

Industrial Processes Emissions Reduction (IPER) Technology Workshop

Southwest Research Institute (SWRI), San Antonio, TX, USA, 5-6 April 2022

John M. Repasky, Technology Development Manager, Oxy Low Carbon Ventures, LLC, a subsidiary of Occidental

# CARBON MANAGEMENT VISION FOR A LOW CARBON ECONOMY



ZERO IN™



# FORWARD-LOOKING STATEMENTS

This presentation contains forward-looking statements based on Oxy's current expectations, beliefs, plans and forecasts. All statements other than statements of historical fact are forward-looking statements. Words, and variations of words, such as "can," "will," "may," "expect," "intend," "plan," "commitment," "target," "develop," "goal" and similar expressions are intended to identify these forward-looking statements, including, but not limited to, statements about Oxy's Low Carbon Ventures and 1PointFive development plans. These statements are not guarantees of future performance as they involve assumptions that may prove to be incorrect and involve risks, assumptions and uncertainties that are subject to change in the future. Factors that may affect Oxy's business and these forward-looking statements can be found in Oxy's filings with the U.S. Securities and Exchange Commission (SEC), including its most recently filed Annual Report on Form 10-K, which may be accessed at the SEC's website, [www.sec.gov](http://www.sec.gov). Oxy disclaims and does not undertake any obligation to update or revise any forward-looking statement in this presentation, except as required by applicable law or regulation. Inclusion of information in this report is not an acknowledgement that such information is material to an investor in Oxy. References to third-party goals or frameworks is not an endorsement or adoption of such goals or frameworks unless expressly stated otherwise. Throughout this presentation, "Oxy," "we" and "our" refers to Occidental Petroleum Corporation and/or one or more entities in which it owns a controlling interest.





**“We have set a target to reach net-zero emissions associated with our operations before 2040 and an ambition to achieve net-zero emissions associated with the use of our products before 2050.”**

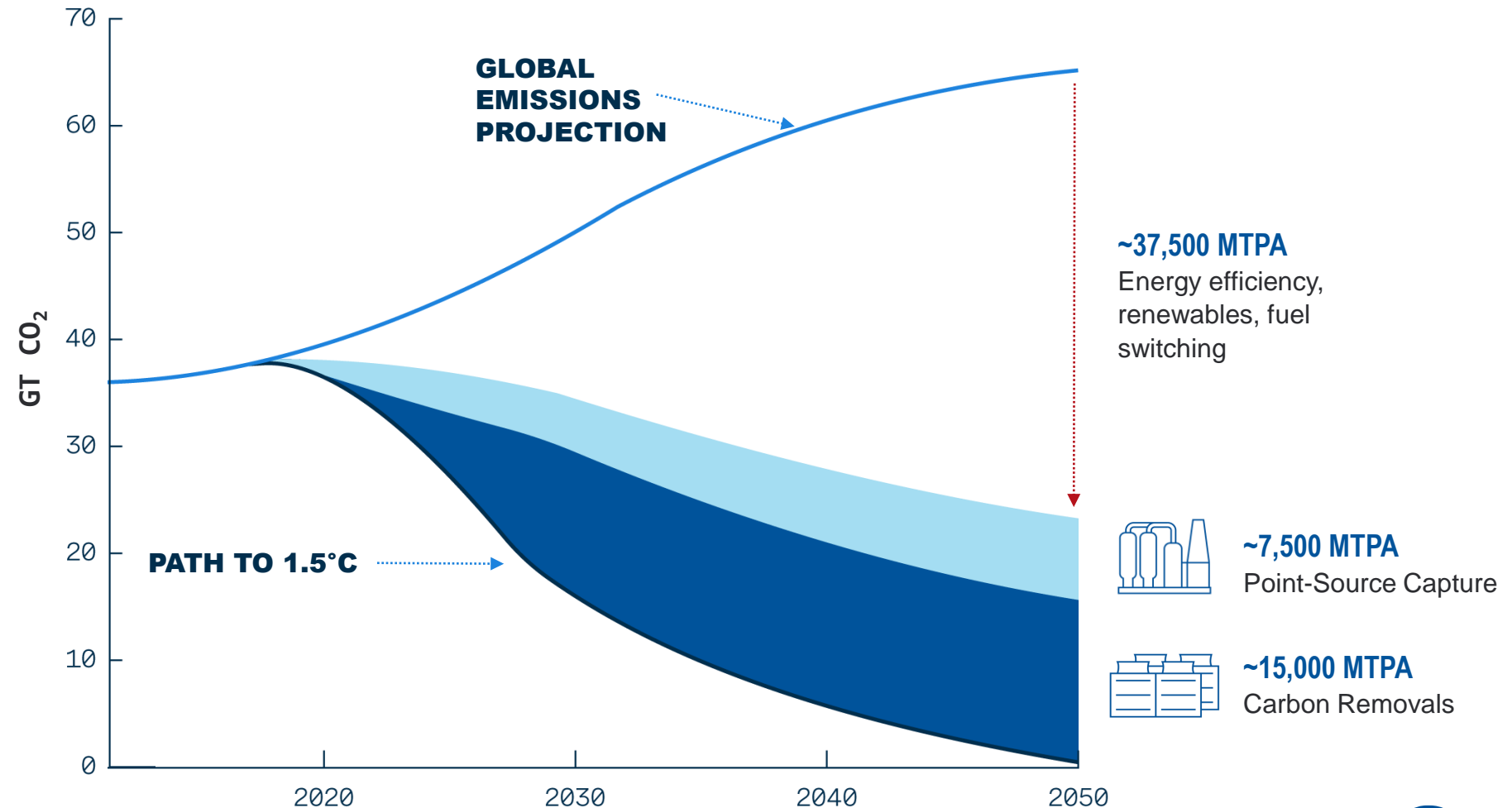
**- Vicki Hollub, Oxy President and CEO**



## CO<sub>2</sub> CHALLENGE GETTING TO NET ZERO

- Current emissions reduction commitments and policy scenarios do not put global emissions on a trajectory to achieve net zero by 2050
- Significant improvements in operational and energy efficiency and sustainable fuels are required to reduce human-made emissions
- According to the IPCC, the path to 1.5°C by 2050 requires multiple solutions including global point-source capture of ~7,500 MTPA and ~10,000 – 20,000 MTPA of carbon removals

