Capture Your Future

TALKING CARBON CAPTURE WITH DOTZ NANO [ASX:DTZ]

Investor Webinar, October 30, 2023

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Dotz in A Nutshell.

Harnessing nanotechnologies for a better planet

Leading developer of innovative climate and industrial nanotechnologies

DIVERSIFIED TECHNOLOGY PORTFOLIO

Primary focus on ground-breaking carbon management technologies as enablers of a carbon-neutral future

VALIDATED TECHNOLOGIES

Proven technology scale-up with customer validation

ATTRACTIVE TARGETED MARKETS

Multi-billion opportunities within the environmental & industrial end-markets

EXPERIENCED LEADERSHIP TEAM

Proven track record of delivering growth

Our Journey.

2015

Company's establishment

2016

Listing at the Australian Securities Exchange (ASX)

2017–2022

Development, scale-up and commercialization of carbon and graphene quantum dotz (GQD) Technologies

2023

Strategic acquisition of innovative CO_2 capture technology

2024–

capitalize on the $600B opportunity in carbon capture

Capture Your Future

Talking Carbon Capture with Dotz Nano

Speakers:

Prof. James Tour
Rice University

Jasmina H. Cavka
SINTEF

Glenn Kelly
Director, Dotz

Michael Shtein, Ph.D.
CTO, Dotz

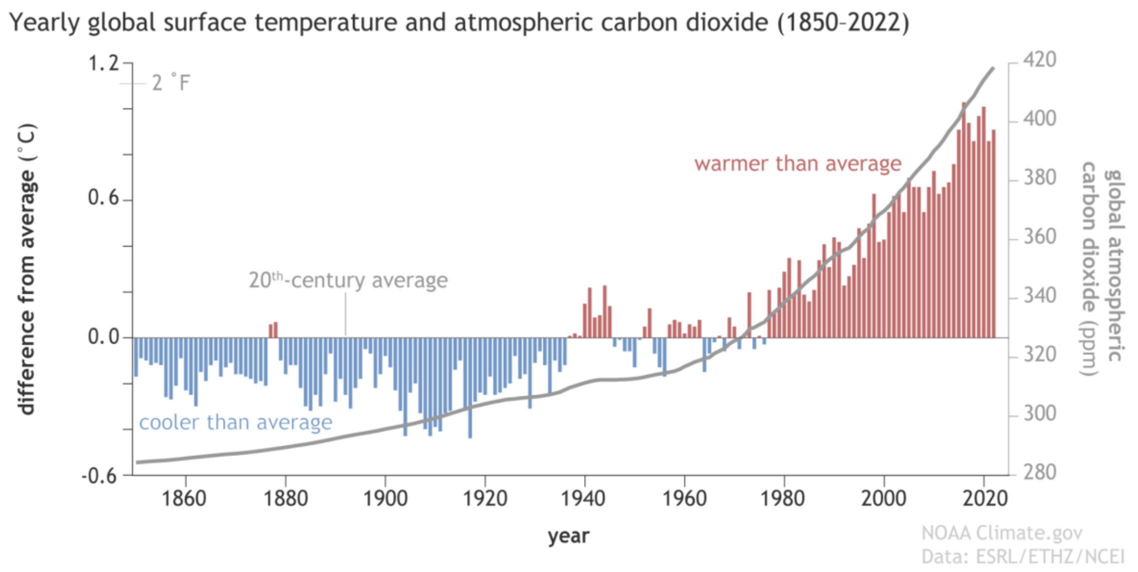
Sharon Malka
CEO, Dotz

Carbon Capture Landscape

Glenn Kelly
Director, Dotz

- Over 35 years of operational, business development, and strategic leadership in the energy and clean technology sectors.
- Acts as a strategic consultant to technology companies, notably in rare earth elements recycling and carbon capture and holds several other directorships, including at CAA Quebec and Avjet Holding inc.
- Past CEO of innovative CO_2 capture technology company. Led development and rollout of capture technology from lab-scale to industrial pilot to 30 tpd commercial demo.

The Fundamental Problem.



Source: NOAA Climate.gov

Average global temperatures have risen

1.2 °C

Due to increasing atmospheric CO_2 concentration

Fossil Fuel for Power & Industry.

Power, Cement, Steel, Chemicals

Accounts for

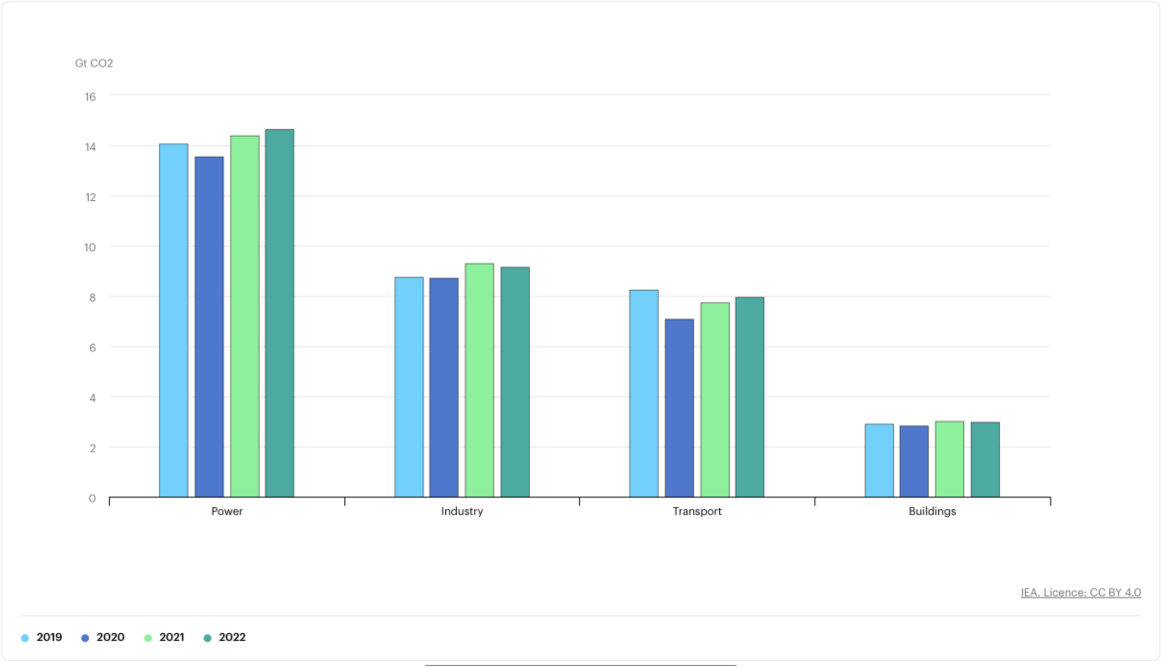
> 60%

Of Global Emissions

Or

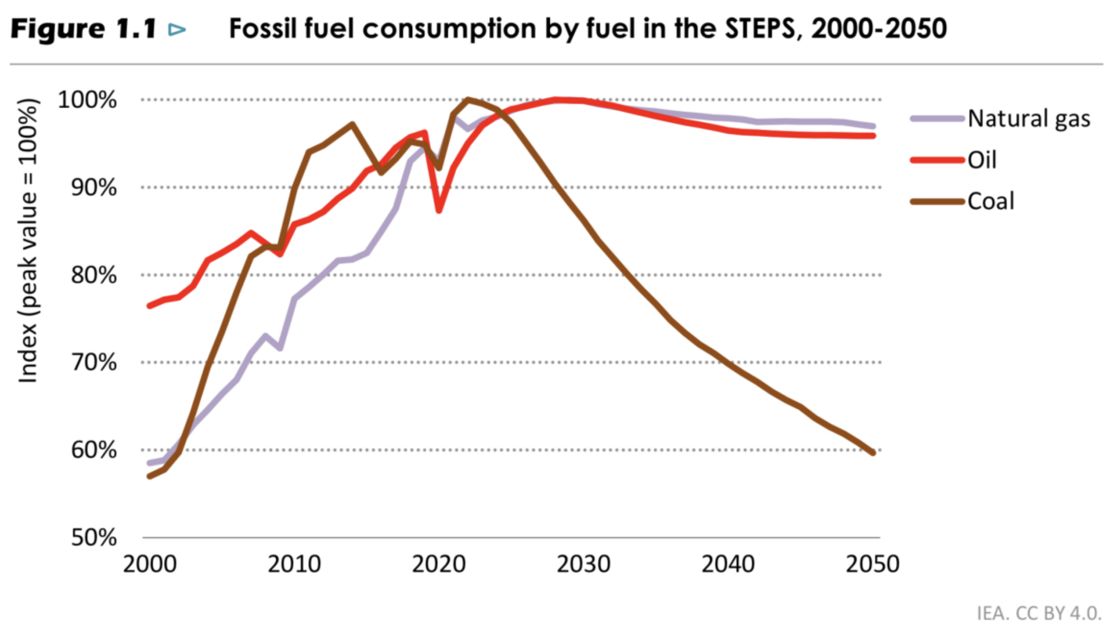
24 Gigaton

of CO_2 every year



Source: IEA

Carbon Capture Will Play Major Role in Energy Transition.



