Karbon CCS Ltd

Carbon Capture Technology

Draft Information Memorandum

Prepared for

टीएचडीसी इंडिया लिमिटेड
THDC INDIA LIMITED

12 July 2021

Confidential Draft – Not for Circulation - Subject to Change

Contents

Notice

Karbon CCS Ltd ("Karbon" or the “Company”) is issuing this memorandum to a limited number of parties who may be interested in providing equity capital to Karbon. The sole purpose of this memorandum is to assist the recipient in deciding whether to proceed with a further investigation of Karbon. It is not intended to form the basis of any investment decision. This memorandum does not constitute an offer or invitation to provide any equity capital to Karbon and its issue shall not be taken as any form of commitment on the part of Karbon to proceed with any transaction.

The information in this memorandum, including any statement of fact or opinion, does not purport to be comprehensive. Neither Karbon nor any of its respective officers, employees, advisers and agents accept any responsibility for nor make any representation or warranty, express or implied, as to the truth, accuracy or completeness of the information in this memorandum or any other information relating to Karbon whether written, oral or in a visual or an electronic form (including, without limitation, in a magnetic or digital form) transmitted or made available to a prospective investor. In particular, no representation or warranty (whether express or implied) is given as to the achievement or reasonableness of any future projections or any of the assumptions underlying them. The only representations and warranties that a recipient may be entitled to rely on are those that may be included in a definitive written agreement relating to a potential investment in Karbon. The recipient should conduct its own investigation of Karbon and the information contained in this memorandum.

Karbon does not undertake any obligation to (i) provide the recipient with access to any additional information; (ii) update this memorandum or any additional information; or (iii) correct any inaccuracies in this memorandum or any additional information. The Company reserves the right to terminate negotiations at any time before the signing of a definitive written agreement relating to a potential investment in Karbon.

This presentation and the information it contains is strictly confidential and is neither an offer to sell nor a solicitation of an offer to buy securities in any jurisdiction. The information contained herein may not be reproduced or used in whole or in part for any other purpose. This presentation and the information it contains is prepared solely for informational purposes. The document should not be used as definitive basis for any decision, contract, commitment or action with respect to any proposed transaction or otherwise. This presentation and the information it contains is based on certain assumptions and information obtained from a variety of sources. The assumptions and information may not be independently verified by those distributing this memorandum, which used the source assuming completeness and accuracy of the assumptions and information for the purpose of this document. Certain of the statements contained herein may be statements of future expectations and other forward-looking statements that are based on management's current views and assumptions and involve known and unknown risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied in such statements. In addition to statements which are forward-looking by reason of context, the words ‘may, will, should, expects, plans, intends, anticipates, believes, estimates, predicts, potential, or continue’ and similar expressions identify forward-looking statements.

Actual results, performance or events may differ materially from those in such statements due to, without limitation, (i) general economic conditions, (ii) capital market conditions, (iii) operating performance of the business, especially the ramp-up of customers (iv) interest rate levels, (v) changes in laws and regulations, (vi) changes in technologies, and (vii) personnel.

The matters discussed herein may also involve risks and uncertainties described from time to time in the Company’s annual reports and/or auditors’ financial statements. Neither intermediaries nor the Company assume any obligation to update any forward-looking information contained herein, and assumes no liability for the accuracy of any of the information presented herein as of a future date.

1. Introduction

1.1. Executive Summary

Carbon Capture Utilisation and Storage ("CCUS") is important for tackling climate change

Man-made CO_2 emissions are mostly from burning fossil fuels for electricity, industry and transport. Climate change can only be controlled if such emissions are eliminated.

CCUS eliminates CO_2 emissions from industrial plants, by extracting the CO_2 from the exhaust gases for storage underground or use in inert products. CCUS can be used for power plants, steel mills, fertiliser and cement plants, and large combustion engines such as ship engines.

Plants equipped with carbon capture can operate their remaining economic lives as they emit no CO_2.

The Total Addressable Market for CCUS is $3 trillion.

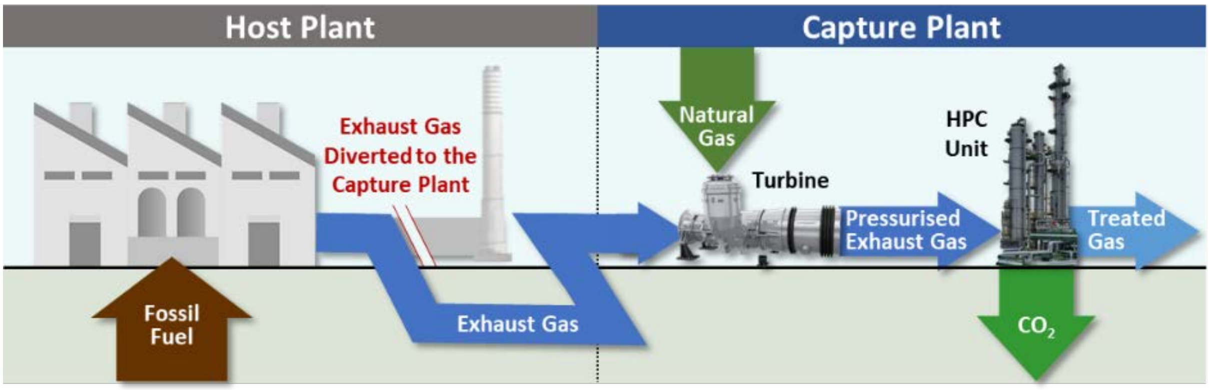
Karbon has developed a cost-effective industrial-scale CCUS process

Karbon captures CO_2 from exhaust gases after they leave the plant and before they enter the plant exhaust stack. Karbon removes at least 90% of CO_2, and SO_x, NO_x, particulate matter and methane slip.

Karbon's cost of capture is lower than for any other technology - as low as $20 per ton of CO_2 all-in.

Most Karbon plants will be located next to host plants which emit CO_2

A Karbon plant operates independently of its host plant without impairing operations, as it is connected only by an exhaust gas pipe. Installation of the Karbon plant does not interrupt operation of the host plant, except briefly when the exhaust gas pipe is diverted.



The Karbon process is an innovative combination of established technologies and processes

Karbon extracts CO_2 with the Hot Potassium Carbonate (HPC) process, which is inexpensive, non-toxic and widely used in the petrochemical industry. However, HPC is inefficient for the lower-concentrations of CO_2 in combustion exhaust gases, unless the exhaust gas is first pressurised (compressed), which is expensive using electrically-driven compressors.

Karbon instead compresses exhaust gas cost-effectively by injecting it into a gas turbine for re-combustion together with natural gas and air. The resulting high-pressure gas stream is ideal for extracting CO_2 with HPC.

The Karbon technology is protected both by patents pending and by exclusivity agreements

Karbon secured a positive International Preliminary Report on Patentability from the European Patent Office in July 2020. This allowed Karbon to apply for patents in 18 key jurisdictions, in which Karbon is protected pending patent issuance.

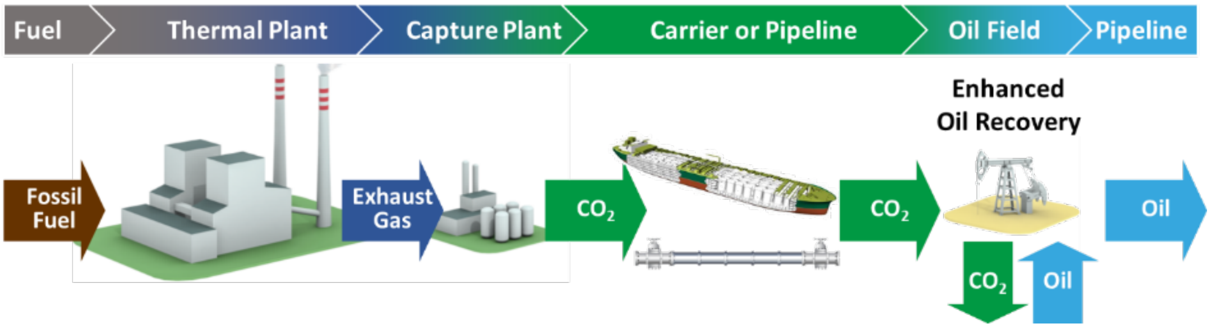
As a further barrier against entry by competitors, Karbon has secured exclusive access to the only large gas turbine in production suitable for its capture process. Siemens Energy, the manufacturer, has granted Karbon an exclusive right to purchase such turbines for CCUS purposes until 2026, extendable.

Karbon has adapted its process to ship engines and other combustion engines

About 100,000 ships worldwide must eliminate all CO_2 emissions. Converting to low-carbon fuels such as hydrogen or ammonia would cost $1-2 trillion. Karbon's compact onboard plants allow ships to keep their current engines, capture and store their CO_2 at low cost and offload it in port for economic use or sequestration. Karbon is developing its first CO_2 capture installation onboard an LNG-fuelled ferry.

Oilfields and subsidised sequestration programs have enormous demand for CO_2

CO_2 extracted with Karbon will have value, and will be sold to oil companies for Enhanced Oil Recovery, or injected underground for permanent sequestration. In due course, CO_2 will also be sold as feedstock for methanol, fertiliser, animal feed and construction materials.



Karbon's current technical and industry partners

A Partnership Agreement with Siemens Energy covers testing and optimisation of Siemens gas turbines for the Karbon process, and global exclusivity for Karbon to use such turbines for CO_2 capture.

An MOU with US oil major Occidental Petroleum covers the purchase by Occidental of up to 30 million tpa of CO_2 for 12-22 years from CCUS plants which Karbon would develop in Texas. Karbon is pursuing further offtake agreements in Europe, the Middle East and Asia. Turn-key contractors consider the technology EPC-ready.

Potential assembly and installation partners for Karbon on ships include Clean Marine, a leading supplier of exhaust scrubbers. Additional installation partners are under consideration.

Karbon commercialises its technology together with partners

Industry partners........................Sales of technology licences to install and operate Karbon plants at existing and newly constructed power and industrial plants.

Development partners................As a principal, develop Karbon plants at power or industrial plants.

Marine installation partners......Install the Karbon solution onboard existing or newly built ships.

1.2. The Karbon Technology

Karbon CCS Ltd ("Karbon")	Karbon owns proprietary technology ("Karbon Technology") which removes virtually all CO_2, SO_x, NO_x, mercury and particulate matter from combustion exhaust gas. It is fitted without disruption to plants which emit large volumes of CO_2. (*e.g.*, thermal power plants, steel mills, fertiliser, cement plants), and to large internal combustion engines (*e.g.*, ship engines).
Cost-effective and scalable CCUS	The Karbon Technology is the least expensive method of extracting CO_2 pure enough for industrial use.[1] It recombines proven processes (*e.g.*, the hot potassium carbonate process), with off-the-shelf equipment (*e.g.*, gas turbines from major manufacturers such as Siemens Energy), and operates independently of host plant without impairing operation.
"Off the shelf" with novel patent-protected features	All components of the Karbon process are well-established. Its four novel features relate to the compression of exhaust gas by recombustion in a gas turbine. The novel features represent low risk, due to their simplicity and extensive testing, verification and reviews.
Siemens Energy is Technology Partner	Karbon has entered into a partnership agreement with Siemens Energy with respect to its SGT class turbines for CO_2 capture. Siemens Energy is performing detailed engineering and combustor optimization, adapting the turbine to an onshore CO_2 capture plant designated by Karbon. Karbon will then have global exclusivity to purchase SGT class turbines for CO_2 capture.
Capture of ship emissions	Karbon Technology also captures CO_2 cost-effectively from ship engines and small power plants, together with NO_x and methane. Karbon enables shipowners to decarbonise while continuing to use fossil fuels, and avoid the enormous expense of converting to new fuels.
Validation of the Karbon Technology	The technology has been developed at a cost of over $50 million over 15 years. The inventors received their first CO_2 capture patent in 2005. All components are commonly used in industry. The novel features have undergone extensive testing, scheduled to complete in 2021 with turbine validation by Siemens Energy. A complete prototype is scheduled in 2021.

Demonstration plant	*2008-11*	A demonstration plant in Sweden and the USA validated that CO_2 can be captured with pressurised HPC. Karbon subsequently improved efficiency substantially by pressurising exhaust gas with a gas turbine.

[1] All-in capture cost below $20/tonne CO_2 for a representative coal-fired power plant in the USA, *vs* $40/tonne for chemical absorption with amine-based solvents, and $28/tonne for hot potassium carbonate extraction with electric pre-compression – please see Section 2.6.

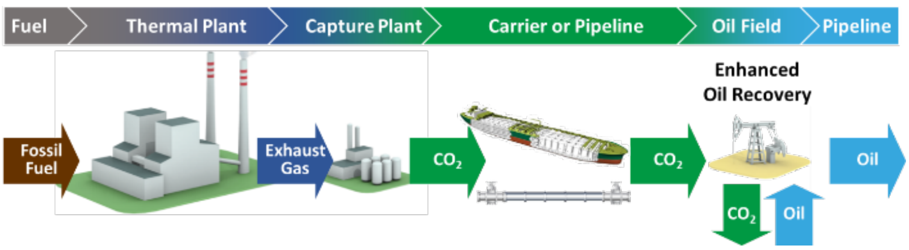
Cardiff University Gas Turbine Research Centre	*Sep 2020*	Computer modelling and physical burner tests by Cardiff University confirmed that exhaust gas combusted with methane and air can produce a mix of gas suitable for CO_2 capture.
Turbine OEM Siemens Energy	*Dec 2019*	Siemens made a commercial offer to supply turbines to Karbon's first US plant, subject to formal validation, scheduled as below.
	Scheduled 4Q 2021	Siemens is preparing to test Karbon Technology at its factory in Berlin, in a full-sized turbine combustor using coal exhaust gas, to satisfy its internal requirements and configure the turbine for Karbon.
Classification society DNV	*Feb 2021*	DNV confirmed the workability of the Karbon technology onboard a gas-fired ship, and positively evaluated the design and mass and energy balances.
Prototype	*Scheduled 3Q 2021*	Karbon intends to build a prototype ship capture plant of the design vetted by DNV.

A large global market for CO_2

In 2017, the global CO_2 market was about 230 Mt[2] valued at $4.6 billion[3], of which roughly 70-80 Mt was for Enhanced Oil Recovery ("EOR").

CO_2 for Enhanced Oil Recovery ("EOR")

EOR is the injection of CO_2 into oil fields to improve production.



Other uses of CO_2

As its price declines, CO_2 will be more widely used as feedstock for methanol, fertiliser, animal nutrients, plastics, foodstuffs, and building materials.

Business model

Licencing	Karbon licences its technology to country and industry partners to install and operate.
Ship engines	Karbon and its partners sell turnkey installations onboard customers' ships.

[2] Source: IHS Markit

[3] Assuming a conservative price of $20/t$CO_2$

	Development	Karbon may selectively develop plants as principal, to benefit from tax credits and strong EOR demand.
Worldwide opportunities	Coal-fired power plants emit 9,800 $MtCO_2pa$ available for capture globally, notably in India, China, and South Africa. Gas-fired power plants emit 3,100 $MtCO_2pa$ available for capture, notably around the Persian Gulf, where over 100 $MtCO_2pa$ is available for capture for EOR within 200 km of many of the world's largest oilfields.	
Opportunity in the USA	Karbon has executed a Memorandum of Understanding with Occidental Petroleum ("Oxy"), the world's largest user of EOR, regarding the purchase by Oxy of up to 30 $MtCO_2pa$ of CO_2 under a 12-year extendable contract, from power plants with aggregate capacity of 3,500 MW. The CO_2 would be transported to oilfields through a new pipeline to be built. US "Section 45Q" tax credits are available for the capture of CO_2 for either EOR or underground sequestration at \$35/tCO_2 and \$50/tCO_2 respectively, for the first 12 years of any project.[4]	
Transport of CO_2 by ship	CO_2 will likely become a globally traded commodity, transported by ship. The Karbon team is designing a dual-use carrier to deliver LNG and carry CO_2 on the return voyage (*e.g.*, LNG to Korea and return with CO_2 for EOR in the Persian Gulf), capturing all pollutants from its own exhaust on the voyage. "Approval in Principle" by classification society DNV is expected in 2021.	
Corporate structure of Karbon	Karbon is establishing subsidiaries to develop and commercialise each of its technologies as principal and/or as licensor to others.	
Significant ESG benefits	Carbon capture with Karbon Technology is the fastest, largest-scale and most cost-effective way to decarbonise industry, allowing existing infrastructure to serve out its remaining operating life, without threatening jobs.	

[4] Legislation proposed in May 2021 would increase capture subsidies to \$60 and \$85 per tonne, to be paid directly as tax refunds rather than as tax credits.

1.3. Relevant to ESG Compliance and Investment

Carbon Capture, Utilisation and Storage	CCUS is essential to mitigating climate change, and only technology capable of decarbonizing major industry[5]. In the IEA Sustainable Development Scenario, CCUS will account for 15% of emissions reductions[6].
Karbon offers the most effective CO_2 capture	CO_2 capture with Karbon Technology is the fastest, largest-scale and most cost-effective way to decarbonise heavy industry.
Important for sectors that are hard to decarbonise	Karbon is a solution for industrial sectors such as shipping, aluminium, chemicals, cement and concrete, and iron and steel, from which CO_2 emissions are expensive or impossible to remove.
Karbon protects assets and employment	Allows existing industrial assets to operate for their remaining economic lives without contributing to climate change. Protects employment by allowing hard-to-abate industrial plants to decarbonise rather than close.
Example: Substantially decarbonise US coal-fired power by 2030	For 1% of the cost of the Green New Deal, privately-financed Karbon Technology could decarbonise the 100 largest US coal-fired plants[7], eliminating 75% of US coal-fired power emissions = 12% of US CO_2 emissions = 25% of President Biden's 2030 CO_2 reduction goals.
The energy sector is looking to CCUS to reduce GHGs	Energy majors are becoming significant players in CCUS, developing CCUS projects and investing in CCUS technology companies such as Karbon.
	In May 2021 a Netherlands court ordered Shell to cut its 2030 global carbon emissions by 45%; the first legal obligation imposed on a corporation to comply with the Paris Accord.
	Exxon — In May 2021 an activist hedge fund gained three seats on the board of Exxon Mobil in order to force changes in strategy to combat climate change.
	bp — In Feb 2020, BP announced a reorganisation to slash its carbon intensity, reach net zero by 2050, invest away from oil and gas, and help the world reach net zero.
	TotalEnergies — In June 2021, Total rebranded as *TotalEnergies* "to contribute to the sustainable development of the planet, facing the climate challenge" becoming a "major player in the energy transition".

[5] International Panel on Climate Change ("IPCC").

[6] https://www.iea.org/reports/ccus-in-clean-energy-transitions/ccus-in-the-transition-to-net-zero-emissions.

[7] Congresswoman Alexandria Ocasio-Cortez estimates the Green New Deal would cost at least $10 trillion, as compared to under $100 billion for 100 Karbon plants.

2. The Karbon Technology

2.1. Overview of the Technology

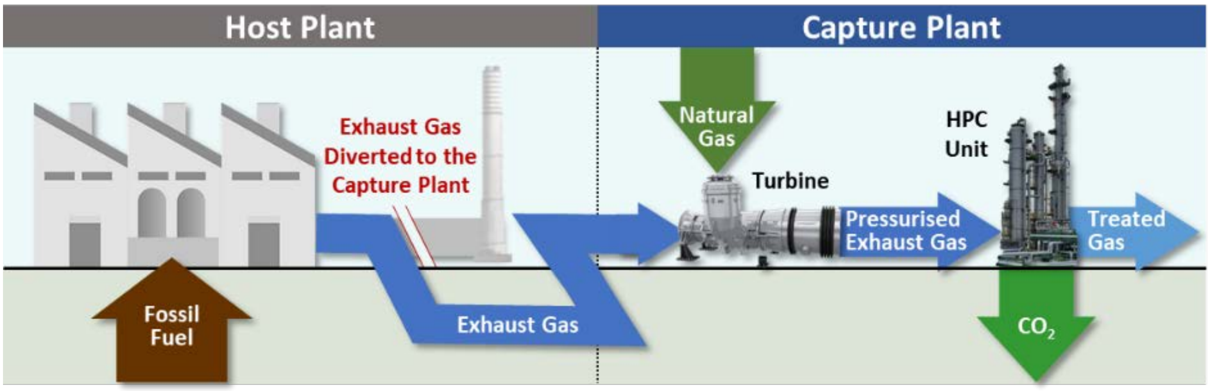
A recombination of proven technology

The Karbon Technology is an innovative application of the proven Hot Potassium Carbonate ("HPC") process widely used in the chemical industry, integrated with proven components from established manufacturers. A gas turbine pressurises exhaust gas from the host plant by combustion with gas and air, and removes over 90% of CO_2. The process has been developed and refined over 15 years at a cost of $50 million. EPC contractors have confirmed that it is EPC-ready.

It is well-suited to thermal power generation, metal smelting and other energy-intensive process industries, as an integral part of newly-built plants, or retrofitted to existing plants. The CO_2 produced is suitable for EOR.

Also eliminates other emissions

In addition to capturing CO_2, Karbon Technology eliminates substantially all SO_x, NO_x, CO, mercury, methane and particulate matter from flue gas. Karbon Technology can therefore either supplement existing scrubbers, or eliminate the need to fit separate scrubbers to newbuild host industrial plants which use Karbon Technology.



Capture Plants are compact

Host Plant		*Capture Plant*	
Fuel	*Capacity*	*Footprint*	*CO_2 Captured*
Coal	1,000 MW	13,000 sqm	7.0 $MtCO_2pa$
Gas CCGT	1,000 MW	11,000 sqm	3.5 $MtCO_2pa$

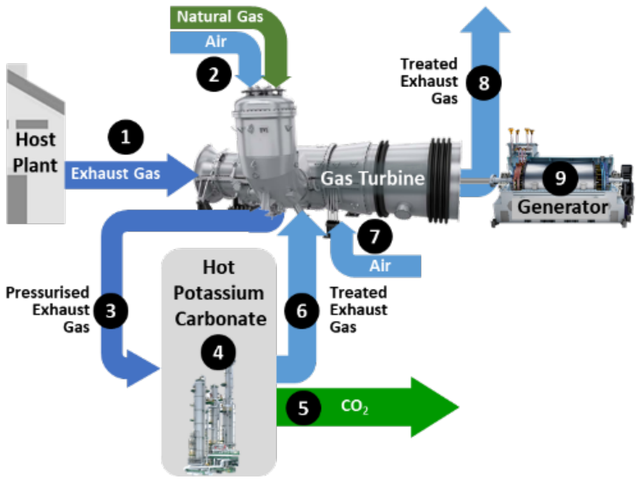
2.2. Core Components of the Technology

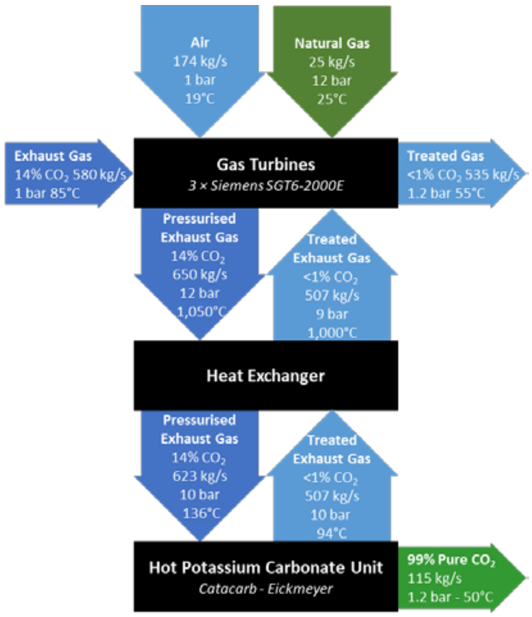
Hot Potassium Carbonate ("HPC")		CO_2 is extracted with the pressurised Hot Potassium Carbonate process which has been used to extract CO_2 from mixed gases[8] in the petrochemical industry for over 50 years, and is currently used in over 1,100 industrial plants worldwide. HPC uses non-toxic, inorganic, benign, and inexpensive absorbents and produces no waste. The HPC units are designed by established specialist HPC contractors, in collaboration with Karbon and the EPC contractor. The HPC contractor provides detail designs and cost estimates, grants performance guarantees, and supplies HPC absorbent, catalysts and inhibitors.
Providers of HPC units	*Eickmeyer & Associates, Inc*	Provides the "CataCarb" HPC system, with 50+ years of experience designing 200+ plants in 30+ countries. Well known to Karbon as designers of the HPC units for the proposed US capture plant. www.catacarb.com
	Honeywell UOP	A subsidiary of Honeywell of the USA, which licences the "Benfield Process". Over 700 Benfield units have been put into commercial service for ammonia and hydrogen production, in natural gas plants and direct iron ore reduction plants. https://uop.honeywell.com
	Giammarco-Vetrocoke	A privately-owned Italian company, with its own patented HPC processes, implemented in over 340 units worldwide. www.giammarco-vetrocoke.com
Gas Turbine		Exhaust gas from the host plant is first pressurised in order to reduce the cost of energy[9], capital and equipment. Karbon compresses the exhaust gas by combusting it inside a gas turbine together with natural gas and air. The resulting exhaust gas is rich in CO_2, low in O_2, and at a pressure of 12 bar (174 psi), ideal for efficient CO_2 capture with HPC. The Karbon Process pressurises exhaust gas in Siemens Energy SGT5-2000E (50 Hz) and SGT6-2000E (60 Hz) turbines, of which over 670 have been sold or licenced worldwide. The predecessor model, the V94.2, is also widely installed. Their external "silo" combustion chambers allow flexible mixing of fuel and complete re-combustion of the exhaust gas.

[8] E.g., from town gas, ammonia, hydrogen, natural gas, and ethylene oxide.
[9] Pressurisation decreases energy required by an order of magnitude.