### Curbing temperature rise to 1.5°C requires rapid deployment of multiple solutions including point-source capture and carbon removals

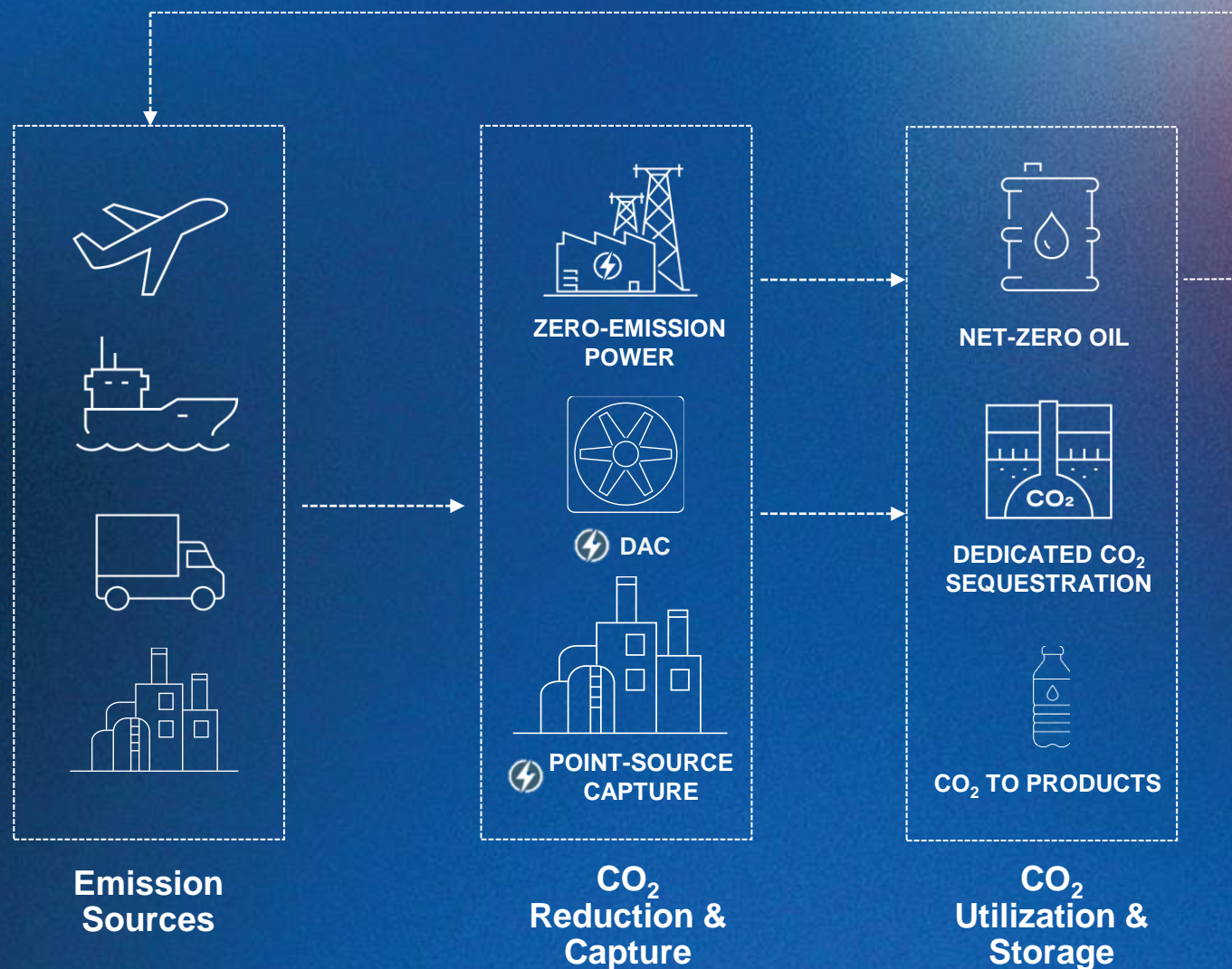


THE FUTURE OF SUSTAINABILITY

# A NET-ZERO SYSTEM











With our low-carbon investments, we are connecting technologies to create a closed-loop system whereby carbon dioxide (CO<sub>2</sub>) can be captured and sequestered while still ensuring an adequate supply of energy to support industrial and transportation growth

*Captured emissions enable net-zero transportation & industry*





# OLCV TECHNOLOGY, PROJECTS AND PLATFORMS

	ZERO-EMISSION POWER	CO <sub>2</sub> CAPTURE & REMOVAL	PIPELINES & GAS PROCESSING	CO <sub>2</sub> SEQUESTRATION	CARBON UTILIZATION & PRODUCTS	CARBON TRACKING METHODOLOGIES AND TOOLS
OXY EXISTING	GOLDSMITH SOLAR	OXYCHEM KOH & PVC	PERMIAN CO <sub>2</sub> PIPELINES & SEPARATION FACILITIES	PERMIAN EOR OPERATIONS	ENERGY MARKETING & TRADING GROUP	THREE U.S. EPA APPROVED MONITORING, REPORTING AND VERIFICATION PLANS
OLCV INVESTMENT	 Zero-emission natural gas power plant <hr/>  Environmentally friendly lithium production	 Direct Air Capture & point-source capture development <hr/>  Direct Air Capture technology <hr/>  Supporting point-source capture and EOR sequestration projects	Building new CO <sub>2</sub> pipelines to connect to sequestration hubs <hr/>  Separation membrane innovation	Dedicated sequestration hub development	Carbon removal credits and low-carbon fuels <hr/>  AIR TO FUELS™ <hr/>  Bio-ethylene produced from CO <sub>2</sub>	 Carbon Finance Labs Developing carbon tracking methodologies and tools <hr/>  Global carbon trading platform



# FROM INNOVATION TO REAL-WORLD SOLUTIONS

Oxy is investing in and accelerating CCUS technologies to bring new businesses and solutions to market—our first is 1PointFive

7



## OXY LEADING THE PROGRESS

Experts in managing the carbon lifecycle with skills and experience in CO<sub>2</sub> separation, transportation, utilization and storage that positions us to develop and accelerate CCUS technology and project implementation



## OXY LOW CARBON VENTURES ACCELERATING INNOVATION

The business unit within Oxy that is pursuing, investing in and accelerating CCUS technologies and project development. OLCV is investing across the carbon capture value chain in emerging carbon markets



