



Cleantech Forum
San Francisco

Enabling a Constructive Future for Coal and CO₂: Visions of Leading Entrepreneurs



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Enabling a Constructive Future for Coal and CO2

Drivers

- Low-carbon economy
- Financial incentives
- Climate mitigation policy

Challenges

- Cost competitiveness
- Commercialization and scaling up
- Feedstock availability

Ecosystem

Innovators



Corporates



Entrepreneur Support Organizations (ESO)



What are we covering today?

- CO2-to-products technologies
- Types of products produced from CO2
- Value propositions beyond carbon pricing
- Regulatory policy



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**MODERATOR:
MATT LUCAS**
Associate
Director For
Carbontech,
Carbon180



**ROWENA
SELLENS**
CEO, Econic
Technologies



CHRIS STERN
CEO & Co-
Founder,
Carbicrete



**MATTHEW
STEVENSON**
CFO, Inventys



BRETT WILCOX
CEO, CVICTUS



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MATT LUCAS

Associate Director For Carbontech, Carbon180

What Is Carbontech?

Any process that converts carbon waste into a product or service while creating fewer emissions than the alternatives

Plentiful, Cost-Advantaged
Carbon Wastes

Conversion Using
Diverse Technologies

Broad Portfolio of
Products and Services



CO₂



Biomass



Manure



Garbage



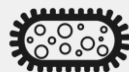
Electrochemical



Photochemical



Thermochemical



Bio-catalyzed



Photosynthetic



Fuels



Food & Feed



Building Materials



Plastics

The Under-Invested \$1T Opportunity

The carbontech portfolio includes services, major products, and high-value consumer goods

\$882B

TRANSPORTATION FUELS

Gasoline, Diesel, Jet

\$101B

BUILT ENVIRONMENT

Cement, Concrete, Asphalt, Aggregate

\$72B

PLASTICS

Polyethylene, Polypropylene

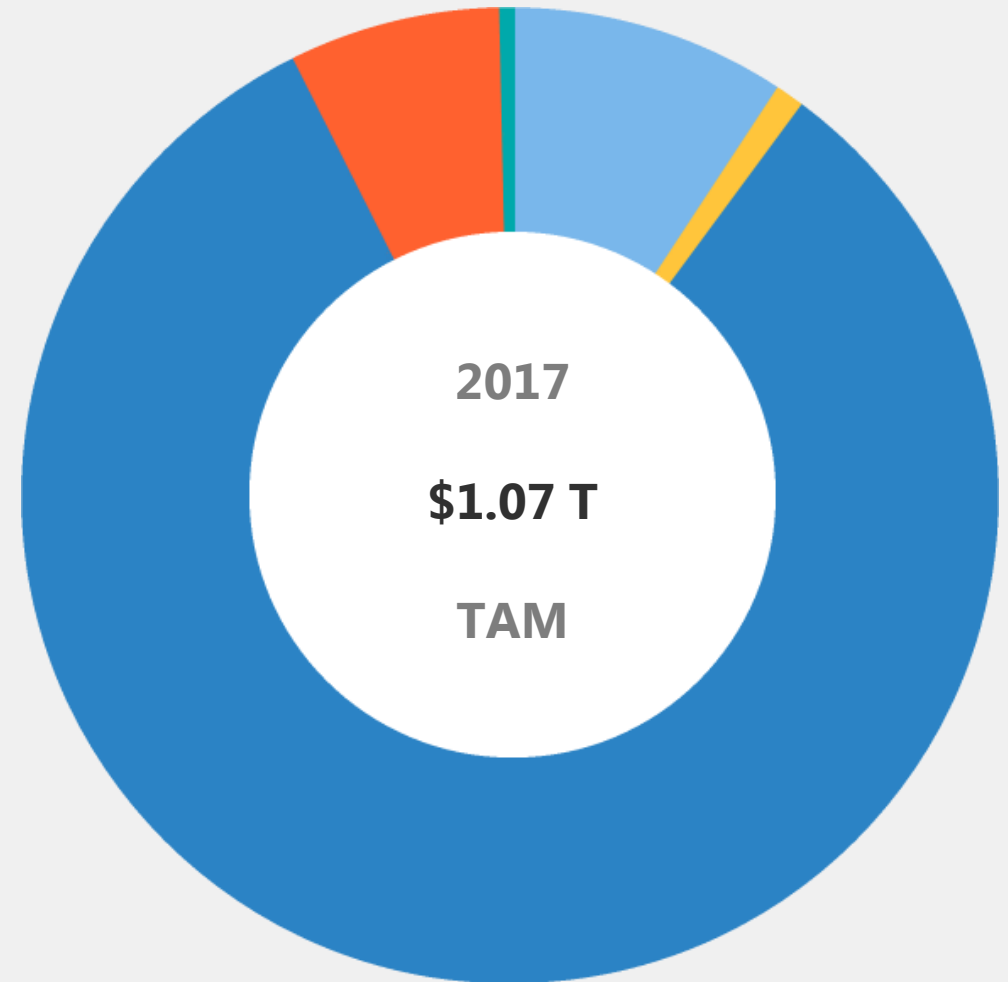
\$13B

WOOD-BASED PANELS

\$2B

CHEMICALS

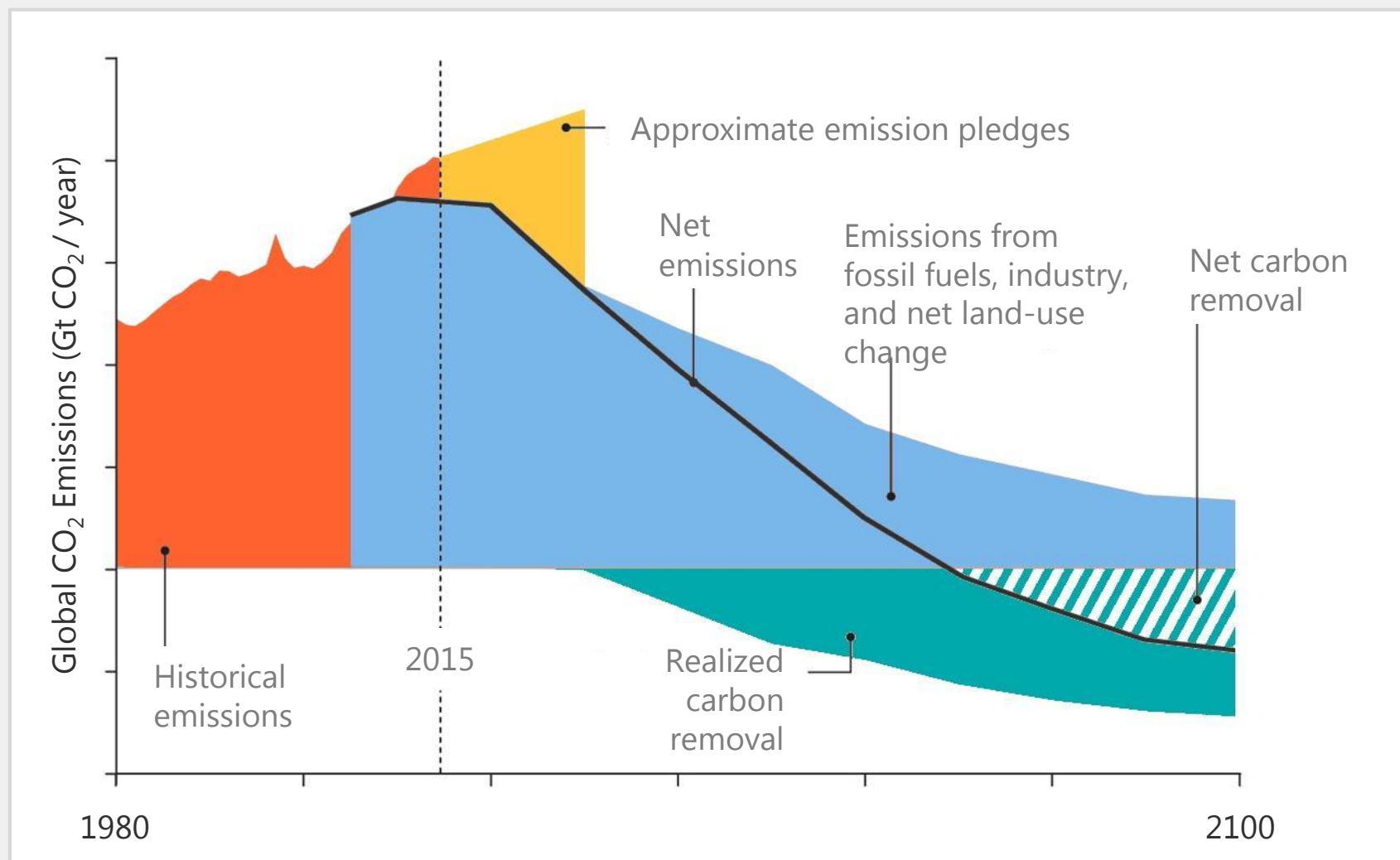
Fertilizer, Feed



SOURCE: [A Review of Global and U.S. Total Available Markets for Carbontech](#), a Carbon180 report
www.carbon180.org/carbontech-labs-reports