Primary Components of the Karbon Process

❶	Host Plant delivers exhaust gas into the compressor of the gas turbine	*Over 640 such Siemens turbines have been deployed worldwide.*
❷	Inject natural gas and air into the combustion chamber with the exhaust gas and combust	*Combustibility modelling and testing by Siemens Energy and the University of Cardiff.*
❸	Cool the pressurised exhaust gas	*Standard heat exchangers for cooling.*
❹	Remove 90%+ of CO_2 and SO_x using pressurised HPC	*HPC is used in 1,100+ plants worldwide.*
❺	Dehydrate and evacuate CO_2	*Conventional CO_2 pipeline at 1.2 bar pressure.*
❻	Reheat treated gas and inject into the turbine expander to rotate the turbine	*Using heat transferred from hot gas through a standard heat exchanger in Step 3*
❼	Add pressurised air	*Replaces the volume of the extracted CO_2*
❽	Release treated exhaust gas to atmosphere	*Through a new short stack.*
❾	Generator generates electricity	*For use by the capture process and for export*





Example mass and energy balances as fitted to a 965 MW coal-fired power plant

Karbon removes other contaminants

In addition to capturing CO_2, Karbon Technology eliminates substantially all SO_x, NO_x, CO, mercury, methane and particulate matter from exhaust gas:

CO_2.......... HPC removes carbon dioxide in an absorber unit by means of an aqueous solution of potassium carbonate (K_2CO_3) absorbent as follows:

$CO_2 + K_2CO_3$..............-> $KHCO_3$

This reaction is reversed in a stripper unit to remove gaseous CO_2.

SO_x.......... HPC removes sulphur oxides (SO_2/SO_3) in the same absorber unit as above, as follows:

$SO_2 + -O_2 + K_2CO_3$.....-> $K_2SO_4 + CO_2$

$SO_3 + K_2CO_3$..............-> $K_2SO_4 + CO_2$

The stream is cooled to precipitate solid K_2SO_4, which is filtered.

PM.......... Particulate matter in the exhaust gas is combusted in the “silo” combustion chamber of the gas turbine. Particulate matter combusts at 1,050°C vs in the combustion chamber.

CO.......... Carbon monoxide is combusted in the gas turbine. Complete combustion is ensured as the large “silo” combustion chamber allows a long combustion reaction time, and the Turbine Inlet Temperature (TIT) is relatively low, under 1,050°C.

NO_x.......... The Capture Plant would capture NO_x with a Selective Catalytic Removal (SCR) unit operating at high pressure (11.5 Bar) and optimum temperature 375°C.

Hg.......... Mercury in the exhaust gas is extracted with an activated coal spray tower upstream of the flue gas condenser. Condensed water is pumped through filters to the re-humidified downstream of the Absorption Column.

2.3. Gas Turbines for the Karbon Process

Gas turbines are the core of the process

The Karbon process is based on the compression of exhaust flue gas in a gas turbine with an external "silo" type combustion chamber. Suitable gas turbines include the following.

Examples of suitable gas turbines

Karbon has entered into a partnership agreement with Siemens Energy with respect to certain SGT5 and SGT6 turbines for onshore CO_2 capture.

Siemens Energy is performing detail engineering and combustor optimization, adapting the turbine to an onshore CO_2 capture plant designated by Karbon. Karbon will have global exclusivity to purchase SGT class turbines adapted for CO_2 capture.

Siemens Energy SGT6-2000E

The GE ALSTOM GT11N gas turbine is suitable for Karbon Technology at onshore industrial plants.

ALSTOM GT11N

Certain Kawasaki gas turbines are suitable for capturing emissions from ship engines.

Kawasaki M1 A series

2.4. Low Technology Risk

Off-the shelf technology with four main novel features	All components of the Karbon process are well-established. The four main novel features relate to the compression of exhaust gas by re-combustion in a gas turbine. The novel features represent low risk, due to their simplicity and extensive testing, verification and reviews.
Novel Feature 1: *Feed exhaust gas into a gas turbine*	Siemens has confirmed that its turbine compressor is not sensitive to the chemical mix of incoming exhaust gas, and that its turbines are suitable for compressing exhaust gas which has been cleaned by cyclone and other filters at the Host Plant.
Novel Feature 2: *Recombust exhaust gas together with natural gas and air*	A mixture of exhaust gas, natural gas and air is combusted in the turbine to compress the exhaust gas, and drive the turbine. The mixture burns completely because of the large size of the external “silo” combustion chamber, and the slow residual combustion time. Section 2.5 describes the successful modelling and testing of the re-combustion of exhaust gas by Cardiff University and Siemens Energy.
Novel Feature 3: *Redirect exhaust gas out of the turbine through a new turbine exit*	In most gas turbines, the exhaust gas passes through the turbine expander immediately after combustion and exits the turbine. For the Karbon process, however, Siemens Energy will modify their turbine to redirect the pressurised exhaust gas to a new exit point out of the turbine. This allows the pressurised exhaust gas to be treated with HPC before being returned to the turbine. Siemens Energy has confirmed that this is viable and will perform the modifications as part of detail engineering under their Partnership Agreement with Karbon.
Novel Feature 4: *Replace the extracted CO_2 with sufficient pressurised air to drive the turbine*	The pressurised exhaust gas which leaves the turbine contains about 5-15% CO_2. The HPC unit extracts such CO_2 before returning the treated flue gas to the turbine. A supplementary compressor injects pressurised air to replace the resulting deficit mass flow. Karbon has performed mass and balance simulations, verified by Siemens Energy, to confirm that this design generates sufficient gas flow to operate the turbine.

2.5. Testing and Verification

Siemens Energy

Siemens has worked closely with Karbon as follows, to verify that its turbines would be suitable for the Karbon CO_2 capture process.

December 2019 Siemens modelled the use of its turbines at the proposed Karbon capture plant at the Sandy Creek Energy Station in the USA, assuming the exhaust gas mix from the specific plant. On the basis of its analysis, Siemens made a commercial offer to supply its turbines to the Sandy Creek project subject to confirmatory testing as described below.

March 2021 Siemens entered into a substantial Partnership Agreement with Karbon with respect to the use of its turbines for carbon capture. Amongst other terms, Siemens committed to performing tests and studies of its SGT5-2000E/SGT6-2000E turbines as adapted to the Karbon Process.

4Q 2021 In Phase 1, Siemens will test Karbon Technology at its factory in Berlin, in a full-sized turbine combustor using coal exhaust gas, to satisfy its internal requirements and configure the turbine for Karbon process.

Phase 2 Siemens will perform a full FEED study, adapting the SGT6-2000E turbine to the Karbon process, using the mix of exhaust gas, natural gas and air as at the Sandy Creek project.

Demonstration plant

The principals of Karbon twice successfully operated a demonstration carbon capture plant using pressurised HPC, at the Värtan power plant in Stockholm, Sweden, audited by the Norwegian government energy institute IFE, and at a 1 MW Consol Energy test facility in Canonsburg, PA, USA, successfully extracting CO_2 from the combustion of ten grades of US coal.

Cardiff University - Proof of Concept Testing

In June 2020, Karbon commissioned proof of concept testing of its turbine design at the Gas Turbine Research Centre ("GTRC") at the Cardiff University School of Engineering in Wales, United Kingdom. Computer modelling and laboratory experiments successfully confirmed that in simulated turbine conditions, the burner could combust the desired mix of exhaust gas, methane and air, to produce suitable exit temperature, thermal power and flame velocity, and a mix of gas suitable for extraction of CO_2 in the next step.

Principal researcher.... Dr Jon Runyon PhD
GTRC Research Associate

Oversight...................... Mr Steve Morris CEng MIMechE Tech IOSH
GTRC Manager Co-Investigator

GTRC chemical kinetic modelling

GTRC performed chemical kinetic modelling with Ansys Chemkin-Pro software, using the GRI-Mech 3.0 chemical reaction mechanism. GTRC modelled non-premixed (diffusion) methane combustion in a exhaust gas represented by a dilute (high-CO_2), vitiated (low-O_2) environment at combustor inlet temperature and pressure conditions (300°C up to 8 bar or

116 psi) relevant to the operation of the Siemens SGT6-2000E turbine selected by Karbon. The tests successfully identified flammability limits, flame speeds, flame temperatures, and diffusion flame behaviour.

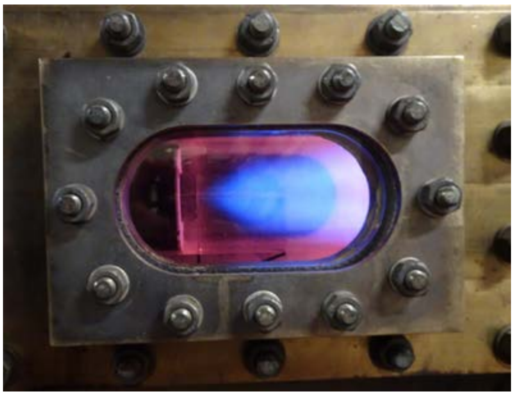
GTRC conclusions re: modelling

31 July 2020

"Stable combustion is feasible under the range of Karbon CCS process conditions, particularly at high-temperature, high-pressure conditions and with careful consideration of the combustor flow field."

Experimental combustion study

GTRC subsequently successfully performed an experimental study in a high-pressure generic swirl burner simulating the Siemens SGT6-2000E turbine. Exhaust gas, methane and air were combusted as specified for the prospective Karbon plant in the USA, to determine the effects of temperature, pressure and combustor velocity on ignitability, flame stability and emissions.



In summary, the burner produced suitable exit temperature, thermal power and flame velocity. The study optimised the fuel/oxidizer ratio and reduced fuel flow, allowing Karbon to estimate fuel costs and maximise operational flexibility. The results will be used in design and operation of the turbine combustor, and in the optimisation of the size of the blend air compressor.

GTRC final report

30 September 2020

"In conclusion, this report informs ongoing discussions between Karbon CCS, Siemens, and Cardiff University on the appropriate combustor selection and burner architecture for the use of dilute, vitiated, non-premixed natural gas combustion in the SGT6-2000E. By demonstrating stable combustion under these conditions with minimal design change to an existing lean-premixed burner, further work is warranted to optimize the use of this mixture in line with Karbon CCS's carbon capture process design."

Results: Flame Stability Limit Conditions at φ = 1 for varying burner operating conditions

Stability Limit Conditions at ϕ = 1.0								**Burner Exit Temp. T3**	Equivalent Dry Flue Gas			**% Max Blend Air Required**
	Thermal Power	Inlet Press. P2	Inlet Temp. T2	Inlet Velocity ū	Re_{ox}	Re_f	Min. Global O_2		N_2	O_2	CO_2	
kW/bar	*kW*	*Bara*	*°C*	*m/s*			*mol%*	*°C*	*mol%*	*mol%*	*mol%*	*%*
22.7	25	1.1	300	17.0	15737	2227	0.120	0946	0.781	0.128	0.091	186%
	50	2.2	300	16.5	30521	4499	0.123	1066	0.781	0.131	0.088	208%
	75	3.3	300	16.5	45843	6760	0.124	1125	0.783	0.132	0.086	215%
	91	4.0	300	16.5	54843	8112	0.124	1130	0.782	0.132	0.086	218%
	91	4.0	340	17.8	53958	7737	0.121	1156	0.781	0.129	0.090	193%
11.35	37.5	3.3	300	8.5	23806	3397	0.120	1033	0.782	0.128	0.090	184%
	50	4.4	300	8.5	31611	4471	0.120	1075	0.781	0.127	0.092	180%

2.6. Patent Protection

Patent status

In March 2018, Karbon filed a comprehensive patent application with respect to the Karbon Technology with the European Patent Office (“EPO”). In July 2020, after the scheduled 28-month investigation, the EPO issued a positive International Preliminary Report on Patentability. Karbon has initiated patent applications in 18 jurisdictions.

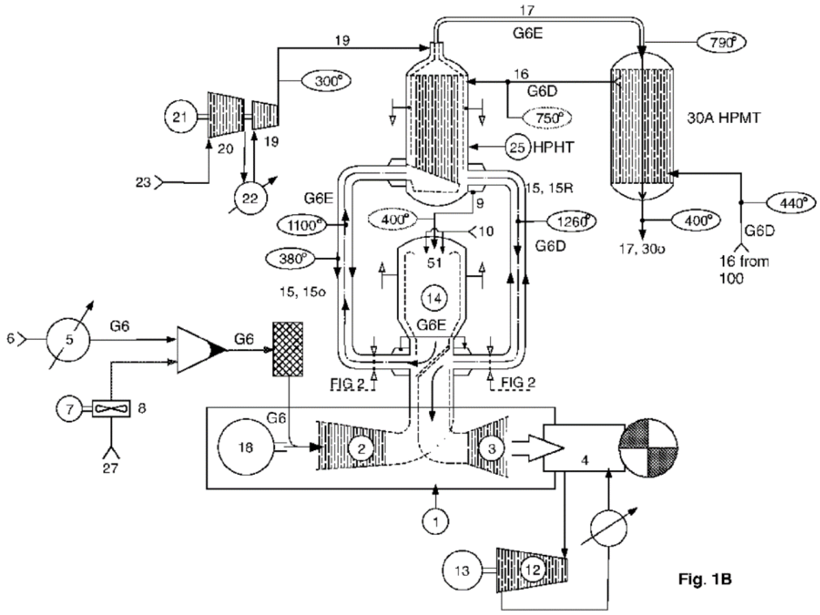
Filing as published

https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2019172772

Scope of patents

A gas turbine with external combustion chambers is modified to receive flue gas rich in CO_2 and mixed with fuel and compressed air, to afterburn such flue gas, and redirect the resulting gas to remove CO_2 in a mass balance with the injected fuel and air, and export the CO_2.

Figure 1B from the Karbon application



Counsel opinion

Patent counsel Acapo expects the patent to give strong protection against circumvention. Any attempt would be prevented temporarily by published patent claims in each nation, and eventually by patents granted. Third parties will always be aware of any divisional, pending patent applications, which may be directed against "near miss" circumventions of the patent. Karbon constantly creates further IP to firewall its core IP.

First phase:

International Claim: Patent Cooperation Treaty

The July 2020 International Preliminary Report of Patentability from the EPO confirmed that all claims have the required “Novelty” and “Industrial Applicability”; and that its main claim and 6 additional claims also have an “inventive step” the equivalent of “non-obvious” in the US system.

Next phase

National patents

Based on its Report of Patentability, Karbon has applied for national patents in 18 key countries, and will apply in further countries in due course. Pending receipt of national patents in 2-3 years depending on jurisdiction, Karbon is

	protected by patents pending retroactively to its EPO filing in March 2018. As patents are granted for 20 years, Karbon IP will be protected to 2042-2043.		
Target countries for national patents	*Applications Initiated*	USA, China, Australia, India, South Korea European Patent Application[10] to be validated *inter alia* in Germany, Poland, Sweden, Finland, Denmark and the United Kingdom[11]	
	Subsequent Applications	Taiwan, Japan, Russia, South Africa, Gulf Cooperation Council states	
Probability of patent success	Counsel Acapo has advised that the patent applications have high probabilities of success in their respective jurisdictions, as follows:		
	USA	90%	A key jurisdiction. Examiners are strict but fair.
	Canada	90%	Depends on the outcome of the US application.
	European Union	75%	EPO examiners can be overly strict and dogmatic.
	United Kingdom	90%	Examiners are precise but pragmatic.
	Australia	90%	Examiners are precise but pragmatic.
	Japan	50%	More difficult and time-consuming.
	South Korea	65-70%	Examiners are pragmatic.
Freedom to operate	The Karbon Technology is different from all other patented carbon capture technology, as confirmed by patent counsel Acapo AS in an Analysis of Freedom to Operate. Acapo concluded that the Karbon Technology is sufficiently different from the main claims of the prior art – the previous patents deemed most relevant by the European Patent Office.		
Karbon Marine technology *Further patent*	Karbon Marine technology for ships (described in Section 5) and smaller power plants is further protected by an additional patent pending with a priority date of January 2021, including in the USA, the UK, South Korea, Norway and Germany.		

[10] The members of the European Patent Organisation are: Albania, Austria, Belgium, Bulgaria, Switzerland, Cyprus, Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, Greece, Croatia, Hungary, Ireland, Iceland, Italy, Liechtenstein, Lithuania, Luxembourg, Latvia, Monaco, North Macedonia, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovenia, Slovakia, San Marino, Turkey, United Kingdom.

[11] Within three months of receiving a European Patent, Karbon needs to validate it in those member states wherein it wishes to keep it active.

2.7. Competitive Position of Karbon

Point source CO_2 capture

Karbon provides "point source" capture; i.e., extracts CO_2 from gases from a specific source, such as a power plant or oil refinery.

The addressable market for Point Source capture is estimated as 17 Gt CO_2[12], with a value of $340 billion.[13]

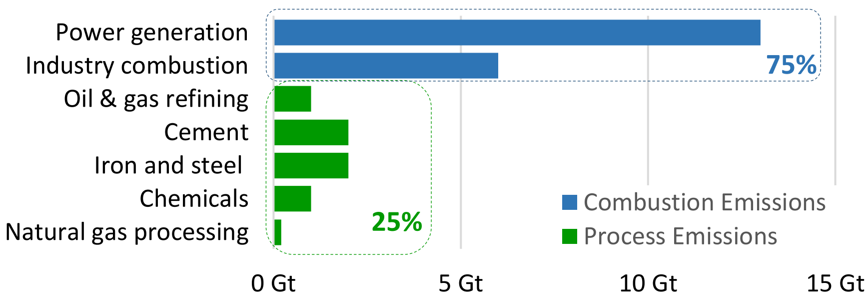
Karbon is not active in "direct air capture" ("DAC") the extraction of CO_2 from the atmosphere. DAC is an early stage technology which is complementary to point source capture, rather than a competitor.

Exhaust gases available for CO_2 capture

About 75% of point source CO_2 is from combustion exhaust gases, including from power stations, industrial combustion, and ship engines.

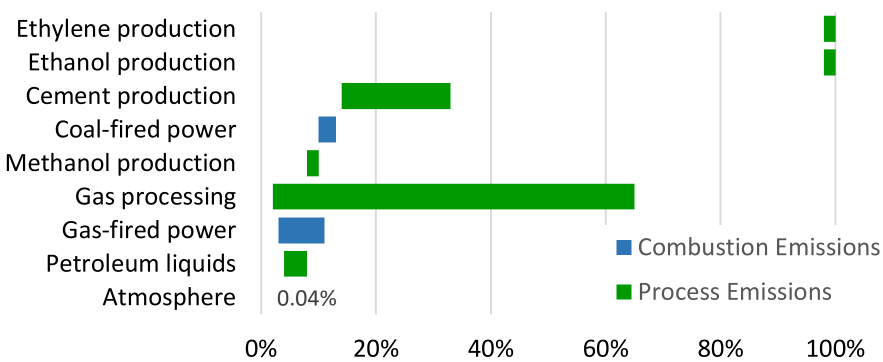
About 25% is from non-combustion industrial processes, including cement manufacture, direct reduced iron, hydrogen manufacture, and processing of natural gas.

CO_2 available for Capture by Process Type[14]



The concentration of CO_2 in exhaust gas varies widely. The cost of capture is lower if the concentration of CO_2 in the exhaust gas is higher.

Concentration of CO_2 in Exhaust Gas[15]



[12] Source: Karbon calculation based on World Resources Institute data.

[13] 17 Gt CO_2 at a conservative price, based on US EOR markets, of \$20/tCO_2.

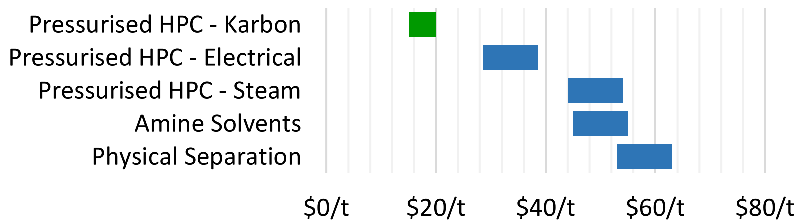
[14] Source: International Panel on Climate Change

[15] Source: Global CCS Institute, Citi

Cost of CO_2 capture

Karbon Technology is the least expensive method of capturing CO_2 from industrial exhaust gases, with a levelized cost under $20/t$CO_2$ extracted[16]. Its closest competitors in terms of cost also use Hot Potassium Carbonate (HPC) absorbent (as does Karbon), but pressurise incoming flue gas with an electric or steam compressor instead of with a gas turbine.

Levelized cost of CO_2 capture



Source: Karbon, IEA, Energimyndigheten

The following analyses of CO_2 capture technologies draw on a 2020 report by the International Energy Agency (IEA).[17]

Pressurised HPC Technology

Pressurised HPC is the capture method used by Karbon. CO_2 Capsol also offers pressurised HPC, although using electric or steam compressors rather than a gas turbine.

Utilisation: HPC has been installed at over 675 sites worldwide, although mostly for chemical processes rather than CO_2 capture. Stockholm Exergi used HPC at a small test biofuel power plant to extract about 700 kg CO_2 per day.

Competitor: CO2 Capsol uses a predecessor capture system to the Karbon Technology, which pressurises exhaust gases with electric or steam compressors. CO_2 Capsol has marketed "Capsol EoP" technology on a licencing basis since 2020.

Capsol EoP is more expensive than Karbon – CO_2 Capsol estimate the levellised cost of their process as $29/t, vs. $20/t or less for Karbon with coal exhaust gas. It may be more competitive in smaller installations, as its operation does not require supplies of natural gas. For larger installations, the footprint of the necessary electric compressors is very large.

Company:

Name	*Domicile*	*Solution Brand Name*
CO_2 Capsol	Norway	Capsol End-of-Pipe (EoP)

[16] Cost for a representative utility-scale coal-fired power plant in the USA.

[17] Energy Technology Perspectives 2020 – Special Report on Carbon Capture Utilisation and Storage CCUS in clean energy transitions – September 2020 – https://www.iea.org/reports/ccus-in-clean-energy-transitions/a-new-era-for-ccus

Amine Solvent Technology

Chemical absorption using amine-based solvents is the most advanced CO_2 separation technique. However, amines are expensive, toxic, carcinogenic in certain forms and concentrations[18]. Amines corrode CCS equipment and degrade with contact with O_2, SO_x, NO_x and heat, after which they remain toxic and are therefore expensive to dispose of. They bind so strongly with CO_2 captured from exhaust gas that substantial energy is required to remove the CO_2.

Utilisation: Widely used in small-scale and large-scale projects:

Power generation: Boundary Dam (Canada), Petra Nova (USA – closed)

Fuel transformation: Quest (Canada)

Industrial production: Al Reyadah CCUS (UAE), COURSE50 Project in steel production (Japan), Enid Fertilizer Plant (USA), Uthmaniyah CO_2 EOR demonstration (Saudi Arabia).

Planned projects: Large-scale CCUS such as Norcem cement (Norway), and waste-to-energy (Norway and the Netherlands).

Competitors: Several companies offer either a full EPC installation of an amine-based CO_2 capture plant, or proprietary technology and amine solvents required for a client to install a bespoke capture plant. They account for all currently installed amine-based CO_2 capture plants, and most plants in development.

Their levelized cost of CO_2 capture is estimated as \$45-55/t, considerably higher than Karbon. However they are large companies offering well-tested and widely deployed technology.

Companies:

Name	*Domicile*	*Solution Brand Name*
Aker Carbon Capture	Norway	Just Catch
Baker Hughes	USA	Compact Carbon Capture
Carbon Clean	UK	APBS-CDRMax
Linde	UK	Rectisol, BASF OASE
Royal Dutch Shell	Netherlands	Cansolv
Mitsubishi Heavy Industries	Japan	KM-CDR
Fluor	USA	Econamine FG Plus
Ion Engineering	USA	ALAS

[18] Emergency and Continuous Exposure Guidance Levels for Selected Submarine Contaminants, Subcommittee on Emergency and Continuous Exposure Guidance Levels for Selected Submarine Contaminants, Committee on Toxicology, Board on Environmental Studies and Toxicology, Division on Earth and Life Studies, National Research Council of The National Academies, The National Academies Press, 2007

Physical Separation Technology	Physical separation is used primarily where the target gas has high concentrations of CO_2, e.g., natural gas processing and the production of ethanol, methanol and hydrogen production. *Adsorption separation* uses a solid surface, e.g., activated carbon, alumina, metallic oxides or zeolites. *Absorption separation* uses a liquid solvent, *e.g.* Selexol or Rectisol.
Utilisation:	Nine large plants operate in the US: *Proprietary solvents* are used in the Century Plant (Texas), Great Plains Synfuels Plant (in North Dakota), Lost Cabin Gas Plant (Wyoming), and Terrell Natural Gas Processing Plant (Texas). *Pressure swing adsorption* is used in Air Products' carbon capture from hydrogen production facility in Texas. *Cryogenic separation* is used in Shute Creek Gas (Wyoming). *Dehydration and compression* is used at the Illinois Industrial Carbon Capture and Storage Project biofuels production facility. *Separation and compression* of highly concentrated CO_2 streams is used at the Coffeyville Gasification Plant.
Competitors:	Physical separation is not a standalone product, and can be custom installed in relatively few technically demanding installations. Karbon therefore does not seek to compete with physical separation.
Companies:	

Name	*Domicile*	*Solution Brand Name*
ExxonMobil	USA	Controlled Freeze Zone
Air Products	USA	Vacuum swing adsorption

Oxy-fuel Separation Technology	Fuel is combusted with almost pure oxygen, producing almost pure CO_2 and water vapour, which is dehydrated to obtain high-purity CO_2.
Utilisation:	*Coal-based power generation:* Callide (Australia), Compostilla (Spain). *Cement production:* Heidelberg Cement Colleferro (Italy), LafargeHolcim Retznei (Austria), Cement Innovation for Climate (Germany).
Competitors:	Zero-carbon power units have been developed, for example for new electricity generation plants. These do not directly compete with Karbon, which focuses on retrofitting its technology to existing plants. Oxy-fuel technology requires pure oxygen, which is energy-intensive and expensive. The technology is not expected to be deployed until 2030.
Companies:	

Name	*Domicile*	*Solution Brand Name*
Clean Energy Systems	USA	
NET Power	USA	Allam-Fetvedt Cycle

Membrane Separation Technology	Uses polymeric or inorganic membranes which allow only CO_2 to pass through.
Utilisation:	*Natural gas processing*: large-scale plant operated by Petrobras in Brazil.
Competitors:	Membranes for CO_2 removal from syngas and biogas are commercially available, and are under development for exhaust gas treatment. Membrane separation is untested, however, and lifecycle reliability and costs are unquantified.