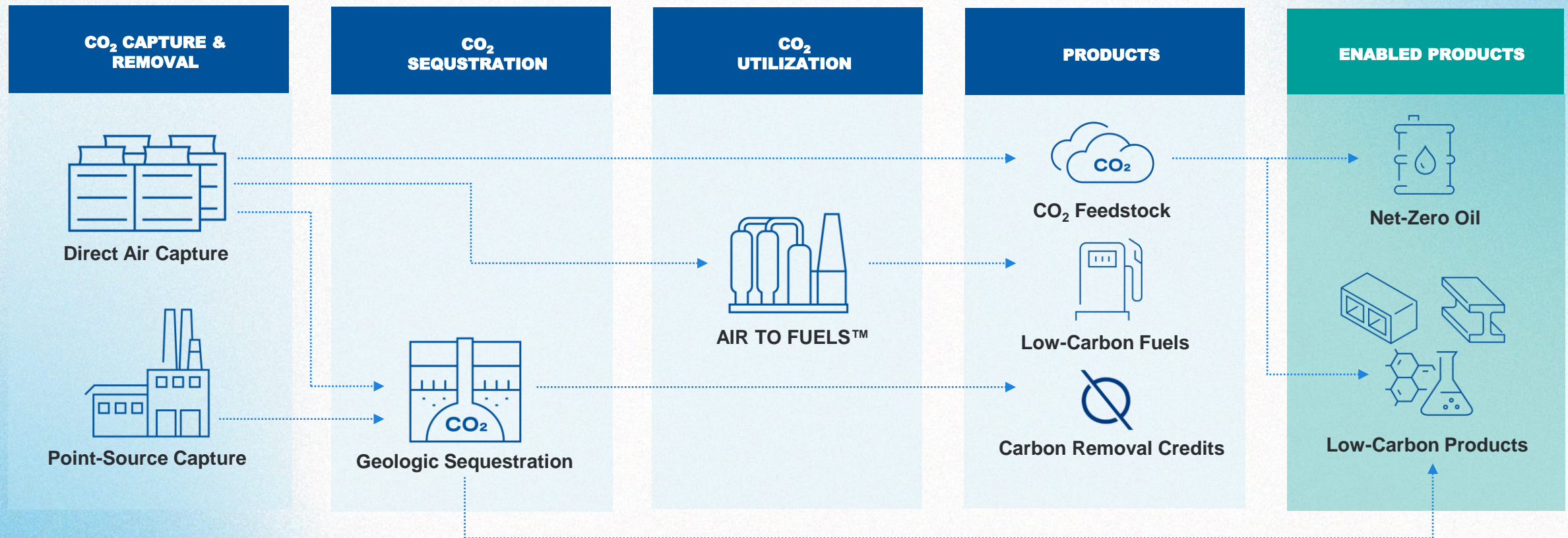
## 1POINTFIVE DELIVERING SOLUTIONS

An integrated CCUS platform, developed from combining technologies to create solutions for emitters to reduce their CO<sub>2</sub> through point-source capture and Direct Air Capture. 1PointFive's products and services can be contracted and purchased today



# 1POINTFIVE OVERVIEW

A wholly-owned Oxy subsidiary, 1PointFive is a durable, integrated CCUS platform with a mission to curb global temperature rise to 1.5°C by delivering carbon capture, sequestration, utilization and products





# POINT-SOURCE CAPTURE

## POINT-SOURCE CAPTURE CORE MARKETS

**ETHANOL****REFINING****AMMONIA****CEMENT****COAL****CHEMICALS**

50+ pre-FEED projects in multiple industries across the United States

In commercial discussions with key point-source emitters representing more than 40 MTPA CO<sub>2</sub> emissions

- Enabling industrial and energy emitters to **capture, transport and permanently store CO<sub>2</sub>**
- Applying capture expertise and **support across the entire project lifecycle** from feasibility to sequestration

Providing comprehensive project support:

FEASIBILITY ANALYSIS

CAPTURE FACILITY ENGINEERING  
& CONSTRUCTION

CO<sub>2</sub> TRANSPORTATION

CO<sub>2</sub> SEQUESTRATION



# SUPPORTING PROJECTS ACROSS INDUSTRY SECTORS

**The OLCV team has been actively engaged in CCS project development and advisory services for several years, leveraging our experience to support projects across the United States**

## ETHANOL

- Carbon capture and transportation of CO<sub>2</sub> from White Energy's two ethanol plants in Texas
- Expect to capture up to 700,000 TPA CO<sub>2</sub>
- CO<sub>2</sub> to be sequestered in CARB/MRV field in the Permian Basin

## BIOFUELS

- CO<sub>2</sub> offtake, transportation and sequestration of CO<sub>2</sub> captured from planned Velocys' Bayou Fuels biomass-to-fuels project in Natchez, Mississippi
- This project is expected to make Velocys' facility a net-negative emitter of CO<sub>2</sub>, enabling zero-carbon transportation fuels

## COAL-FIRED POWER

- Led by the Minnkota Power Cooperative, this project is to build the world's largest CO<sub>2</sub> capture facility at the Milton R. Young Station, a coal-fired power plant in North Dakota
- LCV is providing carbon storage consulting services and recently supported with Class VI permitting

## CEMENT

- LCV is engaged on a joint pre-FEED study to assess the viability and design of a commercial scale CO<sub>2</sub> capture facility at the Holcim Portland Cement Plant in Florence, Colorado
- The capture project would be designed to capture 725,000 TPA CO<sub>2</sub> to be stored in geologic sequestration

## LNG

- Plans to offtake and permanently store CO<sub>2</sub> captured from NextDecade's planned Rio Grande LNG project in the Port of Brownsville, Texas
- Expected to enable the capture and permanent sequestration of more than 5 MTPA CO<sub>2</sub>