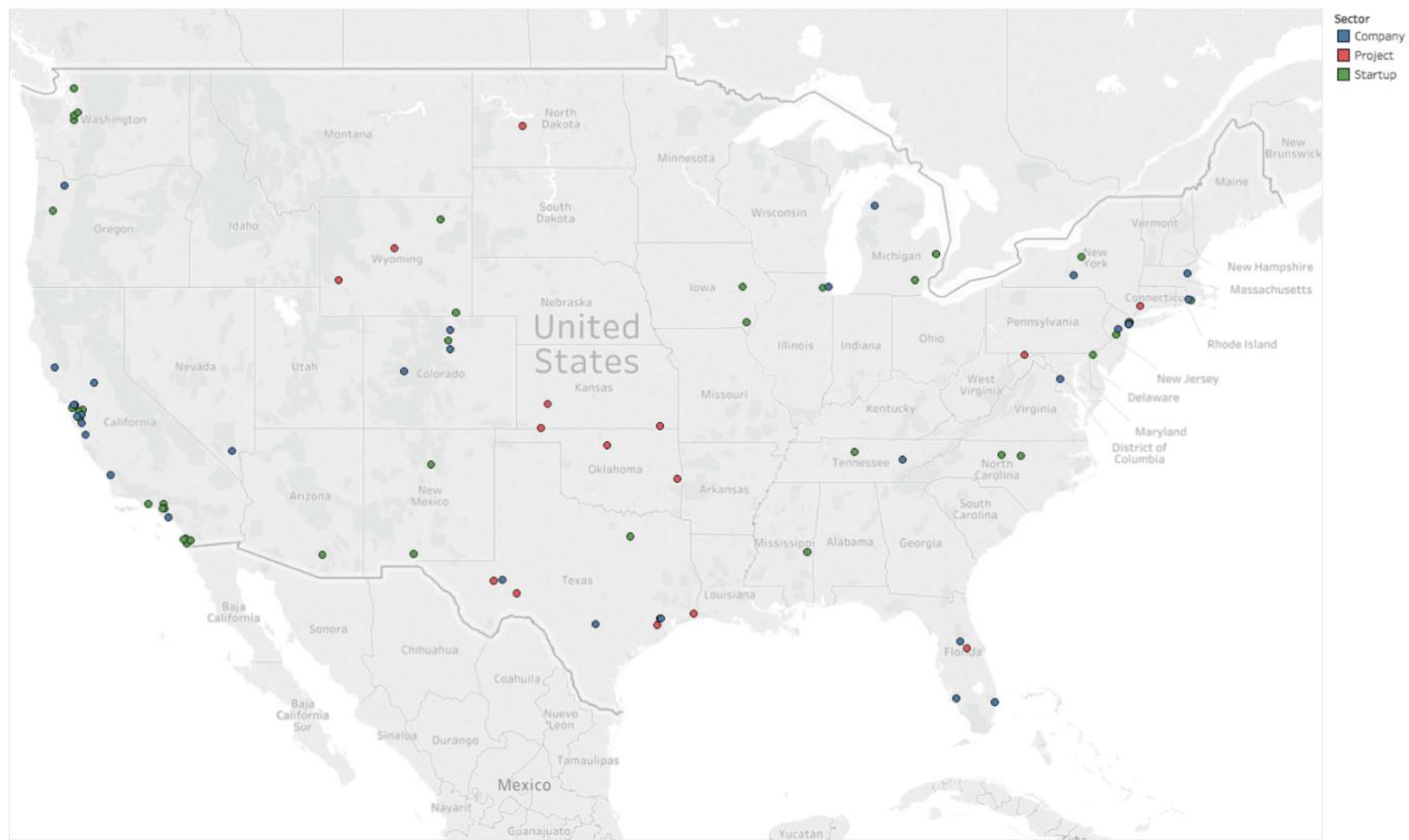
A Double-Bottom-Line Investment

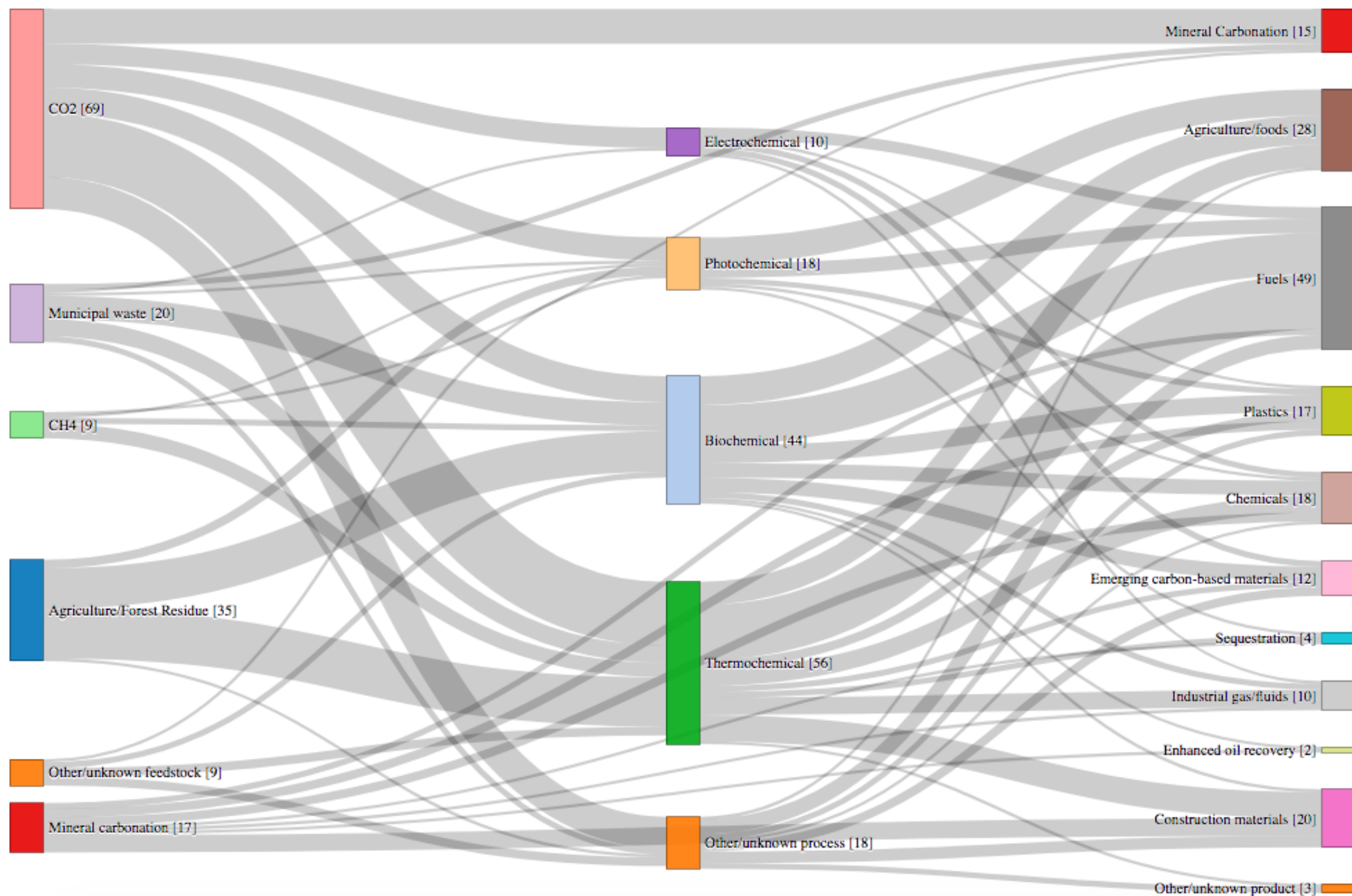
Carbontech offers the path to profitably convert carbon waste to value, while developing technology, markets, and policy to reverse climate change



[Carbontech] can remove over 10% of the emitted CO₂ [and can] keep temperature increases well below a 2°C increase.