Source: IEA

Fossil fuel use will remain

A major energy source

Carbon Capture Will Play Major Role in Energy Transition.

Capture capacity must grow 150x from today

The International Energy Agency ("IEA") estimates that to limit temp. rise to 1.5⁰C,

- 1.2 Gtpa fo CO_2 must be captured by 2030
- **5.6 Gtpa of CO_2 must be captured and sequestered** by 2050
- Presently at 0.04 Gtpa in 2023

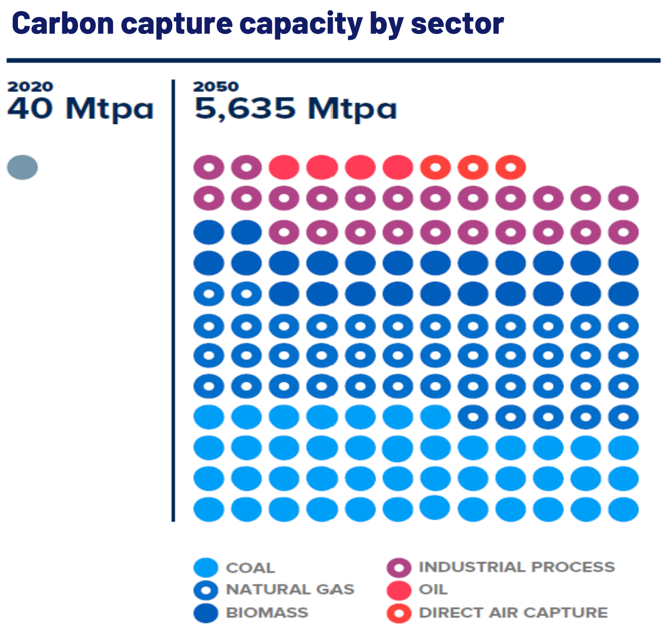


FIGURE 2 CO_2 CAPTURE CAPACITY IN 2020 AND 2050 BY FUEL AND SECTOR IN THE IEA SUSTAINABLE DEVELOPMENT SCENARIO[b]

Includes CO_2 captured for use (369 Mtpa) and storage (5,266 Mtpa) in 2050

Source: IEA

What is the value or price for a ton of Carbon.

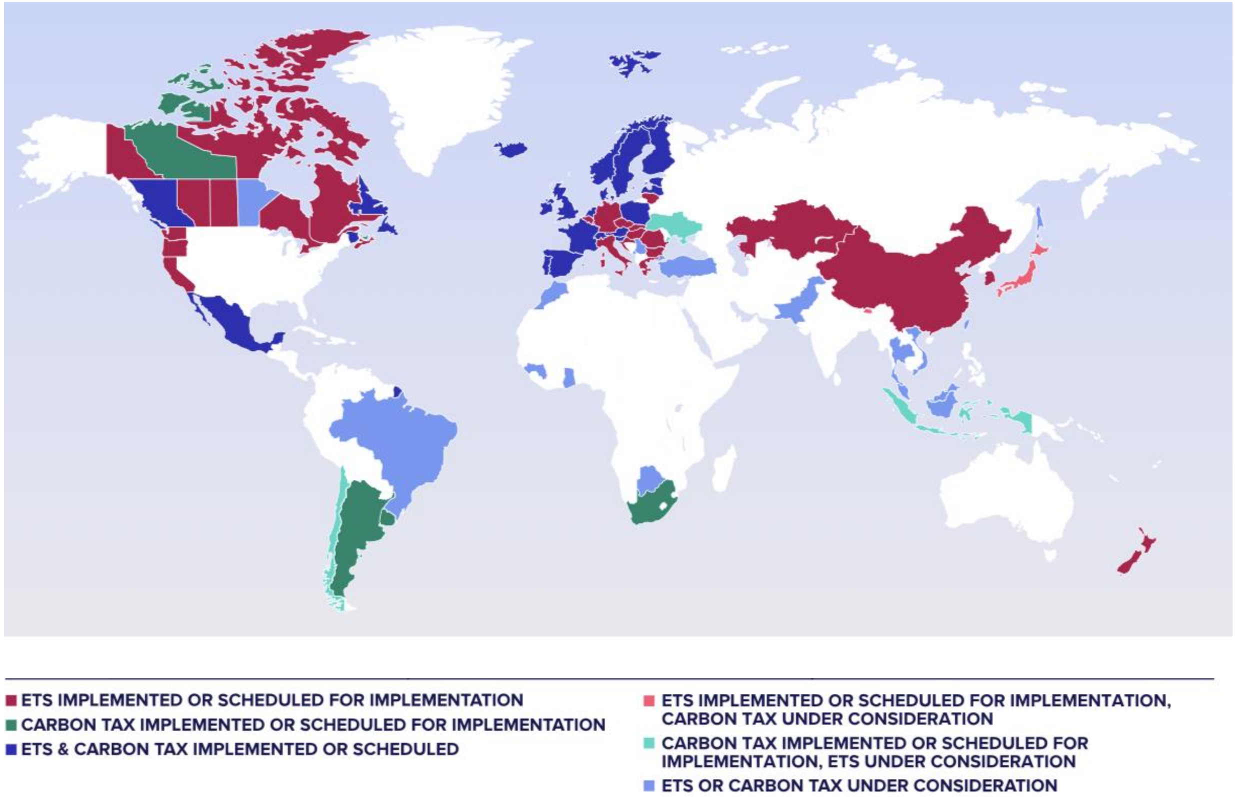
Set by Emissions Trading Systems, Carbon Taxes, or Tax Credits

~ 25%

Of Global Emissions

Presently Covered By

Pricing Mechanism
(excluding US)



