PLUG AND PLAY

NOVEMBER 19-21 2024

SILICON VALLEY SUMMIT

#PNPTCSiliconValley

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ENERGY EXPO

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OPENING REMARKS

Reza Khaj

Director and Investor

Plug and Play Energy

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AGENDA

11:00 – 11:06 AM	OPENING REMARKS
11:06 – 11:12 AM	NEW PARTNERSHIP ANNOUCEMENT, **JERA & CPFL**
11:12 – 11:27 AM	AI & DIGITALIZATION IN ENERGY PRESENTATION
11:27 – 11:42 AM	KEYNOTE SPEAKER: C3 AI (ADRIAN RAMI)
11:42 – 12:15 PM	STARTUP PITCHES
12:15 – 12:35 PM	CORPORATE PANEL WITH KPMG, CPFL, & PLUG AND PLAY

PLUG AND PLAY ENERGY

YEAR LAUNCHED	PARTNERS	STARTUPS ACCELERATED
2017	20+	200+



Silicon Valley
- Energy and Climate Tech

Brazil
- Energy and Climate Tech

Energy Focus Areas

Green and Renewable Energy Generation



SwiftSolar

FERVO ENERGY

ORPC

OKLO

SolarMente

DANDELION

Helical Fusion

Natel

Energy Focus Areas

Green and Renewable Energy Generation



SwiftSolar
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ORPC
OKLO
SolarMente
DANDELION
Helical Fusion
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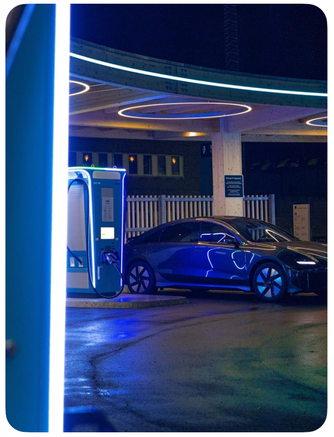
Electrification and Smart Grids



northvolt
Liblac solutions
REDWOOD MATERIALS
Form energy
uplight
WeaveGrid
leap
KOLOMA

Energy Focus Areas

Green and Renewable Energy Generation



SwiftSolar
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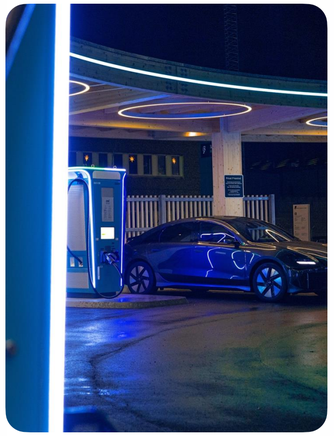

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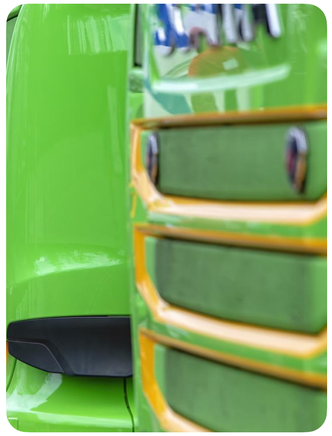
Sustainable Fuels



ammobia
twelve
terreva RENEWABLES
LanzaTech
Synhelion
INFINIUM
sunfire
Hydrogenious LOHC

Energy Focus Areas

Green and Renewable Energy Generation



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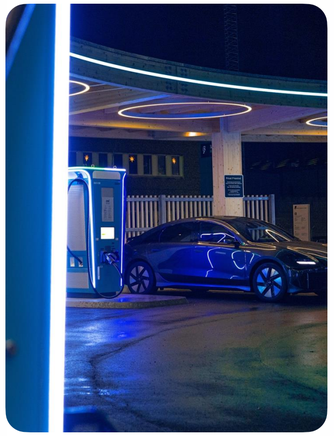

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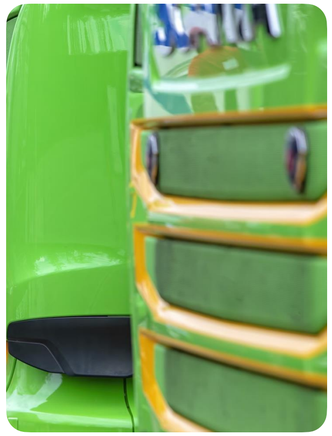