**MCKINSEY STUDY
COMMISSIONED BY
GLOBAL CO₂ INITIATIVE**







Carbontech Labs

The Startup Accelerator and Investment Fund for
Innovators Profitably Reversing Climate Change

AN INITIATIVE OF
Carbon180

MATT LUCAS, PhD
matt@carbon180.org

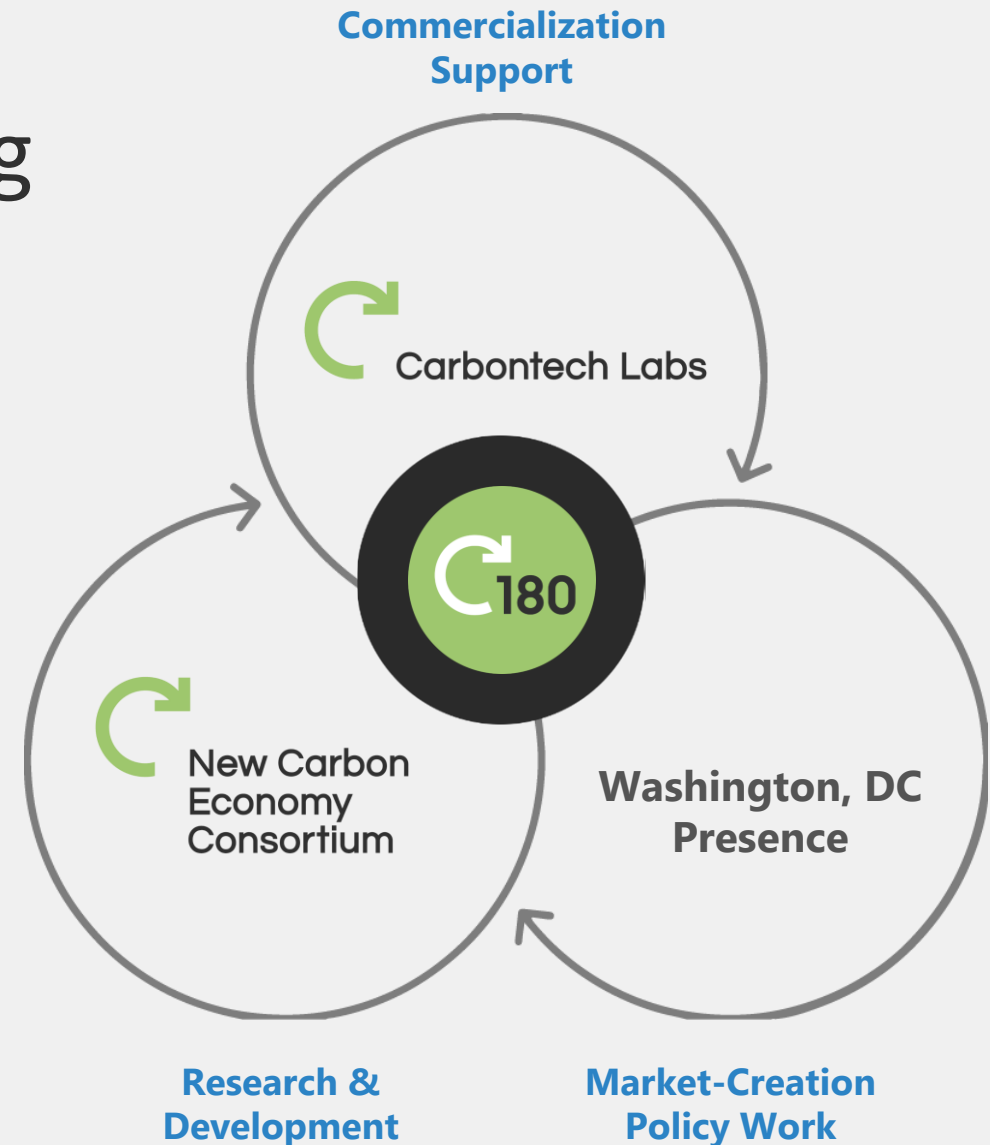
Carbon180 is a new breed of climate-focused NGO rethinking carbon

OUR MISSION

To champion carbon removal solutions through science and innovation.

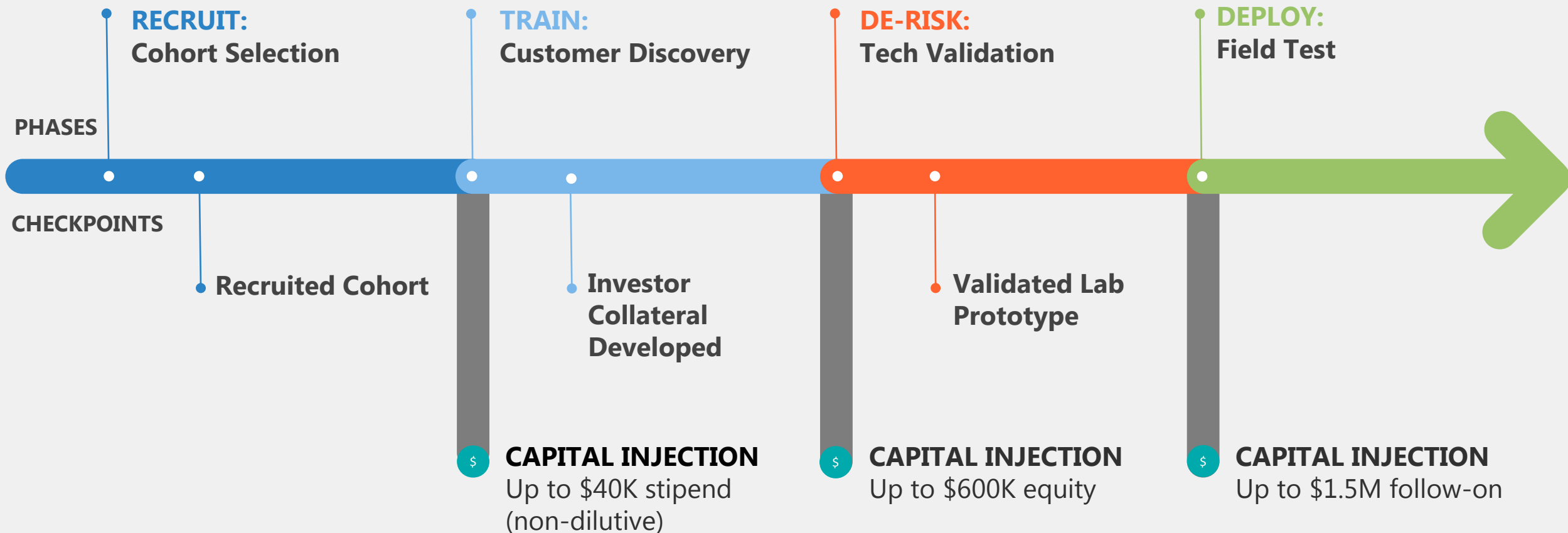
OUR APPROACH

We partner with policymakers, scientists, and businesses to advance solutions and to create a cycle for accelerating technology deployment.



Carbontech Labs Program Structure

Multi-phase investment-driven program for entrepreneurs with clear checkpoints to maximize impact and provide deal flow to investors and corporates



Partner with Carbontech Labs to Profitably Unlock the New Carbon Economy

INNOVATOR Apply now to Carbontech Labs' cohort

INVESTOR Back scalable ventures through our \$29M Carbontech Innovation Fund

CORPORATE Join our Advisory Network and access curated partnership opportunities



MATT LUCAS, PhD

Program Director, Carbontech Labs
matt@carbon180.org



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MATTHEW STEVENSON
CFO, Inventys