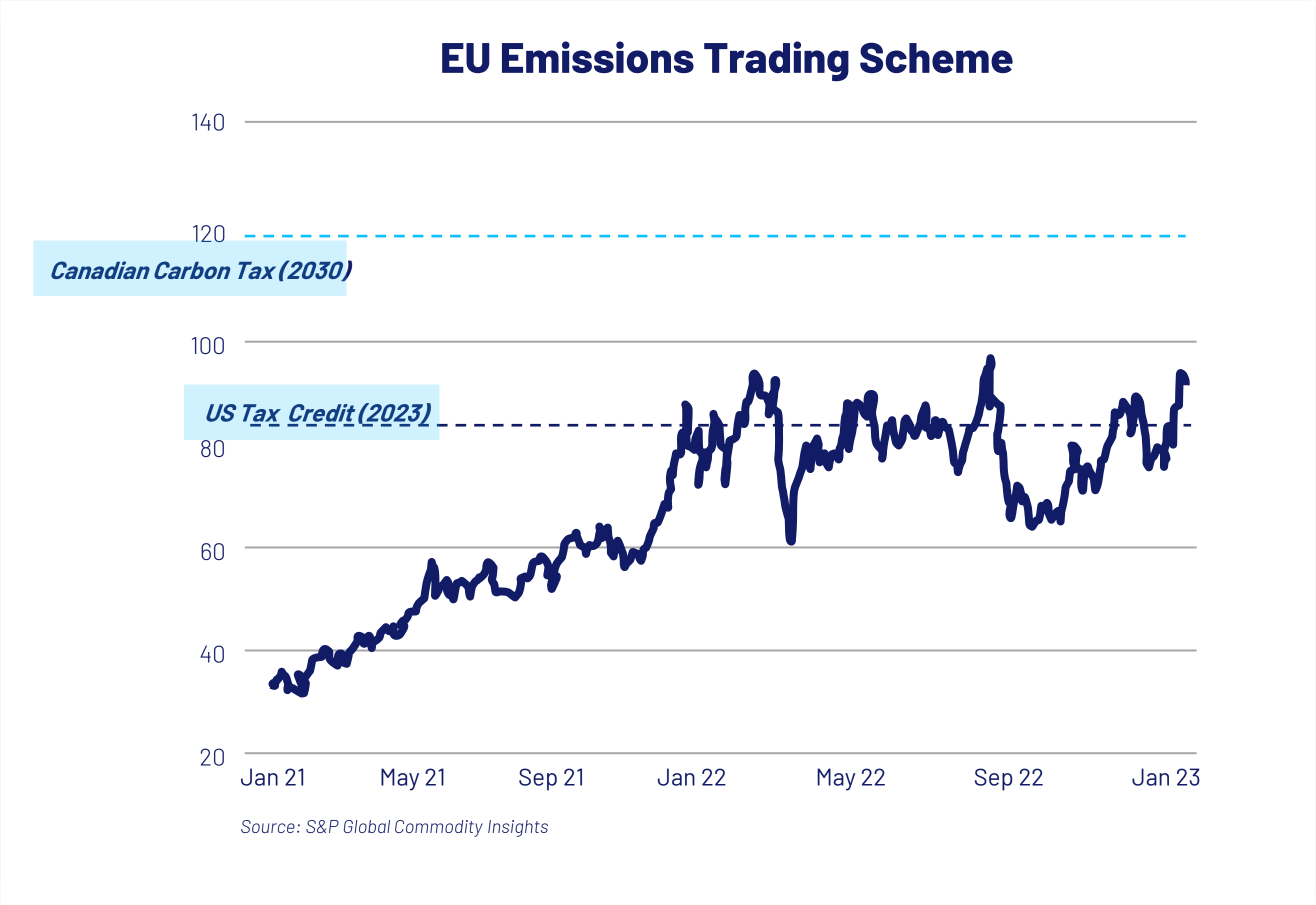
Source: Global CCS institute

Present Pricing Drives Carbon Capture Adoption.

Value/cost of carbon is increasing , driving financial viability and adoption of carbon capture

Governments are allocating billions for carbon capture research, development and demonstration

Government incentives will further boost investment by emitters to manage their emissions



Major governmental funding Programs.

Department of Energy

Biden-Harris Administration Announces Over $2.3 Billion Investment To Cut U.S. Carbon Pollution

MAY 5, 2022

European Union to provide €3 billion in funding to help CCS projects

Some 300 million to 640 million tonnes per annum of carbon dioxide needs to be captured to meet emission targets

1 November 2022 14:08 GMT *UPDATED 1 November 2022 14:08 GMT*

ELECTRIC POWER | ENERGY TRANSITION | LNG | NATURAL GAS | PETROCHEMICALS — 29 Mar 2022 | 15:50 UTC

Australia assigns $975 million for hydrogen, clean energy, CCUS in budget

“CARBON CAPTURE REPRESENTS AN ADDRESSABLE MARKET OF NEARLY $100 BILLION BY 2030 AND $600 BILLION BY 2050 JUST IN THE UNITED STATES.”

David Crane Director, Office of Clean Energy Demonstrations

Carbon capture technologies overview and sorbents

Jasmina H. Cavka

SINTEF

Jasmina H. Cavka
SINTEF

- Research Manager at SINTEF Industry, Department of Process Technology.
- PhD in chemistry from the University of Oslo, specializing in materials science, specifically metal-organic frameworks for applications in separation and catalysis.
- Over 10 years of experience within research management, as well as extensive project management experience.
- Jasmina's research interests are within green technologies enabling emissions reduction, enhanced energy and resource efficiency, and green transition.
- One of the main research areas of her research group is development of sorbents and sorbent-based processes for CO2 capture.

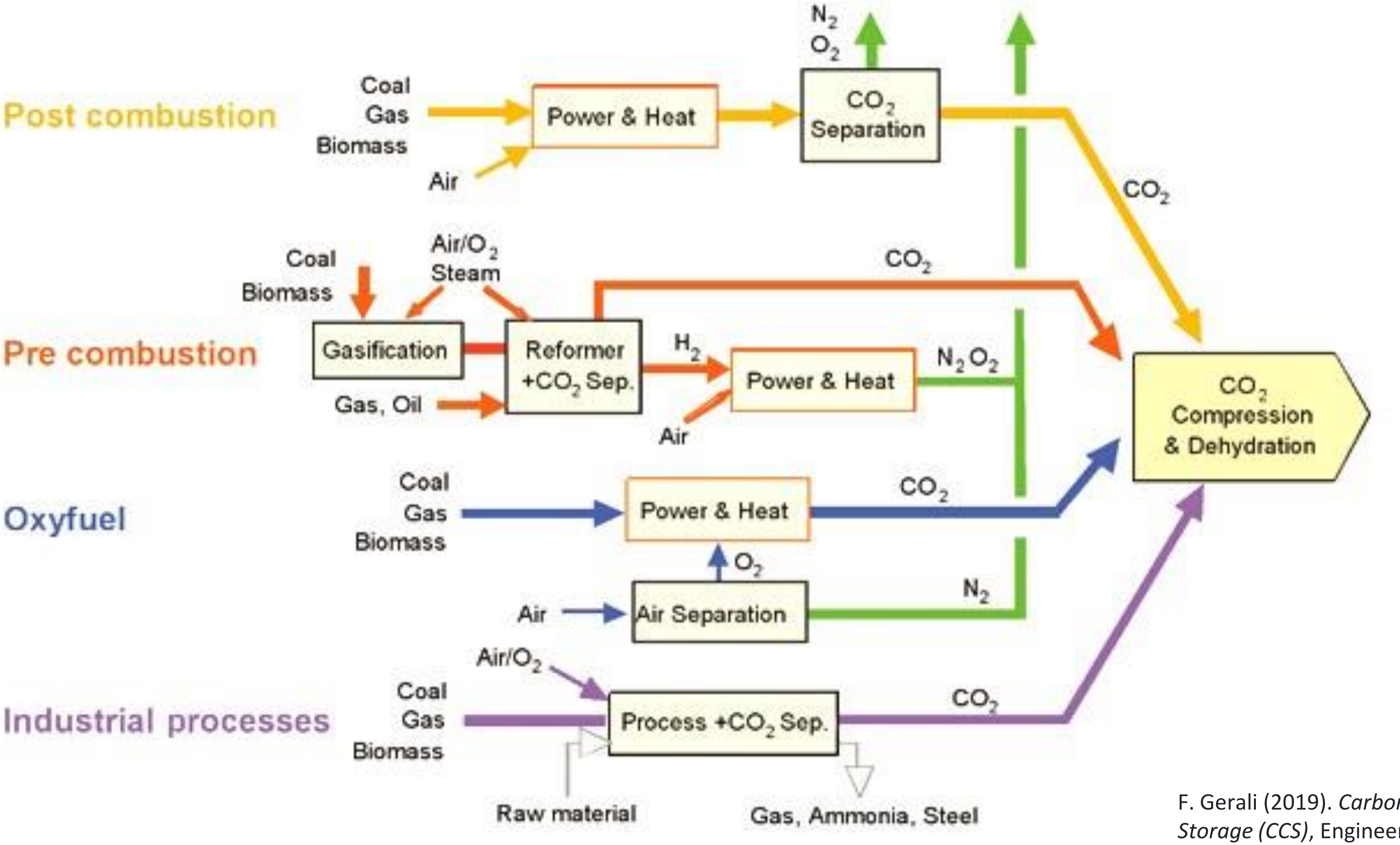
Overview of carbon capture processes

Retrofitting

No Retrofitting

Retrofitting

Retrofitting



F. Gerali (2019). *Carbon Dioxide (CO_2) Capture and Storage (CCS)*, Engineering and Technology History Wiki.

The post-combustion technologies

- Absorption
- Membranes
- Cryogenic separation
- Adsorption
- Hybrid processes

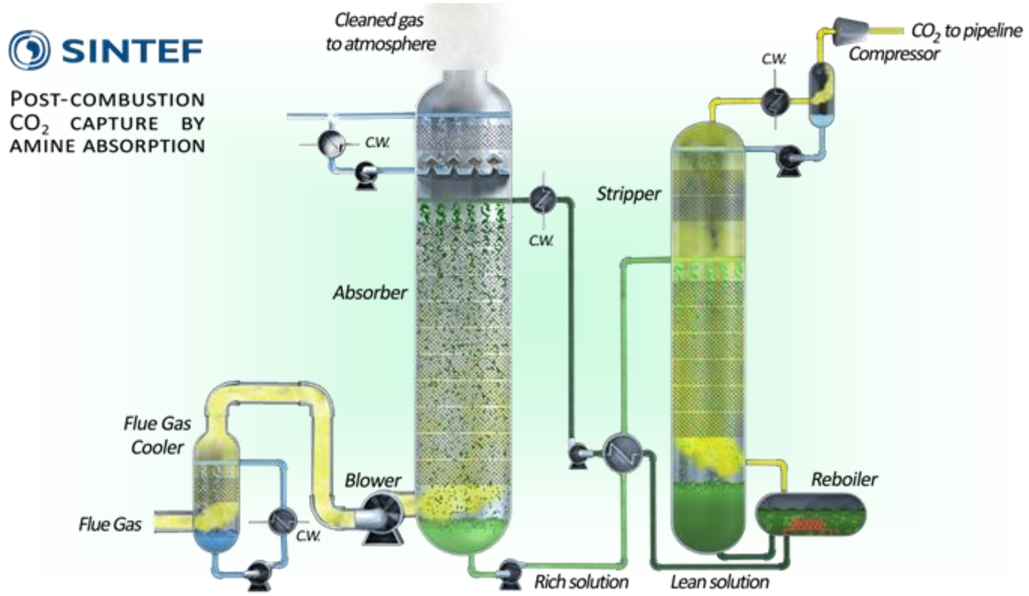
  - There are no other separation principles available for gas separation