Companies:

Name	*Domicile*	*Solution Brand Name*
Svante	Canada	Metal Organic Framework
MTR	USA	PolarCap

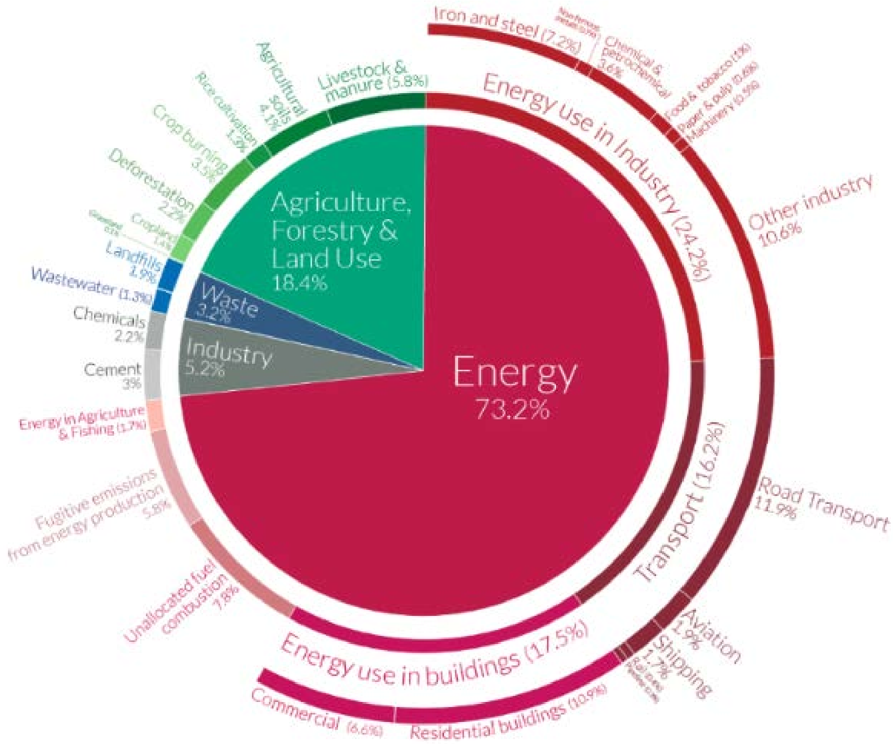
New technologies under development	The following technologies are not expected be deployed within the next five years, and are limited to specific niche markets such as cement manufacture.
Calcium Looping:	CO_2 capture at high temperature. A first reactor uses lime sorbent to capture CO_2 from a gas stream to form calcium carbonate, which a second reactor regenerates to produce lime and CO_2. Mostly at pilot plant scale for coal-fired fluidised bed combustors and cement manufacture. Two European projects are developing calcium looping capture technologies in steel (C4U) and cement production (CLEANKER) at pilot and pre-commercial scales.
Chemical Looping:	A first reactor binds oxygen from the air to small particles of metal (*e.g.* iron or manganese) to form a metal oxide, which a second reactor reacts with fuel to produce energy and CO_2. Technologies developed in academic institutions, research organisations and companies, including in the power sector. Around 35 pilot projects developed and operated, with capacity of up to 3 MW for coal, gas, oil and biomass combustion.
Direct Separation:	CO_2 emissions from cement production are captured indirectly, by heating limestone using a special calciner. CO_2 is stripped directly from the limestone without mixing with other combustion gases. A prototype is being demonstrated at the Low Emissions Intensity Lime and Cement (LEILAC) pilot plant developed by Calix at the Heidelberg Cement plant in Belgium.

3. Sources, Utilisation and Pricing of CO_2

3.1. Sources of CO_2

Global CO_2 emissions are about 37 Gtpa

Global CO_2 emissions are about 37 billion tons per year, mostly from burning fossil fuels for electricity, heat, transport, and industry.[19] All 37 Gtpa must be eliminated by 2040 if warming is to be limited to 1.5°C, the current target.



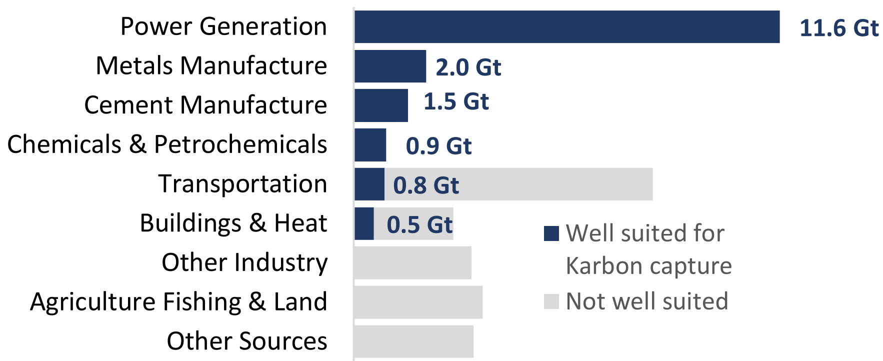
Source: Our World in Data presentation, data from World Resources Institute

Karbon Technology is suitable for capturing 47% of global CO_2[15]

17 Gtpa CO_2........ Could be captured from power, manufacturing, refining, transportation, and district heating.

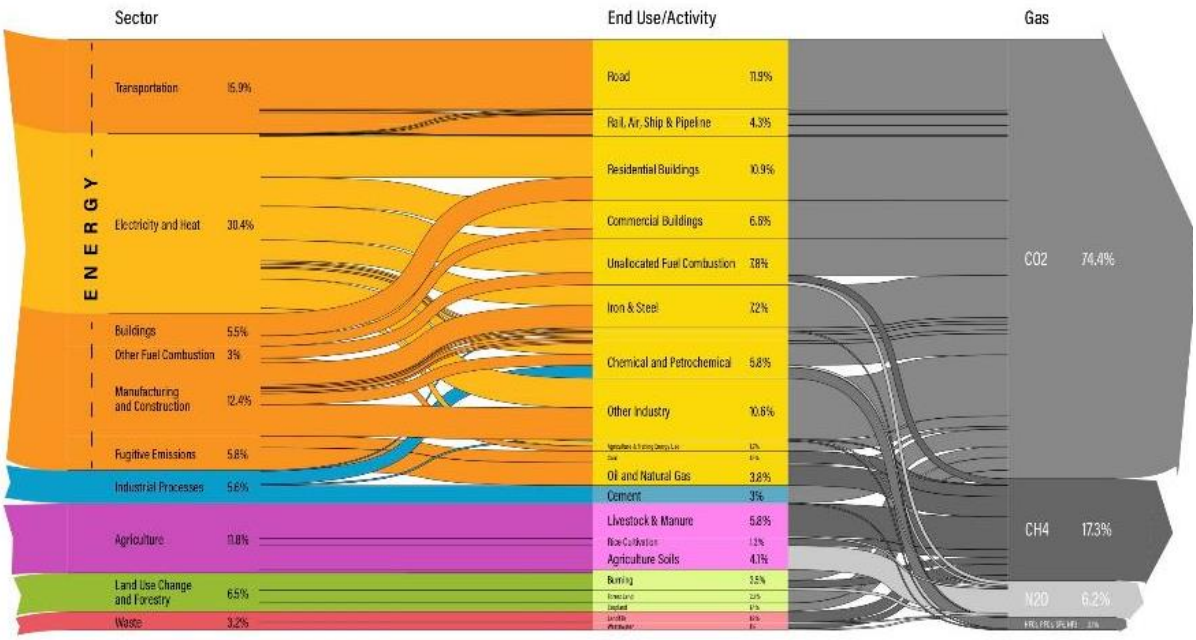
\$2/tCO_2 captured........ Revenue conservatively targeted by Karbon.

\$34 billion/year........ Potential revenue for Karbon.



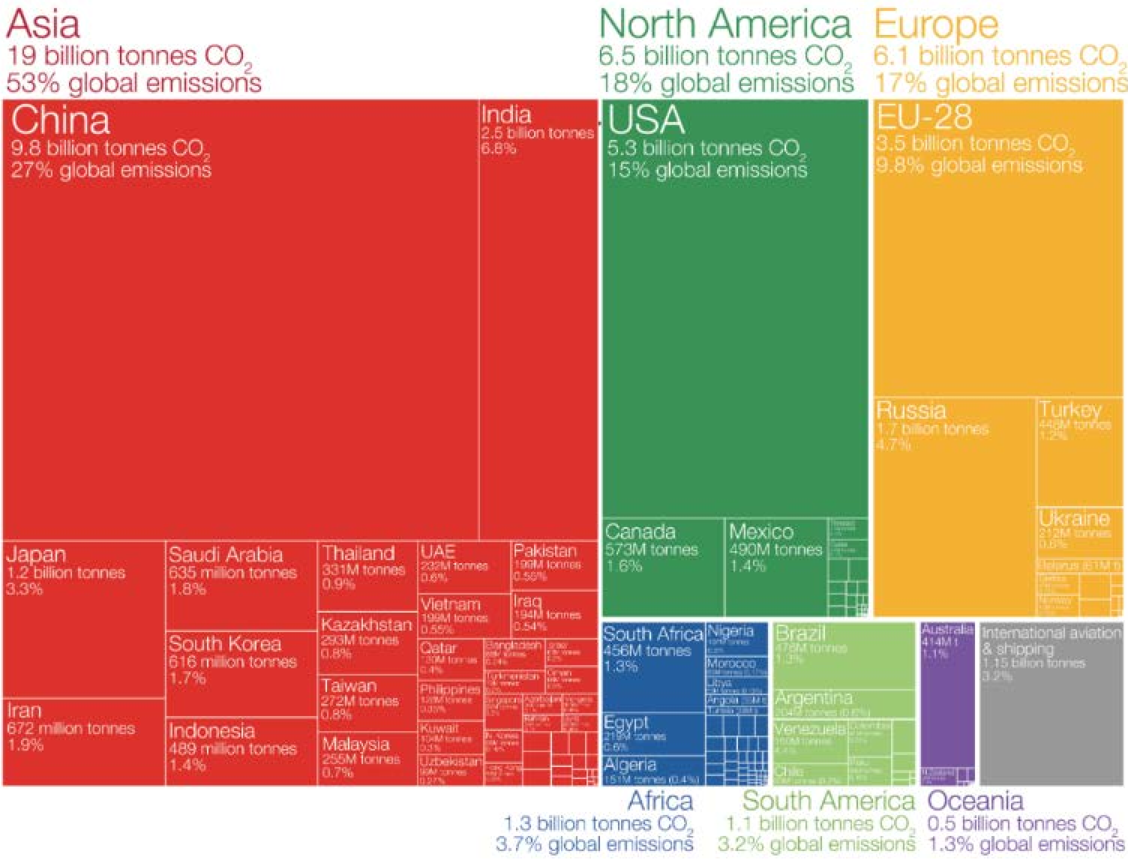
[19] World Resources Institute, Our World in Data

49 $GtCO_2e$ of Greenhouse Gases Global emitted globally



Source: World Resources Institute

CO_2 Emissions by region

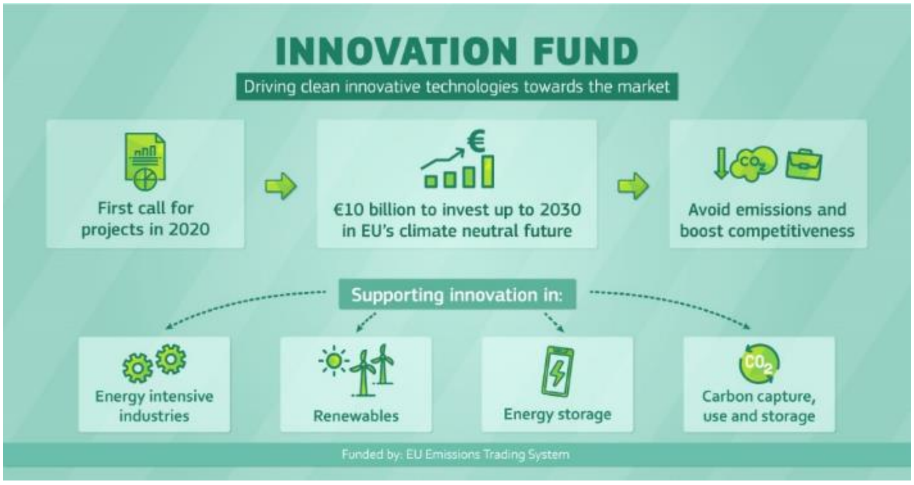


Source: Our World in Data, from IPCC data

3.2. Government Action to Mitigate CO_2

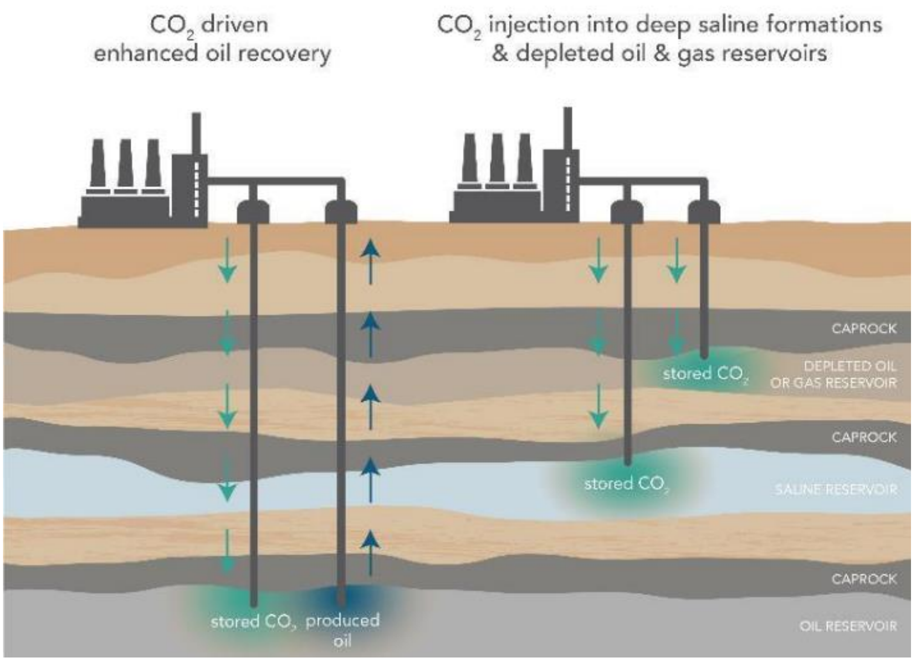
United States of America	US Tax Code § 45Q: "Credit for carbon oxide sequestration" subsidises CCUS with tax credits of \$35-\$50 per tonne of CO_2, increasing with inflation. Legislation proposed in May 2021 would increase § 45Q subsidies to \$60 and \$85 per tonne, paid directly as tax refunds rather than as tax credits.
USE IT Act:	President Trump signed into law the Utilizing Significant Emissions with Innovative Technologies (USE IT) Act supporting CCUS research, and construction and development of carbon capture facilities and CO_2 pipelines. The act directs the US EPA to support CCUS research; clarifies that CCUS projects and CO_2 pipelines are eligible for advantageous permitting review; directs the Council on Environmental Quality to assist project developers and operators of CCUS facilities and CO_2 pipelines; and establishes stakeholder task forces.
Biden Initiatives:	The Biden administration has returned the USA to the Paris Agreement and is taking extensive action to address climate change, including as follows: *Key Initiatives* • Launch a Global Climate Ambition Initiative. • Set ambitious benchmarks for climate investments at U.S. International Development Finance Corporation (DFC). • Commit to climate investments at the Millennium Challenge Corporation (MCC), which will dedicate over half its program funding to climate-related investments. • Launch a Greening Government Initiative for sustainable government. *Mobilise climate change financing* • Scale up international financing, doubling annual public climate finance to developing countries by 2024. • Issue the first U.S. International Climate Finance Plan. • Launch an international discussion of decreasing fiscal climate risk through national budgets. *Transform energy systems.* • Establish a Net-Zero Producers Forum with Canada, Norway, Qatar, and Saudi Arabia, representing 40% of global oil and gas production. • U.S.-India Climate and Clean Energy Agenda 2030 Partnership. • Support ambitious renewable energy goals and pathways in Latin America and the Caribbean. • Support clean energy mineral supply chains. *Revitalise the transport sector.*

	• The Department of Transportation (DOT) is expanding ways for all modes of transportation to transition to zero emissions. • Join the Zero Emission Vehicle Transition Council. • Reduce emissions from international shipping and aviation. *Build workforces for the future and ensure U.S. competitiveness.* • Launch a Global Partnership for Climate-Smart Infrastructure. • Create a Council on Climate, at the U.S. Export-Import Bank (EXIM). • Support workers and communities in the shift to clean energy. *Promote innovation to bring clean technologies to scale.* • Accelerate clean energy innovation and manufacturing. • Reinvigorate leadership and participation in Mission Innovation. • Lead the Agriculture Innovation Mission for Climate. • Join the Leadership Group for Industry Transition (LeadIT) along with co-founders Sweden and India. • Launch a Global Power System Transformation (G-PST) Consortium. • Launch the FIRST Program to support small modular nuclear reactors. *Urgent support for vulnerable countries to adapt to the climate crisis.* • Support environmental justice and climate resilience. • Partner with islands to lead on climate and energy resilience. • Reduce black carbon by investing in clean cookstoves. • Mitigate black carbon health impacts in Indigenous Arctic communities. *Implement nature-based solutions.* • Invest in tropical forests to drive towards a net-zero world. • Fund nature-based approaches to coastal and ecosystem resilience. • Promote resilience in the Southern Ocean. *Promote safety and security at home and abroad.* • Conduct climate exposure assessments on all U.S. installations. • Support assessments in partner countries around the world.
China	The largest emitter of greenhouse gases targets net zero by 2060, requiring an ambitious multi-decade effort to transform its economy, including a significant carbon capture program.
Japan	Targets net zero by 2050 by mobilising over $2 trillion of private sector savings through investment, regulation, subsidies and tax incentives, with a focus on carbon capture.

United Kingdom	As part of its plan for net zero CO_2 by 2050, the government has pledged £200 million for four carbon capture and storage clusters, notably Net Zero Teesside in northeast England, being developed by oil companies including BP, ENI, Equinor, Shell and Total, with BP leading as operator.
European Union: €10 billion Innovation Fund	EU plans for addressing climate change include a 55% cut in emissions by 2030, and climate neutrality by 2050. The EU Emissions Trading System (EU ETS) addresses emissions from power generation, industry and aviation. Its European Green Deal includes the €10 billion EU Innovation Fund for the demonstration and bringing to market of innovative low-carbon technologies to decarbonise Europe. The fund calls for projects focusing on innovative low-carbon technologies and processes in energy-intensive industries, including construction and operation of carbon capture and storage. 

3.3. Current uses of CO_2

CO_2 will be used by industry or sequestered



Source: California Air Resources Board

Global use of CO_2

Source: IHS Markit

Approximately $4.6 billion of CO_2 was used in 2017:

Produce Urea fertiliser	130 Mt
Enhanced Oil Recovery	70-80 Mt
Other uses	20-30 Mt
Total	**230 Mt**

Other uses (see section 3.5) include for food and beverage production, fabrication of metal, cooling, fire suppression, greenhouses to stimulate plant growth, or in its solid state as “dry ice”, primarily for transport refrigeration.

3.4. CO_2 Pricing and Revenue Sources

CO_2 Pricing

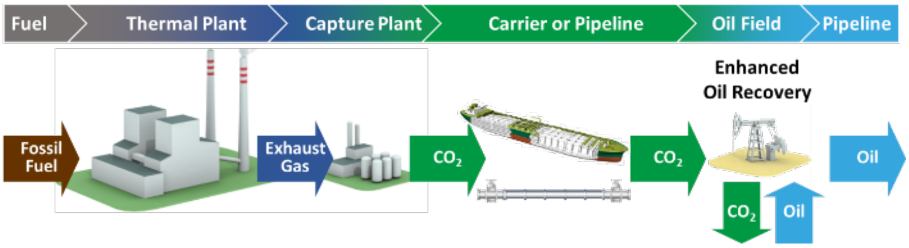
Karbon believes gross revenues of about \$50/tCO_2 are available from a combination of commercial sales, subsidies, and emissions offsets.

This compares favourably with Karbon's all-in capture cost of under \$20/tCO_2[20] including both capital and operating expenditure, which is 50-90% lower than for alternative technologies.

Revenue source 1:

Enhanced Oilfield Recovery ("EOR")

Initially, Karbon's primary source of revenue will be the sale of CO_2 to oil companies for EOR. EOR boosts production by injecting CO_2 into wells. Over 30 years of data from Texas confirms that injecting a tonne of CO_2 can yield about three additional barrels of oil, with substantially all injected CO_2 remaining underground.



Oil producers require more CO_2 than available from natural sources. Marginal oil fields worldwide are estimated to contain 470 billion barrels of stranded oil which could be recovered by EOR. This would require 140 billion tonnes of CO_2[21], the equivalent of ten years of emissions by all coal-fired generation plants in the world.

In the USA, CO_2 for EOR typically costs oil companies \$50/tCO_2 landed cost to the oilfield, equivalent to about \$15 per additional barrel of oil extracted.

Revenue source 2:

Subsidies for CO_2 sequestration

The permanent injection of CO_2 underground for long-term sequestration requires the appropriate geology and long-term monitoring. The cost of CO_2 extraction, transportation to the sequestration site, and injection underground varies greatly by location, and must be funded by government subsidies or by the sale of emissions offsets.

The USA has both a comprehensive subsidy regime for sequestration, and thermal power plants near suitable pipelines and oil fields. Sequestered CO_2 qualifies for a tax credit of \$50/tCO_2, which new legislation may increase to \$85/tCO_2.

In Norway, gas extracted offshore effectively attracts CO_2 taxes of about €70-80/tCO_2[22], which gas companies can offset by capturing and storing CO_2 at a

[20] For a representative utility-scale coal-fired power plant in the USA.

[21] Global Application Criteria for Carbon Dioxide Enhanced Oil Recovery, Report IEA/CON/08/155, Prepared by Advanced Resources International, Inc. and Melzer Consulting, for the IEA Greenhouse Gas R&D Programme.

[22] Norwegian CO_2 tax of about NOK 1/m^3 (about €50/tCO_2) + EU ETS (Emission Trading System) charge of about €20-30/tCO_2.

lower cost. The government has offered to cover the first 80% of the cost of the first carbon capture and sequestration project, estimated at $2.7 billion.

Revenue source 3:

Emissions offsets

Emissions offsets are actively traded, notably on the EU Emissions Trading System ("EU ETS"). The EU ETS is a "cap and trade" system – emitters must limit their emissions to a cap, or if they exceed the cap, to purchase EU Allowances ("EUA"; one tonne of CO_2) from other emitters as an offset.

The EUA price reached a record $63.85/tCO2 (€52.77) on 10 May 2021. Most market participants expect the price will continue to rise. In 2020, over 8 billion EUAs were traded, with a value of €373 billion at current prices.

EU Allowance prices in €/tCO_2

The International Civil Aviation Organization ("ICAO") is developing a market-based offset scheme for civil aviation known as the Carbon Offsetting and Reduction Scheme for International Aviation ("CORSIA").

Such markets could be sources of financing CO_2 sequestration projects. Emitters would pay the project a price per tCO_2, even if the project is in another country or outside the EU. If the Norwegian pilot CCS project is successful, companies in *e.g.*, Denmark and the Netherlands could extract CO_2 for sequestration into the North Sea oilfields, to earn €44/tCO_2 and significant public image benefits as carbon neutral.

Revenue source 4:

Other uses and applications of CO_2

As Karbon Technology will make CO_2 available at a substantially lower price than previously, CO_2 will likely be more widely used as feedstock for methanol, fertiliser, animal nutrients, plastics, foodstuffs, building materials, and new applications to come. See Section 3.5.

3.5. Future Uses of CO_2

Wider use of CO_2 if produced at a lower cost

Karbon produces CO_2 for \$20 per tonne [23], far less than alternative technologies (\$50-120/tCO_2). Karbon's initial focus is on EOR, due to its scale. However, further uses of CO_2 will likely proliferate rapidly as its price drops, for example as feedstock for methanol and other fuels, fertiliser, animal nutrients, plastics, foodstuffs, and building materials.

As CO_2 becomes abundantly available at low cost, Karbon will be at the heart of a developing global market, and will explore related opportunities.

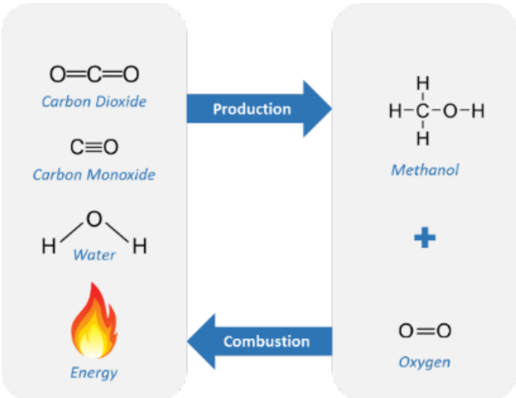
Methanol

Methanol is viable as a vehicle fuel and additive, considered for wider dissemination in the US. However, in 2007 ethanol was prioritised in support of corn farmers. The viability of methanol as a vehicle fuel will require policy action to incentivise its use and the roll-out of distribution infrastructure.

CO_2 is one input for producing methanol, along with large amounts of energy. When methanol is subsequently burned, the energy and CO_2 are released.

Methanol production is viable where excess renewable electricity is available, and methanol can replace fossil fuels. E.g., methanol could be produced with surplus wind power in Texas, or with hydroelectric power and surplus gas in Norway.