Building a CO₂ Market place



Matt Stevenson, VP Finance & Corporate Strategy



30-Jan 2019

San Francisco, CA

www.inventysinc.com | @inventysinc

BUILDING A CO₂ MARKETPLACE

Trading Tonnes Not Carbon Credits

From
\$60-\$200
to

<\$30
Capture cost
per tonne
of CO₂

From
2
to

7
Markets put
CO₂ to industrial
use by 2050

From
0.08Gt
to

7Gt
CO₂ utilization
potential per year
by 2050

From
\$4B
to

\$200B
CO₂ sales
potential
by 2050

Balancing the Carbon Budget in an Emission-Constrained World

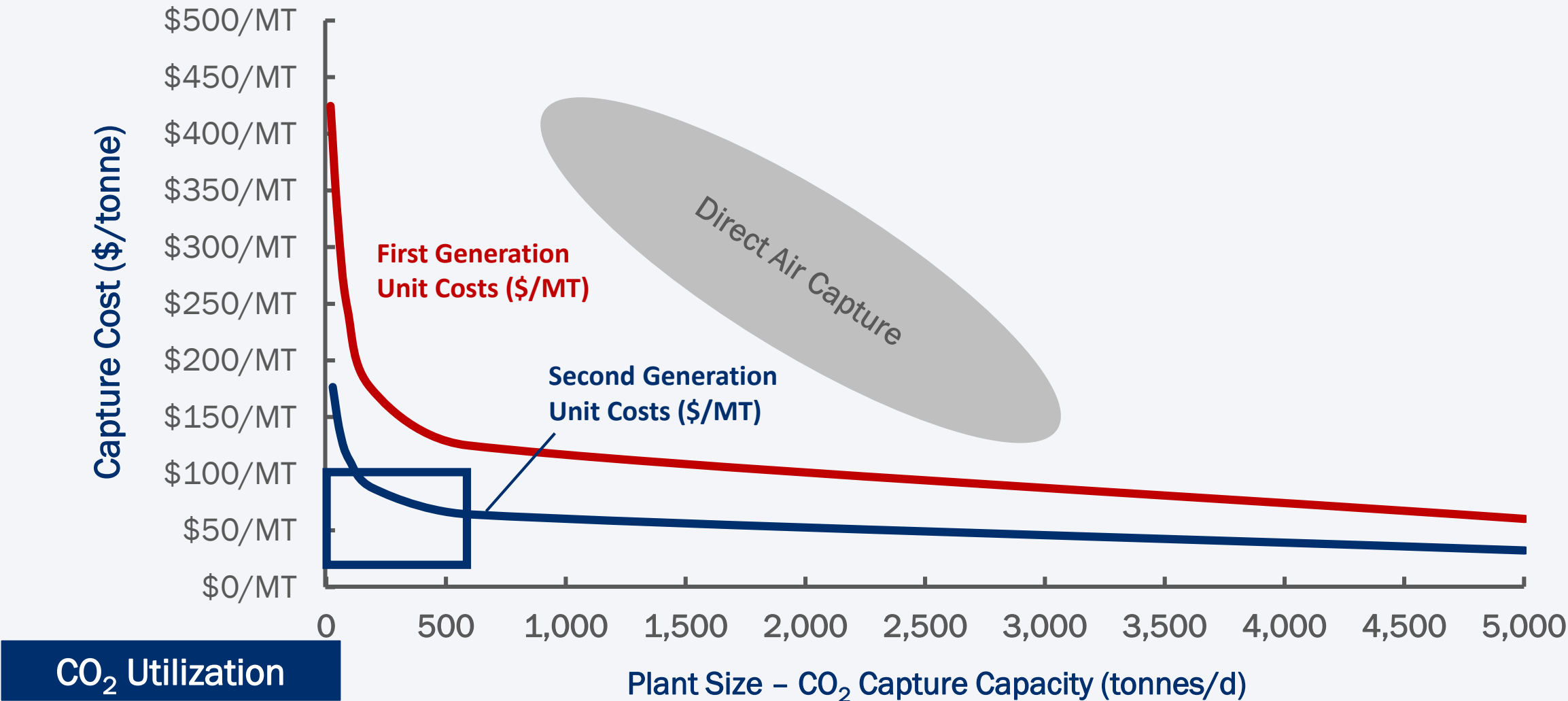
Distributed CO₂ Supply

30 to 600 tonnes per day

CO₂MarketPlace

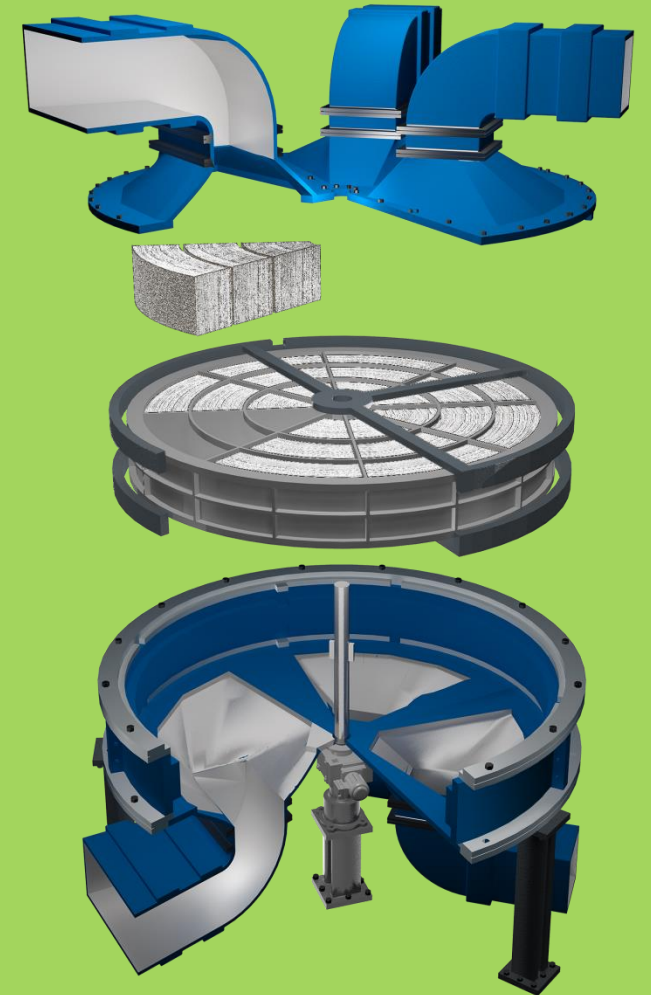
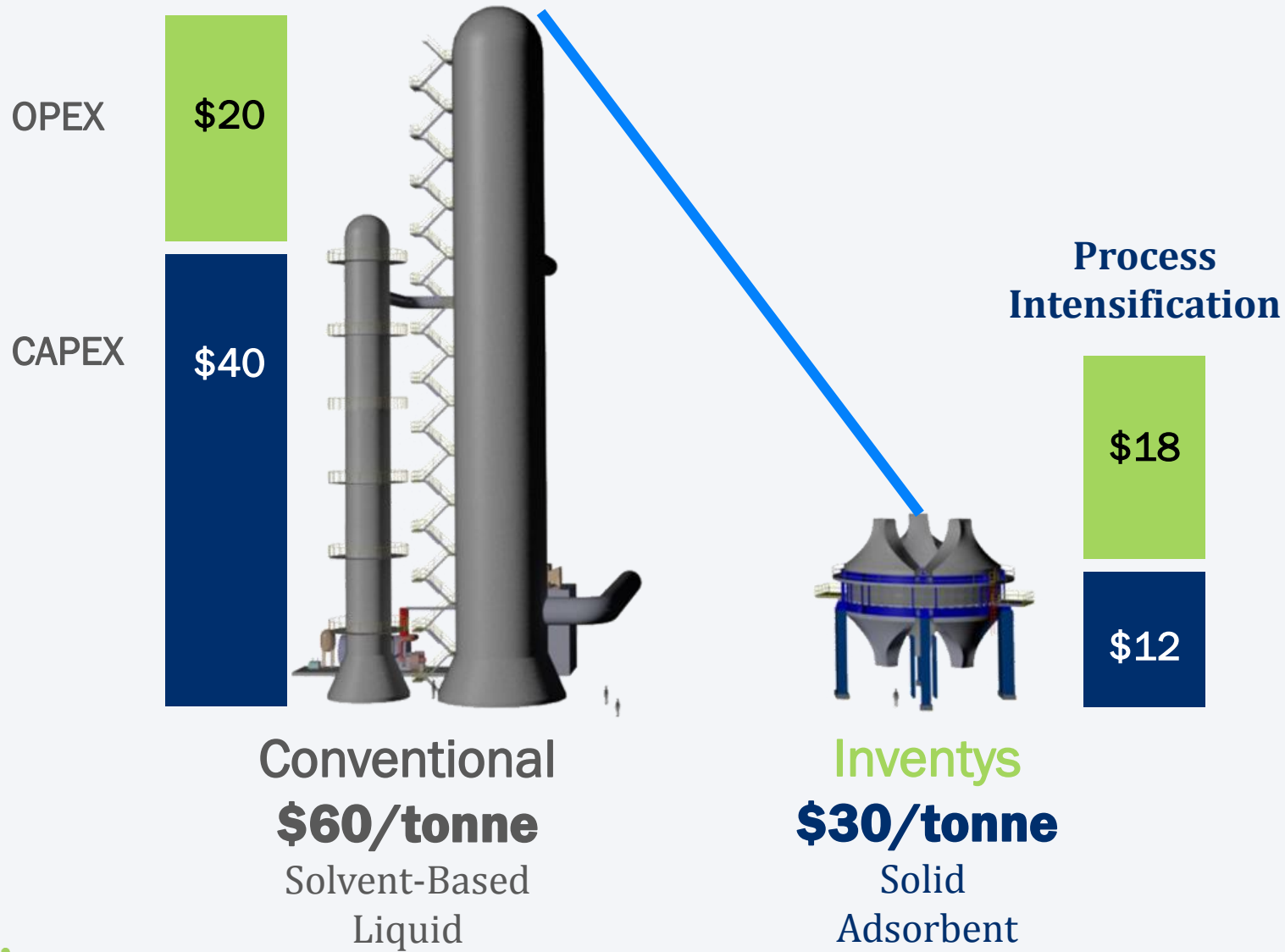
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Shifting the Carbon Capture Cost Curve