Parameters to consider when selecting a CCS technology

Boundary Condition/KPI	Comment
CO_2 Content in flue gas	Key parameter for choice of technology
Flue gas impurities	Pretreatment may be required to protect capture process
Target CO_2 capture rate	Capture technologies vary in how easily they can achieve capture rates
Target CO_2 purity	Capture technologies vary in the CO_2 purity they deliver
Energy consumption as heat and electricity	Technologies vary in requiring heat and/or power
Cooling duty	
Other utility requirements	
Plot space	Technologies varies in plot space requirements
Emissions and waste	Solvent technology has a potential emission issue
Ease of operation	Technologies vary in operational complexity
CAPEX	
Scale of capture process	Technologies vary in how well they are suited to different scales

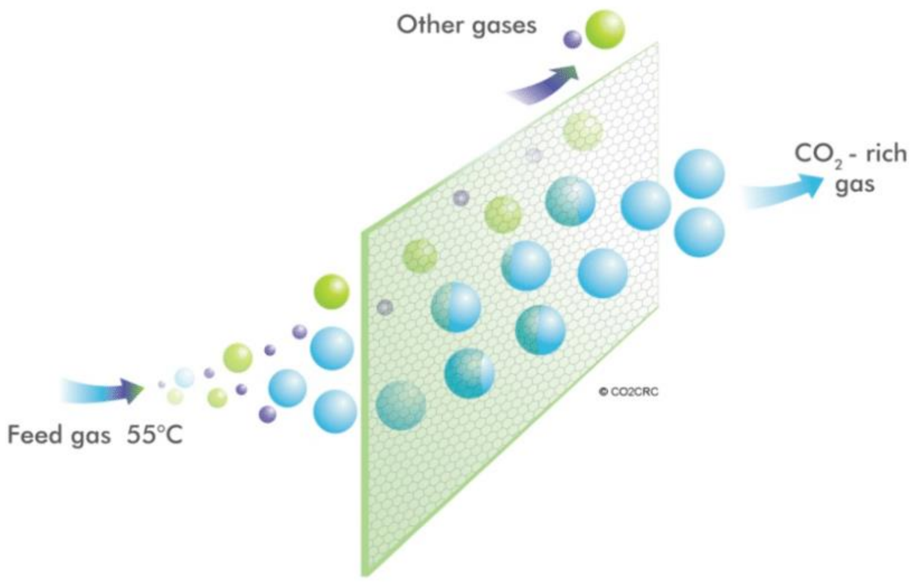
Absorption

- Absorption (solvent-based) capture is the most mature capture technology
- The process is normally a heat-driven temperate swing process
- The process can offer high capture rates (>98%) and a CO_2 stream with high purity (>99.9%)
- Most, but not all, absorption processes are based on aqueous amine technology. For such solvents there is a need for emission control and emission monitoring.



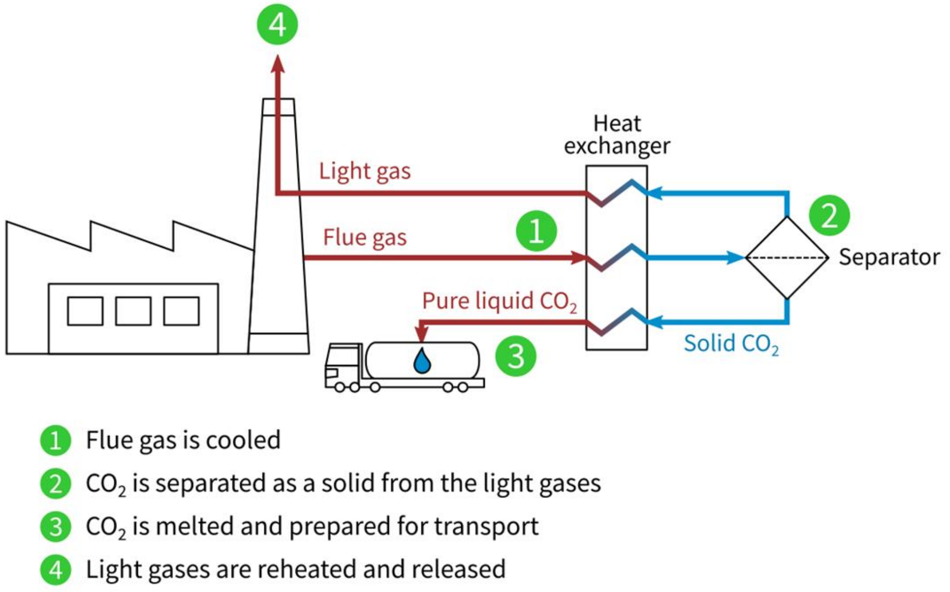
Membranes

- Membrane technology has appeal as being operationally simple and not relying on free chemicals
- It is inherently an electricity driven process, relying on compression and/or vacuum
- Membrane technology is by nature well-suited for bulk removal of CO_2
- It is important to test membrane systems with relevant flue gases
- Few membrane technologies are available at high TRL for post combustion applications



Cryogenic

- Based on cooling the flue gas to the point where phase separation occurs
- There is an inherent need to dry the flue gas
- Is by nature an electricity driven process
- Few developers of cryogenic technology and relatively little data available

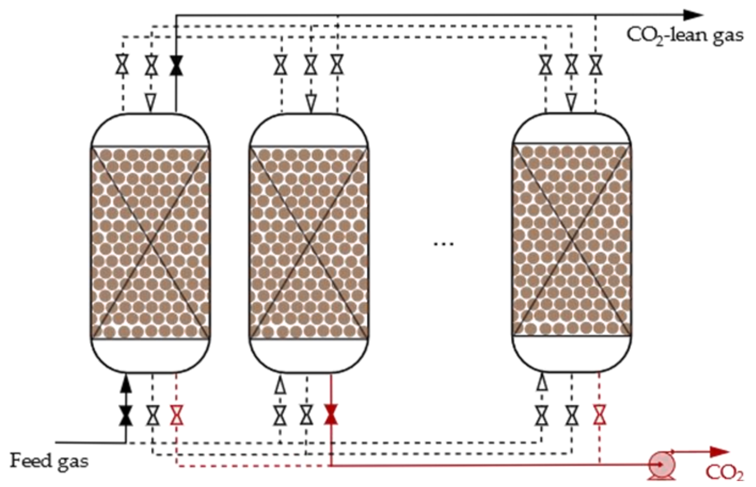


Adsorption

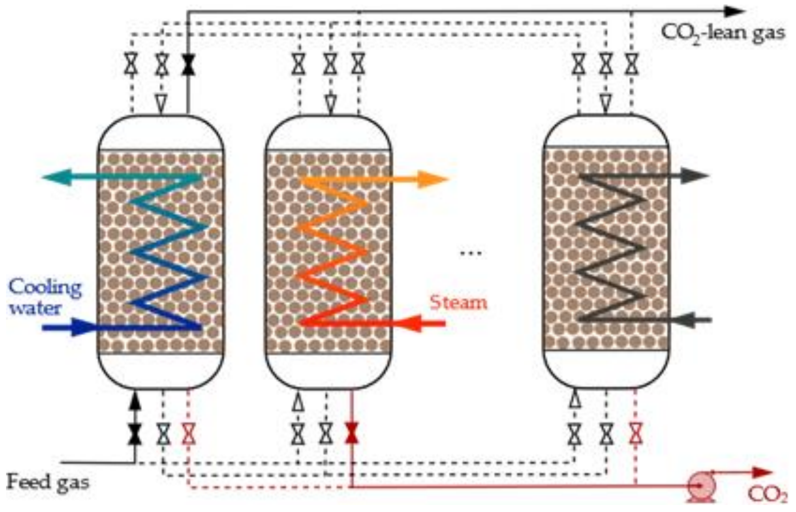
- Adsorption is based on capturing CO_2 on a solid material
- There is a large variety of potential adsorption processes

  that can be considered in CO2 capture, this includes

  fluidized bed systems and variations of fixed bed systems
- The large number of potential processes and materials offer many opportunities for development
- Heat integration is in general a challenge with adsorption technology
- The number of adsorption technologies that have progressed to high TRL is limited



Pressure Swing Adsorption (PSA) processes are widely studied for pre-combustion and post-combustion CCS (>10-15% CO2).