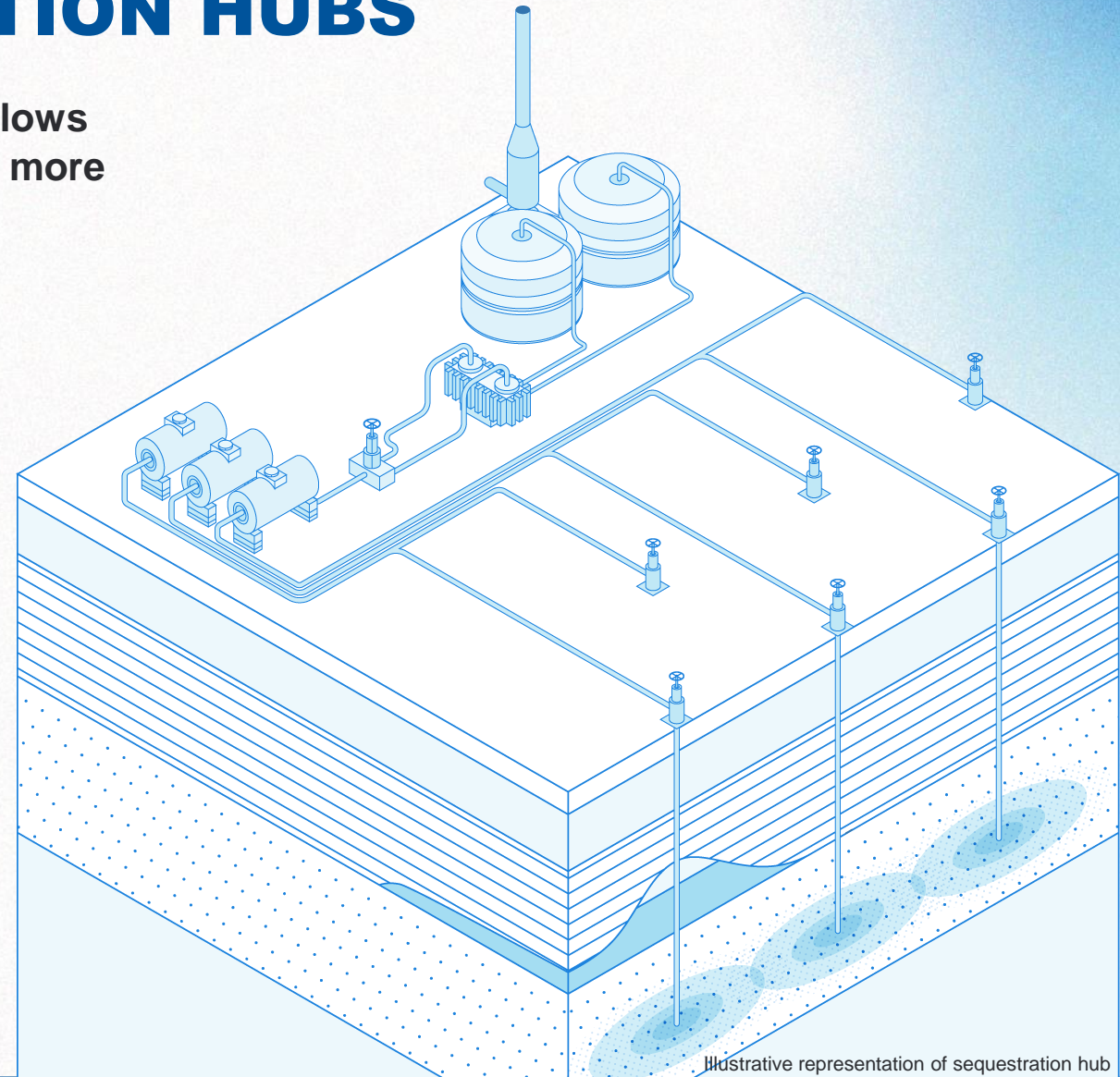


# DEDICATED SEQUESTRATION HUBS

Our hub-based model is a scalable solution that allows access to a shared carbon infrastructure, bringing more options to emitters looking to explore more viable carbon management strategies.

### A typical sequestration hub includes:

- Multiple CO<sub>2</sub> emission sources
- CO<sub>2</sub> pipelines and spur lines to transport CO<sub>2</sub>
- 3+ injection wells
- 5+ monitoring wells
- A separation and CO<sub>2</sub> compression and monitoring facility
- ~30 surface acres



Illustrative representation of sequestration hub



## HIGHLIGHTS

# DIRECT AIR CAPTURE

TEAMED UP WITH CARBON ENGINEERING TO  
DEPLOY TECHNOLOGY TO REMOVE CO<sub>2</sub> FROM THE  
ATMOSPHERE AT SCALE

FIRST FACILITY EXPECTED TO REMOVE UP  
TO 1 MILLION TONNES OF CO<sub>2</sub> ANNUALLY

FIRST COMMERCIAL DAC EXPECTED  
OPERATIONAL IN LATE 2024

FIRST COMMERCIAL DAC FACILITY TO BE  
BUILT IN THE PERMIAN BASIN



# CARBON ENGINEERING'S DAC TECHNOLOGY ADVANTAGES

- Combines proven industrial-scale equipment and processes with known supply chains to enable our facilities to scale up to 1 MTPA
- Closed-loop process recycles chemical reactants
- DAC technologies can be located in many areas around the globe
- OxyChem, Oxy's chemicals business, is a leading producer of KOH and PVC – critical inputs for the CO<sub>2</sub> removal process and DAC facility

Carbon Engineering's Direct Air Capture technology brings together proven equipment and processes in a new way to deliver a scalable global solution for atmospheric CO<sub>2</sub> removal



CARBON ENGINEERING INNOVATION CENTRE, SQUAMISH, B.C.







# PROGRESS TOWARD DAC 1

## **LICENSE TO BUILD**

Exclusive DAC and AIR TO FUELS™ license for U.S. deployment and OLCV has a worldwide agreement as the execution partner for all DAC and AIR TO FUELS™ deployments

## **INNOVATION CENTRE**

Carbon Engineering Innovation Centre built for technology advancements and is currently in commissioning

## **EPC SELECTION FOR FEED**

1PointFive has teamed up with global EPC Worley for the FEED on DAC 1 and pre-FEED on the first AIR TO FUELS™ facility

## **FEED UNDERWAY FOR DAC 1**

First DAC facility in FEED with construction expected to begin 2H2022 and planned start-up in late 2024 in Permian Basin