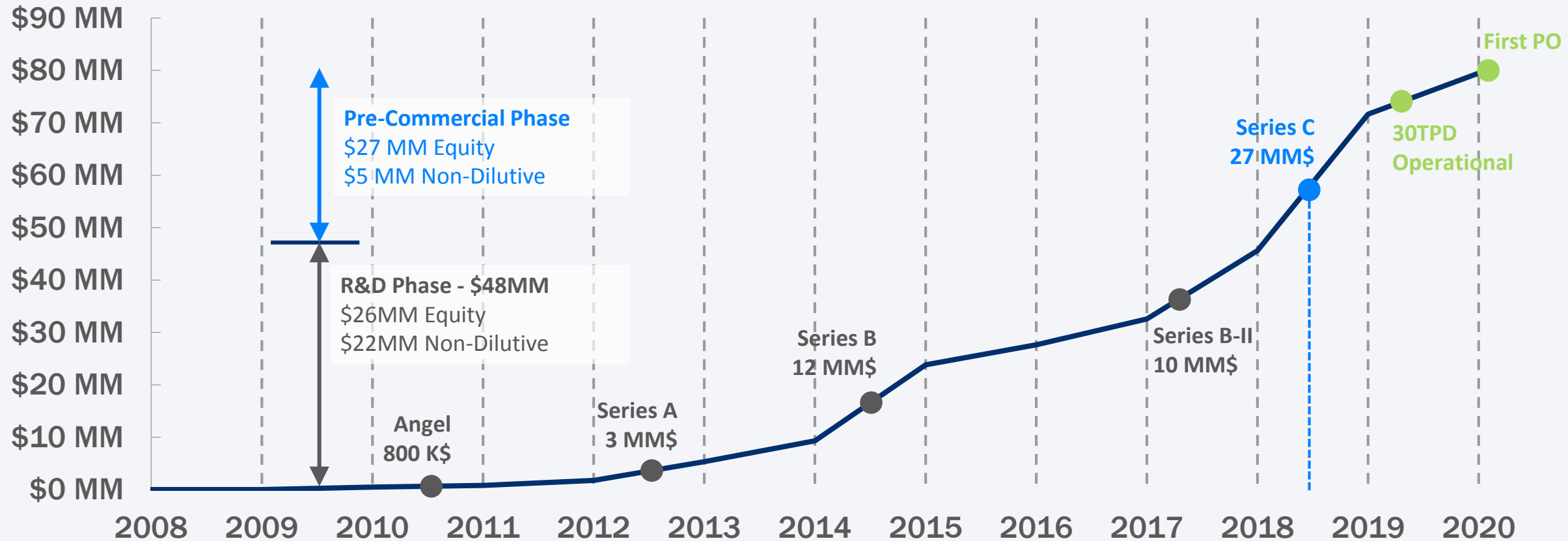
CO₂ Utilization

Process Intensification



How We Got Here – World Class Support

ALL VALUES IN \$ CAD



THE
RODA
GROUP

◆ MITSUI GLOBAL INVESTMENT

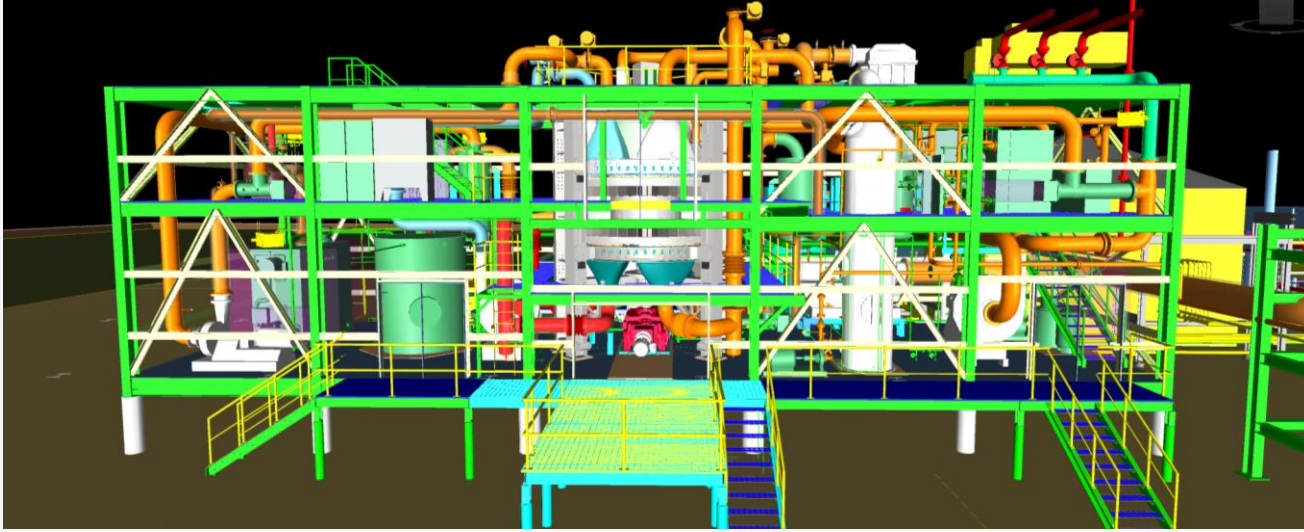
CHRYSLIX
VENTURE CAPITAL



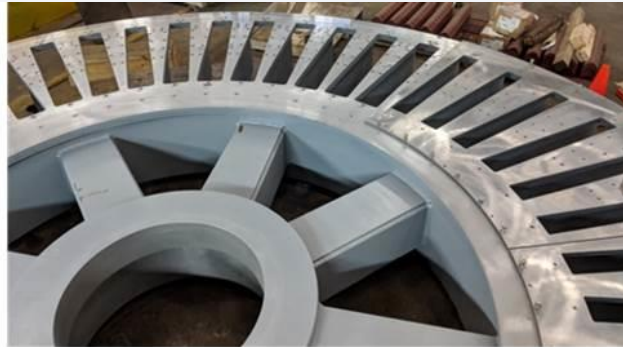
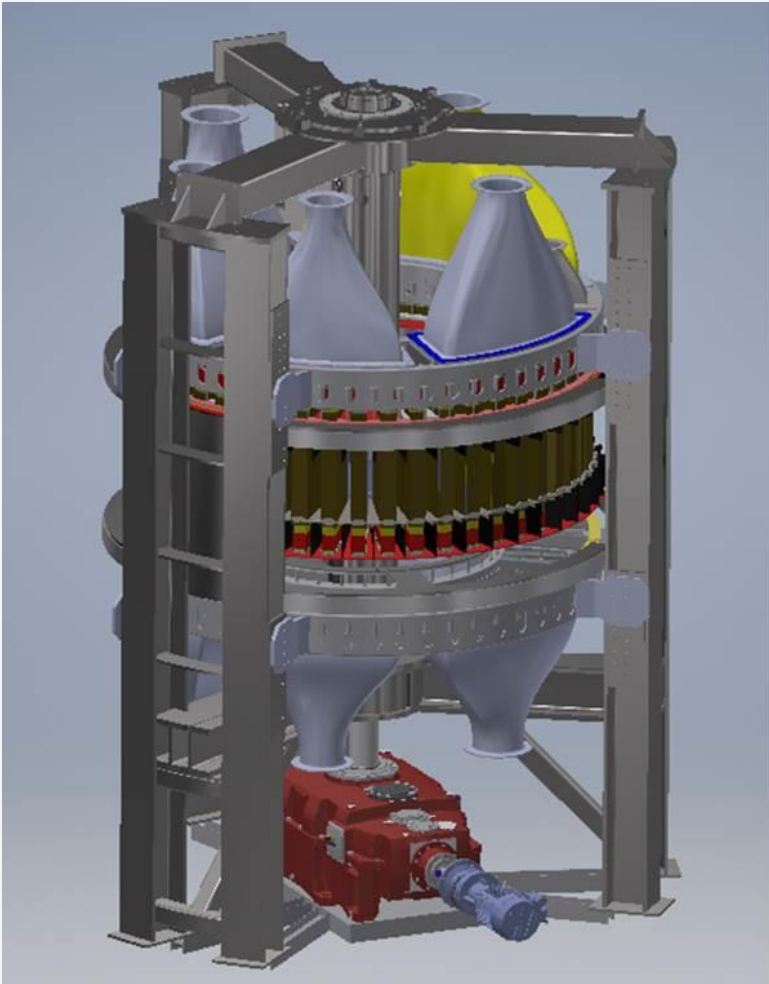
Husky Energy

OGCI
OIL AND GAS CLIMATE INITIATIVE
CLIMATE INVESTMENTS

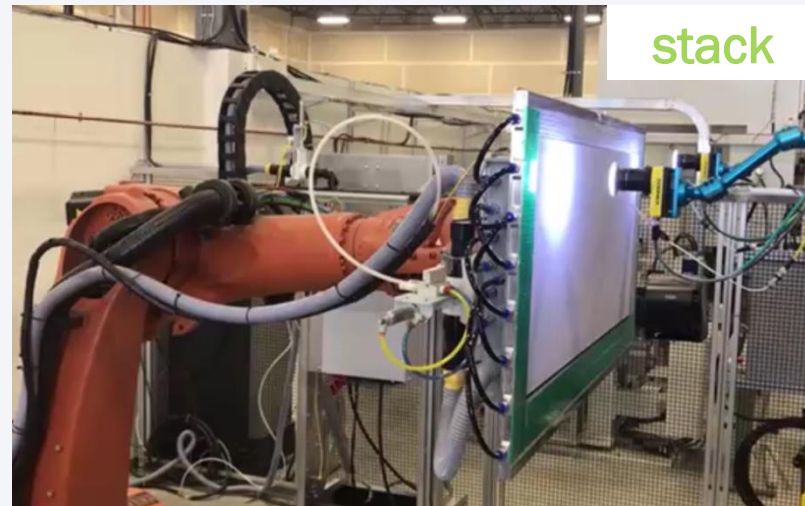
Where Are We At – Husky 30TPD Pilot Plant