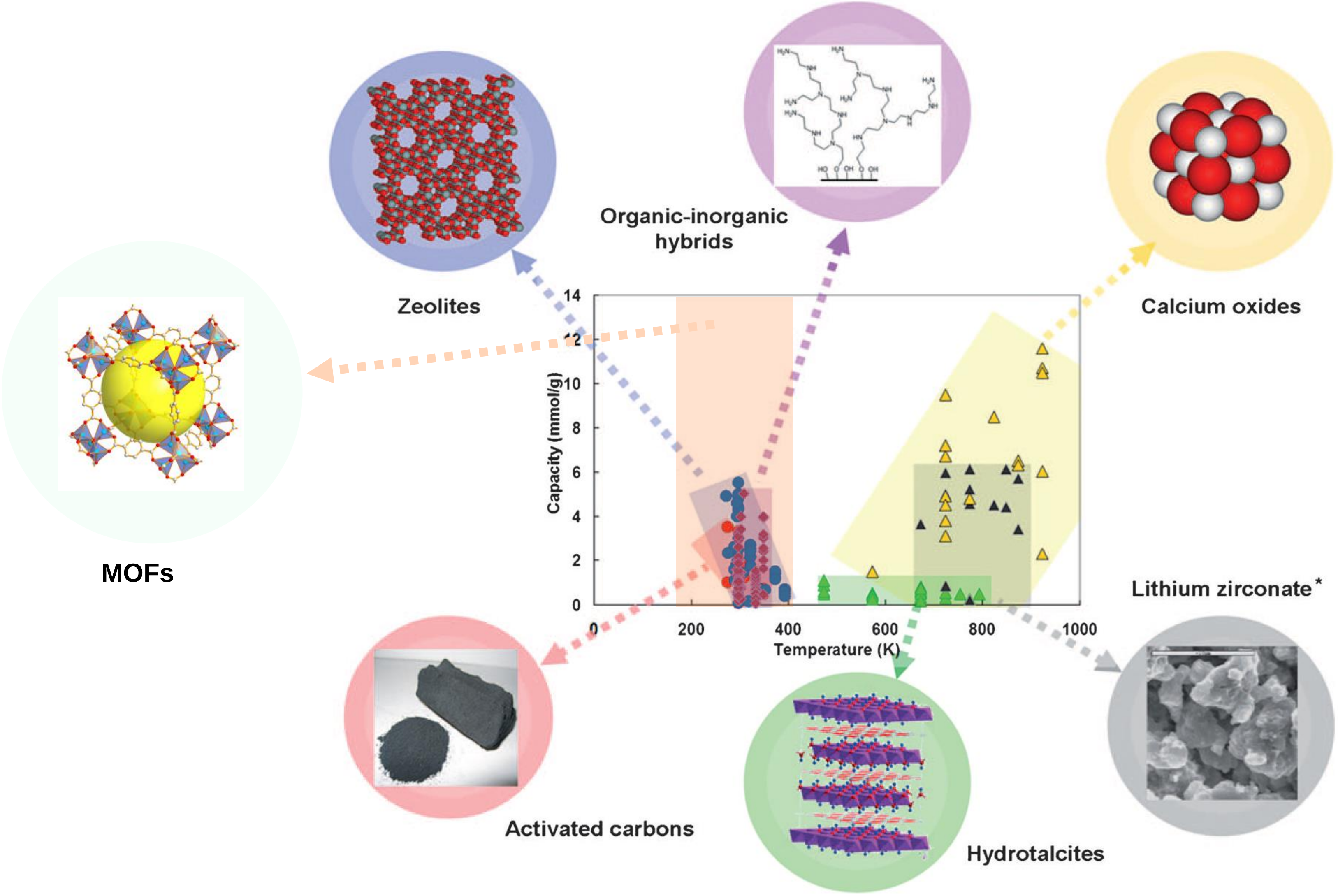
Temperature Swing Adsorption (TSA) processes are more suitable for low concentrations of CO2.

Technology comparison

Technology	Absorption	Membranes	Adsorption	Cryogenic
TRL	7-9	6-7	5-6 (Few developers)	Unclear (Few developers)
Optimal CO_2% in Flue gas	<12 (strongest position)	>12 (strongest position)	Depends on process configuration	Unclear
Energy supply	Heat driven (can be adapted towards electricity)	Electricity driven	Can be both heat and electricity driven	Electricity driven
Strengths	Can deliver high capture rates and high CO_2 purity Well-suited for large scale deployment	Operationally simple No use of free chemicals	Many potential configurations No free chemicals	No free chemicals
Weakness	Many solvents require emission control and emission permitting	Not ideal for high capture rates	Heat integration Plotspace can be issue	Need to dry flue gas is major issue Some uncertainty on maturity of components

Solid sorbents used for CO_2 capture

Various families of solid CO_2 sorbents

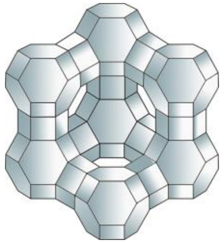


Partly taken from: Choi et al, *ChemSusChem*, 2009

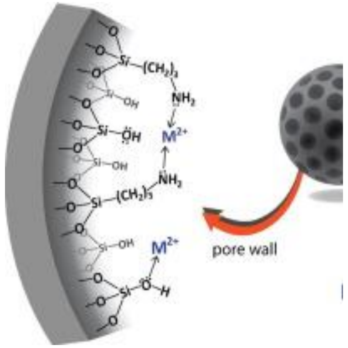
Low temperature sorbents

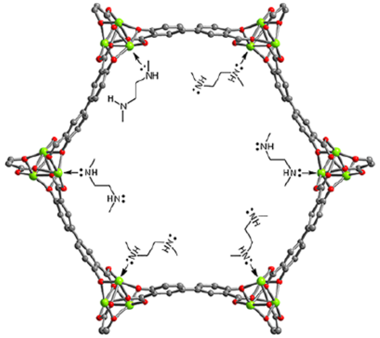
Active carbons

Zeolites



Amine-functionalized





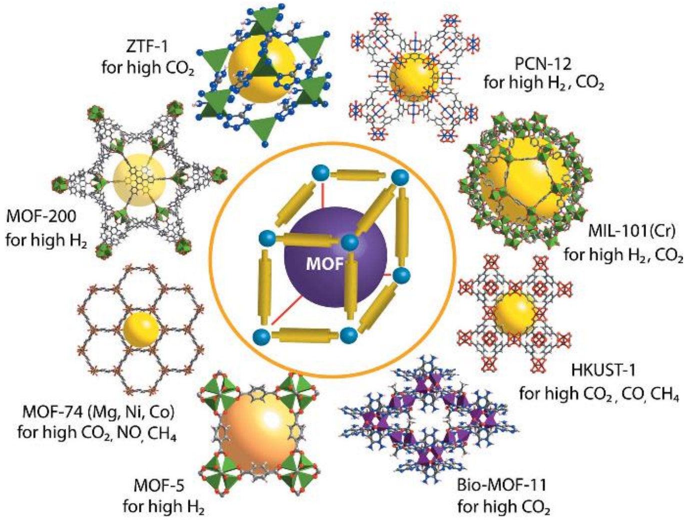
Metal-Organic Frameworks (MOF)