Methanol Production and Combustion Cycle

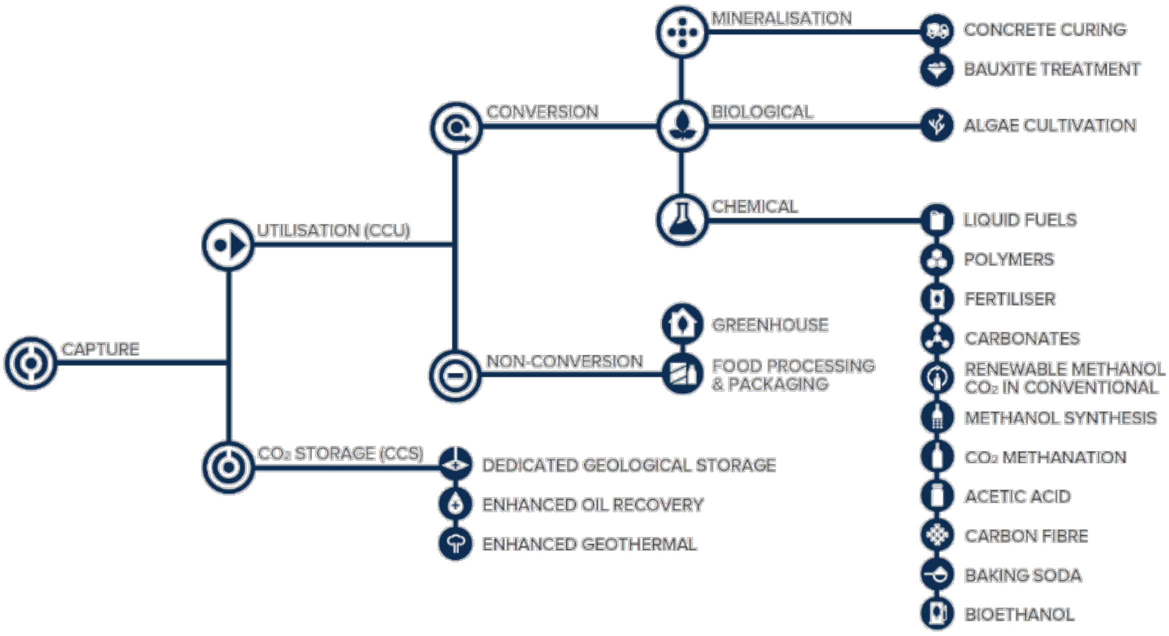


Urea Fertiliser

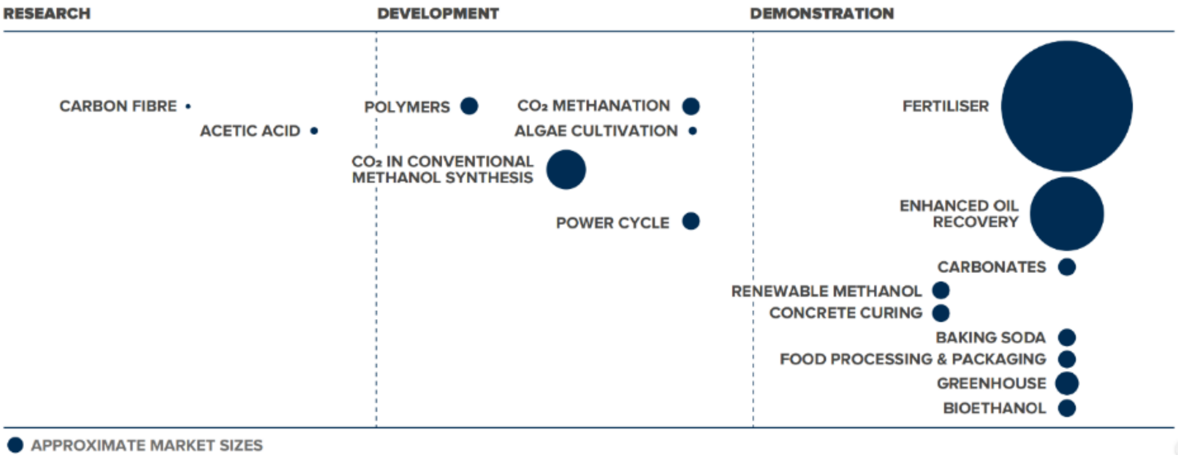
About 130 MtCO_2pa is used to convert ammonia to urea fertiliser, more than any other use of CO_2. Currently all such CO_2 is obtained internally, as CO_2 is a by-product of producing ammonia. Inexpensive CO_2 from Karbon would allow ammonia to be converted to urea not only where the ammonia is manufactured, but at destinations around the world, increasing flexibility of shipping and putting causing downward pressure on costs.

[23] For a representative utility-scale coal-fired power plant in the USA.

Pathways for CO_2 utilisation and storage



Readiness and size of market for CO_2 utilisation technologies



Source: Global CCS Institute

Technologies in commercialisation using CO_2 as an input

KIVERDI www.kiverdi.com	Kiverdi develops processes for creating food and nutrients from CO_2. Its proprietary bio-reactors create organic fertilisers by combining CO_2 with nitrogen, hydrogen, water and mineral nutrients for percolation through a liquid suspension of bio-catalysts. A similar process creates protein-rich fish food for aquaculture, to replace wild-caught fish fed to fish farms.
AIR PROTEIN™ www.airprotein.com	Air Protein, an affiliate of Kiverdi, has developed processes to create edible protein from CO_2. Its proprietary probiotic process heats CO_2, nutrients and hydrogenotroph microbes in fermentation vessels to create amino acids in hours, and produces a flour containing 80% protein.
opus 12 www.opus-12.com	Opus-12 has developed a device to recycle CO_2 into chemicals, ethylene, ethanol, or plastics or any other petrochemical. The only inputs are CO_2, water and electricity, generally from renewable sources.
Blue Planet. www.blueplanet-ltd.com	Blue Planet uses CO_2 as a raw material for making carbonate rocks, for use in place of natural limestone rock mined from quarries, which is the principal component of concrete. On project collects CO_2 from California's largest power plant at Moss Landing.
LanzaTech capturing carbon fueling growth www.lanzatech.com	Lanzatech uses bacteria to convert CO_2 into fuels and chemicals, with several projects around the world.
SKYRE www.skyre-inc.com	CO2RENEW™ converts CO_2 from exhaust gas and into chemicals and fuels using electricity from renewables producing, e.g., methanol and formic acid via an electrochemical pathway.
CARBON CURE. www.carboncure.com	CarbonCure technology introduces CO_2 into fresh concrete, where it mineralises and becomes permanently embedded, providing economic and climate benefits for concrete producers.
Modified Atmosphere Packaging www.modifiedatmospherepackaging.com	Modified atmosphere packaging (MAP) extends the shelf life of fresh food products by substituting atmospheric air inside a package with a protective gas mix including CO_2.

3.6. Impact of Karbon Technology

Rapidly reduce CO_2 emissions	Deployment of the Karbon Technology globally at scale could significantly reduce emissions of GHGs by capturing CO_2 for sequestration. *With just the first five coal-fired power plants it targets in Texas, Karbon could reduce US emissions by almost 1% and Texan emissions by over 7%. With 54 such plants, Karbon could reduce the emissions of the USA by 10%.*
CO_2 will be captured, traded, stored and consumed globally	Thermal power generation alone generates about 13.6 billion tonnes of CO_2 per year, worth $272 billion at a price of $20/tCO_2$. The Karbon Technology will allow much of this CO_2 to be captured cost-effectively, unlocking a global market of CO_2 sources, transport and uses.
Thermal power plants could serve out their operating lives	Operational thermal power plants are being decommissioned and written off prematurely even when economically viable, which represents significant destruction of value. By retrofitting Karbon Technology, thermal power plants could continue to generate carbon-free power for their remaining useful lives. This would provide a lifeline as these markets transition to sustainable energy.

4. Karbon Industrial: Capturing CO_2 from Industry

4.1. Sources of CO_2 for Capture

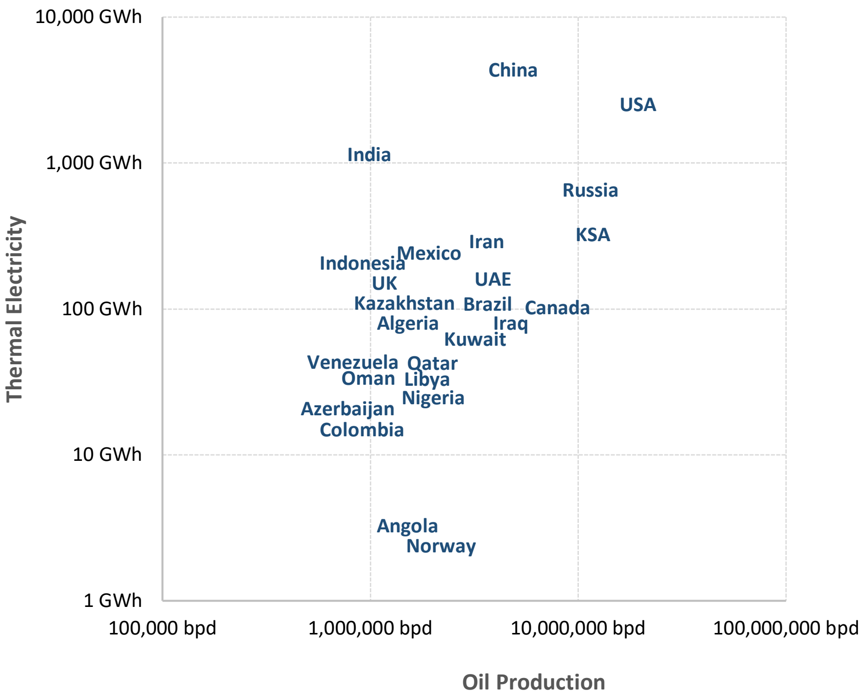
Thermal power generation	Thermal power generation is Karbon's primary target. It is the largest static source of CO_2; *e.g.*, 35% of US greenhouse gases. Thermal power plants are large, geographically concentrated, and generally located in areas possessing the infrastructure necessary for a Karbon installation.
Fertiliser production	Karbon targets fertiliser producers located near petroleum resources suitable for EOR. The focus is on countries which have set CO_2 reduction targets, such as Canada and the USA. Ammonia production consumes about 1% of world energy and produces 406 $MtCO_2pa$[24]. About a third of CO_2 produced is used at site to convert ammonia to nitrates and urea. The remaining 276 $MtCO_2pa$ is available for capture. Ammonia is generally produced near petroleum extraction, as the process uses natural gas (except in China, which uses coal).
Cement production	Cement production emits about 8% of global CO_2, released from fuel for heating and heated limestone. Karbon will seek targets opportunistically where use or sequestration of CO_2, is near cement plants, the locations of which are not generally correlated with petroleum production.
Steel production	Steel production emits about 8% of global CO_2. Karbon will seek targets opportunistically where use or sequestration of CO_2, is near steel plants, the locations of which are not generally correlated with petroleum production.

[24] Source: International Energy Agency

4.2. CO_2 for Enhanced Oil Recovery

Strategic targets: *Oil-producing regions with abundant thermal power generation*	*EOR is largest user of CO_2*	EOR is the largest source of demand for CO_2, at an established and viable long-term price, and provides permanent sequestration of CO_2.
	Thermal power is optimal source	Thermal power plants are large and often located in areas possessing the necessary infrastructure.
	CO_2 transport by pipeline	For the foreseeable future, almost all CO_2 will continue to be delivered by pipeline.
Immediate Targets: *USA (Texas) and* *Persian Gulf*	The southwest USA and the Persian Gulf offer significant opportunities which could be realised rapidly. In both regions, approval and development times are relatively short, CO_2 for EOR has financial, technical and political support, and Karbon projects would attract global interest. Please see summaries below, and detailed sections later in Section 4.	
	USA	The USA is the largest user of CO_2 for EOR, with a well-established market and pipeline network. Immediate targets are 6.7 GW of coal-fired generation with annual emissions of 48 $MtCO_2$ valued at \$960 million per year. Large subsidies for CO_2 for EOR could generate cash profits of up to \$1.2 billion within a year of commissioning a mid-sized project such as Sandy Creek in Texas.
	Persian Gulf	Persian Gulf states have large and modern gas-fired power plants located near oilfields. Immediate targets in Saudi Arabia alone are 11 GW of gas-fired generation with annual emissions of 43 $MtCO_2$ valued at \$860 million per year. Qatar and several other countries offer immediate opportunities to deploy Karbon Technology. Karbon could licence the Karbon Technology to each state, which could self-finance projects and benefit from low-cost gas and capital.
Regions with both EOR and thermal power generation	The graph below illustrates the main opportunities in regions with large amounts of both thermal generation and oil production. Once Karbon Technology becomes established, more regions are likely to institute incentives such as tax credits (as in the USA), and/or inexpensive gas and subsidised financing and operations (as in the Gulf states).	

Thermal electricity generated by top 25 Oil Producers



Regions with thermal power generation but no EOR	South Korea, South Africa and Japan, amongst others, have large emissions of CO_2 but no oil production where EOR could be applied. Such countries can reduce CO_2 by shifting policy and infrastructure towards CO_2 sequestration, CO_2 shipping and/or methanol manufacture.

4.3. Permanent Sequestration of CO_2

Permanent sequestration

Another destination for CO_2 extracted by Karbon is permanent sequestration by injection into underground geological formations, in order to meet climate targets. The IPCC climate pathways model requires the sequestration of 1.2 trillion tonnes of CO_2 by 2100. There is high confidence that large CO_2 storage resources are available to meet these scenarios.

Estimated CO_2 sequestration capacity in billions of tonnes

Source: Global CCS Institute

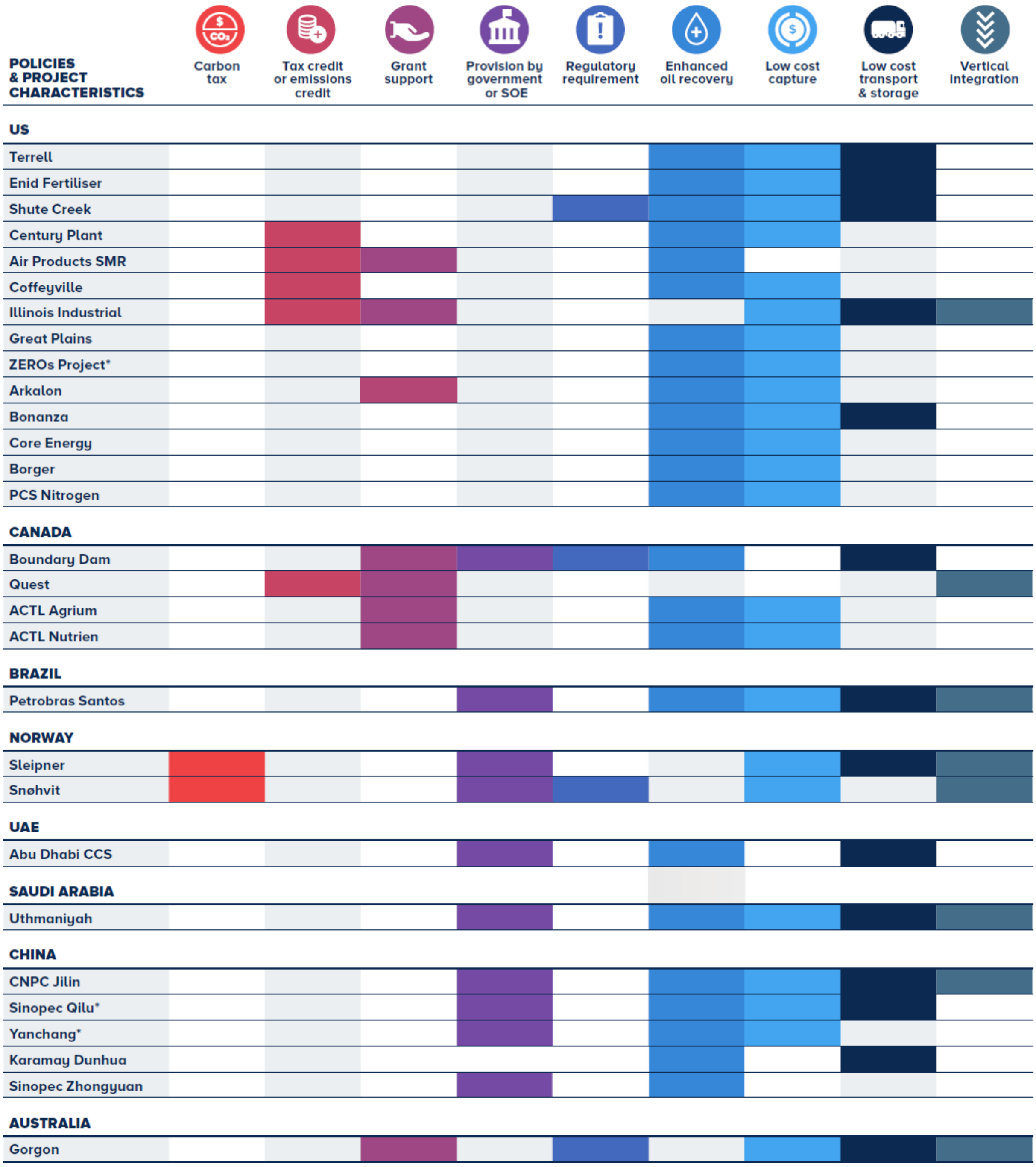
Revenues from sequestration

Karbon would derive revenues through a range of mechanisms driven primarily by government action. E.g., the US government provides tax credits; Canada taxes excess emissions; the European Union limits CO_2 emissions with a cap-and-trade system of emissions credits; carbon traders acquire verified sequestration certificates to be used for compliance purposes; and airlines require emissions offsets to continue operation.

In the USA, sequestration is immediately viable due to extensive CO_2 handling infrastructure and expertise sequestration capacity in disused oilfields, and subsidies of at least \$50/tCO2 in the form of §45Q tax credits.

In Europe an emissions trading framework is in place, and many emitters are in close proximity to sequestration sites with good infrastructure in depleted North Sea oilfields. Large emitters are actively working to developing CCS to reduce their emissions directly, or to acquire offsets. Offshore CCS projects are underway in Norway, the UK, Belgium and Holland.

Main policy and business drivers for the 23 large scale carbon capture and sequestration facilities in operation and under construction



Source: Global CCS Institute

4.4. Business Models for Commercialising Karbon Technology

Licence the Karbon Technology	In this model, Karbon would sell licences to use the Karbon Technology either in a certain country or for a certain project. Karbon would receive royalty payments as follows: *Up front*............Fixed payment; plus a percentage of the value of the EPC at first draw down. *Over time*..........A fixed amount per tonne of CO_2 extracted. The host power plant would own and operate the installed Karbon Technology. Karbon would make personnel available to support the licensee during design, commissioning, and initial operation.
Develop projects as principal	Karbon will develop, own and operate certain projects as principal to seize specific opportunities (*e.g.*, US tax credits).
Develop projects in partnership with in-country developer	Karbon would work in partnership with the owner-operators of power plants who wish to keep control over equipment and operations inside their plants, and co-invest in the carbon capture equipment.

4.5. Opportunities for Karbon by Region

Karbon will focus on regions which offer benefits such as the following:

- Thermal power emitting abundant CO_2 .... *e.g.*, USA, Persian Gulf
- Demand for CO_2 for oilfield EOR .... *e.g.*, USA, Persian Gulf
- Low-cost CO_2 transport and storage .... *e.g.*, USA, UAE
- Subsidies or tax credits for CCUS projects .... *e.g.*, USA
- CO_2 taxes, caps, regulation incentivising CCUS ... *e.g.*, EU, UK, Canada
- Government-funded CCUS infrastructure .... *e.g.*, Norway

The Americas

United States *5,285 $MtCO_2pa$*	• Many coal- and gas-fired power plants near an extensive CO_2 pipeline network. • The world's largest user of CO_2 for EOR. • The tax credit regime is attractive and is being further improved. • Karbon and Oxy are planning projects at coal-fired plants in Texas.
Canada *577 $MtCO_2pa$*	• Many thermal power plants in western Canada. • Near oilfields using EOR and a growing CO_2 pipeline network. • Rising carbon taxes incentivise CO_2 capture.
Mexico *438 $MtCO_2pa$*	• Gas-fired power plants are being developed in northern Mexico. • Oilfields in the north are suitable for EOR.

Persian Gulf

All Persian Gulf countries offer opportunities from thermal power and industry fuelled by domestic gas, often located near mature oil fields where EOR is used to boost production.

Saudi Arabia *582 $MtCO_2pa$*	• 11,000 MW of thermal power generation 100 km from mature oilfields. • Saudi Aramco runs a pilot EOR program at Ghawar, the world's largest oilfield.
UAE *191 $MtCO_2pa$*	• Seeks to be the #4 worldwide for EOR from 31,000 MW of thermal generation. • Emirates Steel delivers CO_2 to oilfields through a 43 km CO_2 pipeline.
Qatar *109 $MtCO_2pa$*	• 13,000 MW of thermal power generation within 100 km of oilfields. • Karbon Marine could decarbonise the LNG fleet, which is growing to 190 carriers.
Kuwait *108 $MtCO_2pa$*	• Looking to boost flagging oil production back over 4m bpd with EOR. • Has established an Improved Oil Recovery Program.
Oman *72 $MtCO_2pa$*	• Oman has used EOR extensively to increasing flagging production by 25%. • CO_2 could be captured at low cost from 11,000 MW of thermal power.
Bahrain *34 $MtCO_2pa$*	• Thermal power and industrial plants produce 10 $MtCO_2pa$. • All are near the offshore Abu Safar and onshore Bahrain oilfields requiring EOR.

Eurasia and Oceania

China *10,175 $MtCO_2pa$*	• World's largest coal-fired power generation fleet, at over 1,000,000 MW. • CO_2 EOR is being pioneered at many mature oil fields. • 20,000 MW of coal-fired generation near the Shengli oilfield, which uses EOR.
India *2,616 $MtCO_2pa$*	• 229,000 MW of coal-fired power generation, industry and gas-fired generation. • EOR is being used to extend the lives of mature oil fields. • Karbon is in discussions with utility NTPC and energy engineering firm BHEL.
Russia *1,678 $MtCO_2pa$*	• Coal- and gas-fired power generation and Combined Heat and Power. • Near large oil fields which are 65-70% depleted and require CO_2 for EOR. • Karbon Marine for LNG carriers servicing Arctic Sea LNG projects.
South Korea *611 $MtCO_2pa$*	• Eight coastal coal-fired power plants emit 119 $MtCO_2pa$. • Captured CO_2 could be transported by ship to, e.g., the Persian Gulf for EOR. • Dual-cargo Karbon Carriers could carry LNG on the inbound voyage.

Europe

United Kingdom *370 $MtCO_2pa$*	• The government has established a comprehensive CCUS framework. • CO_2 pipelines and other infrastructure connect to four CCS hubs with capacity to sequester up to 48 $MtCO_2pa$ under the North Sea.
Netherlands *155 $MtCO_2pa$*	• Four CO_2 sequestration projects are in progress using disused offshore gas pipelines, platforms and other infrastructure. • Karbon targets the 260 $MtCO_2pa$ available for capture from thermal power generation within 250 km in the Netherlands, Belgium, Germany and France.
Norway *42 $MtCO_2pa$*	• The government is aggressively targeting CO_2 emissions with carbon taxes. • Its "Longship" project under construction will by 2024 sequester CO_2 offshore, from domestic sources, ships and imported from e.g., Denmark and Germany.
Romania *75 $MtCO_2pa$*	• Coal-fired power near some of the world's oldest oilfields, which require EOR. • Coal-fired plants emit 22 $MtCO_2pa$ within 50 km of oilfields in SW Romania.

Africa

Egypt *247 $MtCO_2pa$*	• Seven gas-fired power generation plants (total 22,000 MW) emit 46 $MtCO_2pa$. • Mature Egyptian oilfields are turning to EOR to reverse decreases in production.
Nigeria *140 $MtCO_2pa$*	• Gas-fired power generation plants (total 8,000 MW) emit 15 MtCO2pa. • CO_2 will be available for capture from the Dangote Oil Refinery, Africa's largest.
South Africa *479 $MtCO_2pa$*	• Coal-fired power generation includes eight power plants emitting 150 $MtCO_2pa$. • Captured CO_2 could be sequestered, or transported via pipeline and ship for EOR. • National energy and chemical company Sasol is considering a proposal from Karbon for the significant CO_2 produced at its refineries.

5. Karbon Marine: Capturing CO_2 from Shipping Emissions

5.1. Opportunity to Decarbonise Global Shipping

The shipping industry must drastically reduce its carbon intensity

By 2050, emissions from shipping must halve, by roughly 500 $MtCO_2$/y, even as the number of ships in operation is forecast to triple.

98,140 .... Number of ships operating globally in 2020[25]

1,057 $MtCO_2$ .... Annual emissions from shipping[26]

2.7% .... Shipping share of global greenhouse gases.

40-70% .... Required reduction in CO_2 from shipping.

Karbon can cost-effectively capture CO_2 from ships

Karbon has adapted its solution as "Karbon Marine" which captures CO_2, NO_x and methane slip from piston-based ship engines and small power plants. It can be retrofitted to dual-fuel gas engines, and is being adapted for diesel, marine gas oil (bunker fuel), and other low-sulphur liquid fuels. CO_2 would be stored in onboard tanks and off-loaded in port for sale (*e.g.*, for EOR) or permanent sequestration.

Karbon Marine is far less expensive a decarbonisation solution than switching fuels, which the shipping industry is actively considering, as described below.

Karbon Marine is an immediately available and cost-effective measure

Fitting Karbon Marine allows existing ship engines to operate to the end of their useful lives. It requires less onshore infrastructure, and can be deployed faster at a lower cost than switching to low-carbon fuels. Operating costs are offset by selling CO_2 for EOR or other uses. Karbon estimates that global shipping emissions could be reduced by 12% within five years as follows:

125 $MtCO_2$[27] ..... Required annual reduction in emissions

$55 billion ..... Retrofit Karbon Marine to 2,200 large oil and gas carriers.

$40 billion ..... Install CO_2 offloading, storage and transport facilities at the 20 largest oil export terminals and 20 largest LNG liquefaction terminals @ $1 billion per terminal.