30TPD Rotary Adsorption Machine



Manufacturing Line



- » **Commercial scale production line commissioned**
 - » **30TPD Pilot built with production line**
 - » **Can produce one 5,000TPD plant per year**
-
- Multiple 30 to 600TPD units

Key Customers Traction



Equity Investor
0.5 TPD Demo in EOR Site in Canada
30 TPD Pilot Host Site Agreement
Need 5,000 TPD of CO₂



Collaboration Demonstration Agreement
Lab Unit in France
Sponsor for Lafarge CO₂MENT Project



CO₂MENT Demo Project in Canada
1.0 TPD Demo in Cement Plant
CCUS Campus of Innovation



Largest EOR in US
300 TPD Demo Plant in Texas
Potential full scale 5,000+ TPD Plants
Need 100,000 TPD of CO₂

Are **you**
ready to **help**
meet the **greatest**
challenge
of our **time?**

THANK YOU

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CHRIS STERN

CEO & Co-Founder, Carbicrete



CARBICRETE

The cement-free, carbon-negative concrete solution

THE COMPANY

ESTABLISHED: 2016

EMPLOYEES: 8

HIGHLIGHTS:

- CARBON XPRIZE FINALIST
- \$5M RAISED
 - Private equity
 - In-kind from industrial partners
 - Non-dilutive government funding

CURRENT RAISE:

- \$3M IN EQUITY TO FUND PILOT PLANT AND PRODUCT CERTIFICATION

WHAT WE DO

Our patented technology enables the production of **cement-free, carbon-negative concrete**.

The end product is more durable and more sustainable than cement-based concrete.

VALUE PROPOSITION

Using a licensing model, we offer concrete manufacturers the **process, materials and support** to make high-quality precast concrete in a way that reduces their carbon footprint and **lowers their cost of materials**.

WHAT IS CARBICRETE?

Carbicrete is concrete that:

- Uses no cement and avoids the emissions that come from cement production
- Is made with steel slag, a by-product of the steel-making process
- Is cured with CO₂, making it carbon-negative
- Has lower material costs than cement-based concrete even without carbon pricing

RECOGNITION



THE WALL STREET JOURNAL.

FAST COMPANY



Bloomberg

WIRED





CONTACT

Chris Stern

CEO, Co-founder

1-514-210-5078

Chris.stern@carbicrete.com

CARBICRETE.COM



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BRETT WILCOX
CEO, Cvictus

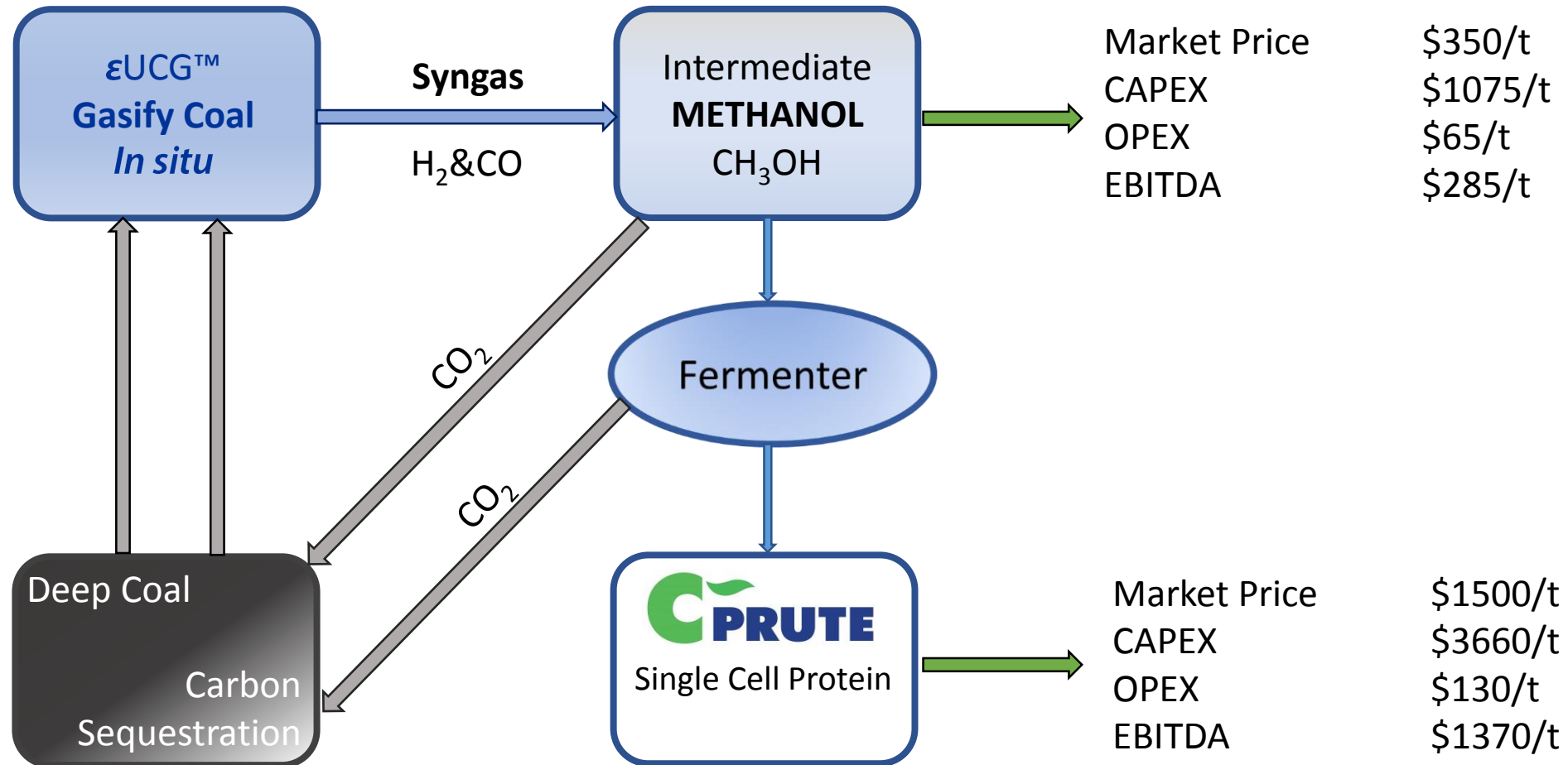


- Our name: Carbon negative nourishment and way of living
- Our mission: Very profitable, carbon-reducing feed and fuel

Profit *and* Impact from Paradox

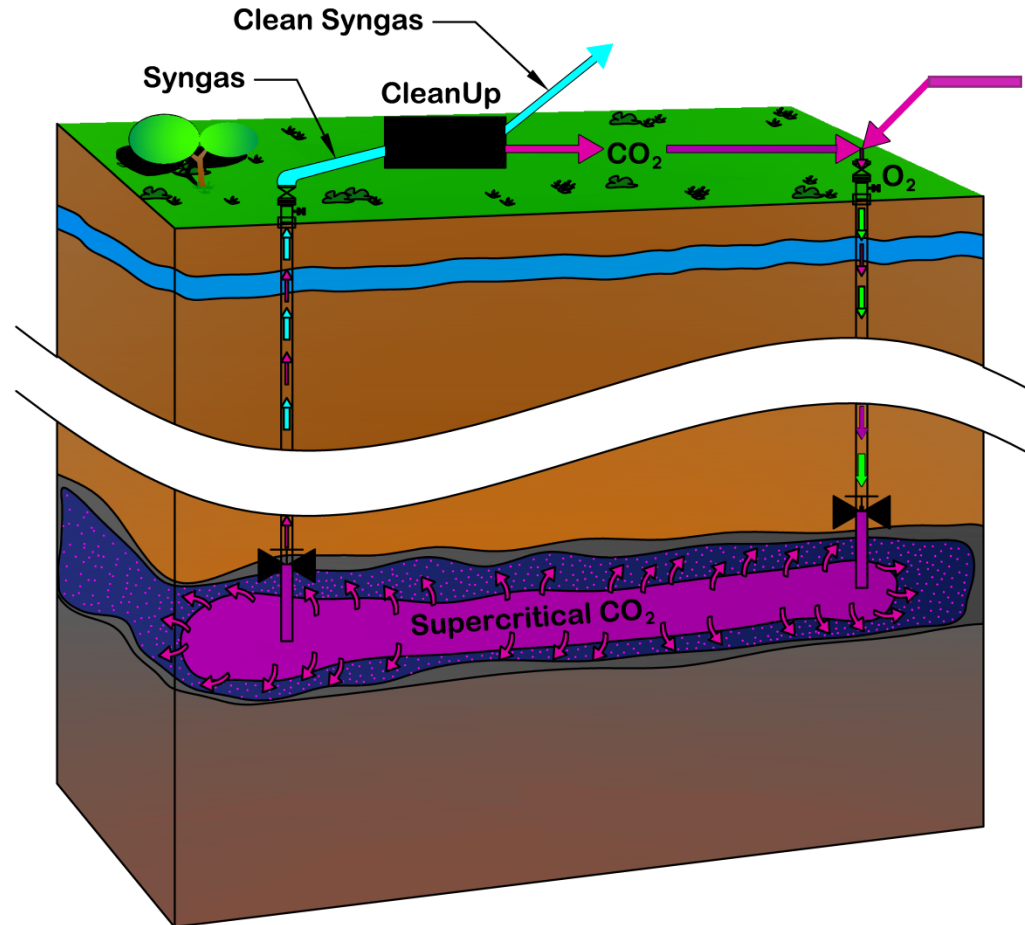
- Conventional fossil energy fuels and feeds are low cost *but* high carbon. Other alternatives are lower carbon *but* much higher cost.  **Cvictus Inc.** is *both* lower cost *and* lower carbon.
-  **Cvictus Inc.** starts with very low-cost deep coal and extracts as much hydrogen and as little carbon as possible—only the carbon essential for life, to grow single cell protein (SCP). We leave non-essential carbon in the ground and capture and sequester CO₂ in the same coal seam.
-  **Cvictus Inc.** proprietary process of **εUCG™**—underground coal gasification with carbon capture and sequestration— is a much lower carbon and lower cost way to produce methanol, the simplest alcohol, than conventional methods.
- Using methanol produced with **εUCG™** as feedstock to grow SCP is a much lower carbon and lower cost way to produce protein for animal feed than fishmeal or soybean meal. By substituting for soybean meal our SCP —  **Cprute** —can help save and restore the Amazon rainforest and other natural areas.
- Paradoxically, protein fed on methanol from coal actually *reduces* CO₂ levels by helping save and restore forests so trees can remove CO₂ from the atmosphere.