+ =

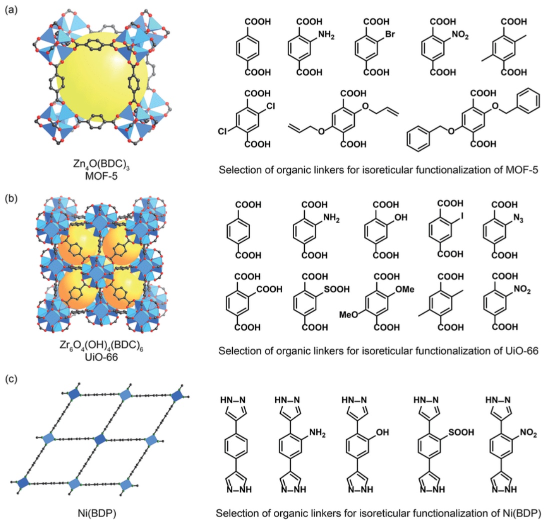
Metal cluster

Organic linker

3D porous framework



>6000 catalogued architectures



Infinite variation of chemistry

Can vary metal / linker / function

A growing number of MOF vendors

BASF We create chemistry

NuMat TECHNOLOGIES

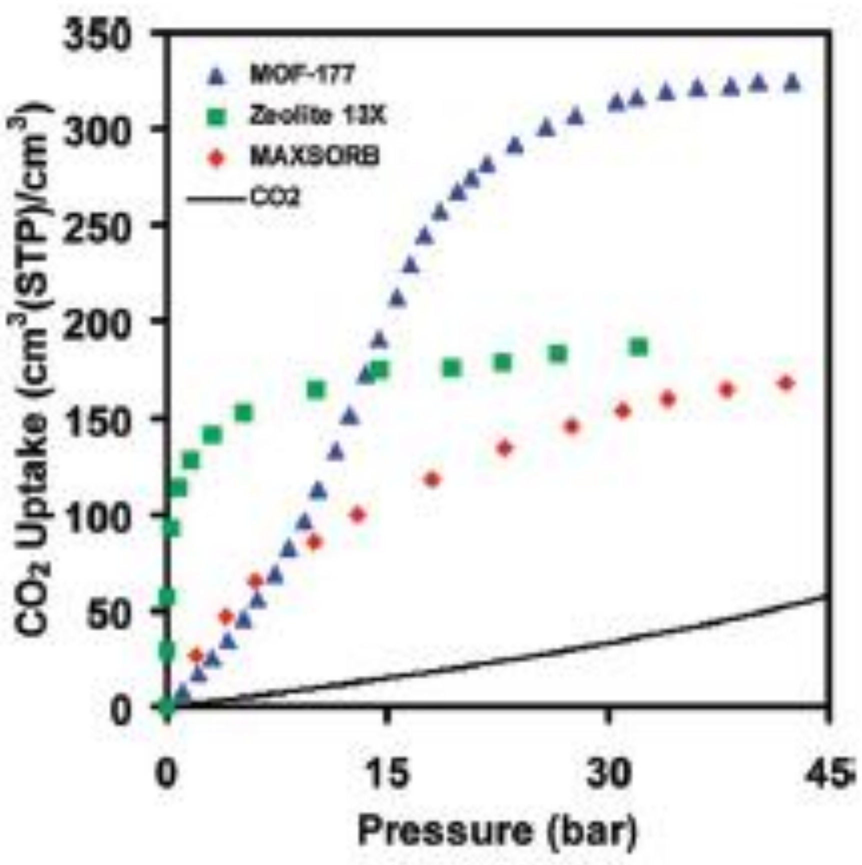
mosaic

Nuada

What determines the applicability of a certain adsorbent?

- The shape of the isotherm relative to boundary conditions of the adsorption process.
  - T, p & composition of inlet gas
  - T, p & composition demand of outlet gas(es)
  - For TSA processes you need a sorbent having large capacity difference between sorption and desorption temperatures
  - For a PVSA process you need a sorbent having large capacity different between the sorption and desorption pressures

- And certainly; selectivity is an issue
- And so is the physical stability of the sorbent
- Adsorption kinetics is also an important parameter
- Material scalability



Milward & Yaghi, *J. Am. Chem. Soc*, 2005

Technology for a better society

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From Plastic Waste to Carbon-based Solid Adsorbent

Prof. James Tour
Rice University

- Dr. Tour is a Professor of Chemistry, Professor of Computer Science, and Professor of Materials Science and Nano-Engineering with 30 years of experience, first at the University of South Carolina followed by his present position at Rice University, Texas, USA.

- Dr. Tour has over 650 research publications and over 200 patents, with total citations over 77,000.

- Dozens of successful technology commercialization (founder of Weebit and Dotz)

- Dr. Tour was listed in "The World's Most Influential Scientific Minds" by Thomson Reuters ScienceWatch.com in 2014. He won the NASA Space Act Award in 2008 for his development of carbon nanotube reinforced elastomers as well as over a dozen prestigious scientific awards over the past decade.

- Dr. Tour holds a Ph.D. in Synthetic Organic and Organometallic Chemistry from Purdue University, Indiana, USA and Postdoctoral training in Synthetic Organic Chemistry from the University of Wisconsin and Stanford University.

Plastic Waste Product Captures Carbon Dioxide in Nanometer Pores

Wala A. Algozeeb, Paul E. Savas, Zhe Yuan, Zhe Wang, Carter Kittrell, Jacklyn N. Hall, Weiyin Chen, Praveen Bollini, and James M. Tour*

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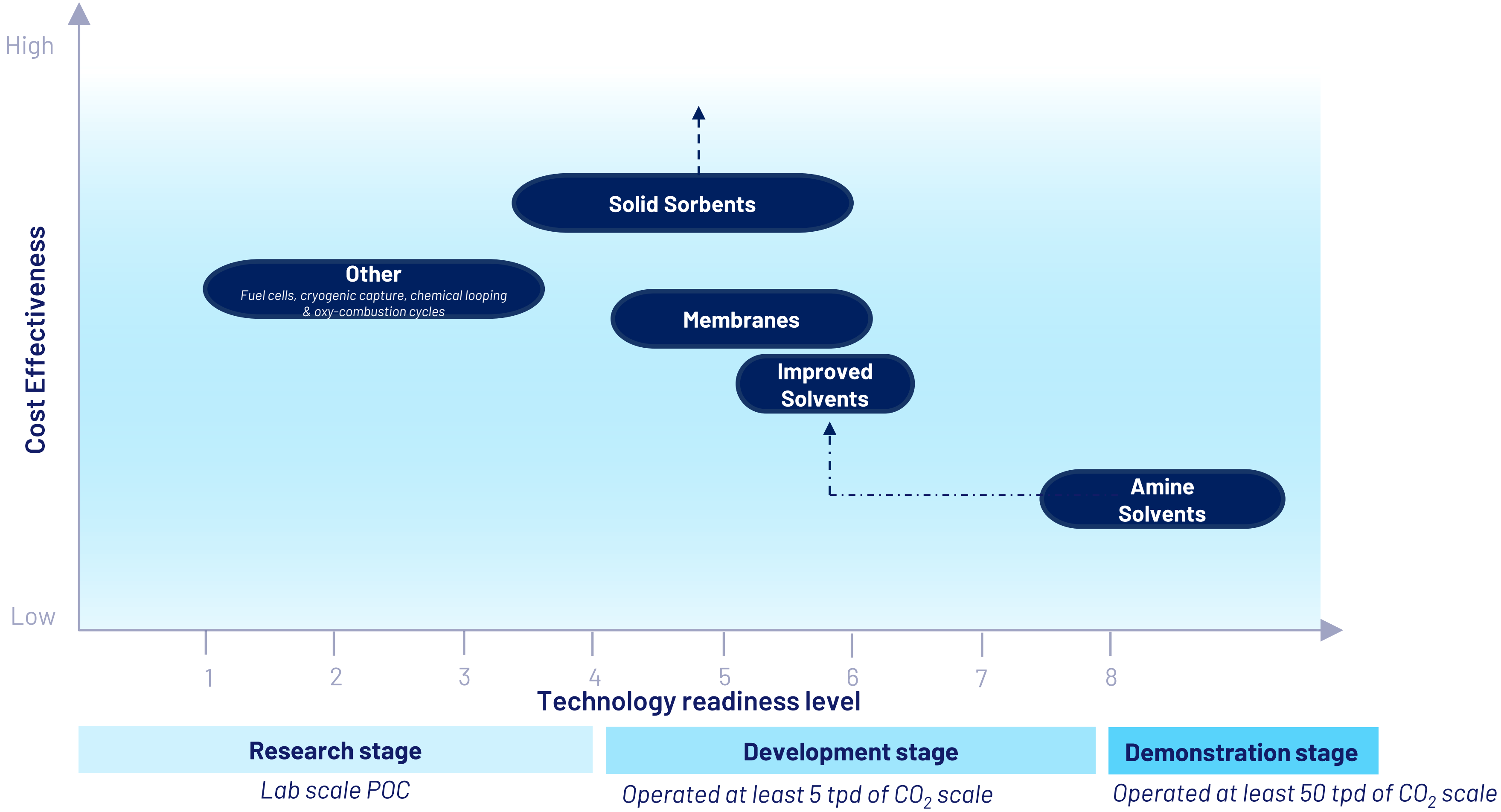
Development Plan

Michael Shtein, Ph.D.