$95 billion ..... Total Capital Expenditure for Karbon Marine

$2.5 billion ..... Annual revenue if CO_2 sold for EOR @ $20/$tCO_2$.

[25] UNECTAD Review of Maritime Transport 2020: world fleet of 100 gross tonnes and above, equivalent to 2,061,944,484 dwt of capacity, increasing by about 4.1% (net) per year.

[26] 2018 emissions according to the Fourth Greenhouse Gas Study by the International Maritime Organization, published July 2020.

[27] From current levels – i.e., adding no additional ships

The alternative low-carbon ship fuels present challenges

The shipping industry is actively considering switching to low-carbon fuels such as ammonia, hydrogen or methanol. However, all such alternatives would be far more expensive than fossil fuels, are 5-7 years from commercial availability, and would require enormous investment on ships and onshore.

Ammonia............... Ammonia is generally produced by electrolysing water with renewable electricity to produce hydrogen, which is combined with atmospheric nitrogen. Although liquid at normal temperatures and pressures, it is toxic and corrosive, and produces powerful greenhouse gases when combusted improperly.

Hydrogen............... Although favoured by Shell and others, hydrogen as ship fuel requires liquefaction or compression, which is less efficient than converting it into ammonia.

Methanol............... Although it contains carbon, methanol produced from biomass or atmospheric carbon is considered "green" and could be used as a bridge fuel in the medium term.

Adoption of low-carbon fuels could cost $1.65 trillion[28]

Switching all ships to low-carbon fuels would require enormous capital expenditure estimated as follows:

$1,430 billion..... Power generation and supply chain infrastructure to manufacture, transport and store low-carbon fuels[29]

$200 billion..... Convert ships to low-carbon fuel, scrap existing ship engines

$20 billion..... Energy efficient technologies

$1,650 billion..... Total Capital Expenditure to Adopt Low Carbon Fuel

[28] UMAS 2020 "Aggregate investment for the decarbonisation of the shipping industry"

[29] "Low-carbon" fuels are manufactured using renewable electricity, or thermal processes with carbon capture.

5.2. Karbon Marine Technology

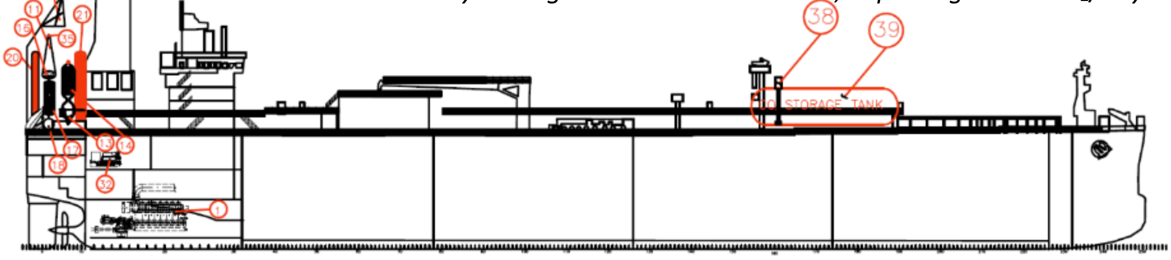
Compact Karbon Technology for ships

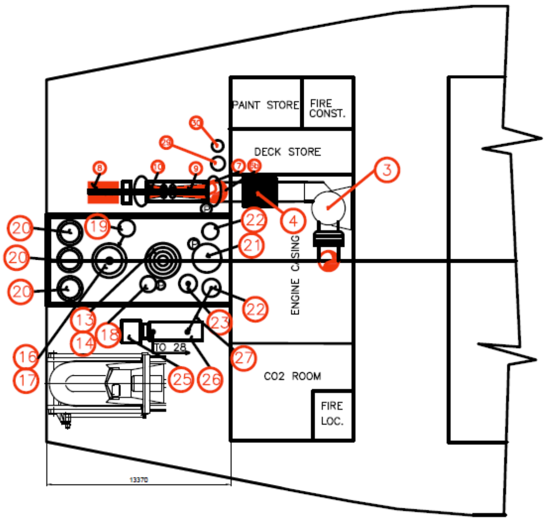
As the Karbon shipborne CO_2 and NO_X capture plant uses the same pressurised HPC technology as its onshore technology, it is also cost-effective with a small footprint. All components are off-the-shelf and commercially readily available, including several alternative gas engine turbines.

Captured CO_2 is stored for use or sequestration

Captured CO_2 will be stored in onboard tanks and offloaded in port for sequestration or use for EOR or by industry. CO_2 will over time become in high demand and widely traded.

Preliminary arrangement onboard a VLGC, capturing 120+ tCO_2/day





1. Main engine (11,216 kW @ NCR}
2. Exhaust black and bleed valves (not shown)
3. Exhaust fan
4. Self-cleaning filter
5. Thermic oil exit (to 22) (not shown)
6. Flue gas heat exchangers (a + b)
7. Seawater cooled flue gas cooler
8. El.-Generator / start engine (560 kW}
9. Flue gas compressor
10. Flue gas expander
11. Fuel gas compressor (not shown)
12. Premix gas burner (not shown)
13. Combustion chamber
14. High-temp. gas to gas heat exchanger
15. Urea/water storage tank (30 tonnes)
16. SCR Selective Catalytic Reduction
17. Low temp. gas to gas heat exchanger
18. Condenser
19. Re-humidifier
20. Absorber column
21. Desorber/stripper column
22. Reboiler
23. Absorbent heat exchanger (not shown)
24. Absorbent fluid pipe (not shown)
25. Electric motor (460 kW)
26. CO_2 compressor
27. CO_2 gas pipe
28. CO_2 liquid pipe to storage tanks
29. Thermic fluid expansion tank (not shown)
30. Cooling water pump (not shown)
31. El.-motor (13 kW) (not shown)
32. Aux. engines
33. Reliquefication unit (not shown)
34. Urea pump (not shown)
35. Urea injection
36. Air Intake (not shown)
37. Thermal oil circulation pump (not shown)
38. CO_2 Deepwell Pumps
39. CO_2 Storage Tanks
40. Air Filter (not shown)
41. Air Fan (not shown)

Karbon Marine is protected by multiple patents pending	Karbon Marine is protected by the patents pending for the Karbon Technology. Karbon also applied for additional patent protection with respect to Karbon Marine in January 2021. It thereby received protection in the form of priority in certain jurisdictions including the USA, the UK, South Korea, Norway and Germany. Karbon intends to exercise the resulting right to improve such application, merge it with superseding applications and/or make an international application under the Patent Cooperation Treaty.
Certification by DnV is underway	Karbon engaged IACS maritime certification institution DnV as follows

Positive Initial Assessment	In February 2021 DnV completed a preliminary assessment, based on the design, lay-out and mass and energy balance for a CO_2 and Nox capture plant for a 90,000 m^3 VLGC gas-fired ship. DnV identified no "showstoppers" and confirmed the output as 120 tCO_2/d.
Concept Review	Having completed the Initial Assessment, DnV is progressing to the Concept Review based on a specific ship design nominated by Karbon, focusing on • performance verification; outline revisions (simplifications), mass and energy balances, and simulations for complete system mission profile; • safety review and compliance, applicability to environmental regulations and class rules; and • installation, operation and maintenance aspects.
Preliminary Approval	After completing the Concept Review and performance verification, DnV grants Preliminary Approval.
Approval in Principle	Once DnV has granted Preliminary Approval, it will proceed to its Approval-in-Principle process.
Positive feedback	DnV added that the Karbon *"pressurized process using existing components, is considered highly interesting and applicable to scaling required for larger plants, addressing large emissions reductions desired in the future."*

InstallationPartners

CLEAN MARINE

www.cleanmarine.no

Karbon has identified several suitable marine engineering firms and shipyards worldwide. One such potential installation partner is Clean Marine AS, a reputable supplier of exhaust scrubbers for ships.

Clean Marine has its headquarters in Oslo, Norway, and offices in Singapore, Indonesia, Singapore, Bulgaria. Since its foundation in 2009, it has grown to 490 employees. Clean Marine has installed 265 emission cleaning systems since 2017 and has capacity for 35 systems per year

Plant in Bantam, Indonesia, with shipyard facilities nearby in Singapore

Clean Marine Clients

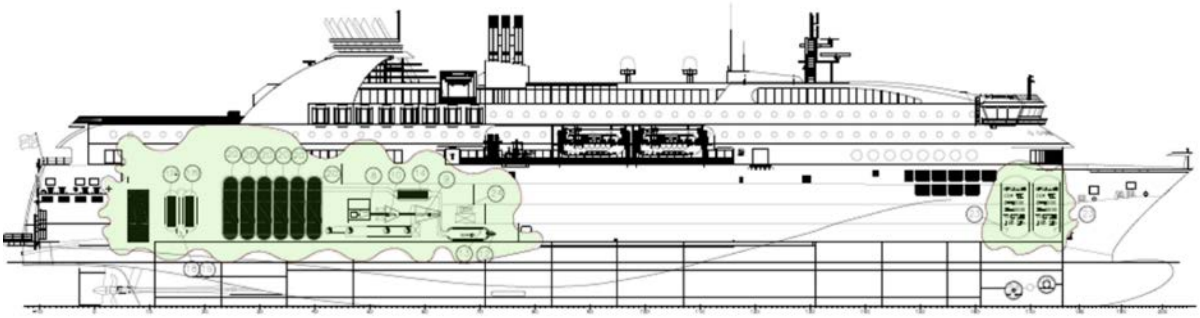
5.3. Zero-Carbon Combustion-Powered Ship Project

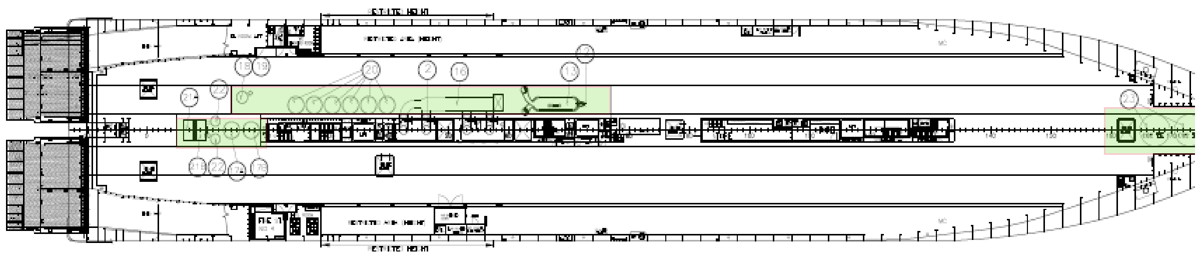
Karbon Marine is being installed on a ferry

Karbon Marine is finalising terms to install a capture unit onboard MS Bergensfjord, an LNG-fuelled passenger and vehicle ferry servicing ports in Norway and Denmark.

A consortium of Clean Marine, SNC Lavalin, and Trosvik Engineering will contract, manufacture, engineer, design and install on a turnkey basis.

Preliminary layout of Karbon Marine retrofitted to MS Bergensfjord





1. Diesel engines
2. Exhaust block and bleed valve
4. Self-cleaning filter
6. Flue gas heat exchangers
8. Steam generator/start engine
9. Flue gas compressor
10. Flue gas expander
12. Premix gas burner
13. Combustion chamber
14. Heat exchanger – high temperature gas to gas
16. Exhaust manifold
17. Heat exchanger – low temperature gas to gas
18. Condenser
19. Re-humidifier
20. Absorber column
21. Stripper
22. Re-boiler
23. CO_2 storage tank
24. CO_2 liquidiser/compressor

Emissions captured

Karbon Marine will initially capture 90% of CO_2 and eliminate 100% of methane (CH_4) from one of the four main engines and from two of the three auxiliary engines. (The LNG engines emit no SO_x, and any NO_x is removed by scrubbers before the exhaust gas reaches Karbon Marine unit.)

	Exhaust Source		*Emissions*		
	Engines	CataCarb	Total	Captured	Capture %
CO_2	2,135 kg/h	214 kg/h	1,495 t/y	1,345 t/y	90%
CH_4	7.5 kg/h	7.5 kg/h	52.5 t/y	52.5 t/y	100%

Captured CO_2 will be sold for food use or permanently sequestered

CO_2 captured onboard the ferry could be purified for sale to the food industry for up to $400/t$CO_2$. Alternatively, CO_2 could be offloaded for permanent storage at the Northern Lights sequestration facility under development near Bergen Port, a port of call for the Bergensfjord.

5.4. Benefits of Karbon Marine to Shipowners

Significant benefits for shipowners

In the long term, Karbon Marine saves shipowners the considerable cost of switching ship engines and onshore infrastructure to zero-carbon fuels such as hydrogen and ammonia.

The IMO, EU and governments already require ships to operate so as to maximise energy efficiency instead of economic returns, and require newbuild ships to be highly energy efficient. In the medium term, Karbon Marine allows shipowners to avoid such added costs.

Shipowners can sell captured CO_2 or, if they are oil producers, use it for EOR.

Financial benefits

IMO, EU and national schemes will require shipowners to purchase offsets or pay taxes on all emissions of CO_2. A shipowner could instead fit Karbon Marine plants, eliminating virtually all CO_2, NO_x and methane emissions.

Return on shipowner investment in fitting Karbon Marine[30]:

CO_2 Price	*Offset cost*	*IRR*	*Payback*
\$100	\$3.0m	6%	7 years
\$150	\$4.5m	36%	3 years
\$200	\$6.0m	61%	2 years

Simple and rapid installation

Karbon will arrange installation and testing of Karbon Marine units, indicatively as follows:

Installation partner..... Clean Marine, at its plant in Bantam, Indonesia, and drydock facilities in Singapore.

Installation time.......... 10 days in drydock

[30] For a ship emitting 30,000 tCO_2pa, capital cost of Karbon Marine is \$25 million, financed with 75% debt at an interest rate of 2.5% repaid over 10 years, investment horizon of 10 years.

5.5. Initiatives to Decarbonise Shipping

IMO emissions measures

The IMO has committed to reduce emissions from international shipping, under its pollution prevention treaty (MARPOL) – the Energy Efficiency Design Index (EEDI) mandatory for new ships, and the Ship Energy Efficiency Management Plan (SEEMP). In 2018, it adopted an initial strategy on the reduction of GHG emissions from ships.

The schemes proposed by the IMO focus on energy efficiency as a proxy for emissions reduction, using a variety of measures.

DCS............Data Collection System for fuel consumption of ships, with which the IMO has been indirectly monitoring CO_2 emissions of ships since January 2019.

EEDI...........Energy Efficiency Design Index, a satisfactory level of which all newly built ships have required since 2013.

EEXI...........Energy Efficiency Existing Ships Index, which will subject all ships to requirements similar to the EEDI.

CII...............Carbon Intensity Indicator, which each ship will in future be required to calculate (based on fuel consumed), and which must demonstrate year-on-year improvement.

SEEMP........Ship Efficiency Management Plan required by every ship, governing reporting and efficiency improvements.

Web link to IMO Marpol Treaty Annex IV

EU emissions measures

The European Parliament wants annual average CO_2 emissions from ships to decline by over 40% by 2030, and in September 2020 voted to include emissions of greenhouse gases from ships over 5,000t in the emissions trading system EU ETS. The European Commission will develop monitoring and enforcement in collaboration with the IMO.

From 2018, ships entering or departing EU ports must meet EU monitoring, reporting and verification ("MRV") obligations, which indirectly track CO_2 emissions by logging fuel consumption. The legislation passed by the EU parliament in September 2020 seeks to add limits on shipping emissions. It has been proposed that ships that enter any EU port be subject to the EU ETS requirement, although the EU is considering alternative mechanisms such as a fuel levy on ships. Although the EU recognises the need to align IMO and EU emissions measures, such alignment will require a considerable effort

Web link to EU policy re shipping emissions

National emissions measures

Some national governments are establishing more stringent rules. Norway, is part of the EU ETS program, and adds an additional levy, which will increase the cost of emitting a tonne of CO_2 in Norway to NOK 2,000 ($237).

Karbon Marine is an attractive alternative to CO_2 allowances

Shipowners can choose to purchase CO_2 emissions allowances instead of reducing ship emissions. However, the cost of CO_2 allowances is high – the price on the EU Emissions Trading System (EU ETS), a good market indicator, has reached \$50/tCO_2 and is rising. Many analysts expect significant increases by 2030[31] in the price of a tonne of CO_2.

Current EU ETS	Price June 2021	€54	\$65
Forecasts for 2030	S&P Global Platts	€56-89	\$68-108
	Energy Aspects	€65	\$79
	Bloomberg NEF	€79	\$96
	Refinitiv	€89	\$108
	Norway	NOK 2000	\$180

The industry is showing commitment to reducing emissions

The Mission Possible Partnership was launched at Davos in January 2021 as part of the World Economic Forum, to accelerate the decarbonization of shipping, transportation, and other heavy industry. It brings together over 400 companies, customers, suppliers, bankers, shareholders and regulators. It is run by the Energy Transitions Commission, Rocky Mountain Institute, the We Mean Business coalition, and the WEF, with funding from the Bezos Earth Fund and Breakthrough Energy.

www.missionpossiblepartnership.org

A global initiative by ship charterers to report greenhouse gas emissions under a standard scheme, to integrate climate considerations into chartering decisions. Signatories include ADM, Anglo American, Bunge, Cargill Ocean Transportation, COFCO International, Dow, Equinor, Gunvor Group, Klaveness Combination Carriers, Louis Dreyfus Company, Norden, Occidental, Shell, Torvald Klaveness, Total, Trafigura, and Ørsted.

www.seacargocharter.org

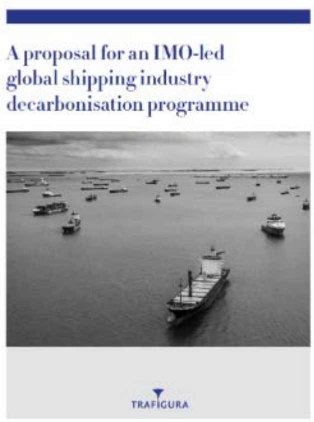
[31] S&P Global Platts 3 December 2020 https://www.spglobal.com/platts/en/market-insights/latest-news/coal/120320-analysts-see-eu-carbon-prices-at-eur56-eur89mt-by-2030

Royal Dutch Shell has taken a leadership position within the shipping industry to accelerate decarbonisation. Together with Deloitte, it prepared a report describing the shipping industry's approach to decarbonisation.

In May 2021 a Netherlands court ordered Shell to cut its 2030 global carbon emissions by 45% compared with 2019 levels. This judgement is the first legal obligation imposed on a corporation to comply with the Paris Accord.

Web link to Shell policy – Web link to Shell report

Trafigura, one of the world's largest ship charterers, proposes that the IMO introduce a carbon levy of \$250-300/tCO_2 equivalent on shipping fuels, in order to make zero- and low-carbon fuels more economically viable and more competitive, and progress towards decarbonisation of shipping.



Web link to Trafigura report

Cargill's 2050 pathway to ZERO is aligned with the commitments of the IMO to reduce GHG from shipping by at least 50% by 2050; of the Sea Cargo Charter to set a new benchmark for responsible shipping and transparent climate reporting; and of Cargill itself to reduce GHG by 30% per ton of product across its global supply chains vs 2017.

6. Karbon Carrier: Proprietary CO_2/LNG Carrier

Liquid CO_2 can be transported by ship

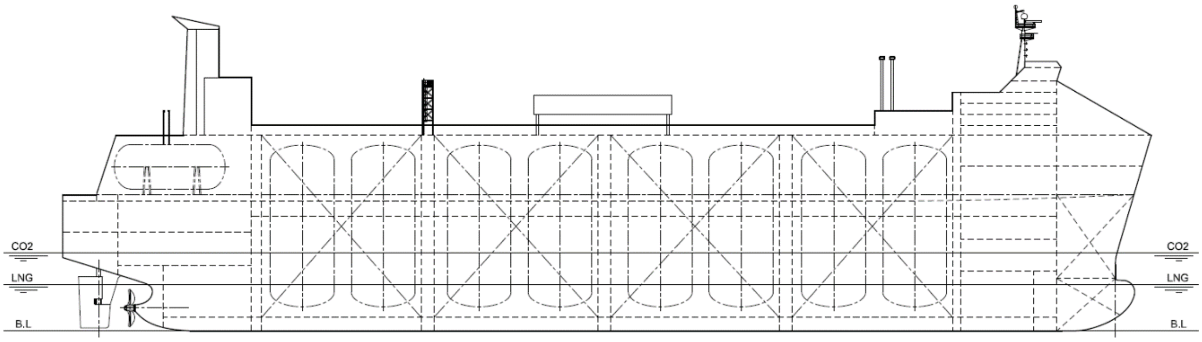
In future, large amounts of CO_2 could be shipped over long distances in large specialist vessels similar to LNG carriers. Karbon Technology, combined with shipborne transport could make CO_2 a globally traded commodity.

Karbon proprietary dual-use LNG-CO_2 Carrier

Karbon is applying its extensive shipping industry and marine engineering, ship and offshore design experience, to the design of a dual-use LNG-CO_2 carrier (the "**Karbon Carrier**"). This vessel could transport CO_2 to oilfields for EOR, and carry LNG on the return voyage. Karbon is seeking "Approval in Principle" of its Karbon Carrier design from an IACS Classification Society in the course of 2021.

Patent protection

Karbon is in the process of patenting the Karbon Carrier solution.



Reducing CO_2 transport costs

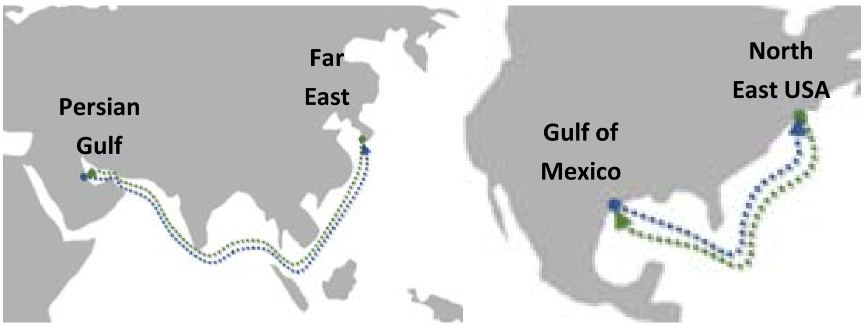
The Karbon Carrier would carry cargoes on both the outward and inbound legs of a journey, for example:

Between the Persian Gulf and the Far East

- Transport LNG from Qatar to Korea/Japan for power generation
- Return with extracted CO_2 for EOR in Saudi Arabia

Between the Gulf of Mexico and the North-East

- Transport LNG from Texas to New England for power generation
- Return with extracted CO_2 for EOR in Texas



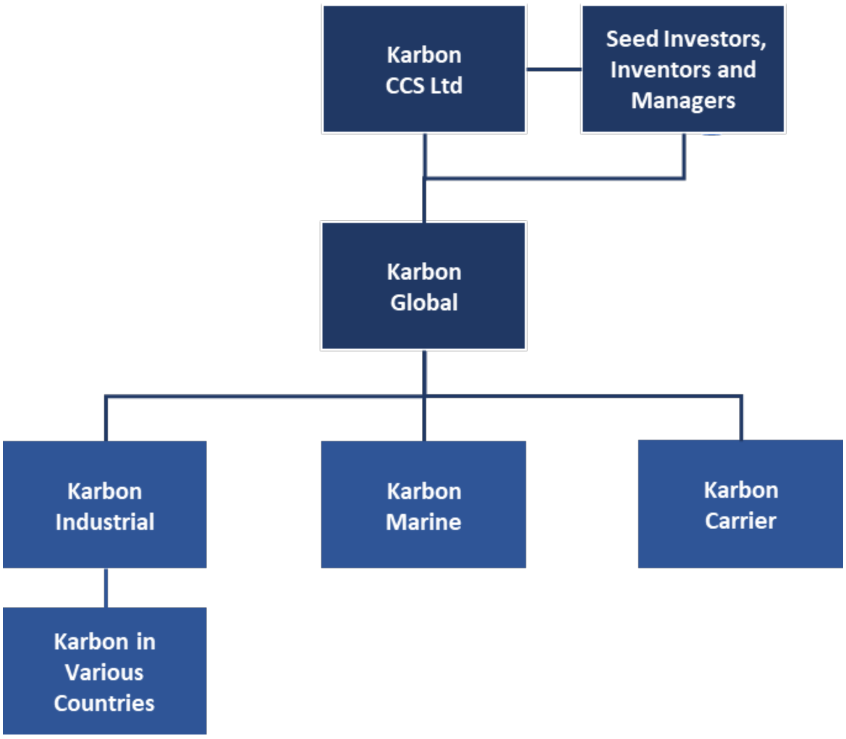
Shipping with near zero emissions

The Karbon Carrier would be equipped with Karbon Marine to capture and store its own CO_2 emissions.

7. Karbon CCS Ltd

7.1. Ownership and Structure

Karbon CCS Ltd	Owned by the management team and certain close investors. It owns the intellectual property related to the Karbon Technology, and has provided seed capital, as well as technological and commercial development.
Karbon Global Ltd	The main entity for commercialising Karbon technology, granted exclusive rights for its deployment by Karbon CCS Ltd. Parent of all subsidiaries.
Karbon Industrial	Deploys the Karbon Technology at industrial plants, in close co-operation with country partners.
Karbon Marine	Deploys the Karbon Technology on ships, in close co-operation with shipping partners.
Karbon Carrier	Develops a bespoke dual-use CO_2/LNG vessel, in co-operation with shipping and funding partners.



Intellectual property	Karbon CCS Ltd expects to grant the right to use the Karbon Technology via an Intellectual Property Agreement, first to Karbon Global and thence to each Karbon partnership, and in some instances directly to projects. Karbon CCS Ltd expects to earn a License Fee, generally an upfront payment plus a target US$ per tonne CO_2 captured during operations.

7.2. The Inventors

Knut Børseth and Henrik Fleischer and their related businesses have invested over 20 years and $50 million into the Karbon Technology.