Cvictus Inc. Process: Low Cost and High Profit



Sequesters Almost All CO₂ From εUCG™

- Very low CO₂ emissions from our process.  retains carbon in the ground and captures and sequesters CO₂.
- Total impact is *negative* carbon—each tonne of  saves or restores 1.8 hectares of forest or savannah. More trees remove more carbon.
- Reforestation is the only practical way to remove and store atmospheric CO₂ in time, at scale.



- εUCG™ sequesters CO₂ from process:
- Retains 1/3 of carbon in ground;
 - Reflux uses CO₂ as part of process;
 - Quenches cavity with liquid CO₂; and
 - Entombs CO₂ in surrounding seam.
- Future sequestration of other's CO₂?

Methanol from εUCG™: Lower Cost *and* Lower Carbon

Lower Cost

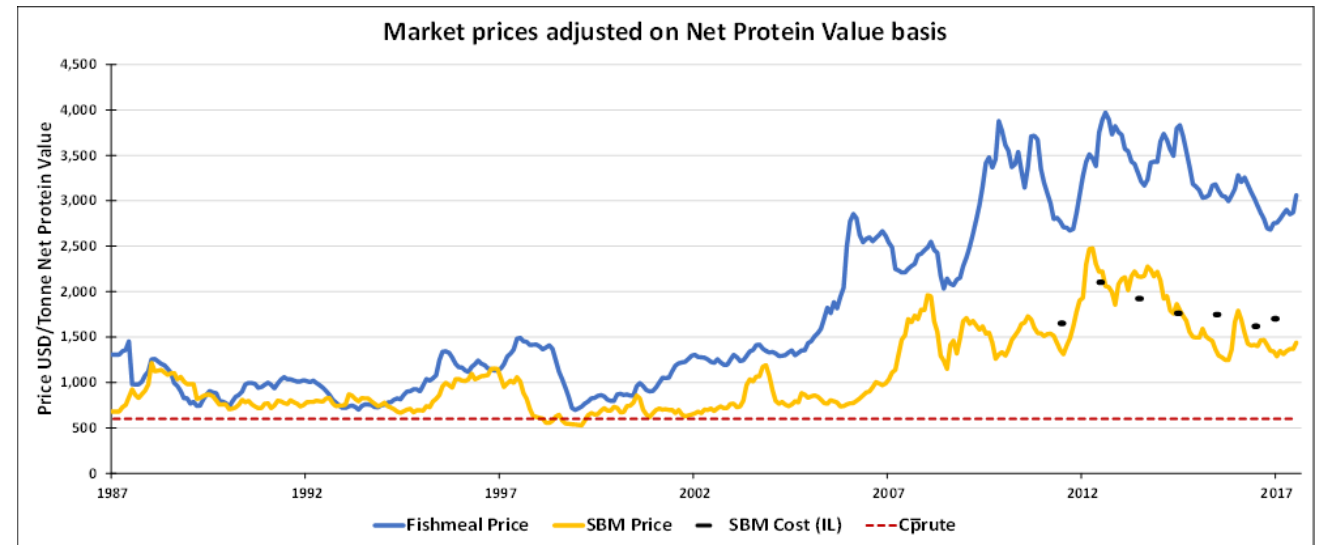
- Methanol is an 82 million metric tonne, \$35 billion/year world-wide market, growing 5%/year.
- Methanol produced by εUCG™ costs less than **half the cost** of methanol produced from natural gas and less than one-third the cost from conventional surface gasified coal.

Lower Carbon

- Producing methanol using εUCG™ emits less than **30% of the CO₂** emitted by producing methanol from natural gas.
- Each tonne of methanol from εUCG™ that substitutes for gasoline reduces 'well to wheel' vehicle CO₂ emissions about 10%.

C̄PRUTE is Low Cost and High Profit

- Massive market for protein for animal feed:
 - 230 million MT/yr
 - \$135 billion/yr
 - Growing about 3%/yr
- **C̄PRUTE** has higher Net Protein Value:
 - Soybean Meal, 26%
 - Fishmeal 48%
 - C̄prute 61%
- **C̄PRUTE** is *Much* Lower Cost:
 - 20% the price of fishmeal
 - 40% the price of soybean meal



PRUTE is Low Carbon and High Impact

- CO₂ emissions from production of soybean meal are 52% higher than from production of .
- Each tonne of  saves or restores 1.8 hectares of forest or savannah. Reforestation currently is the only practical way to reduce atmospheric CO₂ levels.
-  also substitutes for fishmeal, displacing the 'reduction fishery' that is strip mining almost 25% of ocean catch.
- Low-cost feed helps reduce hunger.

Carbon Emissions (Kilograms/Metric Tonne of Cprute Equivalent)			
	<u>New Soya</u>	<u>Old Soya</u>	<u>Cprute</u>
Fossil Fuel Energy for Production	425	425	280
Carbon in Protein from Fossil Fuels	-	-	442
Carbon in Protein from Photosynthesis	2,526	2,526	
Carbon Removed by Photosynthesis	(2,526)	(2,526)	
Land Use Changes	138,646	-	2
Reduced Photosynthesis from land use	1,740	1,740	0.01
Total Carbon Emissions into Atmosphere	140,811	2,165	724

VICTUS Inc. Financial Projections

- Phased development reduces risk.
- Two rounds of financing to build first commercial plant.
-  single cell protein—
 - Revenues \$105 million/yr
 - EBITDA \$83 million/yr
- Intermediate methanol—
 - Revenues \$45 million/yr
 - EBITDA \$36 million/yr
-  has huge potential for growth at very high margins.

Financial Projections--Sources & Uses (\$Millions)

	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
CAPEX--Phases					
1. UCG Plant	7.5	22.5	51.0		
2. Methanol Plant		12.0	73.0		
3. Protein Plant				<u>45.0</u>	<u>45.0</u>
Total	7.5	34.5	124.0	45.0	45.0
SAFE (early A)					
A Round		18.5			
Grant/Loan		30.0			
B Round			115.0		
Debt				40.0	
Methanol Net Income				35.7	17.8
Cprute Net Income					36.4

High Profit *and* High Impact

 **Cvictus** Inc. with ϵ UCG™ +CCS has what it takes to make a real difference:

- **Low Cost.** Production is much lower cost than existing alternatives.
- **Low Carbon.**  **Cvictus** Inc. process has lower CO₂ emissions than conventional production. Each tonne of  **Cprute** that substitutes for soybean meal saves or restores 1.8 hectares of forest or savannah. Reforestation is the only practical way to *remove* large amounts of CO₂ from the atmosphere at scale, in time.
- **Large Scale.** Suitable sites in many locations at very large scale. Huge markets for animal feed protein, methanol, energy and petrochemicals.
- **Rapid Deployment.** 3-4 years to plan and build large plant.
- **High Value to Consumers.** Lower cost *and* higher quality, *plus* environmental benefits.
- **High Profit to Producers.** High EBITDA margins ensure capital for growth.
- **Market Driven, Doesn't Require Mandate or Subsidy.** Just need visionary co-investors.