Founder, CTO

- Entrepreneur with over 15 years of managerial and R&D experience, Dr. Shtein is an expert in commercializing academic concepts to products and is a co-founder of several Nanotech and Biomed companies.
- CTO & Co-Founder of Dotz Nano
- Before founding Dotz, he was the Chief Material Engineer for the Israeli Ministry of Defense and has developed several new materials and compounds.
- Dr. Shtein holds a Ph.D. in Nano technology interdisciplinary studies from Ben-Gurion University, together with an M.Sc in Chemical Engineering and an MBA.

Competitive Landscape.



Source : [Next generation carbon capture technology: technology review work package 2 (publishing.service.gov.uk)]

New Generation of Carbon Capture Sorbent.

Upcycling plastic waste to mitigate CO_2

Abundant and renewable process
Production process using waste plastics

Tailorable surface properties
High adsorption capacity facilitated by its unique structure & surface area

Enhanced CO_2 adsorption
High CO_2 selectivity & moisture sensitive

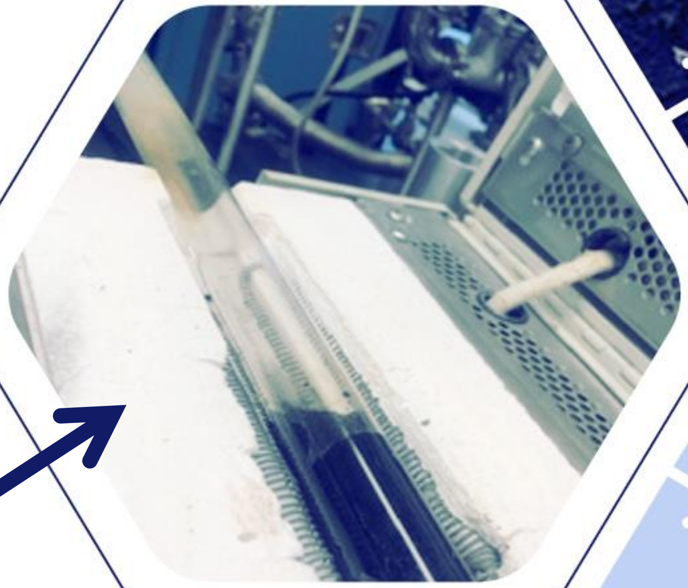
Regenerability and reusability
for cyclic capture processes

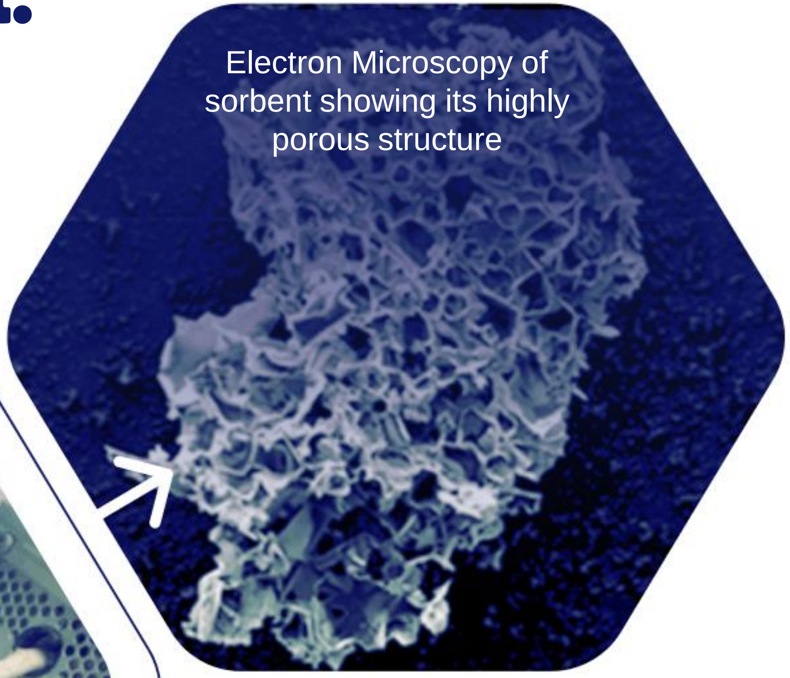
Versatility and compatibility
with diverse CO_2 sources and capture conditions

Doubles the impact

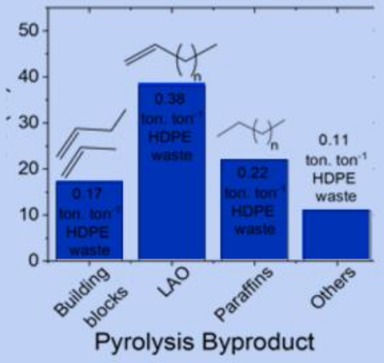
Plastics + salts

Thermal Treatment





Valuable byproducts



Source : https://doi.org/10.1021/acsnano.2c00955

Dotz Earth Development Roadmap.

2023	2024	2025	2026	2027

TRL 3

Sorbent optimization
Formulation and formation of the sorbent, scale-up and optimization

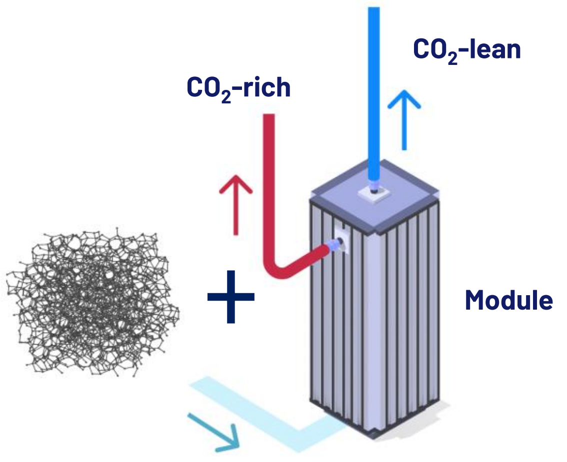
TRL 5

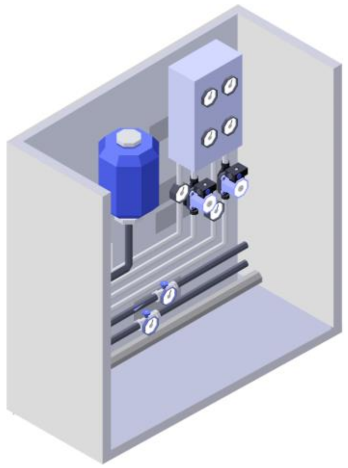
Bench-scale demo unit
Design and manufacture a BSU designed to capture 0.1-0.2 TPD
Objective: technology demonstration at lab scale

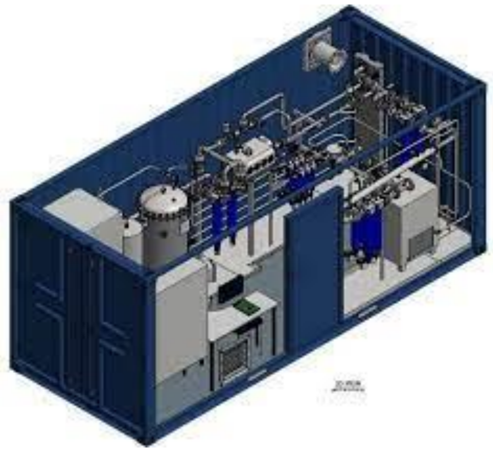
TRL 7

Lab-scale pilot unit
Design and manufacture a pilot unit designed to capture 1-2 TPD
Objective: validate a technology for a given flue gas/application

Industrial units
Design and manufacture an industrial unit designed to capture >10 TPD
Objective: unit for small/med scale emitters / first step CCS implementation