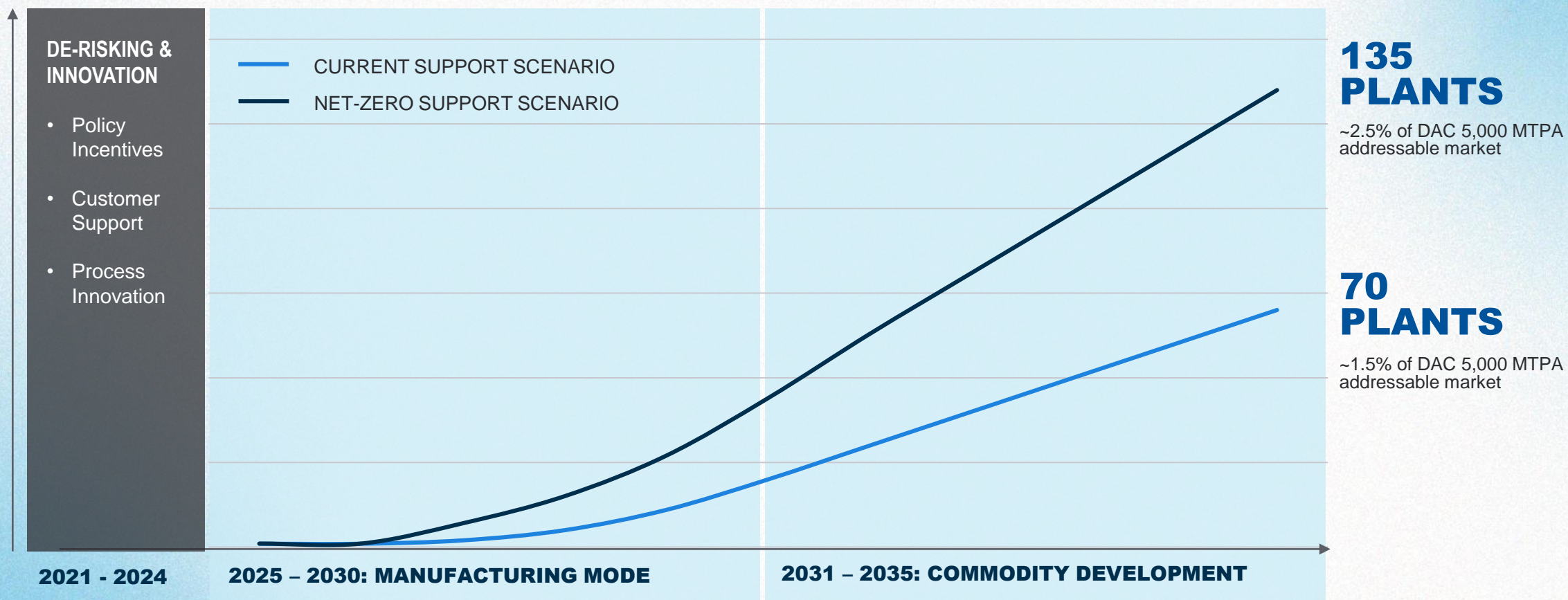
# DAC DEVELOPMENT SCENARIOS

16

**Current support scenario** assumes today's policy, voluntary and compliance markets

**Net-zero support scenario** assumes increase in global policy incentives and demand in voluntary and compliance markets led by net-zero business to achieve global targets for society by 2050

Estimated # of plants online





# AIR TO FUELS™ PROCESS



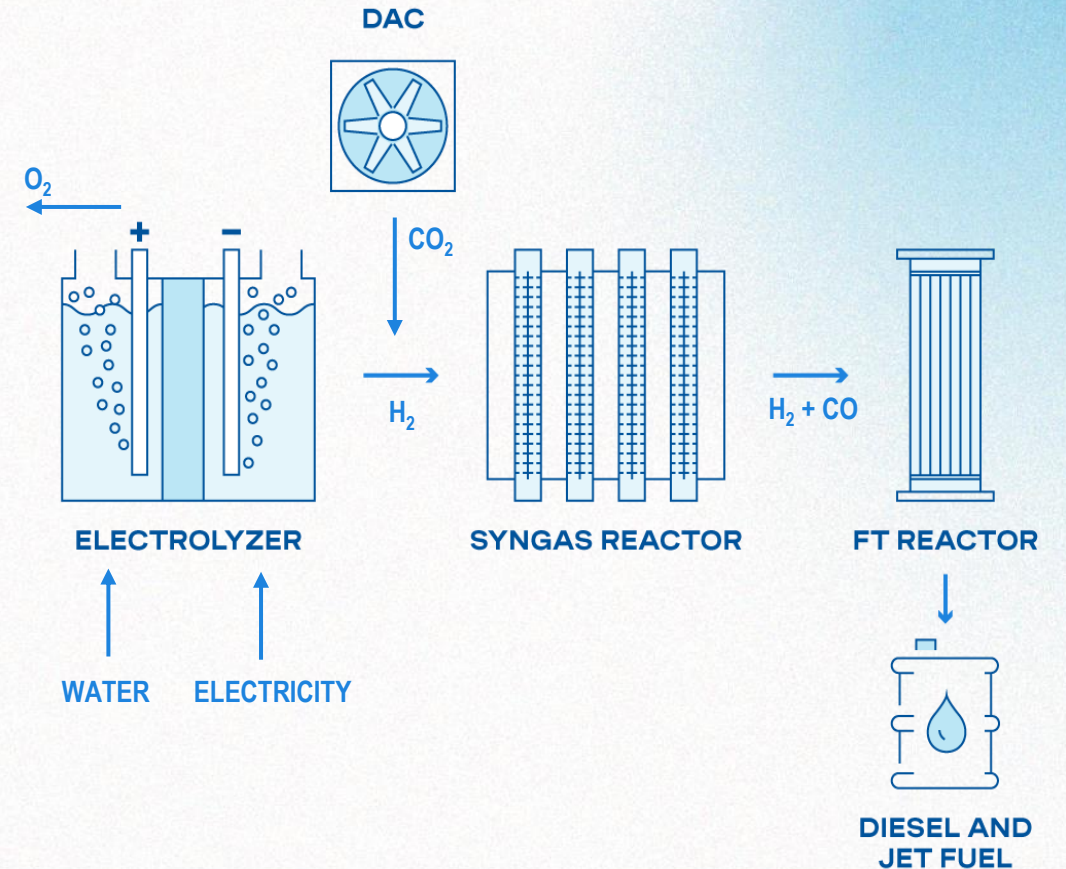
First fuel developed by  
Carbon Engineering  
December 2017

AIR TO FUELS™ facilities can be co-located with Direct Air Capture sites. Pure CO<sub>2</sub> captured from DAC will feed into the process to synthesize diesel or jet fuel.