2000 — While marketing Siemens gas turbines to the offshore industry, Knut and Henrik foresaw demand for better exhaust gas purification techniques. They developed the concept with input from specialists from Siemens and ALSTOM in Sweden, and Mats Westermark, professor of chemical engineering at the Royal Institute of Technology in Stockholm.

2002 — Knut and Henrik applied for their first patent.

2005 — Knut and Henrik received a process patent for a power plant with integrated capture.

2006-08 — The first demonstration plant was designed, built, and operated, and subsequently analysed and appraised in international scientific publications by Professor Westermark.

2009-16 — Knut and Henrik filed several more patents to firewall their proprietary technology and founded Sargas AS to develop new-build CCS plants.

At Sargas, they negotiated an IP agreement with GE, securing rights to own all IP related to the use of a specific GE gas turbine for Sargas CCS plants.

2016 — After a shareholder conflict at Sargas, Knut and Henrik founded Karbon CCS Ltd to focus on retrofitted capture technology.

2018 — Karbon filed a comprehensive patent application with respect to the Karbon Technology with the European Patent Office.

2020 — *July* — MOU with Occidental Petroleum regarding the long-term sale of 30 $MtCO_2pa$ captured from power plants in the USA.

Positive International Preliminary Report on Patentability from the European Patent Office.

August — Karbon initiated patent applications in 18 jurisdictions.

September — The Cardiff University School of Engineering successfully completed proof of concept testing of the turbine design in a high-pressure generic swirl burner.

2021 — *January* — Karbon applied for additional patent protection with respect to Karbon Marine.

February — Classification society DNV confirmed the Karbon Marine design as workable with a positive assessment of the design and mass and energy balances.

March — Karbon executed a partnership agreement with Siemens Energy, which will validate and optimise the turbine design, and grant Karbon global exclusivity to purchase SGT class turbines for CO_2 capture.

7.3. Advisory Board

Karbon Global is in discussions with industry and sector experts and regional industrialists who would comprise its Advisory Board.

7.4. Management Team

Karbon CCS Ltd. is managed by experienced technical, industrial and finance executives with long experience in chemical processes and power turbine technology, including over a quarter century designing and building carbon capture plants, in shipbuilding, and in energy and structured emissions finance. Initially, the Karbon CCS team will manage Karbon Global, which will add personnel as commercialisation gathers pace.

The current and future management team are allocated Warrants with an exercise price.

Dr Dong-Shik Shin

Co-Chairman and Shareholder

Dr Shin has spearheaded the development of Korea's maritime and shipbuilding industries. He was the Government' Technical Advisor for Maritime Affairs in the Ministry of Economic Affairs in the early 1960s before being appointed by Late President Park Jung-Hee as Chairman of the Special Maritime Advisory Committee, Senior Economic Secretary and Secretary General of the Presidential Council on Economy and Sciences. His numerous achievements include responsibility for initial planning and overall construction management of Okpo shipyard, currently DSME, the second largest and most modern shipyard in the world today. In the 1970s Dr Shin established Korea Maritime Consultants Ltd. ("KOMAC"). He has received numerous government and industry citations.

Henrik Fleischer

Executive Chairman,
Co-CEO,
Inventor and Shareholder

Henrik is a Norwegian citizen and a graduate from the Royal Norwegian Naval Academy O/MA III and Vienna University of Economics. He served in the Royal Norwegian Navy as Commanding Officer of a missile-carrying fast patrol boat. Henrik was for many years the Norwegian representative for Mitsui & Co and Mitsui Engineering & Shipbuilding Co, Tokyo and Sembcorp, Singapore shipyards in the Norwegian market. He is a serial entrepreneur in the maritime sector. In 2008, he successfully sold an owner-operator of chemical tankers which he had founded in 1997. He has since focused on commercialising carbon capture and co-invented several carbon capture patents, and is a founding shareholder of Karbon CCS Ltd.

Dr Louis van Pletsen

Shareholder and Co-CEO

Louis founded the InAfrica Group, investing in energy infrastructure, and is a shareholder in Karbon CCS Ltd. He was previously partner and co-founder of a developer and investor in the power generation and energy infrastructure sector across Africa. Previously, Louis was a partner of Denham Capital Management, a global energy and commodities private equity fund, heading its London office and serving on its Investment and Valuation committees.

	He has also been Managing Director of the International Energy Group at Nomura International, Head of Continental European Energy and Utilities for Credit Suisse First Boston, Head of International Business Development for Eskom International, Africa's largest utility, and Manager of Corporate Investment Strategy at the Industrial Development Corporation, the South African investment firm. Louis holds BCom, BCom Hons and MCom degrees from the University of the Free State, South Africa, a Doctor of Commerce in Economics from Rand Afrikaans University, South Africa, an MBA from the University of Notre Dame, USA, a HD in Company Law from the University of the Witwatersrand, South Africa, an ADP from London Business School, UK.
Divisional Chief Executive Officers	Karbon will in due course appoint divisional CEOs for Karbon Industrial and Karbon Marine.
Chief Financial Officer Karbon CCS / Global	Karbon has identified a candidate whom it will appoint subject to confirmation by an incoming investor.
Knut Børseth *Chief Innovation Officer, Inventor and Shareholder*	Knut is a naval architect with 40 years of experience in the technology field, co-inventor of the concept of Floating (Oil) Production and Storage (FPSO) vessels and designer of several FPSO vessels. He was formerly a Vice President of Petroleum Geo-Services Offshore Technology and Director of Banff Field Development Offshore UK. Knut holds a number of patents in the areas of CCS, floating production vessels and oil field development as co-inventor and inventor. He was awarded an honorary Prize from NTNF 1989, Science & Research Council, Norway.
Andres Truuvert *COO London and Shareholder*	Andres was previously COO for Karbon, a developer and investor in power generation and energy infrastructure across Africa, with nine investments in eight countries in sub-Saharan Africa. He was previously with Denham Capital Management, a global energy and commodities private equity fund, a Director of Structured Finance at Nomura International and Merrill Lynch in London, focusing on securitisation and credit derivatives. He was with Financial Security Assurance, a guarantor of securitisation bonds in New York and London. Andres holds an MBA from the Booth School of Business at the University of Chicago and a BSc in Computer Science from the University of Toronto. He is a native speaker of English, and is fluent in Estonian, French and Italian.
Dr Blazo Ljubicic *Specialist Advisor*	Blazo's expertise covers heat transfer, fluid mechanics, non-Newtonian fluids, fluid transients and the design of thermal, hydraulic and mechanical process equipment. At the Energy and Environmental Research Center at the University of North Dakota, he worked to develop Coal Water Fuel

Technology and a pilot scale Transport Reactor Demonstration Unit for coal gasification. As Director of Technology at Koch Heat Transfer, his responsibilities included directing and managing product development from concept to production. As Director of Research at Heat Transfer Research Inc, he was responsible for application-oriented research on large-scale heat transfer and associated fluid flow equipment. Blazo has applied his broad industrial experience and analytical skills to a number of studies of the performance and optimization of heat transfer equipment in the process and power generation industry. He holds MSc and PhD degrees in engineering from the University of Novi Sad, Yugoslavia.

Karbon USA Team

Karbon USA would have its own management, focusing on North America, and development and operation of the initial project in Texas.

CEO........................ A candidate has been identified, with senior responsibility for developing a full-scale carbon capture plant.

CFO........................ A candidate has been identified. For the time being, the CFO of Karbon Global will act as CFO of Karbon USA.

VP Engineering...... Karbon has identified a candidate who is currently a Senior Vice President of a major EPC-firm and has highly relevant background in CCS technology.

Don Bernard

EPC Director

Don has been an executive at some of the industry's largest EPC firms, most recently Senior Vice President of SNC-Lavalin, responsible for Business Development worldwide. Previously, Don was President of the industrial Division of ConXtech, responsible for strategic relationships and sales of construction solutions, and Vice President of project execution and sales in offshore for Dockwise. He has also been Senior Vice President of the Energy & Chemicals division at Shaw Stone & Webster and has two decades of experience in engineering and construction at Kellogg/KBR.

Lisa Murphy

Development Director

Lisa has over 35 years of experience in permitting and regulatory activities with a focus on Texas. She founded and ran her own environmental consulting firm in Austin, Texas for over 25 years until selling it to BSI Group. Previously, Lisa spent almost a decade in various positions with the Texas Commission on Environmental Quality. She holds a B.S. in Civil Engineering from Texas A&M University.

8. Appendix A: Opportunities by Country

8.1. United States of America

USA has advantages for deployment of Karbon Technology

About 12,739 thermal power plants operate in the USA. The oil and gas industry requires large volumes of CO_2 for EOR in oil fields, and existing sources are insufficient. Government grants attractive tax credits for CO_2 sequestration via EOR and permanent storage.

12,739 thermal power plants

856,851 MW of generation capacity

Thermal Fuel	*Number of Plants*	*Total Capacity*
Natural Gas	5,952	537,292 MW
Coal	738	264,073 MW
Petroleum	3,647	37,029 MW
Biomass	2,305	15,563 MW
Other Gas	97	2,894 MW
Total	*12,739*	*856,851* MW

The USA is the world leader in CO_2 EOR

EOR was pioneered and used in the USA for almost 50 years. EOR is now used in the production of about 5% of US oil, of which 450,000 barrels per day is with CO_2. The world's most active EOR region is the Permian Basin in Texas and New Mexico, which accounts for over 75% of CO_2 EOR. The Permian has extensive CO_2 infrastructure, including over 6,000 miles of CO_2 pipelines. The IEA estimates the price of CO_2 as $15-30/Mt$CO_2$.

83 US oilfields use EOR[32]

Producer	*Fields*	*Oil bpd*	*Producer*	*Fields*	*Oil bpd*
Occidental Pete	34	115,800	Amplify Energy	2	4,400
Kinder Morgan	5	53,800	Whiting Pete	1	4,000
Denbury	7	49,400	Apache	2	4,000
Chevron	6	21,000	Trinity	2	2,600
XTO Energy	3	10,900	Merit Energy	2	2,400
Denbury	1	8,000	Resolute	1	1,900
North Ward Estes	1	8,000	Anadarko	1	1,300
ConocoPhillips	2	6,000	Devon	1	1,200
George R. Brown	1	6,000	Elk Pete	1	1,000
Perdure Pete	1	5,700	Nine others	9	2,900

Market participants

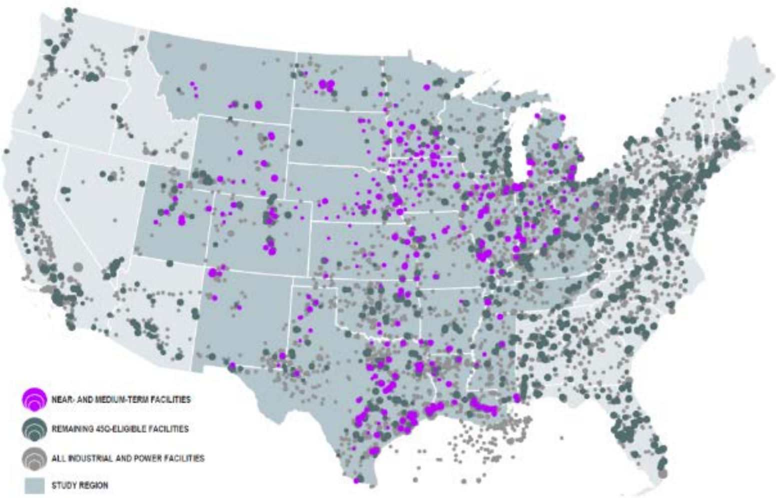
Occidental Petroleum, Karbon's prospective counterparty for CO_2 projects in Texas, is the world's largest user of CO_2, injecting 2.6b scfpd.

Kinder Morgan is the largest CO_2 transporter in North America, transporting about 1.2 bscfpd from fields in Colorado to New Mexico and Texas for EOR. It sells CO_2 and produces 20,000 bpd of natural gas liquids with EOR.Ex

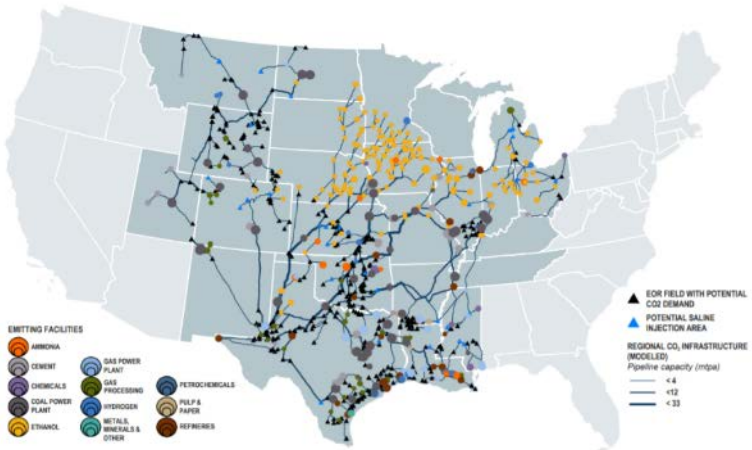
[32] Source: IEA

Existing CO_2 pipeline network is over 6,000 km[33]

Numerous emitting facilities suitable for tax credits and CO_2 capture



Potential expansion of pipeline network connecting CO_2 capture to CO_2 storage



Source: Transport Infrastructure for Carbon Capture and Storage. Great Plains Institute, University of Wyoming, June 2020

[33] Source: U.S. Department of Energy

Karbon opportunities near oilfields

Karbon is focusing on deployment at power plants in Texas, where it is actively developing a capture project at the Sandy Creek Energy Station (described below), and is in discussions with other potential hosts. The potential CO_2 off-taker Oxy has identified several suitable coal-fired plants.

Target coal-fired plants in Texas

The target coal-fired plants are large and emit more CO_2 to be extracted by a given size of Karbon plant. Coal-fired plants are under economic pressure, and therefore highly motivated to collaborate with Karbon in installing a technology that keeps them operating and dispatched.

Power Plant	*% dispatch*[34]	*Capacity*	*Cost*	*CO_2pa*[35]
Sandy Creek	59%	965 MW	$700m	7.0 MT
Oak Grove	83%	1,796 MW	$1,303m	12.8 MT
Fayette	62%	1,690 MW	$1,226m	12.0 MT
Tolk	27%	1,135 MW	$823m	8.2 MT
Harrington	38%	1,080 MW	$783m	7.8 MT
Total		*6,666 MW*	*$4,835m*	*47.8 MT*

Target gas-fired plants in Texas

Karbon Technology is less expensive and easier to retrofit to gas-fired plants, as gas handling and supplies are in place, and the host plant has gas expertise. Gas plants are, however, smaller and emit less CO_2. The plants below are near the CO_2 pipeline network.

Power Plant	*% dispatch*	*Capacity*	*Cost*	*CO_2pa*
Odessa Ector	68%	1,054 MW	$700m	2.8 MT
Quail Run	33%	550 MW	$500m	1.0 MT
Mustang	60%	487 MW	$400m	1.3 MT
Cunningham	50%	465 MW	$400m	0.9 MT
Ector County	17%	330 MW	$300m	0.2 MT
Maddox	50%	173 MW	$200m	0.4 MT
Total		*3,059 MW*	*$2,500m*	*6.6 MT*

Attractive tax equity financing based on US tax credits

Projects are expected to qualify for US tax credits of about $35 per tonne of CO_2 if used for EOR, and about $50 per tonne if permanently sequestered.[36] Such tax credits support non-recourse tax equity financing ("Tax Equity") commonly used for US renewables generation projects. Karbon believes it could raise sufficient Tax Equity to cover the cost of installing the Karbon Technology and generate a surplus.

[34] Percentage of plant capacity dispatched in the 12 months from March 2019 to February 2020
Source: The Energy Information Agency of the US Department of Energy

[35] Assumes full capacity is dispatched

[36] Legislation proposed in May 2021 would increase capture subsidies to $60 and $85 per tonne, to be paid directly as tax refunds rather than as tax credits.

Facilities qualifying for §45Q tax credits *millions of metric tonnes*

Industry	Number of Facilities	Share of 45Q-Eligible Facility Emissions	CO_2	Biogenic CO_2	Methane	Nitrous Oxide
Coal Power Plant	308	53.8%	1,269.6	0.3	3.0	6.2
Gas Power Plant	571	23.8%	565.4	0.7	0.4	0.4
Refineries	78	6.9%	163.3	-	0.6	0.4
Cement	135	3.7%	88.8	0.9	0.1	0.2
Hydrogen	57	2.7%	64.3	-	0.1	0.1
Steel	31	2.3%	54.0	-	0.2	-
Ethanol	173	1.3%	31.0	8.97	0.1	0.1
Ammonia	21	1.2%	25.1	0.0	0.0	4.1
Petrochemicals	30	1.1%	26.0	0.1	0.4	0.1
Metals, Minerals & Other	37	0.9%	19.5	-	0.4	-
Gas Processing	40	0.9%	19.9	-	0.7	-
Chemicals	16	0.8%	8.7	-	0.0	10.4
Pulp & Paper	18	0.4%	7.8	25.5	2.4	0.1
Waste	2	0.1%	0.8	1.2	0.6	-
Grand Total	**1,517**	**100%**	**2,344.2**	**29.3**	**9.1**	**22.1**

Facilities viable in medium term even without Karbon Technology *millions of metric tonnes*

Industry	Number of Facilities	Estimated Capturable CO_2 mmt/year	Share of Total Capturable Estimate	Average Estimated Cost $/ton	Range of Cost Estimates $/ton
Coal Power Plant	58	143.4	40.1%	$56	$46 - $60
Gas Power Plant	60	67.9	19.0%	$57	$53 - $63
Ethanol	150	50.6	14.1%	$17	$12 - $30
Cement	45	32.7	9.1%	$56	$40 - $75
Refineries	38	26.5	7.4%	$56	$43 - $68
Steel	6	14.6	4.1%	$59	$55 - $64
Hydrogen	34	14.4	4.0%	$44	$36 - $57
Gas Processing	20	4.5	1.3%	$14	$11 - $16
Petrochemicals	2	1.7	0.5%	$59	$57 - $60
Ammonia	3	0.9	0.3%	$17	$15 - $21
Chemicals	2	0.7	0.2%	$30	$19 - $40
Grand Total	**418**	**357.8**	**100.0%**	**$39**	**$11 - 75**

Source: Transport Infrastructure for Carbon Capture and Storage. Great Plains Institute, University of Wyoming, June 2020

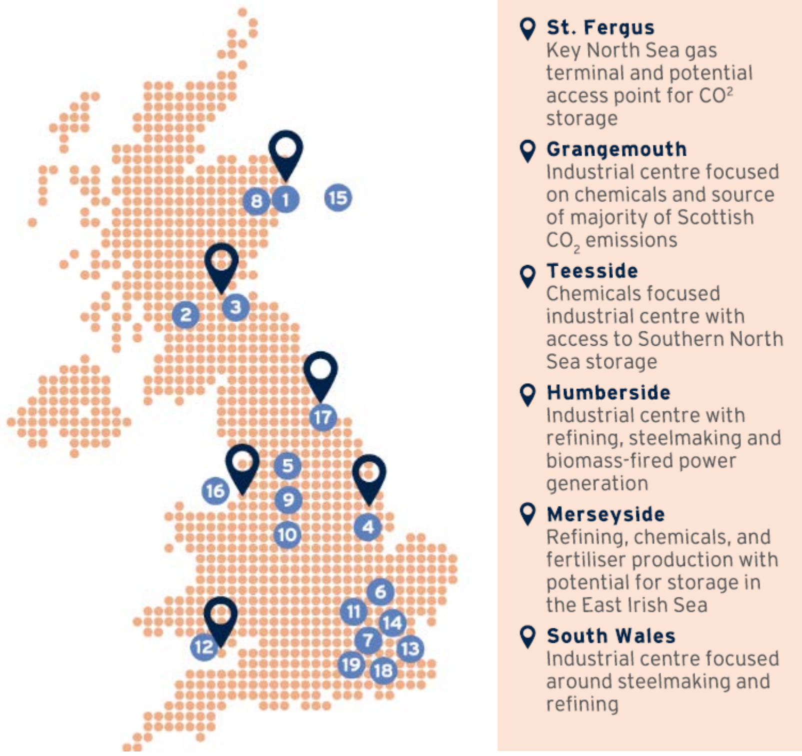
8.2. United Kingdom

Opportunity for Karbon	The British government has prioritised CCUS, established a world-class policy and industrial framework, earmarked $1.4 billion of funding, and announced an Action Plan including regional hubs for aggregating and sequestering CO_2. This provides Karbon with incentives for CO_2 capture, pipeline and sequestration infrastructure, and removes policy and regulatory barriers.
Strong CCUS policy framework with clear objectives	Objectives: • Reduce CO_2 emissions to meet climate change targets. • Decarbonise "difficult to abate" sectors of British industry, allowing their continued operation without scrapping viable infrastructure. • Economic and employment stimulus for industrial regions by implementing CCUS projects, "helping to support 50,000 jobs". • Establish the UK as a global leader in CCUS as an industry generating business and employment opportunities worldwide. https://www.gov.uk/government/publications/the-uk-carbon-capture-usage-and-storage-ccus-deployment-pathway-an-action-plan
Good potential for EOR in North Sea oilfields	North Sea oil fields are mature and declining and could likely benefit from cost-effective CO_2. Notably, one report stated as follows[37]: *"It is the view of a number of informed Task Force members, and others who have been consulted, that CO_2 EOR investments will be actively pursued, and probably sanctioned on some fields, as soon as there is confidence that CO_2 is being delivered to the Central North Sea "*

[37] "The Potential for Reducing the Costs of CCS in the UK" - UK Carbon Capture and Storage Cost Reduction Task Force May 2013

Strategy centred on CCUS hubs

Six hubs will gather CO_2 from regional power generation and other industry for offshore sequestration and possibly for EOR.



CCUS Hub:

Net Zero Teesside

Project lead...... BP as lead and operator, under the auspices of the Oil and Gas Climate Initiative (OGCI), which identified the project as one of the five global hubs for its CCUS KickStarter

Participants...... Eni, Equinor, Shell and Total.

Capacity........... Up to 6 $MtCO_2pa$

Timetable.......... FID 2023-24 and COD 2026

Website............ *www.netzeroteesside.co.uk*

CCUS Hub:

Zero Carbon Humber

Participants......Associated British Ports, British Steel, Centrica, Drax Power, Equinor, Mitsubishi Power, National Grid, px Group, SSE Thermal, Triton Power, Uniper.

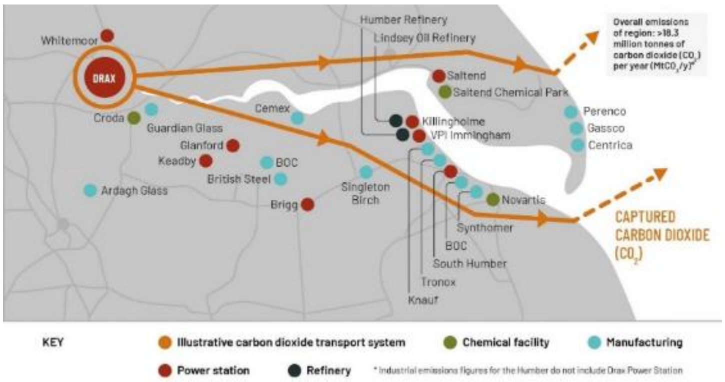
Project lead......BP, as lead and operator, under the auspices of the Oil and Gas Climate Initiative (OGCI), which identified the project as one of five global hubs for its CCUS Kickstarter

Capacity...........Up to 18 $MtCO_2pa$

Timetable.........FID 2023-24 and COD 2026

Opportunity......For Karbon, primarily the capture of up 7 $MtCO_2pa$ from Drax Power Station, which is a key part of the project and will install carbon capture to become carbon negative by 2030.

Website............*www.zerocarbonhumber.co.uk*



CCUS Hub:

HyNet North West

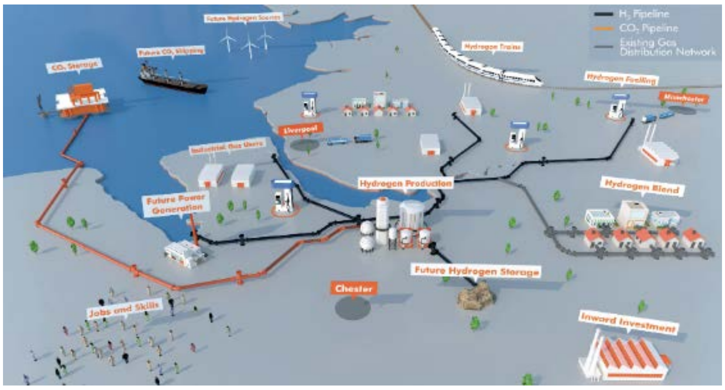
Project lead......Cadent.

Capacity...........Up to 5 $MtCO_2pa$

Timetable.........FID 2023 and COD 2025-26

Karbon.............The primary opportunity for Karbon is to capture up to 8 $MtCO_2pa$ from the Fiddler's Ferry Power Station, which would otherwise be decommissioned.

Website............*www.hynet.co.uk*



CCUS Hub:

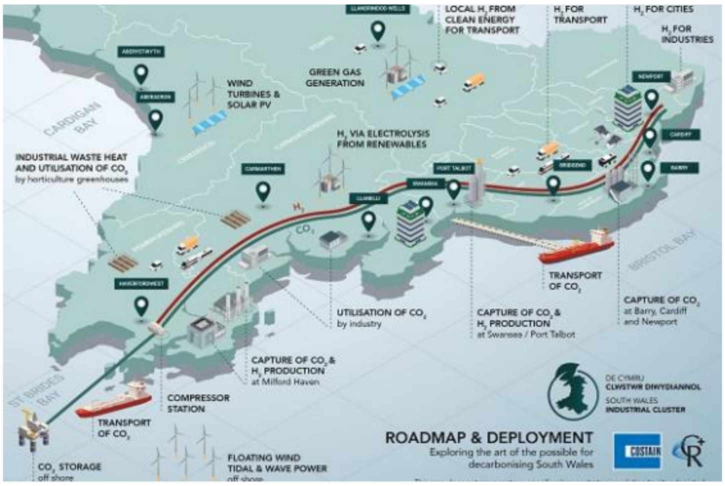
South Wales Industrial Cluster

Project lead......Costain.