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sunfire
Hydrogenious LOHC

Digital Transformation and AI



Terra AI
UPTAKE
sparkcognition
datch
SeeQ
COGNITE
HData
EXOWATT

Plug and Play Energy Focus Areas

Green and Renewable Energy Generation



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OKLO
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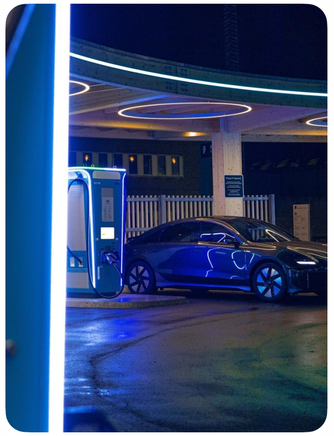
Electrification and Smart Grids



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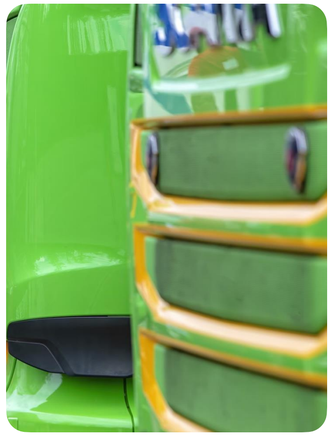

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Digital Transformation and AI



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datch
SeeQ
COGNITE
HData
EXOWATT

Carbon Circularity



vaulted deep
Heirloom
UCANEO
Carbon Ridge
Watershed
Sylvera
Carbon Reform
planA

Our Energy and Climate Tech Portfolio

40+

Portfolio companies

$160k

Plug and Play average ticket

$1.2B+

Total money raised



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New portfolio highlights 2024

AEROVY

2022, West Lafayette, IN, US

Round: Pre-seed, $860K

M25 FLYWHEEL FUND PURDUE INNOVATES

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M25 · FLYWHEEL FUND · PURDUE INNOVATES

Yama

2023, Paris, France

Round: Pre-seed, $2.5M

Grantham Foundation for the Protection of the Environment · Deep Science Ventures · VOYAGERS.IO

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CONCENTRO

2023, NY, US

Round: Pre-seed, $3M

Silence · firstminute capital · LifeX Ventures

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Silence · firstminute capital · LifeX Ventures

UCANEO

2022, Berlin, Germany

Round: Seed, €4M

Grantham Foundation for the Protection of the Environment · SMART ENERGY Innovationsfonds AG energie360° · CARBON REMOVAL PARTNERS · IBB Ventures

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M25 · FLYWHEEL FUND · PURDUE INNOVATES

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Grantham Foundation for the Protection of the Environment · SMART ENERGY Innovationsfonds AG energie360° · CARBON REMOVAL PARTNERS · IBB Ventures

General Galactic

2023, El Segundo, CA, US

Round: Seed, $8M

Refactor Capital · HARPOON

Latest Portfolio Highlights

Avathon

Avathon (FKA SparkCognition, 2014, Austin, US) provides AI-powered asset management solutions, using predictive analytics to optimize performance, reduce downtime, and enhance operational efficiency across industries like energy and manufacturing.

Stage Series D, **Funding** $287M

National Grid Renewables Selects SparkCognition's AI-Enabled Asset Performance Management Solution to Power its Growing Project Portfolio

sparkcognition

vaulted deep

Vaulted (2023, Houston, US) is a biomass carbon removal and storage (BiCRs) solution. Vaulted delivers permanent, high quality carbon removal at scale through the geologic sequestration of carbon-filled organic waste. Vaulted's approach is designed to be the lowest-cost, gigaton scale, permanent carbon removal.

