CO_2 CAPTURE

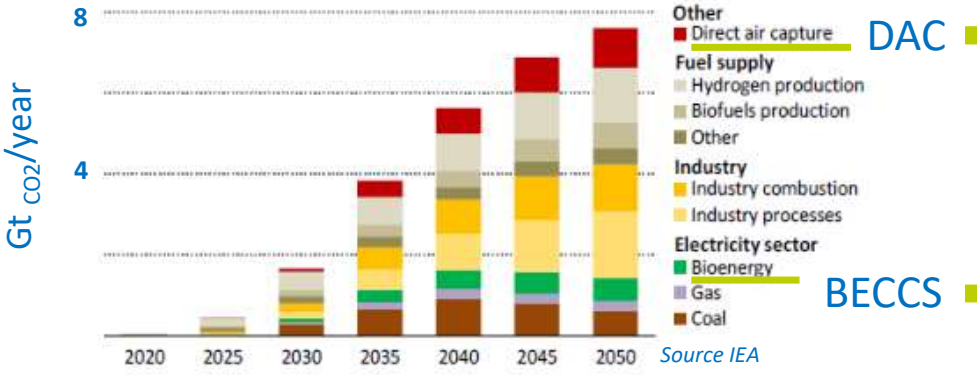
POTENTIAL AND CHALLENGE OF (NON-FOSSIL) CARBON CAPTURE TECHNOLOGIES

F. GUILLOU

STORAGE : MAIN APPLICATION OF CO_2 CAPTURE

Climate, environment and circular economy

2022 : 37 Gt_{CO2}/year*



Source IEA

~25% usable CO_2

¾ to storage
« Émissions négatives »

¼ to utilization
Aviation Fuel, chemicals

PROJECTION IN 2050

- 8 Gt CO_2/year ➔ 20% of 2022 emissions
- +90 % of captured CO_2 to be stored
- ~25 % of captured CO_2 from biogenic (ex BECCS) or atmospheric (DAC, direct air capture) origin

CHALLENGES

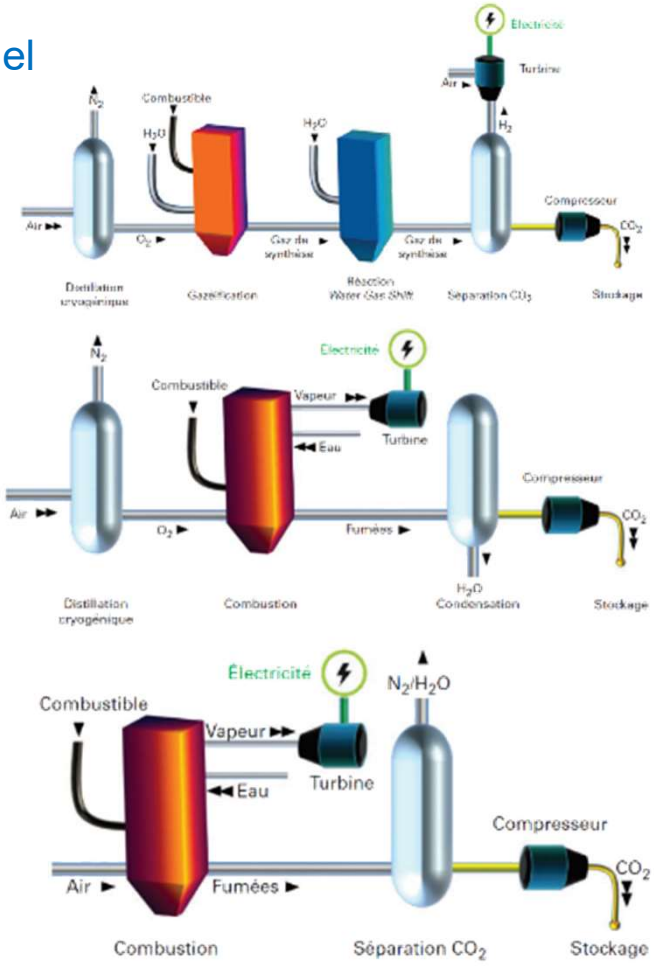
- Reduce energy consumption (2-4 GJ/tCO_2) and investment intensity to reduce CO_2 avoidance cost (100's €/t)
- Yearly scale-up challenge :
  - 10's storage sites
  - 100's capture sites
  - 1000's kilometers of CO_2 transport infrastructures

*41 Gt_{CO2eq}/year (including methane), IEA report, March 2023, « CO2 Emissions in 2022 »

CO2 CAPTURE FOR NEGATIVE EMISSIONS : BIO ENERGY WITH CCS

Climate, environment and circular economy

Biomass Fuel



Low carbon energy

Precombustion

Decarbonize fuel before use

Oxycombustion

Combustion with pure O_2

Postcombustion

Capture CO2 in flue gases

Biogenic CO_2 to storage

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CLC

Chemical looping combustion

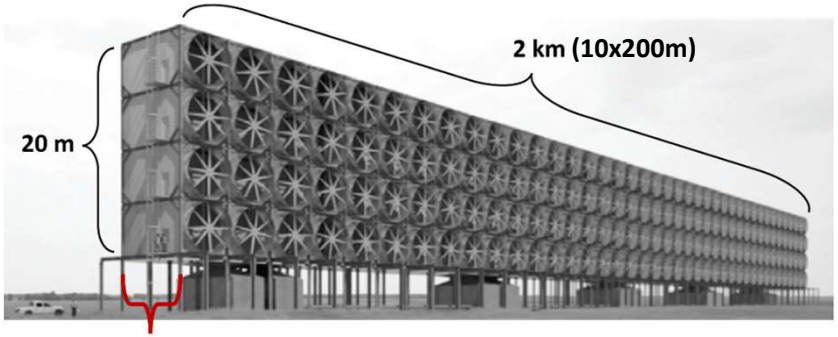
DMX™

2nd generation amine process

CO2 CAPTURE FOR NEGATIVE EMISSIONS : DIRECT AIR CAPTURE

Climate, environment and circular economy

Atmosphere



Carbon Engineering 1MtCO_2/year scale

Climeworks 40ktCO_2/year scale

Low carbon energy

Liquid sorbent

Continuous process

Solid sorbent

Batch process

Atmospheric CO_2 to storage

R&I CO2 CAPTURE PERSPECTIVES FOR NETs

Climate, environment and circular economy

DEDICATED TECHNOLOGIES

Process intensification to reduce CAPEX

HUB and clusters for energy and equipment mutualization

Continuous R&I effort, majority of 2050 capture technologies are still to be developed

ENVIRONMENT AND CARBON INTENSITY

Low impact sorbents

Biosourced raw materials

Electrification, integration of renewable and low carbon energies

Eco-conception and LCA driven process development

Innovating for energy

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