- Produces low-carbon fuels with up to ~90% emissions reduction factor (ERF) when compared to conventional diesel and jet fuels
- Provides highly competitive carbon intensity versus competing renewable fuels that are capable of scale to large volumes
- Requires no change in diesel or jet engines to operate and can be blended up to 50% with conventional fuels
- Meets American Society for Testing and Materials (ASTM) standards
- Creates drop-in fuels, keeping costs competitive
- Uses proven processes and equipment

OLCV and Carbon Engineering are assessing other technologies to convert CO<sub>2</sub> to low-carbon fuels

## ILLUSTRATIVE AIR TO FUELS™ UTILIZING A FISCHER TROPSCH (FT) PROCESS





# CCUS PROTOCOLS AND METHODOLOGIES

High-integrity, internationally recognized CCUS protocols and methodologies for generating tax and carbon credits are paramount for scaling the CCUS industry



Secured 1<sup>st</sup> two MRV plans approved by the **U.S. EPA** and has been reporting under these for over a decade to generate 45Q tax credits



Filed the 1<sup>st</sup> **California Air Resources Board (CARB)** reservoir permanence certification for EOR to generate LCFS credits



Founding member of the **CCS+ Initiative**, which is developing an expansive set of CCS methodologies for use in the voluntary and international (Article 6) carbon markets



# DIRECT AIR CAPTURE

19

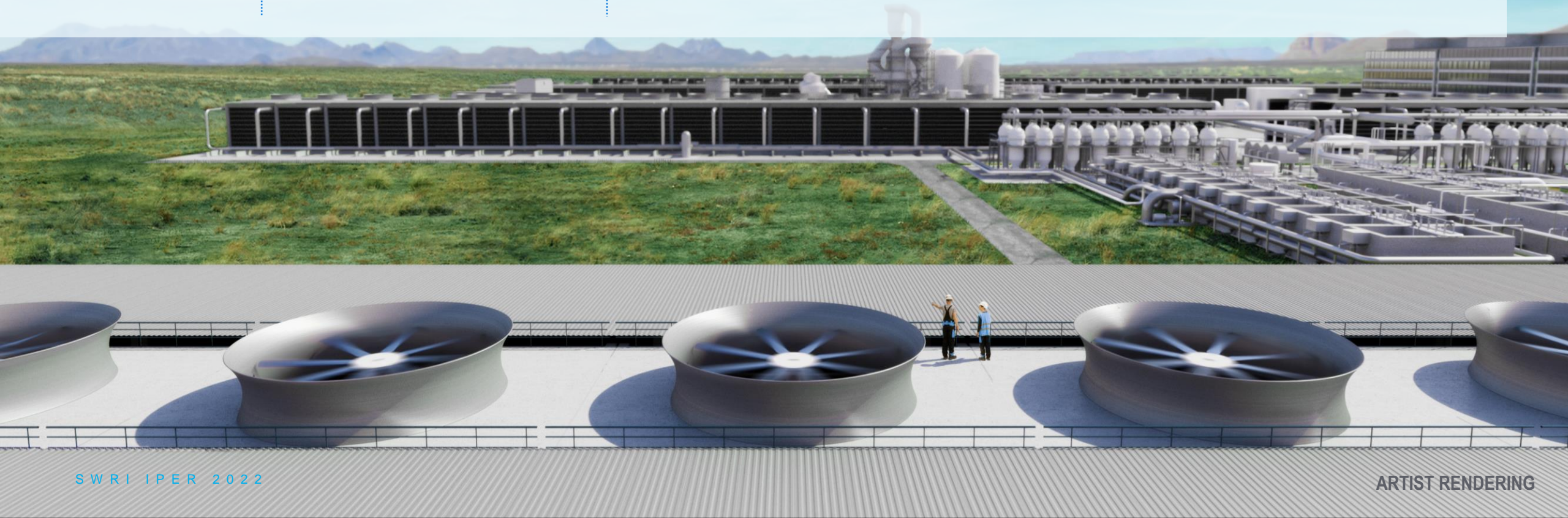
## TECHNOLOGY



## ENGINEERING & CONSTRUCTION



## DAC FIRST-MOVERS AND EARLY ADOPTERS





# POSITIONED TO ACCELERATE A NET-ZERO ECONOMY

Our existing infrastructure and experience lay a unique foundation for our expansion into low-carbon markets

20

## WORLDWIDE OPERATIONS

- Experienced, integrated teams
- Robust supply chain

## CO<sub>2</sub> EOR

- 50 years' experience utilizing CO<sub>2</sub> in operations
- Extensive CO<sub>2</sub> processing and sequestration infrastructure
- Reservoir management, monitoring, verification and reporting mechanisms in place

## MAJOR PROJECTS

- Experience building global, complex infrastructure projects on time and on budget, and developing technologies from lab- to commercial-scale

## OXYCHEM

- Leading manufacturer of essential chemical products
- History of innovation and patented processes

## CO<sub>2</sub> INFRASTRUCTURE TODAY

- Up to 20 million tonnes of CO<sub>2</sub> stored annually
- Over 2,500 miles of accessible CO<sub>2</sub> pipelines
- 6,000+ CO<sub>2</sub> injection wells
- 13 CO<sub>2</sub> recovery plants

Illustrative representation of operations



# BUILDING A FUTURE NET-ZERO ECONOMY

**ZERO-EMISSION POWER**

**KOH & PVC FROM OXYCHEM TO DAC**

**DIRECT AIR CAPTURE &  
AIR TO FUELS™  
SOLUTIONS**

**CO<sub>2</sub>-TO-PRODUCT  
MANUFACTURING**

**POINT-SOURCE  
CAPTURE**

**LOW-CARBON  
DIESEL AND JET  
FUELS MADE FROM  
ATMOSPHERIC CO<sub>2</sub>**

**DEDICATED CO<sub>2</sub>  
SEQUESTRATION HUBS**

**NET-ZERO OIL  
PRODUCTION**

Illustrative representation of future low-carbon operations







# **APPENDIX**



# STRATEGIC TECHNOLOGY INVESTMENT PORTFOLIO

OLCV has a license to commercialize and deploy Carbon Engineering's DAC technology and AIR TO FUELS™ process



Possesses patented technology for environmentally friendly method of ultra-pure lithium production by extracting lithium salts from subterranean brine



1PointFive's mission is to commercialize DAC at scale to help curb global warming at 1.5°C by integrating and deploying CCUS technologies