Stage Seed, **Funding** $8M



May 1/ 2024

Frontier

Frontier buyers sign $58.3M in offtake agreements with Vaulted Deep



Nov 14/ 2024

Reuters

Vaulted Deep's Series A raise of $32.3 million, led by Prelude Ventures

Plug and Play Energy Brazil

São Paulo

2024 Foundation

Tech Interests 2024

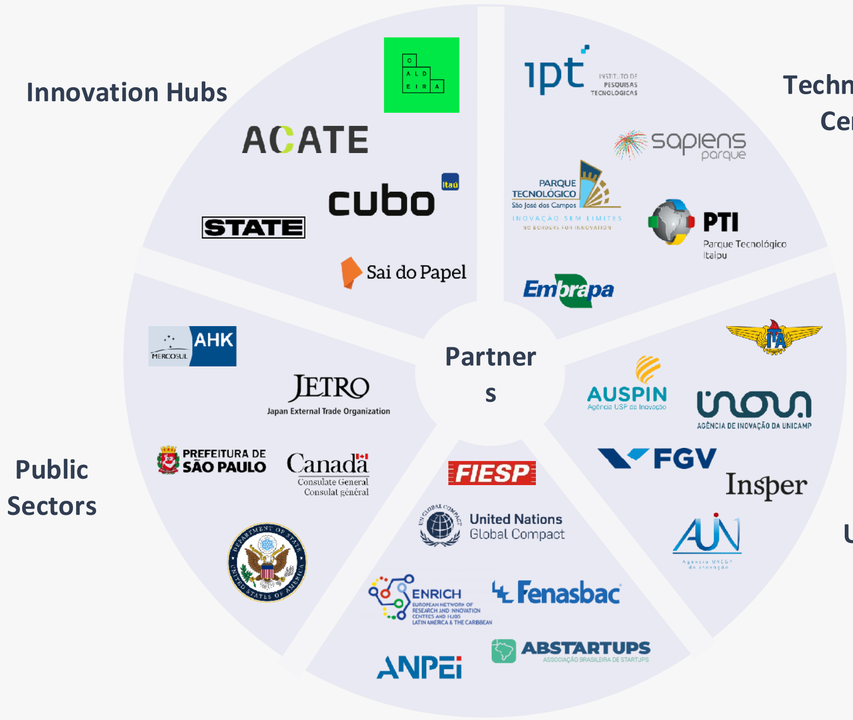
Sustainable Fuels
Carbon Market
Clean Energy
Hydrogen

