship} + C_{fug}) \right) \times (C_{fCO_2} \times GWP_{CO_2} + C_{fCH_4} \times GWP_{CH_4} + C_{fN_2O} \times GWP_{N_2O}) + \left(\frac{1}{100} (C_{slip_ship} + C_{fug}) \times C_{sfx} \times GWP_{fuelx} \right) - S_{Fc} \times e_c - S_{FCCU} \times e_{CCU} - e_{OCCS} \right)$$

Note: terms S_{FCCU} , e_{CCU} and e_{OCCS} are pending further methodological guidance to be developed by the Organization.
For more details refer to footnotes 11 to 13.

Emission credit due to biomass growth

Emission credit from the used captured CO2 to produce synthetic fuels

Emission credit due to CC on board and storage

CCS and LCA Guidelines

$$GHG_{TCW} = \frac{1}{LCV} \left(\left(1 - \frac{1}{100} (C_{slip_ship} + C_{fug}) \right) \times (C_{fCO_2} \times GWP_{CO_2} + C_{fCH_4} \times GWP_{CH_4} + C_{fN_2O} \times GWP_{N_2O}) + \left(\frac{1}{100} (C_{slip_ship} + C_{fug}) \times C_{sfx} \times GWP_{fuelx} \right) - S_{Fccu} \times e_c - S_{Fccu} \times e_{ccu} - e_{OCCS} \right)$$

Note: terms S_{Fccu} , e_{ccu} and e_{OCCS} are pending further methodological guidance to be developed by the Organization. For more details refer to footnotes 11 to 13.

Term	Units	Explanation	Note	CG status
e_{OCCS}	gCO _{2eq} /g fuel	Emission credit from carbon capture and storage (e_{OCCS}), where capture of CO ₂ occurs onboard. This should properly account for the emissions avoided through the capture and sequestration of emitted CO ₂ , if CCS occurs on-board. From the above-mentioned emission credit, all the emissions resulting from the process of capturing (e_{cc}), and transporting (e_t) the CO ₂ up to the final storage (including the emissions related to the injection, etc.) need to be deducted. This element should be calculated with the following formula: $e_{OCCS} = c_{SC} - e_{cc} - e_t - e_{st} - e_x$	Pending further methodological guidance to be developed by the Organization, the value of e_{OCCS} should be set to zero.	No default emission factors are provided for the use of onboard CCS (e_{OCCS}), the amount of captured carbon per unit of fuel mass should be specifically certified. The parameters related to emission credits from the used captured CO ₂ as carbon stock to produce synthetic fuels (e_{ccu}) requires further development. The need for considering the long-term storage, when a specific credit for the CCS pathways is generated, is valid for both on-board and on-land pathways. Specific guidelines are needed for the e_{st} term. Associated with the long-term storage of CO ₂ there are potential leakages to be considered.
c_{SC}	gCO ₂ /g fuel	Credit equivalent to the CO ₂ captured and stored (long-term: 100 years)		
e_{cc}	gCO _{2eq} /g fuel	Any emission associated with the process of capturing, compress and temporarily store on-board the CO ₂		
e_t	gCO _{2eq} /g fuel	Emissions associated with transport to long-term storage site		
e_{st}	gCO _{2eq} /g fuel	Any emission associated with the process of storing (long-term: 100 years) the captured CO ₂ (including fugitive emissions that may happen during long-term storage and/or the injection of CO ₂ into the storage)		Working on methodological position, measurement methods, shop tests on carbon capture system , onboard measurements on carbon capture system, numerical calculation on carbon capture, type approval of the system, system degradation.
e_x	gCO _{2eq} /g fuel	Any additional emission related to the CCS		

CCS

EU Fit for 55



EU ETS: captured emissions shall be multiplied by zero

Fuel EU Maritime: no benefit for onboard carbon capture

- emissions verified as **captured and transported for permanent storage** to a facility for which a permit is in force in accordance with Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide.
- emissions of greenhouse gases which are considered to have been captured and utilised in such a way that they have become **permanently chemically bound in a product** so that they do not enter the atmosphere under normal use, including any normal activity taking place after the end of the life of the product.”

Table B.6

Application of carbon capture and storage technologies referred to in Part C, point 1.4, of Annex II to Regulation (EU) 2015/757

Description of the technology in use	Supporting evidence for compliance with the requirements spelled out in Article 12(3a) or Article 12(3b) of Directive 2003/87/EC	Emissions source to which capture and storage and/or carbon capture and utilisation is applied

For more info:



**Thank you for
your attention**

Our experience. Your growth.