Growing the marketplace for carbon removals through methodology development, as well as financial and technology innovations



Developing zero-emission power generation that can run 24/7 while capturing CO<sub>2</sub> for storage or use



Creating a global trading platform for data-driven and transparent Environmental, Social and Governance (ESG)-inclusive commodity products



Developing a CO<sub>2</sub> utilization platform that mimics photosynthesis using CO<sub>2</sub> as feedstock to produce ethylene for industrial chemicals and polymers

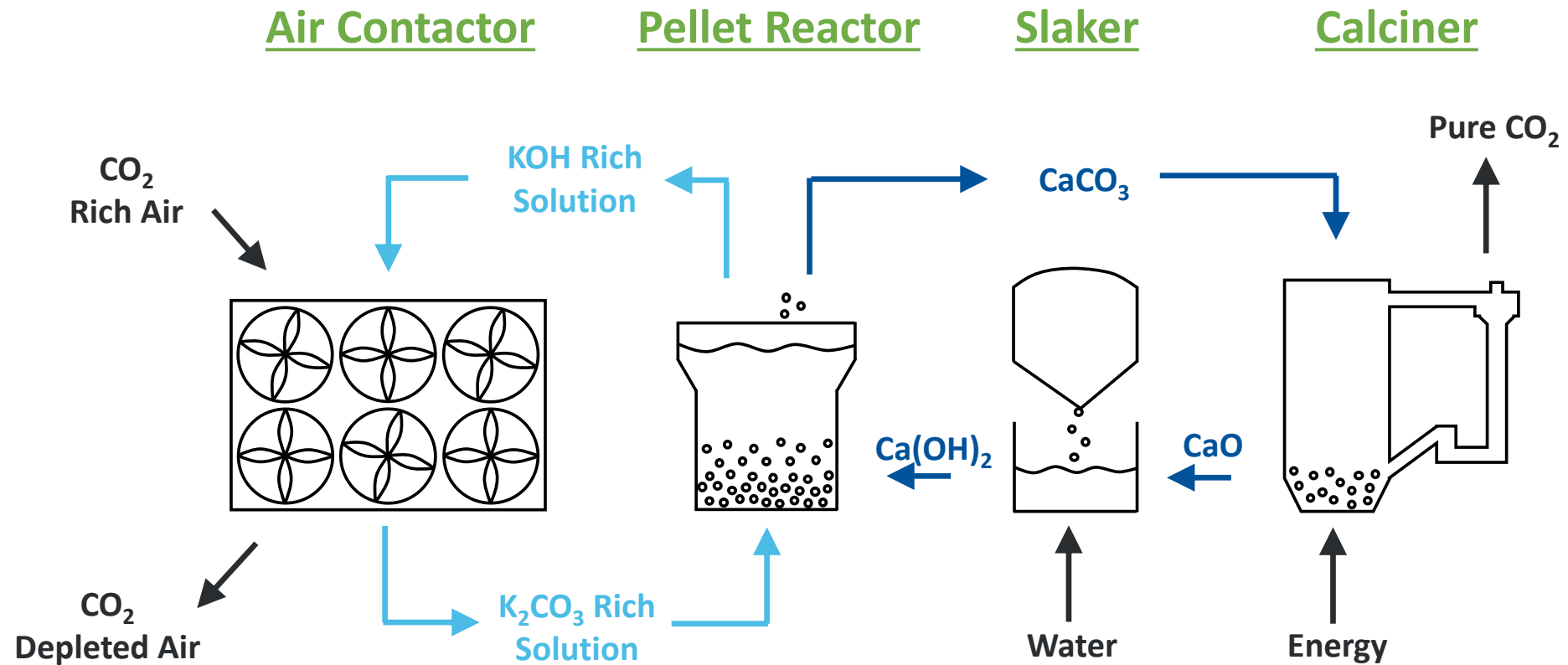


## Current focus areas:

- Commercial deployment of market-ready technology
- Improvements to existing technologies in portfolio
- Investments in CO<sub>2</sub> utilization technologies and products