Participants......Associated British Ports, Capital Law, CR Plus, Industry Wales, Lanzatech, Lightsource bp, Milford Haven Port Authority, Progressive Energy, RWE Generation, Shell, Simec Power, Tarmac, Tata Steel, The Port of Milford Haven, The University of South Wales, Valero Energy and Wales & West Utilities

Opportunity......The most immediate opportunity for Karbon is to capture up to 9 $MtCO_2pa$ from the coal-fired Aberthaw Power Station.

Website.............*www.swic.cymru*



CCUS Hub:

ACT Acorn Scotland

Source of CO_2....“Central Belt” of Scotland

Pipeline.............Repurposed onshore pipeline

Location............St Fergus Gas Terminal, arrival point of UK gas.

Website............*https://pale-blu.com/acorn/*

8.3. State of Qatar

Multiple opportunities	Qatar emits about 109 $MtCO_2pa$, for the world's highest per capita emissions of CO_2. Karbon could allow Qatar to reduce its emissions rapidly and cost-effectively, as follows: *Karbon Technology* ..... Decarbonise thermal power plants at a profit, using the captured CO_2 to boost its oil production with EOR. *Karbon Marine* ..... Decarbonise the LNG fleet by capturing the CO_2 from ship engine exhaust, to be used for EOR. *Karbon Carrier* ..... Increase revenues of the LNG fleet, by transporting CO_2 on return voyages which are now ballast legs. *Carbon Offsets* ..... Low-cost carbon offsets for Qatar Airlines. Qatar could reduce its CO_2 emissions by up to a quarter within five years, far more than possible with solar power and energy conservation, establish itself as a world leader in decarbonisation, and generate a profit in the process.
Decarbonising thermal generation	Qatar could completely decarbonise all power generation with Karbon Technology, reducing its carbon footprint by almost half:

Installed Capacity	13,000 MW	Thermal generation
CO_2 Emissions	20 Mtpa	Available for capture
Capital Investment	$12 billion	Karbon Technology and CO_2 pipelines to oilfields
Operating Cost	$100 million/year	Operated by staff of the host power plants.
Cost of Gas	*Market*	Qatar would supply the required gas fuel from its own reserves
Cost of Water	*Minimal*	The required cooling water is available from the Persian Gulf
Benefits from EOR	$5 billion/year	Value of increased oil production

Low cost of decarbonisation	The $12 billion estimate of capital investment is conservatively high, and could likely be reduced by economies of scale. Almost all Qatari plants are gas-fired and have the required supplies of gas, gas handling facilities and cooling water. The cost of O&M would be low, as it would likely be performed internally by the host plants, which have expertise in gas turbines. Fuel gas for operating the Karbon Technology would be procured at cost from local reserves. Cooling water would be from existing seawater cooling infrastructure.

Commercial arrangement

Karbon would grant a licence for the use of the Karbon Technology, and coordinate its procurement and installation.

Remuneration for the licence and technology management would be in stages, at the time of engagement, of implementation, and over the course of operation.

EOR in Qatar

Qatar could significantly increase its oil production from the Al Rayyan and other fields through the use of EOR. Operators have used EOR in several fields, including Al-Shaheen, Dukhan, Bu Hanine, and Maydan Marjam. Low-cost CO_2 from Karbon capture plants would enable Qatar to use EOR extensively and extract an estimated \$5 billion of additional oil per year.

CO_2 for greenhouse cultivation

Qatari greenhouses could significantly improve crop yields by means of CO_2 enrichment supplied by Karbon capture plants

Decarbonising Qatari LNG shipping

Qatargas currently operates 70 LNG carriers to transport its LNG world-wide, and has an orderbook of 120 more LNG carriers by 2027.

The global shipping sector, including Qatargas, must substantially reduce CO_2 emissions. Qatar could do so by switching its fleet to alternative fuels, or by installing Karbon Marine, as follows:

Karbon Marine ...... Qatar would retrofit Karbon Marine to all its carriers, to capture emitted CO_2 for storage in onboard tanks and offloading in Qatar into a pipeline for transport to oilfields for EOR. Within a few years, this would substantially decarbonise the Qatari fleet and eliminate methane slip without replacing any ship engines or fuel infrastructure

Capital Cost of Karbon Marine .... *\$4 billion*

Incremental oil revenues from EOR .... *\$1 billion/year*

	Alternative Fuels.... Qatar follows the shipping industry and adopts low-carbon fuels such as ammonia, hydrogen or methanol. It converts its ships, installs onshore storage and transport infrastructure for the alternative fuels, and pays increased fuel costs over time. *Capital Cost of Alternative Fuels*......................*$21 billion*
Qatari Carriers for both LNG and CO_2	At present, Qatari LNG carriers carry cargo only on the outbound leg of each voyage, and return empty, incurring considerable fuel and operating cost as well as the opportunity cost of capital. By adopting Karbon Carriers, Qatar could carry cargoes of CO_2 when returning, for example, from South Korea and Japan. The CO_2 is valuable in Qatar for EOR, and governments in Asia and worldwide are willing to pay significant amounts for any solution which permanently sequesters their CO_2. Karbon believes that in future, many ships will use Karbon Marine technology to capture CO_2, which they will deposit in hundreds of ports worldwide. Karbon Carriers could collect such stranded CO_2 for transport to Qatar or elsewhere in the Persian Gulf.
CO_2 offsets by Qatar Airways	Global aviation needs to offset almost 1 billion tonnes of CO_2 per year. Qatar Airways emitted 20 $MtCO_2$ in 2018. Karbon could provide Qatar Airways cost-effective carbon offsets. Qatar Airways could offset its emissions for the long term by capturing 20 $MtCO_2$pa from 3,000 MW of coal-fired plants. With Qatar Airways as long-term off-taker, Karbon could build and finance CO_2 extraction at several thermal power plants.

8.4. United Arab Emirates

191 $MtCO_2$pa of emissions presents multiple opportunities

Karbon could reduce emissions rapidly and cost-effectively. The UAE could reduce emissions by up to half within five years, establish itself as a world leader in decarbonisation, and generate a profit in the process.

Karbon Technology ..... Decarbonise thermal power plants at a profit, using the captured CO_2 for EOR.

Karbon Marine ..... Decarbonise the LNG fleet by capturing CO_2 from ship engine exhaust, to be used for EOR.

Karbon Carrier ..... Increase revenues of the LNG fleet, by transporting CO_2 on return voyages which are now dead-heads.

Carbon Offsets ..... Low-cost offsets for Emirates and Etihad Airways.

Decarbonisation of thermal generation

Karbon Technology could substantially decarbonise power generation in the UAE, reducing its carbon footprint by almost half:

Thermal generation	31,000 MW[38]	
CO_2 Emissions	54 Mtpa	Available for capture
Capital Investment	$30 billion	Karbon Technology and CO_2 pipelines to oilfields
Operating Cost	$300 million/year	Operated by host plant staff.
Cost of Fuel Gas	*Market*	UAE could supply gas from its own reserves
Cost of Water	*Minimal*	The required cooling water is available from the Persian Gulf
Benefits from EOR	$10 billion/year	Value of increased oil production

Low cost of decarbonisation

The estimate of capital investment ($30 billion) is conservatively high, and could likely be reduced by economies of scale. Most power plants in the UAE are gas-fired and have the required supplies of gas, gas handling facilities and cooling water. The cost of O&M would be low, as it would likely be performed internally by the host plants, which have expertise in gas turbines.

Fuel gas for operating the Karbon Technology would be inexpensive, as local reserves are large and underutilised. Cooling water would likely be free, as host plants are next to the Persian Gulf and have water supply infrastructure.

[38] USA Department of Energy, Energy Information Agency data for 2018

Commercial arrangement

Karbon would licence the use of the Karbon Technology, and coordinate its procurement and installation.

EOR in UAE

Abu Dhabi is increasing its oil production with EOR, helped nearly double proved reserves Dhabi during the past decade.

ADNOC plans for the UAE to be amongst the top four countries in the world in carbon capture, use, and storage enhanced oil recovery projects by 2025, with 5 $MTCO_2pa$ CCUS. Low-cost CO_2 from Karbon capture plants would enable ADNOC to expand and accelerate its use of EOR.

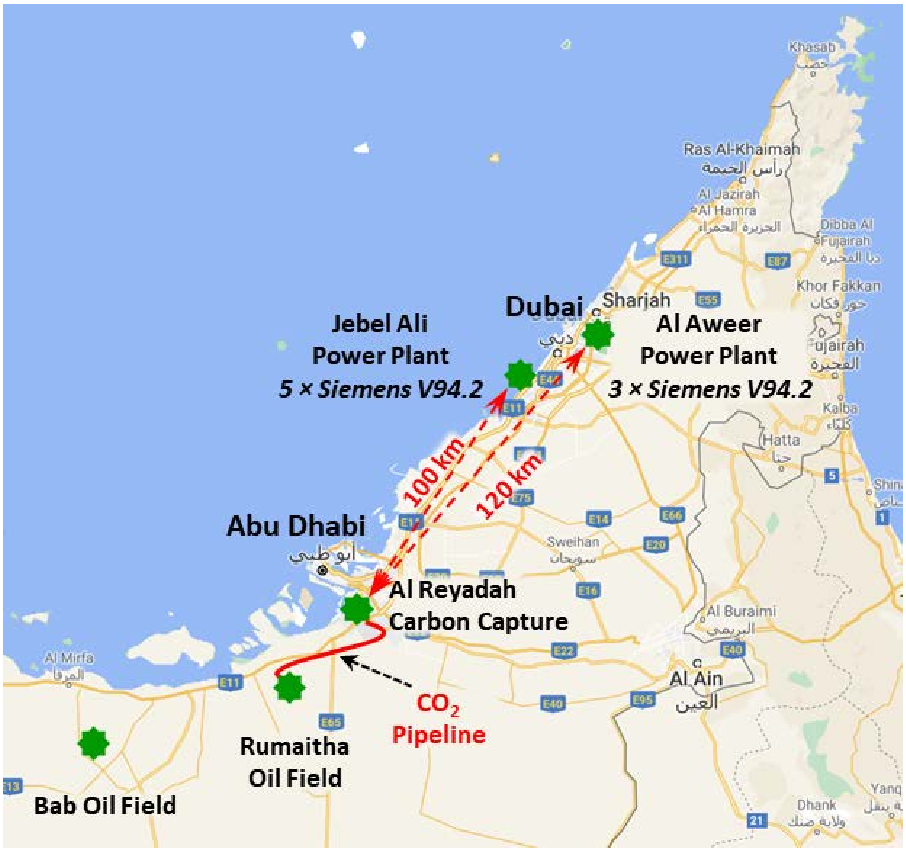
Al Reyadah - Abu Dhabi Carbon Capture Company

Al Reyadah, a 100% owned subsidiary of Abu Dhabi National Oil Company ("**ADNOC**"), is owner/operator of a project capturing CO_2 from the adjacent Emirates Steel plant. It uses amine solvents to capture from gas containing 70-80concentrated CO_2 from the Direct Reduced Iron ("DRI") process. Capture capacity is 0.8 $MtCO_2pa$.

CO_2 is transported 43 km to the Rumaitha Oil Field via an 8-inch high-pressure pipeline sufficient to evacuate 7 $MtCO_2pa$, which delivered first CO_2 in 2016.

A Karbon plant at Emirates Steel could capture further CO_2 from thermal combustion of coal, estimated as up to 9 $MtCO_2pa$.

Existing and potential CO_2 and EOR in UAE



Decarbonising UAE LNG shipping

ADNOC Logistics & Shipping operates 32 LNG, gas and oil carriers, and has 25 more on order. The following analysis shows how Karbon Marine could be installed for far less than switching the fleet to alternative fuels:

Karbon Marine...... Retrofit Karbon Marine to all 57 carriers, capture emitted CO_2, store in onboard tanks, offload in Abu Dhabi into a pipeline for transport to oilfields for EOR.

Almost entirely decarbonise the fleet within a few years without replacing ship engines or fuel infrastructure.

Capital Cost of Karbon Marine........................*$1.4 billion*

Incremental oil revenues from EOR.....*$350 million/year*

Alternative Fuels... Convert 57 carriers to ammonia, hydrogen or methanol, install onshore storage and transport infrastructure for the new fuel, and pay increased fuel costs over time.

Capital Cost of Alternative Fuels.....................*$7.1 billion*

Karbon Carriers for both LNG and CO_2

ADNOC L&S carriers now carry cargo (LNG) only on outbound legs and return empty, incurring considerable fuel and operating cost as well as the opportunity cost of capital.

Karbon Carriers would allow ADNOC L&S to carry cargoes of CO_2 when returning, e.g., from South Korea and Japan. Not only is the CO_2 valuable in Abu Dhabi for EOR, but governments in Asia and worldwide are willing to pay significant amounts for any solution which permanently sequesters their CO_2.

Karbon believes that many ships will capture CO_2 with Karbon Marine, for deposit in hundreds of ports worldwide. Karbon Carriers could collect such stranded CO_2 for transport to Abu Dhabi or elsewhere in the Persian Gulf.

CO_2 for greenhouse cultivation

Greenhouses in the UAE could significantly improve crop yields by means of CO_2 enrichment supplied by Karbon capture plants

CO_2 offsets by Emirates and Etihad Airways

Global aviation needs to offset almost 1 billion tonnes of CO_2 per year. Emirates and Etihad Airways emitted a total of 46 $MtCO_2$ during 2018.

Karbon could provide them with cost-effective carbon offsets. They could offset their emissions for the long term by capturing 46 $MtCO_2$pa from 12 GW of gas-fired power plants. With Emirates and Etihad as long-term off-takers, Karbon could build CO_2 extraction at several thermal power plants.

8.5. Kingdom of Saudi Arabia

The Opportunity for Karbon

The Karbon Technology could cost-effectively capture CO_2 from gas-fired power generation plants. Of 46 GW of gas-fired generation, 11 GW is from three plants on the coast of the Persian Gulf, which emit over 40 MtCO_2pa.

Such host plants are fuelled cost-effectively by nearby gas fields or associated gas from oilfields. Although Saudi Arabia has enormous gas reserves, it exports none and flares over 1 tcf of gas per year.

Saudi Aramco is keen to use EOR at Ghawar, the world's largest oilfield, which is located 80-120 km from the host plants, and already operates a pilot EOR program at Ghawar.

Opportunity

Karbon could licence its technology to Saudi entities to finance, install and operate the Karbon Technology to capture essentially all CO_2 emitted by the three plants. Karbon would receive a royalty upfront and on each tonne of CO_2 extracted. Saudi Aramco would construct and operate CO_2 pipelines from the host plants to its oilfields.

Capital cost

Karbon estimates the capital costs of Karbon facilities at the three plants as under \$5 billion. Costs would be reduced by (i) economies of scale; (ii) pre-existing supplies of gas, gas handling facilities and cooling water (as the plants are gas-fired); and (iii) in-house EPC and O&M by the operators of the plants. About 450 km[39] of CO_2 pipeline would be constructed from the three plants to oilfields, at a cost which estimated as under \$1 billion.

Operating costs

O&M would be inexpensive as likely performed internally by the host plants, which have expertise in gas turbines. Fuel gas for operating the Karbon Technology would be extremely inexpensive, as local reserves are large and underutilised. Cooling water would likely be free, as the plants are on the coast of the Persian Gulf and have their own water supply infrastructure.

Potential benefits to Saudi Arabia

Low-cost CO_2 from the Karbon plants would allow the aggressive use of EOR in the region. For example, Saudi Arabia could extract over \$5 billion of additional oil per year, with only the CO_2 from three coastal power plants which would cost under \$6 billion to construct.

[39] Quarayyah, Ghazlan and Jubail are 80 km, 100 km, and 120 km, respectively from the Aramco test EOR site at Uthmaniyah in the Ghawar field.

8.6. Kingdom of Bahrain

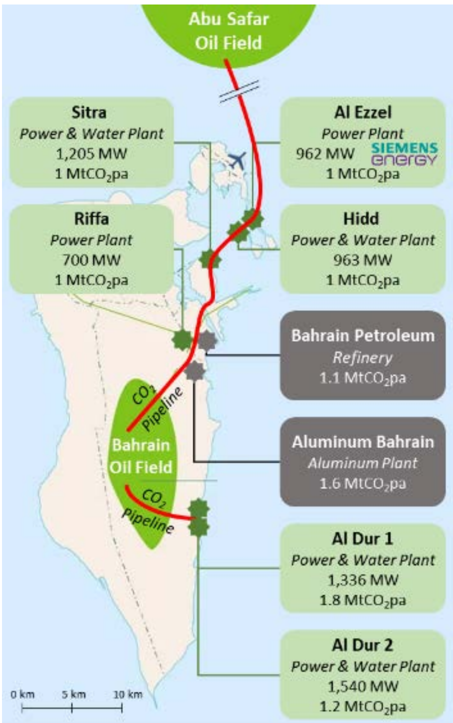
The Opportunity for Karbon

Karbon plants could capture substantially all exhaust gas of all power and industrial plants, meet environmental commitments, provide Bahraini oil fields with much-needed CO_2 for EOR.

Capture of CO_2 from industrial and power plants

Karbon Technology could capture up to 9 $MtCO_2pa$ and decarbonise six power stations, and the Bahrain Petroleum Company (BAPCO) and Aluminium Bahrain (ALBA) plants, at a capital cost estimated as under $3 billion.

The CO_2 would be transported by pipelines to be built to the Abu Safar and/or Bahrain oil fields, both of which require CO_2 for EOR. Substantial and inexpensive CO_2 for EOR could transform the economics of both fields, and increase oil production sufficiently to cover the capital cost of the Karbon plants within a few years.



Al Ezzel
Power Plant

Al Ezzel is an attractive host for an initial carbon capture plant, as it already uses Siemens V94.2 gas turbines suitable for the Karbon Technology, and gas and cooling water are available. One turbine could be converted to compression of exhaust gas, to extract up to 1 $MtCO_2pa$, reducing generation capacity from 140 MW to 56 MW.

Bahrain Petroleum
Refinery

The refinery is also attractive for an initial plant, as it is within 10 km of the Bahrain Field, a 164,000 tonne per year CO_2 capture plant using another technology is already installed, and gas and cooling water are available.

Al Dur 1&2
Power & Water Plants

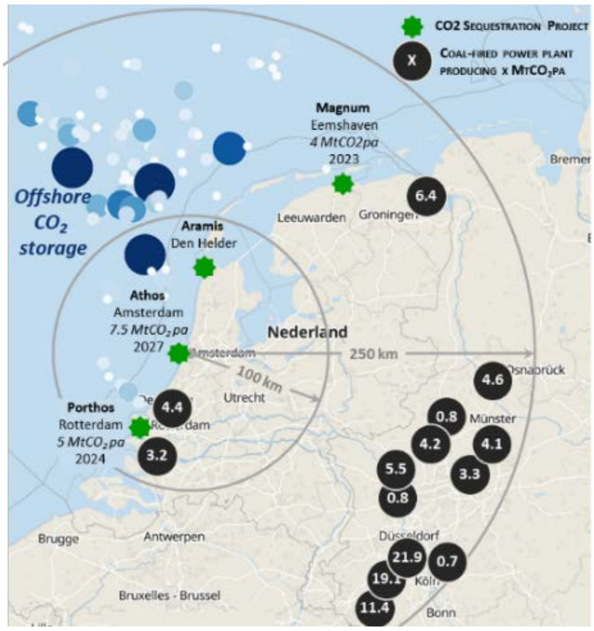
Al Dur represents an excellent opportunity for a large-scale Karbon plant capturing up to 3 $MtCO_2pa$. The Al Dur plants have gas, cooling water and available land within 10 km of the Bahrain Field.

8.7. The Netherlands

Four CCUS projects are underway

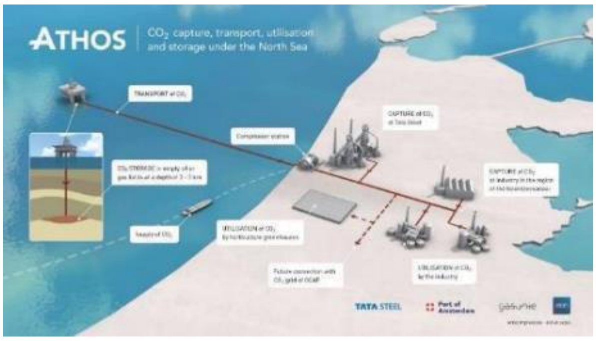
The projects have capacity to sequester up to 1,678 $MtCO_2$ in 104 reservoirs under the North Sea using disused gas pipelines, wells and platforms.

260 $MtCO_2$pa is available for capture from coal-fired power plants and other industry in Netherlands, Germany and Belgium in a 250 km radius.



Source: North Sea Energy Atlas, EBN & Gasunie estimates, Carbon Brief

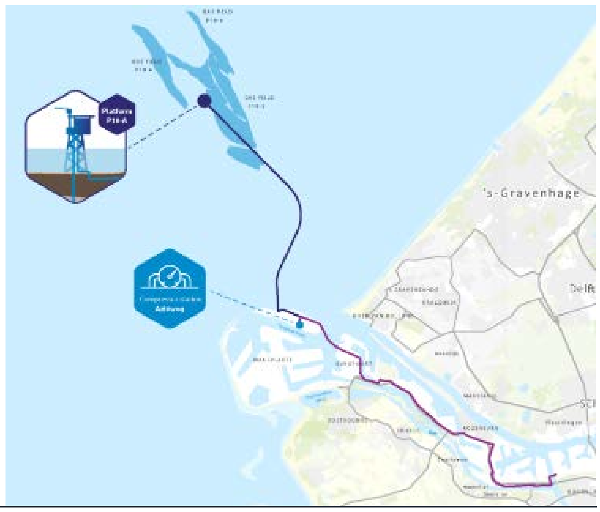
Athos CCS Project Amsterdam



Collect CO_2 from Tata Steel works and other facilities nearby, for transport by pipeline to the North Sea for sequestration, with some used in horticulture in nearby greenhouses. The developer is a consortium of Gasunie, Energie Beheer Nederland (EBN), the Port of Amsterdam and Tata Steel. Funding from the Netherlands government and the EU Connecting Europe Facility.

Porthos CO_2 Transport & Storage Rotterdam

Collect CO_2 from area industry, including Air Liquide, Air Products, ExxonMobil and Shell, for sequestration offshore. Participants include the Port Authority of Rotterdam, Gasunie and EBN, with funding from the EU.



8.8. Romania

Overview

Much Romanian power generation is from coal, and is located near mature oilfields which could benefit substantially from EOR.

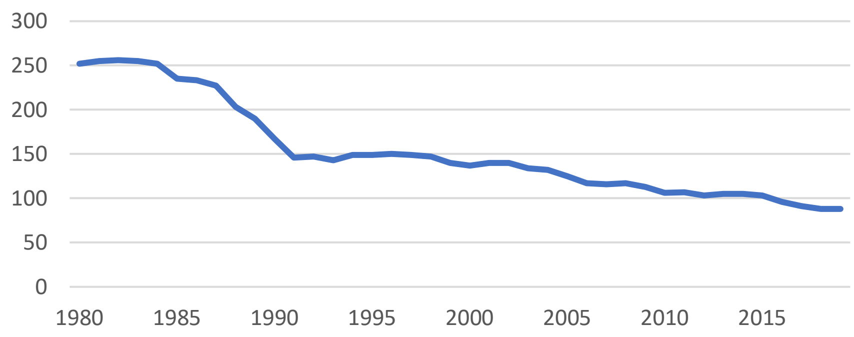
Concessionary funding

Considerable funding is available from the EU and the EIB for mitigation of CO_2 emissions, and for economic development in Romania.

CO_2 is in demand for EOR in Romania

Romania has some of the world's oldest oilfields. Oil production has been declining for four decades. Although EOR is therefore a high priority, little CO_2 is available in the area.

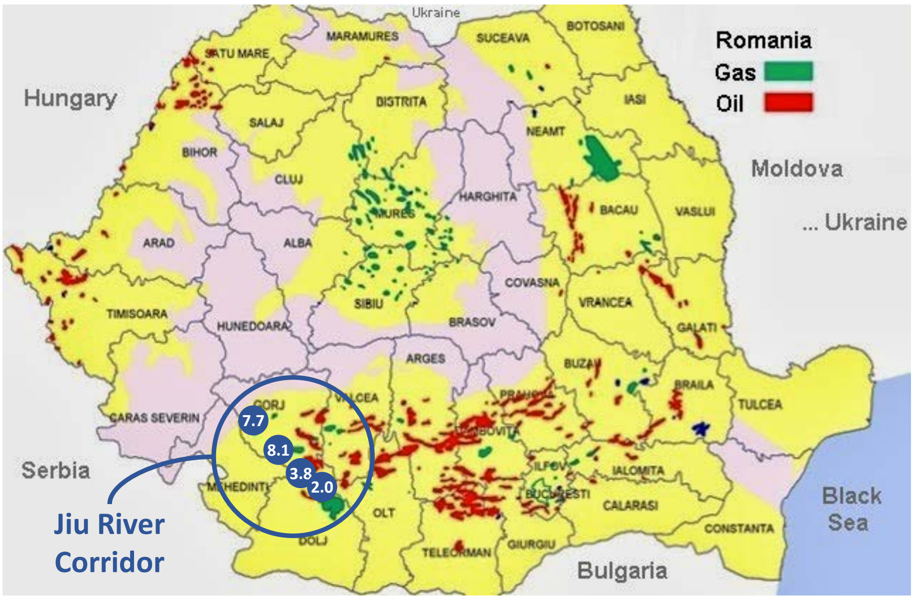
Petroleum liquids produced – bpd thousands



Source: US DOE EIA

CO_2 capture opportunities

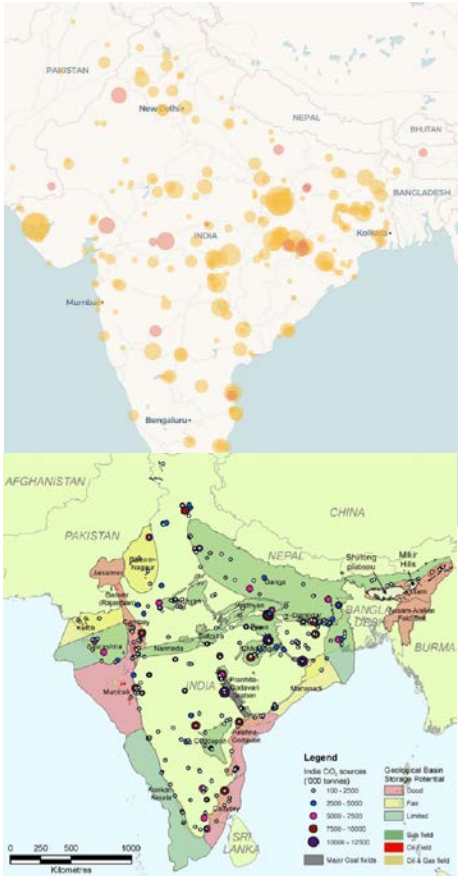
About 21.6 $MtCO_2pa$ is available for capture from four coal-fired power plants in south-western Romania within a 50 km radius, with installed capacity of 3,570 MW. The power plants are situated along the Jiu River, a corridor for oil pipelines from nearby mature oilfields suitable for EOR.