Main Industries

Utilities
Oil & Gas
Mobility
Mining
Agriculture

Partners

We connect our partners to Brazil's innovation ecosystem with a 360º vision



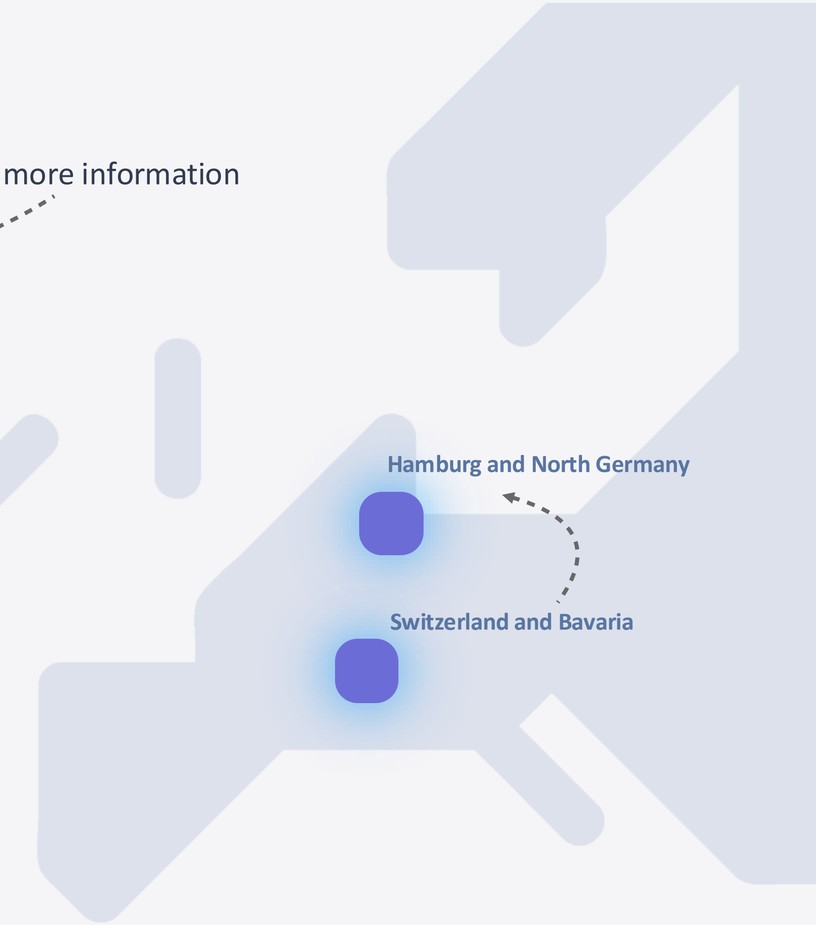
*Dates are subject to change

Hydrogen Immersion Week in Europe (4-13 February 2025*)

Objectives

- **Pilots/Partnerships**
- **Learnings on Production/Storage/Use**
- **Learnings on Commercialisation/Regulations**

Scan to request more information



4-7 February

Site Visits

Switzerland and **Germany**

- Production Sites
- Storage Facilities
- Hydrogen Use and Conversion



10-13 February

Workshops and Dealflows

Germany

- In-Person Meetings
- Startup Pitches