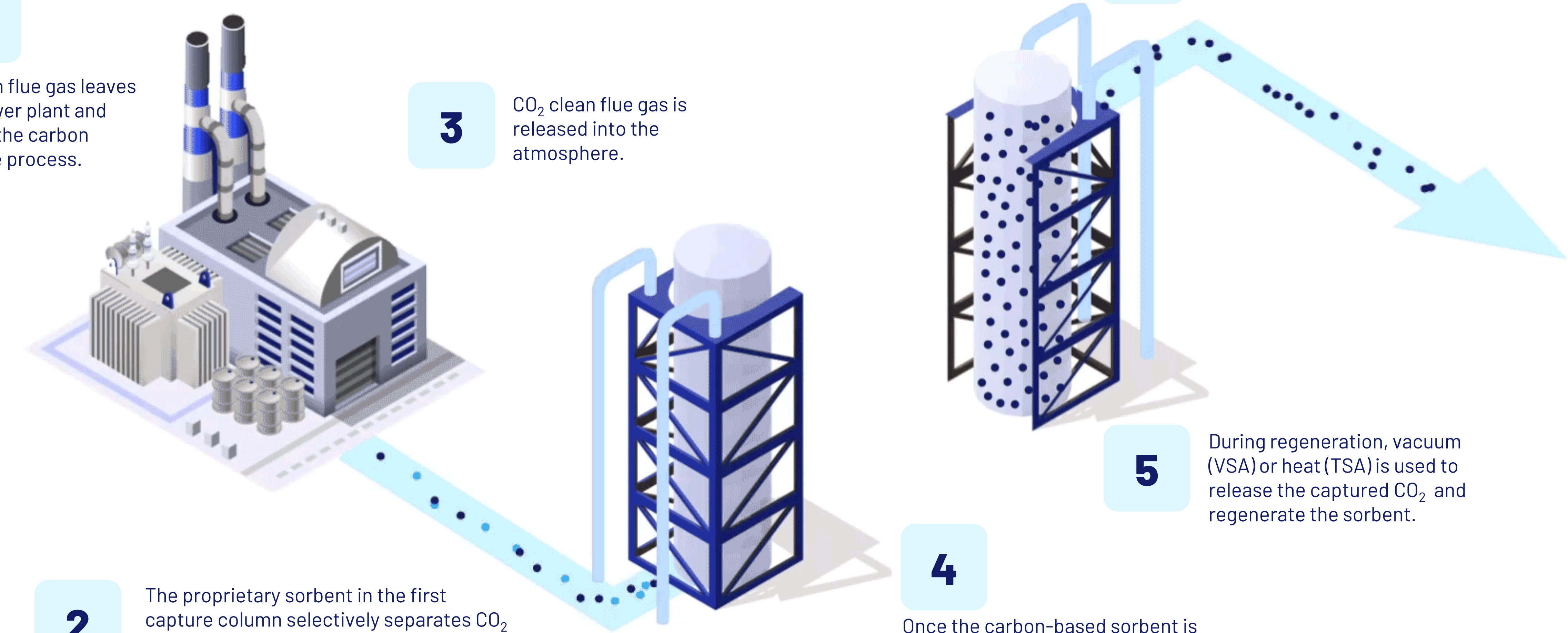






Illustrative Conceptual Design.

Simple, straightforward and modular process



1

CO_2 rich flue gas leaves the power plant and enters the carbon capture process.

2

The proprietary sorbent in the first capture column selectively separates CO_2 from the flue gas. The CO_2 is adsorbed into the pores of the carbon-based sorbent through physical bonds.

3

CO_2 clean flue gas is released into the atmosphere.

4

Once the carbon-based sorbent is saturated, it is regenerated. During regeneration, the CO_2 rich feed gas is diverted to another parallel column for continuous removal process .

5

During regeneration, vacuum (VSA) or heat (TSA) is used to release the captured CO_2 and regenerate the sorbent.

6

A pure stream of CO_2 is compressed & liquified, then transported via pipeline to be safely stored or used.

Development Collaborations.

Dotz.

Development

Validation

Application

RICE UNIVERSITY

SINTEF

A New Era of Sorbents Powered by Nanotechnology.

Harnessing the power of nanotechnology towards carbon-neutral future

- Energy efficient
- Low cost of ownership
- Environmentally friendly
- Selective adsorption
- Scalable
- Proprietary and patented
- Adaptable across multiple industries

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Q&A Session

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Closing Remarks

In Summary.

- CARBON CAPTURE IS THE ONLY VIABLE SOLUTION TO REDUCE CO_2 EMISSIONS
- A MULTIBILLION MARKET OPPORTUNITY, BACKED BY STRONG TAILWIND
- THE FUTURE OF COMMERCIAL CARBON CAPTURE TECHNOLOGIES IS BASED ON SOLID SORBENTS
- DOTZ EARTH IS AN IDEAL PLATFORM TO ENTER THE CLIMATE SPACE

Key Enablers of The Energy Transition.

Technologies and collaborations are the driving forces towards net zero

Technology innovators

Technology is one of the key enablers of energy transition, supporting industries, businesses and governments to find efficient solutions to mitigate emissions

Industries

Cross-sector partnerships to achieve common goal & Strategic alliances to address the value chain challenge

Governments

R&D fundings; progressive regulation and subsidies and expand carbon offset procurement

Investors

Public and private investment funds may be available for the development of carbon capture projects

Our technology.

- A proprietary carbon-based solid sorbent, represents the next evolution in carbon capture technologies
- Double the impact - Upcycling plastic waste to mitigate CO_2
- Point-source technology offering an efficient and sustainable approach to drive industrial deep decarbonization
- Clear value creation milestones

Experienced Leadership Team.

Experienced team with execution track record

EXECUTIVE TEAM

Sharon Malka

CEO

MediWound pwc Variance Economic Consulting

Michael Shtein, Ph.D.

Founder, CTO

משרד הביטחון MINISTRY OF DEFENCE

Liat Bar Ziv Alperovitz

CFO

ANAGOG teva ENDOSPAN

Shirley Shoshaney-Kleiner

CMO

IAI Israel Aerospace Industries AquaMaof Elbit Systems

Davidi Tulipman

CPO

Kornit Digital bonding matters stratasys Kodak

Zohar Birman

COO

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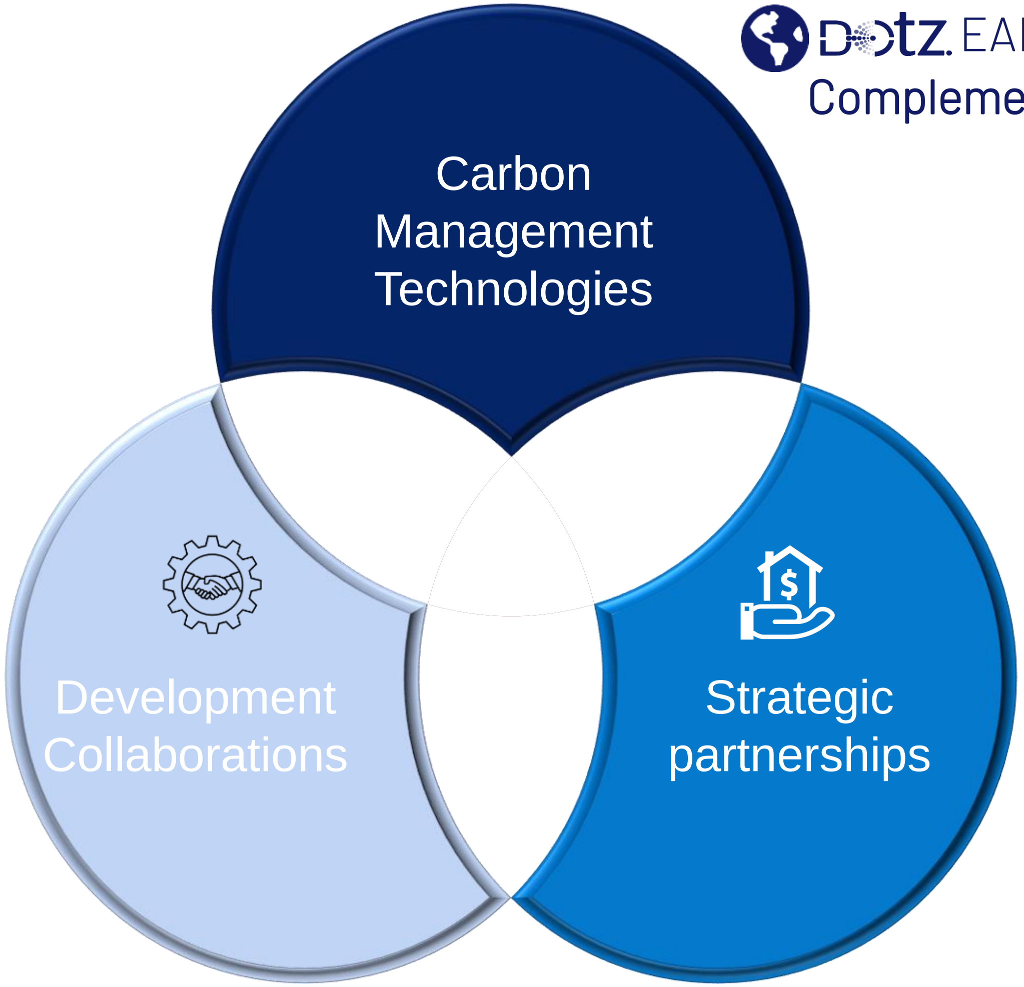
Collaborations Across The CO_2 Value Chain.

Technology and collaboration as the driving forces

Dotz.EARTH
Complementary technologies



RICE
SINTEF

Industrial emitters

Engineering companies

Dotz.

Join our Journey