8.9. Republic of India

Coal-fired Generation in India

Karbon could capture CO_2 from 229 GW of coal-fired and 25 GW of gas fired power generation plants.



The captured CO_2 could largely be sold profitably for EOR in India's oilfields. Oil production has declined in India because much is from aging wells that have become less productive over time. Domestic exploration companies are trying to extend the lives of currently operational wells, for which EOR is well-suited. Cairn Oil & Gas, Vedanta Limited uses EOR in India.

CO_2 could also be permanently sequestered. Suitable geological basins are near certain sources of CO_2, notably on the northwest coast. E.g., six coal-fired plants on the Gulf of Kutch in Gujarat have combined capacity of over 10 GW and emit over 35 $MtCO_2$pa.

NTPC is also considering using of CO_2 as feedstock for methanol.

Opportunity

Through its subsidiary Karbon India, Karbon seeks to partner with NTPC, the owner and operator of 70,000 MW of mainly coal-fired power generation, and with BHEL, the major EPC and producer of power equipment.

Karbon India would provide the Karbon Technology to NTPC, which would install it at its coal-fired and gas-fired generation plants, or other plants. Karbon would receive a fee and a percentage of the EPC cost up front, and a percentage of the proceeds of CO_2 sales over time.

Capital cost

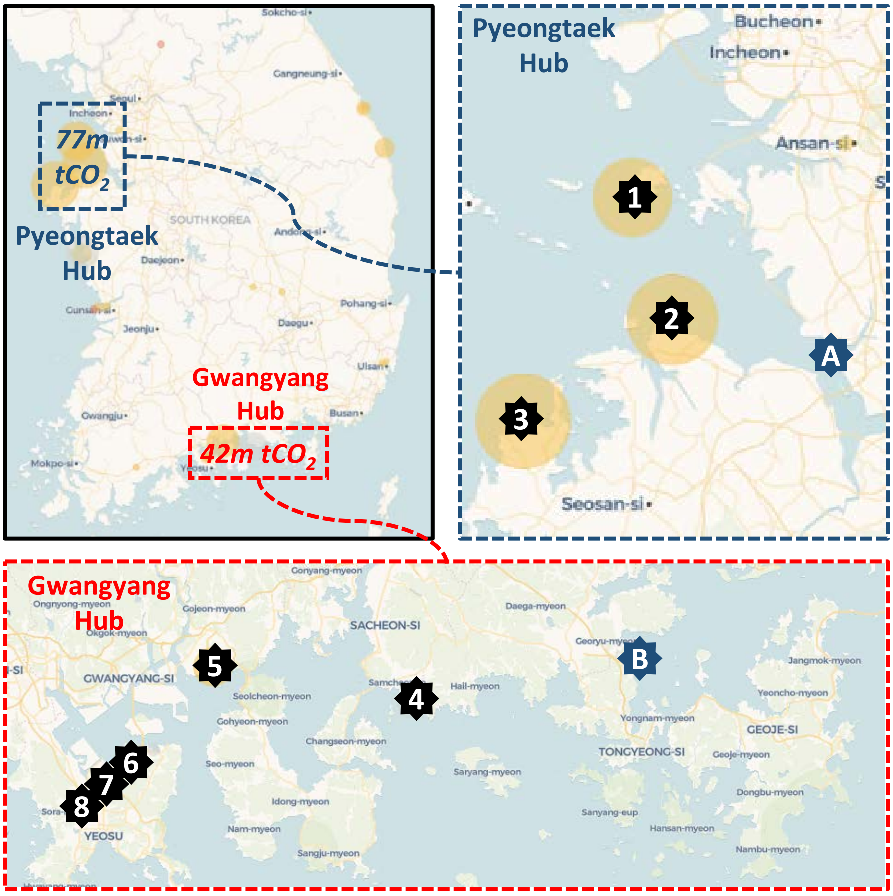
The capital cost would be financed on the basis of (i) CO_2 sold for EOR or another use, (ii) funding from coal-fired power plants keen to remain open in the face of climate pressure, (iii) government subsidies, (iv) the sale of carbon credits on global markets, and/or (v) a CO_2 offset program with Air India.

8.10. Republic of Korea

Coal-fired Generation in South Korea

Karbon technology retrofitted to eight large coal-fired power plants (the "**Target Plants**") could capture up to 119 Mt of CO_2 almost 20% of the nation's CO_2 emissions, with a value of over $2.4 billion per year[40].

Target Plants:
25,953 MW capacity
119 $MtCO_2$pa emissions



Hub	#	Facility	Type	Capacity	CO2 Mtpa
Pyeongatek	1	Yeongheung	Power Plant	5,080 MW	22.0 Mtpa
	2	Taean	Power Plant	6,400 MW	28.4 Mtpa
	3	Dangjin	Power Plant	6,040 MW	26.7 Mtpa
	A	Pyeongtaek	*LNG Terminal*		
Gwangyang	4	Samchonpo	Power Plant	3,240 MW	16.6 Mtpa
	5	Hadong	Power Plant	4,000 MW	19.0 Mtpa
	6	Yeoso	Power Plant	679 MW	3.5 Mtpa
	7	Yeoso Hanwa	Power Plant	250 MW	1.4 Mtpa
	8	Kumwo Yeosu	CHP	264 MW	1.4 Mtpa
	B	Tongyeong	*LNG Terminal*		
Total				**25,953 MW**	**119 Mtpa**

[40] 119 MtCO2 at a conservative value of $20/t based on US EOR markets

CO_2 could be removed by ship	The extracted CO_2 could be transported by ship. All the Target Plants are on the sea with docking facilIties, allowing CO_2 carriers to load CO_2 easily. CO_2 could be sold, for example to the Persian Gulf for EOR. Saudi Aramco has recently announced a program to import CO_2 from Korea for use in its oil fields. Oman, the United Arab Emirates and other oil producers also have pilot EOR programs in place and represent strong demand for CO_2. The cost of shipping in large carriers is estimated as about \$20/tCO_2.
Dual-cargo carriers	All Target Plants are within 70 km of an LNG terminal. This presents an opportunity to use dual-cargo carriers such as the "Karbon Carrier" designed by Karbon. Dual-cargo carriers would transport LNG or LPG from the Persian Gulf to the Pyeongtaek and Tongyeong terminals, where they would load cargoes of CO_2 from the Target Plants. CO_2 would be gathered from the power plants to the Pyeongtaek and Tongyeong LNG terminals by either shuttle CO_2 carriers and/or by short CO_2 pipelines to be built in due course.
Benefits for the Republic of Korea	The Republic of Korea aims to reduce GHG emissions by 173 MtCO_2eq by 2030. The Karbon scheme described above above would achieve 69% of this goal for only \$1.2-3.0 billion a year, while allowing Korea's fleet of coal-fired power generation plants to remain in operation.
Korea Electric Power Corporation ("KEPCO")	KEPCO is the largest electric utility in South Korea, with over 33,700 MW of coal-fired power generation capacity. KEPCO is looking to engage Karbon to prepare a feasibility study of CO_2 capture at certain of its coal-fired plants which are facing closure due to high CO_2 emissions. KEPCO and Karbon are discussing the terms of the engagement.

8.11. People's Republic of China

The Opportunity for Karbon

China emits about 10 $BtCO_2pa$, over a quarter of global CO_2. Its fleet of coal-fired power generation is the world's largest: 1 million MW in operation emitting about 7 $BtCO_2pa$, with 250,000 MW more under development.

In September 2020 President Xi Jinping pledged China would reach "peak carbon" before 2030, and drive down emissions to virtually zero by 2060. This will require a significant effort, including carbon capture.

Many oilfields near power generation

Reserves total about 26 billion barrels of commercially recoverable crude. Many oilfields are old and tapped out. China has used EOR with a variety of materials, including CO_2, which is not yet widely available in scale.

Of the four largest petroleum companies, three have undertaken CO_2 flooding pilots (PetroChina, Sinopec and Shaanxi Yanchang) and one (CNOOC) has considered EOR for its offshore fields in the China Sea.

The Shengli oilfield is a candidate

The Shengli oilfield, which is pioneering EOR in China, is located in the highly developed Yellow River Delta area. Over 50 coal-fired power plants are within 200 km, of which over 20 exceed 1,000 MW of capacity. Amine-based carbon capture plants are being installed to extract CO_2 to be transported by pipeline or ship to Shengli for EOR.

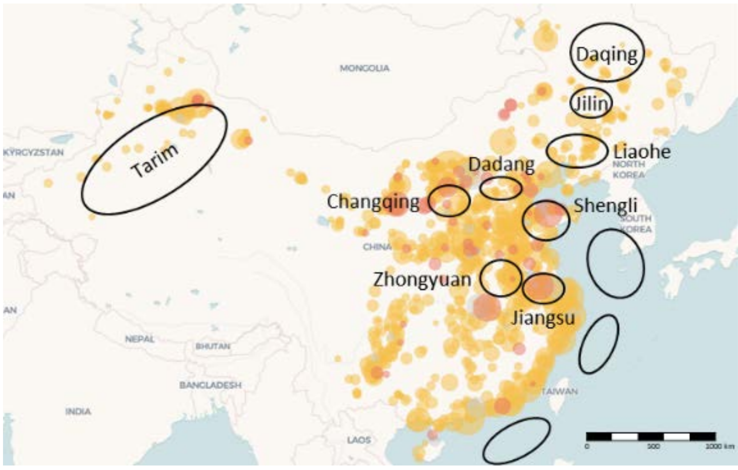
An enormous addressable

Karbon could potentially capture 5% of emissions from coal-fired generation in China (350 $MtCO_2pa$ from 50 GW of generation capacity), at a royalty of $3/$tCO_2$, generating revenues of $1 billion per year.

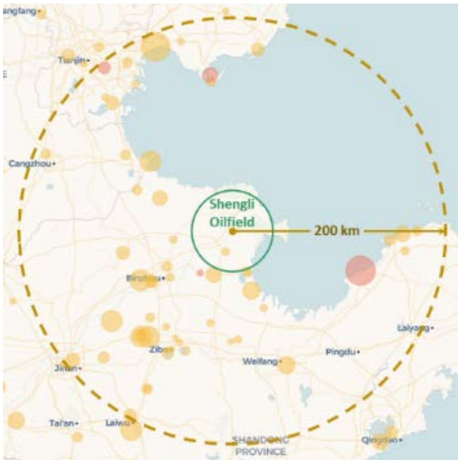
Approaching the Chinese market

Karbon would approach the China market together with one or more partners which have the leverage to enforce a fair deal, and protect the Karbon IP. Karbon has a patent pending in China.

Oilfields overlaid onto coal-fired power plants



Shengli Oilfield



9. Appendix B: Project in the USA as Principal

9.1. Background

EOR in the USA is an early opportunity	Karbon is pursuing CO_2 for EOR in the USA, which it can scale rapidly and where it is in discussions with several power generation and industrial plants. Such plants likely qualify for substantial US government "Section 45Q" tax credits for capturing CO_2 for either EOR or for sequestration, *e.g.*, in exhausted oil wells. Karbon could also licence the Karbon Technology to developers or the owners of industrial plants.
MOU with Occidental Petroleum (USA)	Karbon has executed a Memorandum of Understanding with oil major Occidental Petroleum ("Oxy"). Under a 12-year extendable contract, Oxy would purchase up to 30 $MtCO_2pa$ of CO_2 extracted by three Karbon plants in Texas, which would be transported through a pipeline to be built, and Oxy would pursue CO_2 capture at such three plants exclusively with Karbon. Oxy is a world leader and the world's largest user of EOR particularly in the nearby Permian Basin, and a prospective partner for permanent sequestration.
Initial project at a coal-fired power plant in Texas	The most developed opportunity is the 965 MW Sandy Creek coal fired power plant emitting up to 7 $MtCO_2pa$. Karbon completed a Pre-Feasibility Study in 2019 and has started detailed engineering. Karbon expects Section 45Q tax credits (at least \$35/tCO_2 for 12 years) would support up to \$2 billion of tax equity financing for this plant, sufficient to construct the Project and the CO_2 pipeline and leave a substantial profit.
Progress towards financial close	Karbon has long collaborated with global EPC contractors, including SNC-Lavalin, which has worked with Karbon and its team since 2010. EPC contractors, Siemens and key equipment suppliers consider it feasible to retrofit the Karbon Technology. On the basis of discussions with several EPC contractors, Karbon believes that offers will be available for lump sum turn-key EPC with process, schedule and financial guarantees. Karbon targets financial close in 2022 and commercial operation in 2024 for Sandy Creek, and COD for the other two Texas projects by 2025.

9.2. Project Overview

Sandy Creek Coal-fired Power Plant	Karbon proposes retrofitting Karbon Technology (the "Project") to the existing Sandy Creek Energy Station, a 965 MW coal-fired power plant in Riesel TX, ("Sandy Creek"). At full capacity, it would extract over 90% of exhaust gas CO_2, about 7 million tonnes per year, for EOR or permanent sequestration by injection into underperforming oil wells. The Project could be operational within 2023 at a cost of about $700 million.
Oxy as off-take partner	Under the MOU, Oxy would purchase CO_2 for 12 years, extendable by Oxy for a further 5+5 years, at a base price plus potentially an incentive arrangement.
Host agreement	The Karbon Technology would be constructed and operated under long-term agreements at the Sandy Creek site, which is more than large enough to accommodate the installation.

Potential Layout of the Karbon Project at Sandy Creek

Karbon and Sandy Creek are in the process of negotiating the business, financing and technical model for the Project.

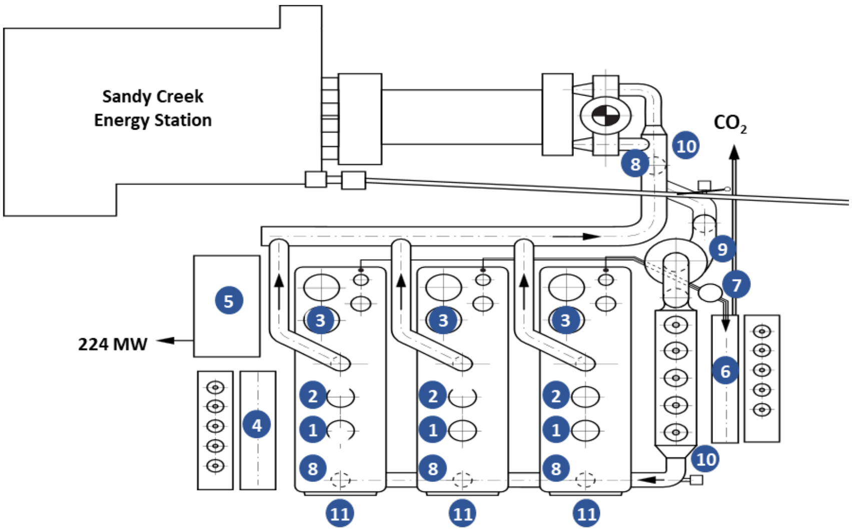
In the simplest model, Karbon would develop, finance, construct, own and operate the Project at the Sandy Creek site, and purchase all exhaust gases produced by Sandy Creek. However, this model entails concerns for both parties, for example with respect to operational responsibility, security, liability, and risk management.

The parties are therefore considering an alternative, namely for (i) the owners of Sandy Creek to arrange construction finance; which is (ii) refinanced with tax equity when issued after COD; (iii) Sandy Creek to act as principal developer, financier, constructor, owner and operator of the Project; (iv) Karbon to hold a structured participation in the profitability of the Project; and (v) the parties to allocate risks by means of contract.

Indicative configuration

Exhaust gas is mixed with natural gas and air for re-combustion in three Siemens SGT6 2000E gas turbines. The pressurised exhaust gas is processed with hot potassium carbonate to produce high-quality CO_2. The gas turbines provide 224 MW of generation for internal use and sale to the grid.

Indicative layout

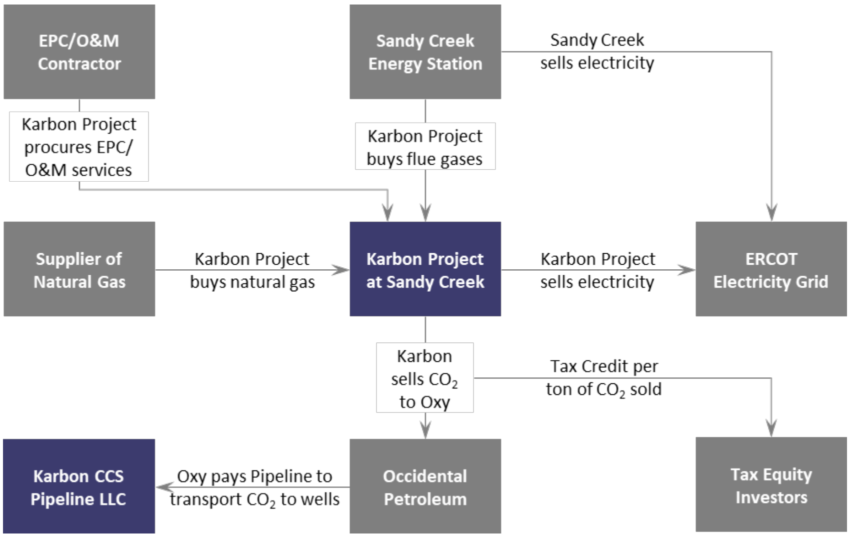


1. SGT6-2000E gas turbine
2. Heat recovery unit
3. Absorber
4. Steam turbine generator
5. Switchyard
6. CO_2 export compression, H_2O abatement
7. Flue gas oxygen capture
8. Block and bleed butterfly valve
9. Flue gas cyclone
10. Electric motor for flue gas booster fan
11. Air inlet for gas turbine

Inputs	*Exhaust gas*	Karbon will purchase all exhaust gas produced by Sandy Creek, at a price to be agreed.
	Natural Gas	About 30 million MMBTU per year of natural gas, currently for about \$2.50/MMBTU.
	Water	About 9 million tonnes per year of cooling water, available at site at about \$1 per tonne.
Outputs	*CO_2*	The Project would extract over 90% of CO_2 and deliver up to 7 million tonnes per year of EOR-ready CO_2, which Oxy would buy take-or-pay at the plant gate for 12 years, and transport to its oil wells at its own cost.
	Electricity	The Project would generate 9.5 million MWh per year, primarily for its own use, with an excess of about 22% available to sell to the grid or Sandy Creek, indicatively at \$24 per MWh.

	NO_x, SO_x, Mercury, particulate matter	The Project would extract substantially all pollutants for safe disposal at minimal cost, with no commercial use therefor seen at present.

Commercial inputs and outputs



Prospective parties to the project

Plant host	*Candidate:* Sandy Creek Energy Station	In operation since 2013. Majority shareholder is LS Power, a large US independent power and energy infrastructure developer. The other shareholders are Brazos Electric Cooperative and Lower Colorado River Authority.
Off-taker of CO_2	Occidental Petroleum	Oxy has signed an MOU for take-or-pay off-take at plant gate of all CO_2 produced for 12 years, extendable to 22 years).
EPC and O&M Contractors	*Major global contractor to be selected*	Contractors will be engaged on a fixed-price lump-sum turnkey basis with process, schedule and cost overrun guarantees and damages. Global contractors which have expressed interest in being EPC and/or O&M contractor include SNC Lavalin (Canada), Technip (France), and CTCI (Taiwan). Karbon and its team have a longstanding relationship with SNC Lavalin, a well-established global engineering and construction firm with operations in 160 countries. SNC Lavalin has reviewed the Project configuration, cycle reviews, taken part in discussions with the OEMs, Plant Owners and Oxy, and concluded

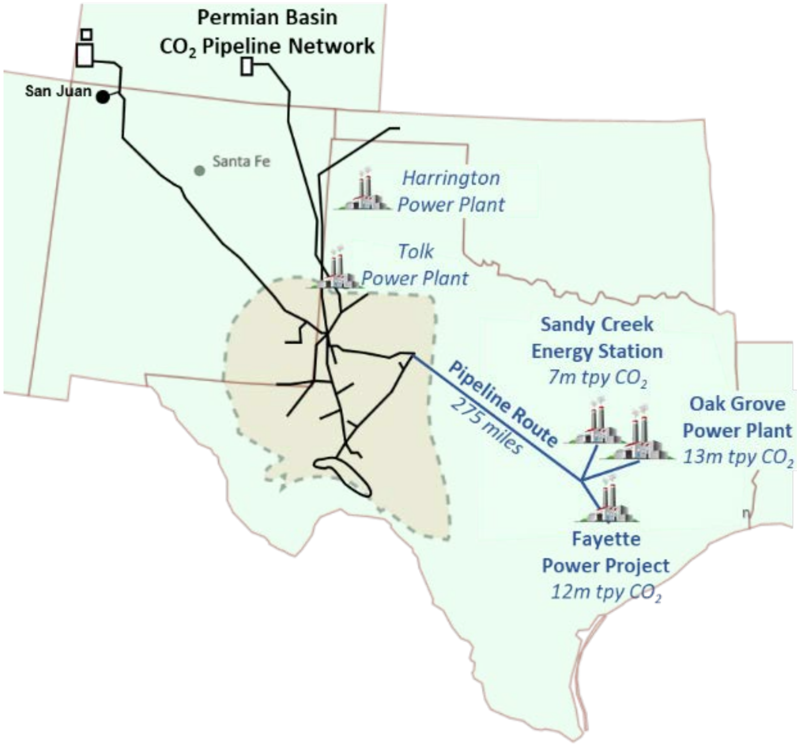
		that the Project is viable and capable of delivering EOR-grade CO_2.
Owners Engineer	*To be selected*	Karbon will engage a qualified global engineering firm.
Turbine Supplier	*Preferred bidder:* Siemens Energy AG	Siemens is a leading multinational technology conglomerate headquartered in Germany, and the largest industrial manufacturer in Europe.
Tax Equity Investors	*Interested parties*	The large base of potential tax equity investors includes Bank of America, J.P. Morgan and GE Capital, Berkshire Hathaway and Alphabet. Interest has been expressed by GE, which is experienced with CCS and the Karbon team, and by LS Power, lead owner of Sandy Creek.

Indicative operating revenue *Assuming operation at full capacity*	*Revenue*	Sell CO_2 for EOR	$142m
		Sell electricity to grid	$50m
		Total revenue	*$192m*
	Expense	Purchase natural gas	$75m
		Purchase exhaust gas	$10m
		Purchase water	$10m
		O&M cost	$8m
		General & Administrative	$2m
		Total expense	*$105m*
	EBITDA		*$87m*

9.3. CO_2 Pipeline

Pipeline from Sandy Creek to the Permian Basin

A 275-mile pipeline (the "Pipeline"), indicatively 24" in diameter, will be required to transport CO_2 for EOR to wells in the Permian Basin, initially up to 7 mtpy from Sandy Creek Energy Station.



Karbon will build the CO_2 Pipeline

The construction and operation of the Pipeline would be through a separate LLC, with management and ownership by Karbon as principal and/or in partnership with local developers. Oxy would use the Pipeline under a long-term contract which covers the cost of construction, financing and operation. Oxy would be responsible for resolving right-of-way issues, the cost of which will be credited to the Pipeline.

Further projects in Texas with Oxy

The Karbon-Oxy multi-plant MoU also covers further power plants in Texas. The next likely candidates are the Oak Grove and Fayette plants, located 55 km and 175 km from Sandy Creek, respectively, which together produce up to 25 million tonnes of CO_2 per year. The Pipeline would be extended to such plants and its capacity increased by adding compressors. This would reduce the cost of transportation to about \$4 per tonne of CO_2, from about \$8 per tonne for only Sandy Creek.

Parameters

Assuming pipeline diameter is 24"

Phase	*Capacity in metric and US units*		*Cost*
Sandy Creek	10m tpy	500 mmscfd	\$700m
Capacity increase	10m tpy	500 mmscfd	\$200m
Total	*20m tpy*	*1,000 mmscfd*	*\$900m*

Funded from one or more sources	*Tax Equity*	The Pipeline could be combined into the Tax Equity financing even though it generates no §45Q tax credits, as its accelerated tax depreciation is valuable. It might also be financed separately, as some tax investors have a policy of avoiding pipelines, which can bring environmental concerns. In either case, the §45Q credits will allow more tax equity to be raised than required for the Project. Karbon could invest the excess tax equity proceeds in the Pipeline on an arm's-length basis. In either case, once the Pipeline is operating, it could be refinanced or sold to extract substantial value.
	Project Equity	The Pipeline would be attractive to infrastructure investors, due to its stable, high-quality committed long-term revenues.
	Project Finance Debt	The Pipeline would qualify for project finance debt from banks, possibly including those involved in tax equity or construction financing.
	Debt from the Department of Energy	The US DoE is actively promoting carbon capture and has expressed preliminary interest in providing debt on concessionary terms. Such debt would further increase the credibility of the Pipeline in the eyes of tax equity investors.