- Innovation Workshop



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NEW PARTNERSHIPs

JERA

CPFL ENERGIA

#PNPTCSiliconValley

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PLUG AND PLAY

SV SUMMIT



SPEAKER

Tim Romero

Partner

JERA Ventures



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SPEAKER

Rafael Moya

Innovation Manager

CPFL

#PNPTCSiliconValley

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TREND PRESENTATION

Floren Van de Velde

Sr. Ventures Analyst

PLUG AND PLAY
ENERGY

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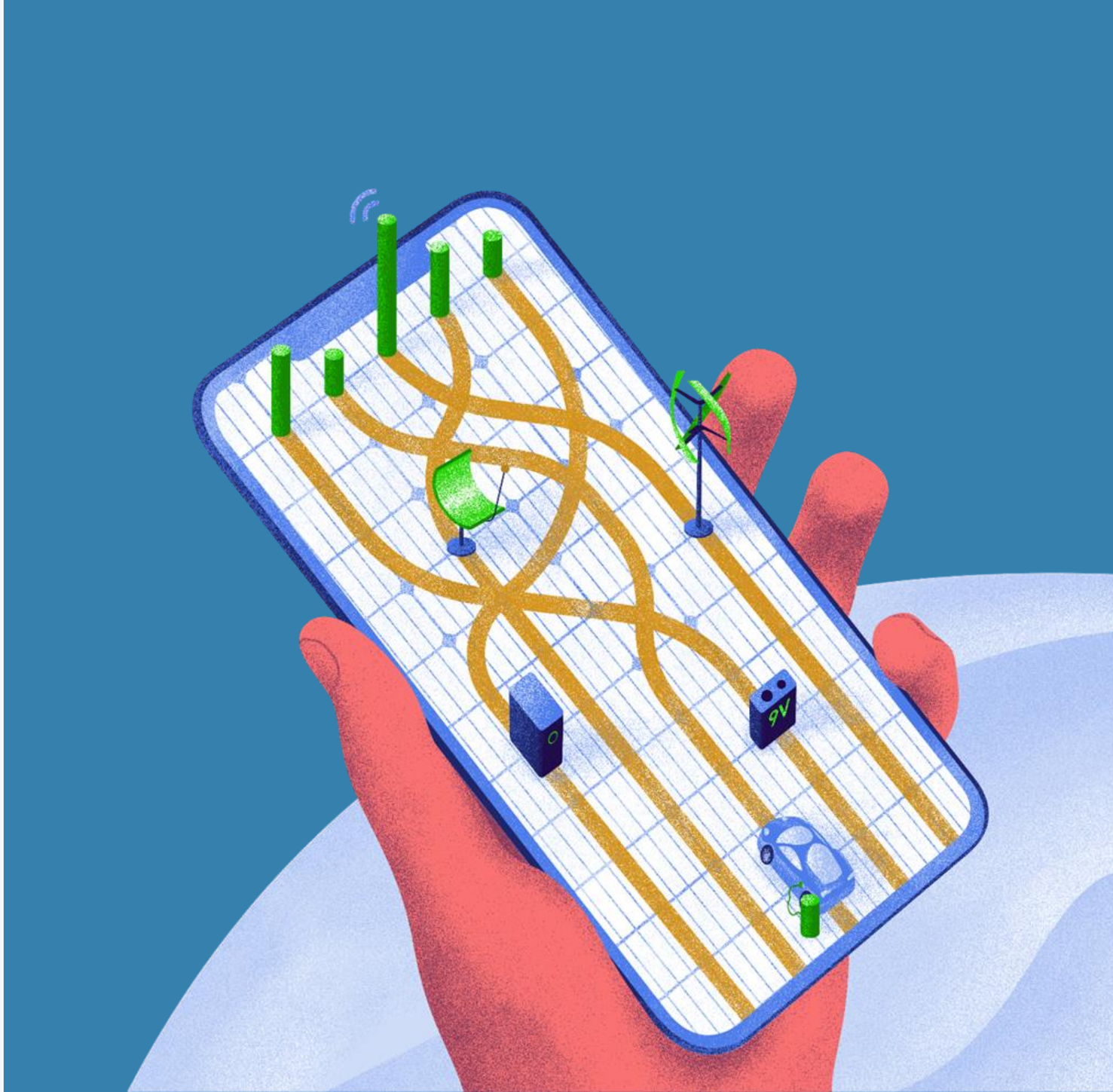
AI and Digitalisation in Energy