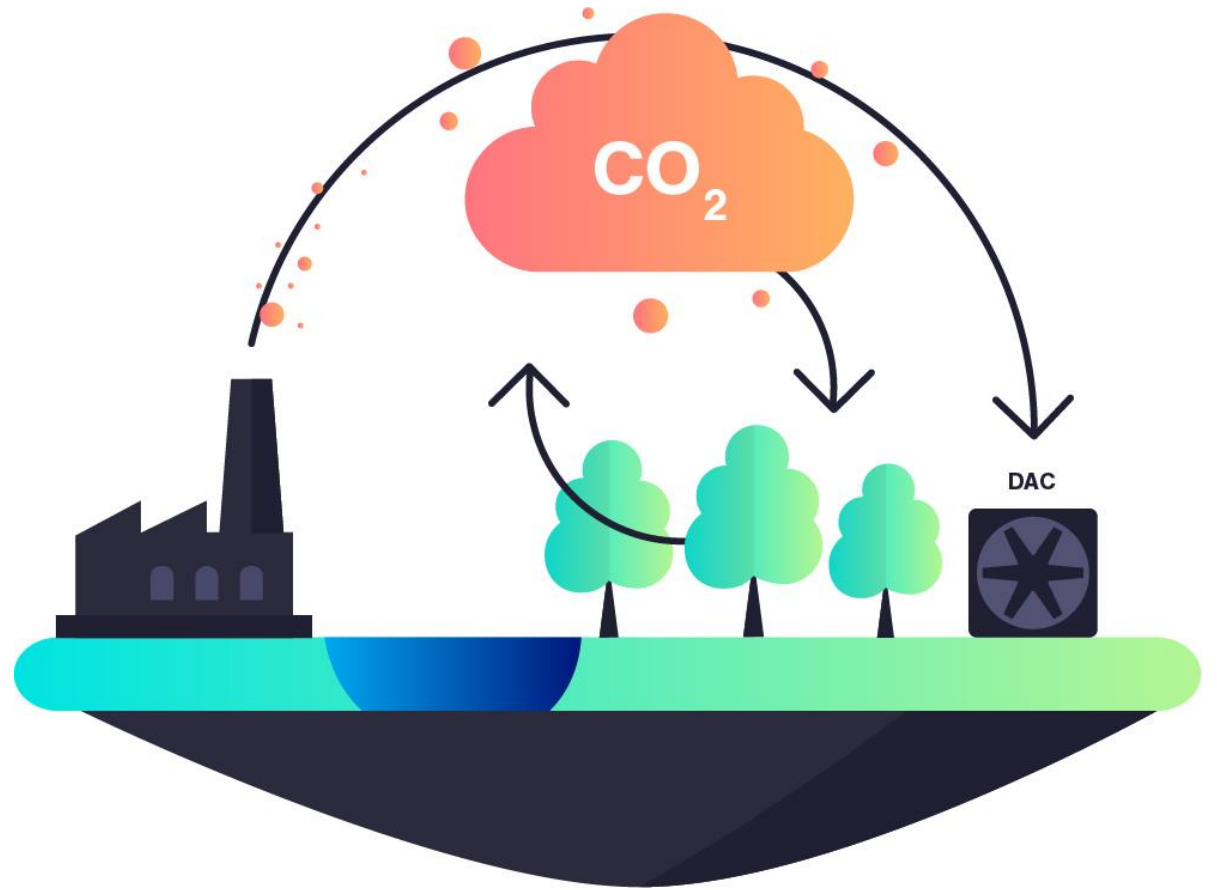
## THE TECHNOLOGY





## SUPPORTING THE NATURAL CARBON CYCLE

- The world has a natural carbon cycle, with the capacity to self-regulate
- Centuries of human-made CO<sub>2</sub> emissions have pushed this cycle beyond its capacity to manage excessive atmospheric carbon dioxide
- Human-made CO<sub>2</sub> emissions have impacted the natural carbon cycle resulting in an imbalance
- Direct Air Capture has the potential to assist nature in restoring the balance





# DAC CAPTURE & LAND USE EFFICIENCY

Can be deployed alongside nature-based solutions to achieve greater removal scale and speed

## Ability to scale is a function of efficiency

- DAC enables large-scale deployment and increased speed of emissions reduction, and is orders of magnitude more efficient per unit of land than natural solutions
- A/Reforestation and Bio Energy Carbon Capture and Storage (BECCS) involve arable land displacement, food vs capture decisions and large freshwater requirements

## Net CO<sub>2</sub> Capture Efficiency (Tonnes / Acre / Year)

10,000

DAC

7.8

BECCS

1.4

A/Reforestation

## Land Requirement for 10 GTPa of Carbon Removal

0.6%  
the size  
of Texas

DAC

50%  
of the  
United States

BECCS

3x  
the  
United States

A/Reforestation



# CARBON ENGINEERING

- Oxy has partnered with Carbon Engineering to deliver its proven, proprietary Direct Air Capture (DAC) technology on an industrial scale.
- This practical carbon removal methodology is designed to pull CO<sub>2</sub> directly from the atmosphere—giving new options to industries that have long been difficult to decarbonize such as trucking, marine transport, aerospace and rail transportation.
- OLCV and Huron Clean Energy have begun engineering on a groundbreaking DAC-to-Fuels facility in British Columbia utilizing Carbon Engineering's AIR TO FUELS™ technology, which is expected to produce 100 million litres of ultra low carbon fuel annually.







## BUILDING DIRECT AIR CAPTURE FACILITIES

# 1POINTFIVE

- 1PointFive plans to build a first-of-its-kind direct air capture facility with technology licensed from Carbon Engineering. The technology pulls CO<sub>2</sub> directly from the air with the potential to be deployed globally.
- When fully operational, facility expected to remove 1 MM tonnes of CO<sub>2</sub> from the atmosphere each year.
- Captured CO<sub>2</sub> to be safely sequestered.
- Facility will utilize Oxy's extensive CO<sub>2</sub> infrastructure, engineering experience and OxyChem's KOH and PVC products.
- Expected FEED to be completed 1H22 with construction to commence 2H22.
- First facility to be built in the Permian Basin expected to be operational in late 2024.



# NET POWER

- Oxy's 2018 investment in NET Power provides critical support for the commercialization of this zero-emissions approach to natural gas power generation.
- NET Power's technology is designed to decarbonize natural gas power generation, providing zero-emission power that's anticipated to deliver affordable clean energy.
- With its capacity to produce emissions-free, 24/7 energy that can increase output on demand, NET Power is expected to be a strong complement to renewables like wind and solar.
- NET Power has constructed a pilot plant in Texas and is currently designing a full-scale commercial facility planned for operation in 2025.





## DEVELOPING BIO-ETHYLENE

# CEMVITA



- OLCV has invested in this forward-thinking biotech firm, which has developed a CO<sub>2</sub> utilization platform that mimics photosynthesis using CO<sub>2</sub> as feedstock to produce industrial chemicals and polymers.
- By commercializing these new bioengineered pathways for CO<sub>2</sub>, we aim to harness the power of nature to turn CO<sub>2</sub> from being emitted into a valuable feedstock for the creation of sustainable products.
- OLCV and Cemvita plan to construct and operate a one metric ton per month bio-ethylene pilot plant applying a jointly developed technology using human-made CO<sub>2</sub> instead of hydrocarbon-sourced feedstocks.
- Start up of the pilot plant is expected in 2022



# TERRALITHIUM

- TerraLithium's technology extracts trace lithium from waste geothermal power plants and other brines and converts the lithium to battery-grade products.
- Alternative process to conventional lithium production which has significant environmental challenges.
- Patented TerraLithium technology includes Direct Lithium Extraction (DLE) and direct conversion of lithium chloride to lithium hydroxide.
- Striving to supply ultra-high purity lithium hydroxide to the growing Li-ion battery market.

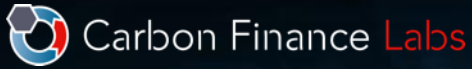




## CARBON TRACKING METHODOLOGIES

# CARBON FINANCE LABS

- Carbon Finance Labs' expertise at the intersection of carbon finance and technology keeps Oxy on the forefront of the emerging carbon commodity and net-zero fuels market.
- The company leverages new information technology, regulations and marketplaces to help define transparent processes for carbon tracking and create exciting new markets for carbon products and services.





# XPANSIV

- Xpansiv is developing a global marketplace for data-driven and transparent Environmental, Social and Governance (ESG)-inclusive commodity products.
- Oxy's work with Xpansiv has enabled the launch of our first carbon-attributed, tradeable oil and gas product that accounts for carbon intensity by incorporating emissions reductions from our carbon capture, utilization and storage operations.