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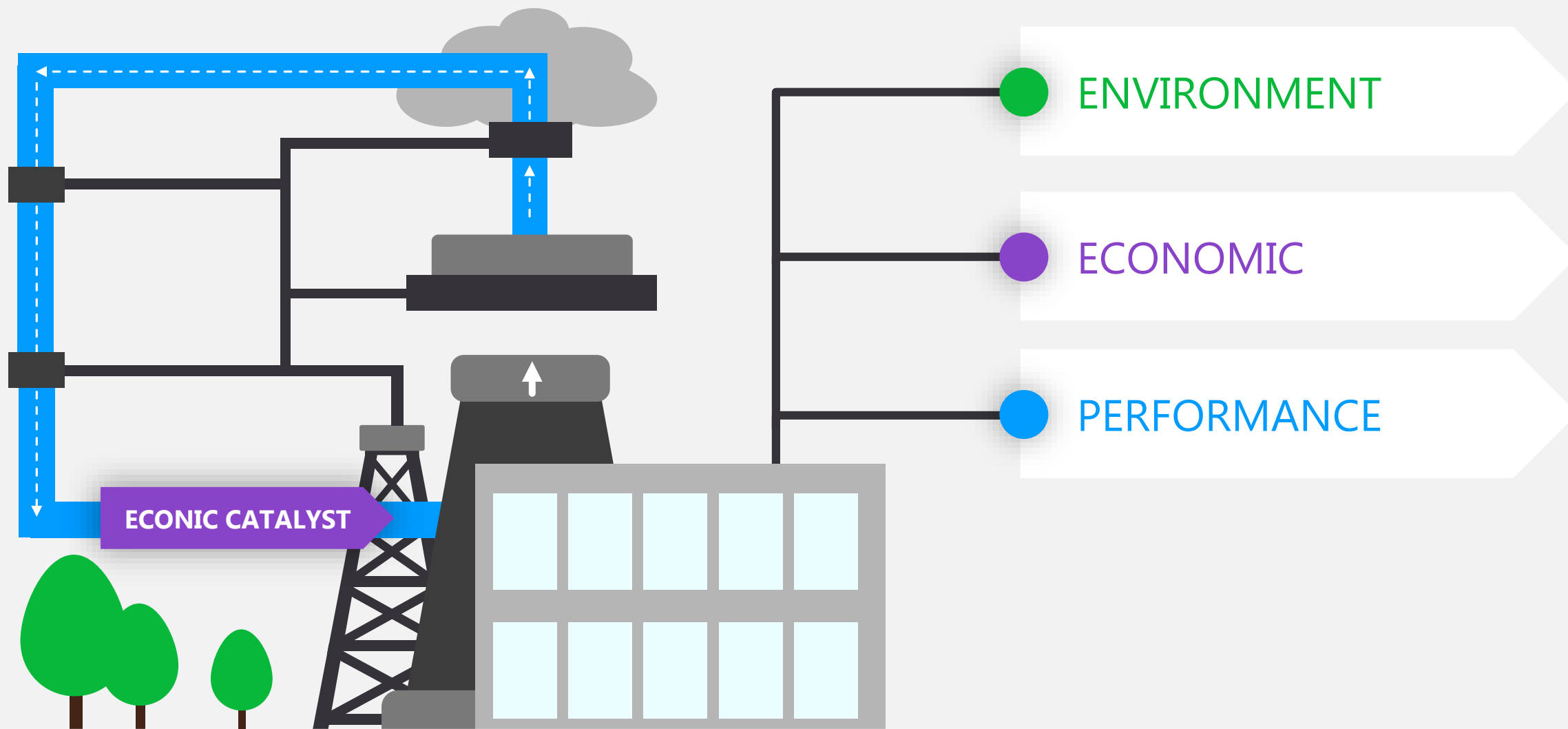
ROWENA SELLENS
CEO, Econic Technologies



ECONIC TECHNOLOGIES LTD

ROWENA SELLENS - CEO

RECYCLING CO₂ INTO REVENUE AND SO MUCH MORE...



UP TO 50% OF OIL-BASED RAW MATERIALS REPLACED WITH CO₂



TRANSFORMING POLYURETHANE AS THE FIRST MARKET

A \$20BN OPPORTUNITY

46

Automotive

Architecture

Trainers



Lower
production
cost



Better
properties

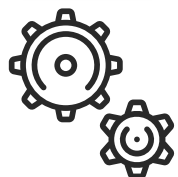


50%
margin
increase

\$500m

additional revenue for
average polyol producer

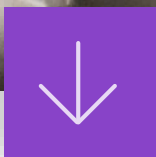
OUR CUSTOMER DEMONSTRATION FACILITY DE-RISKS LOW COST RETROFIT INVESTMENT



Retrofit kit
< \$2M



ROI
< 2YRS

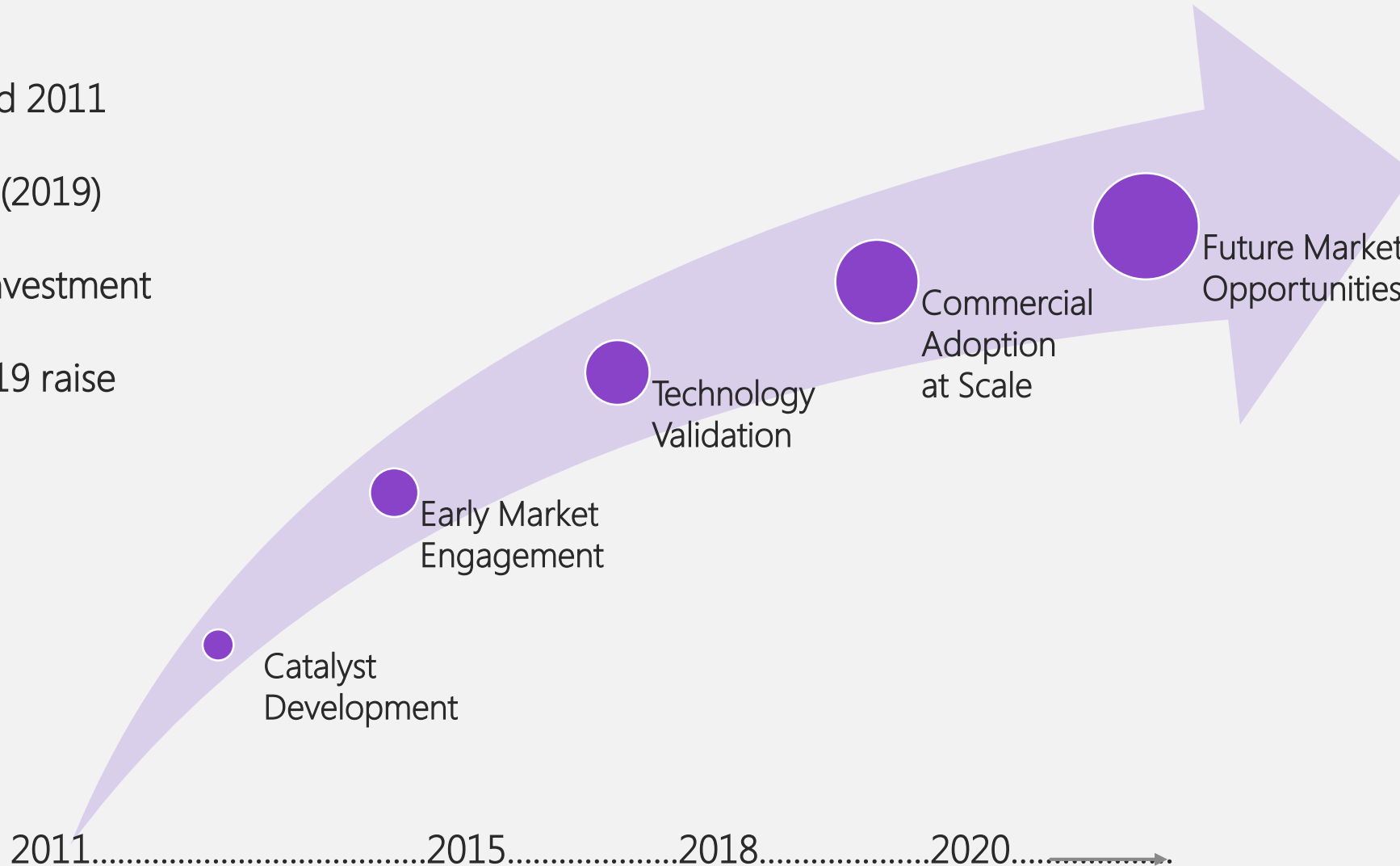


Expert
support



PROVEN DISRUPTIVE POTENTIAL ACCELERATING TOWARDS ADOPTION

- Founded 2011
- 30 staff (2019)
- \$25M investment
- Late 2019 raise



RECYCLING CO₂





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