A Plug and Play Energy Report



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AI and Digitalisation in Energy

Disclaimer

This analysis was completed using the Plug and Play internal database of startups (~80,000 companies) that we have met with and qualified as appropriate for our innovation ecosystem. Therefore this report does not include an exhaustive list of all digitalisation startups. The team highlighted key findings as appropriate for the audience and length of this specific event.

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AI and Digitalisation in Energy

Agenda

1. Adoption and Barriers of AI in Energy
2. Challenges and Applications in Energy
    a. Field Work Digitalisation
    b. Monitoring and Maintenance
    c. Compliance
    d. Planning and Design
    e. Performance and Operations
    f. Trading and Electrification
3. AI Adoption Roadmap
4. Final Remarks

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Overview of Energy AI and Digitalisation Landscape

250+
Startups Reviewed

6
Regions

2000 - Present

Stage Agnostic

Navigating through the data

In the following sections, you will find:

➲ An overview of the AI and digitalisation startup landscape in the energy sector, including an overview of which geographies are most engaged in the space right now
➲ Startups have a strong software component, designed for O&G and electric utility clients, digitalising and optimising their current operations
➲ Analysis of current funding breakdown and investor involvement
➲ Key opportunities for collaboration

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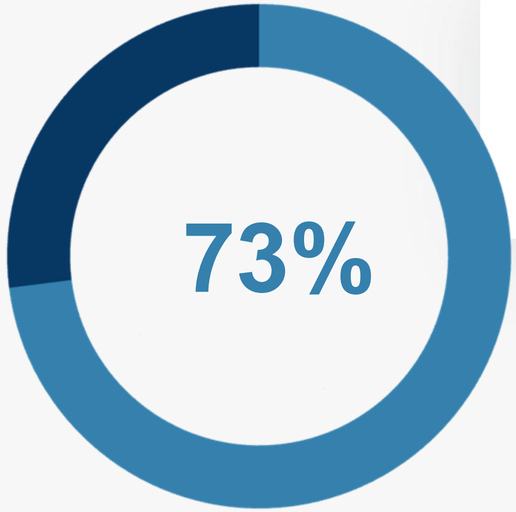
High Interest, Slow Adoption



Energy companies piloting or planning AI

With 91% maintaining or increasing spending next years

Source: DNV (n=390), Rigzone

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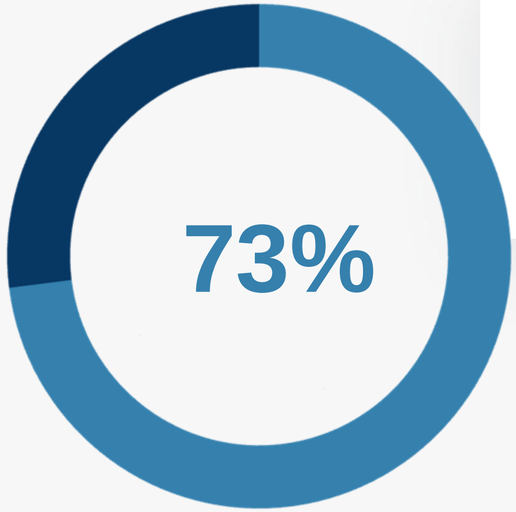
High Interest, Slow Adoption

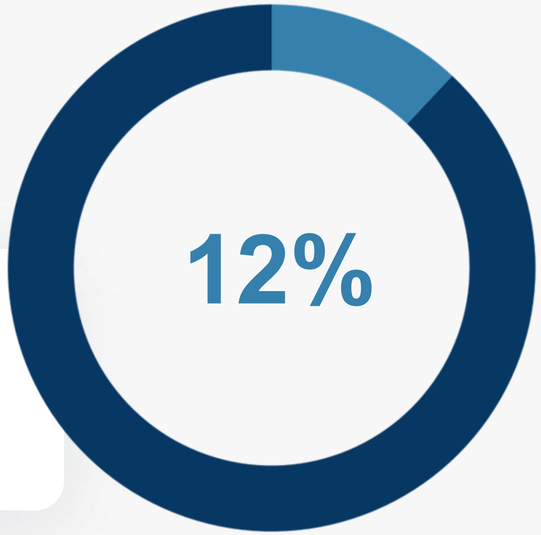


Energy companies piloting or planning AI

With 91% maintaining or increasing spending next years

Advanced stages of AI development and integration

68% says it changes their way of work



Source: DNV (n=390), Rigzone

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AI Adoption Barriers in Energy

Existing Infrastructure

Legacy platforms, heavy data clean up

Conservative Culture and Trust

Critical industry with focus on reliability

Source: DNV, Infosys, Mesh AI

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AI Adoption Barriers in Energy

PLUG AND PLAY ENERGY

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Talent and Skills Gap

Attracting and retaining tech talent

Investment and ROI Concerns

Uncertainty about short term return

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Regulatory concerns

Data compliance, OT- and cybersecurity

External Partners and Technologies

Aversion to invest in outdated tech

Source: DNV, Infosys, Mesh AI

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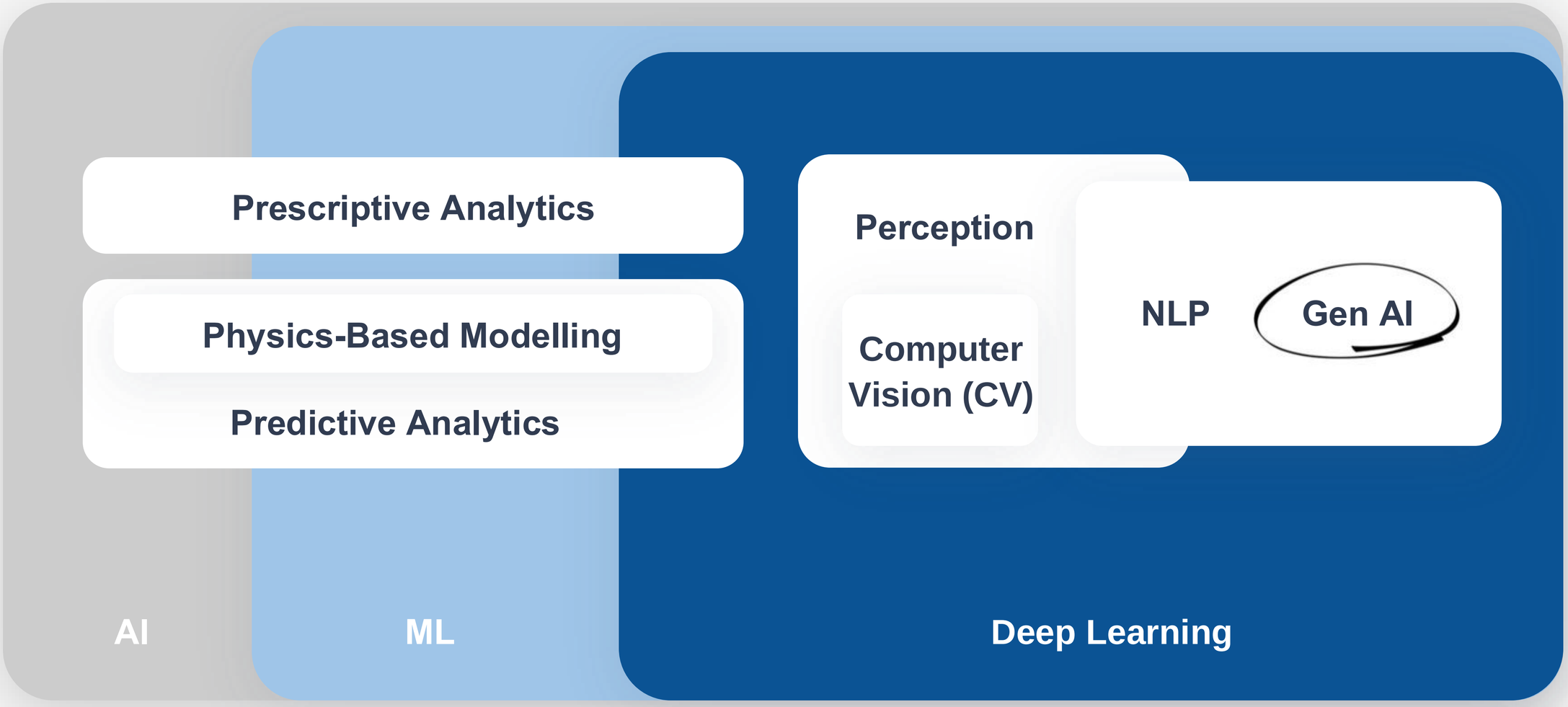
AI Methodologies in Energy



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Generative AI Breaking Barriers in Energy

Existing Infrastructure
Legacy platforms, heavy data clean up

Conservative Culture and Trust
Critical industry with focus on reliability

Talent and Skills Gap
Attracting and retaining tech talent

Investment and ROI Concerns
Uncertainty about short term return

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Source: Xenonstack, DNV, Infosys, AlphaSense

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Fast adaptation to new conditions

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PLUG AND PLAY ENERGY

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Fast adaptation to new conditions

Regulatory concerns
Data compliance, OT- and cybersecurity

External Partners and Technologies
Aversion to invest in outdated tech

+ Generation capability helps with predictions, scenario's and complex problems
+ Holistic system understanding and anomaly detection

Source: Xenonstack, DNV, Infosys, AlphaSense

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Generative AI Breaking Barriers in Energy

~~**Existing Infrastructure**~~
Less need for data gathering or cleanup

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Integrates faster with intuitive interface

Talent and Skills Gap
Attracting and retaining tech talent

~~**Investment and ROI Concerns**~~
Fast adaptation to new conditions

Regulatory concerns **BUT**
Security solutions ensuring compliance

External Partners and Technologies
Aversion to invest in outdated tech

+ Generation capability helps with predictions, scenario's and complex problems
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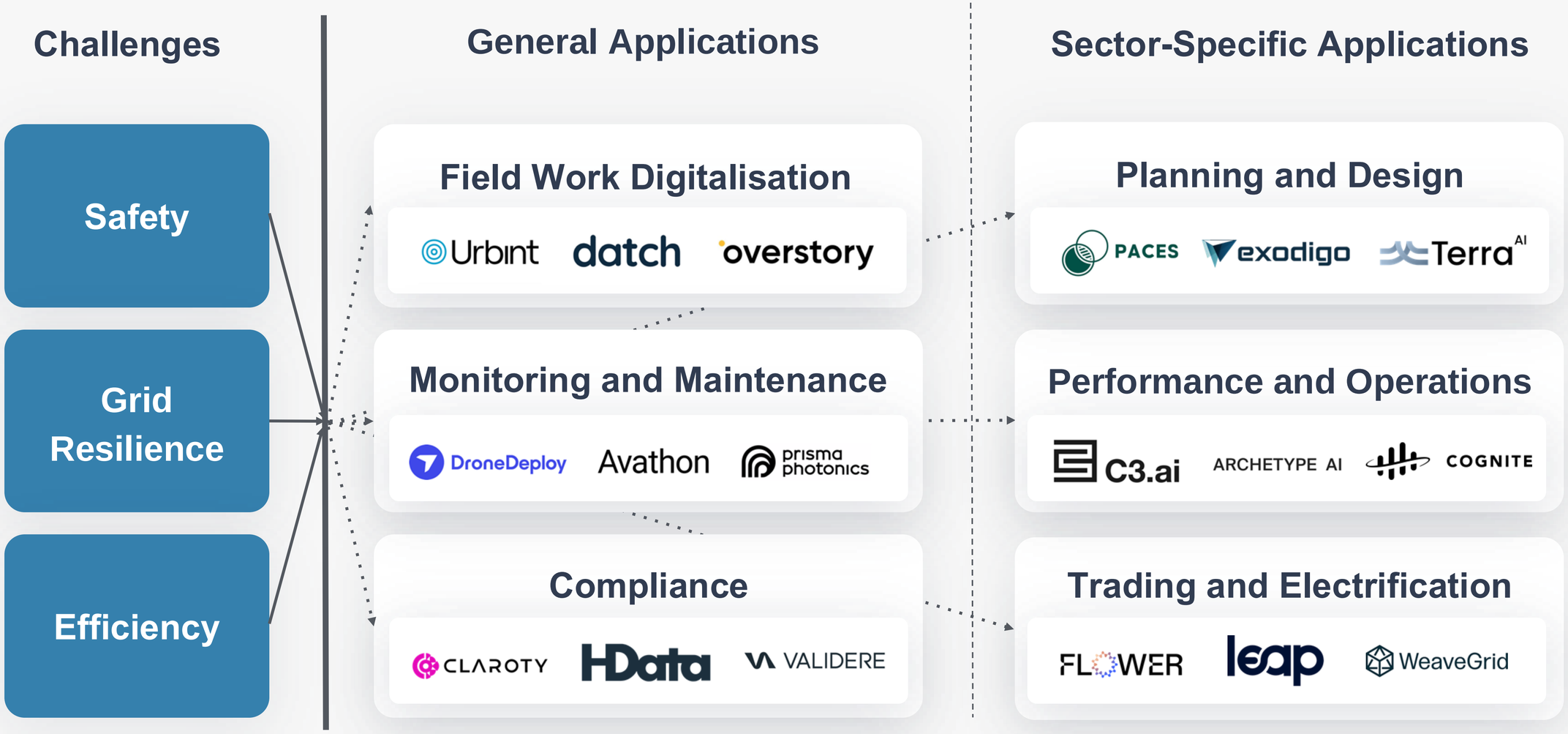
Challenges and Applications



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General Applications in Energy

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Field Work Digitalisation

- Frontline Communication
- Training
- Health, Safety and Environment

Safety

Grid

Efficiency



Efficiency

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General Applications in Energy

PLUG AND PLAY ENERGY

Field Work Digitalisation

- Frontline Communication
- Training
- Health, Safety and Environment

Safety

Grid

Efficiency



Monitoring and Maintenance

- Robotics and Drones
- Inspection and Monitoring
- Predictive Maintenance

Safety

Grid

Efficiency



Safety

Efficiency

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General Applications in Energy

PLUG AND PLAY ENERGY

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Grid

Efficiency



Monitoring and Maintenance

- Robotics and Drones
- Inspection and Monitoring
- Predictive Maintenance

Safety

Grid

Efficiency



Compliance

- Cybersecurity
- Reporting and Documentation
- Emissions Management

Safety

Grid

Efficiency



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Sector-Specific Applications in Energy

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Planning and Design

- Financial Planning
- Site and Route Selection
- Scenario Modelling

Safety

Grid Efficiency



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Sector-Specific Applications in Energy

PLUG AND PLAY ENERGY

Planning and Design

- Financial Planning
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- Scenario Modelling

Safety

Grid

Efficiency



Performance and Operations

- Performance Optimization
- Grid Operations
- Industrial DataOps

Safety

Grid

Efficiency



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Sector-Specific Applications in Energy

PLUG AND PLAY ENERGY

Planning and Design

- Financial Planning
- Site and Route Selection
- Scenario Modelling

Safety

Grid

Efficiency



Performance and Operations

- Performance Optimization
- Grid Operations
- Industrial DataOps

Safety

Grid

Efficiency



Trading and Electrification

- Customer Electrification
- Demand Response
- Trading and Demand Forecasting

Safety

Grid

Efficiency



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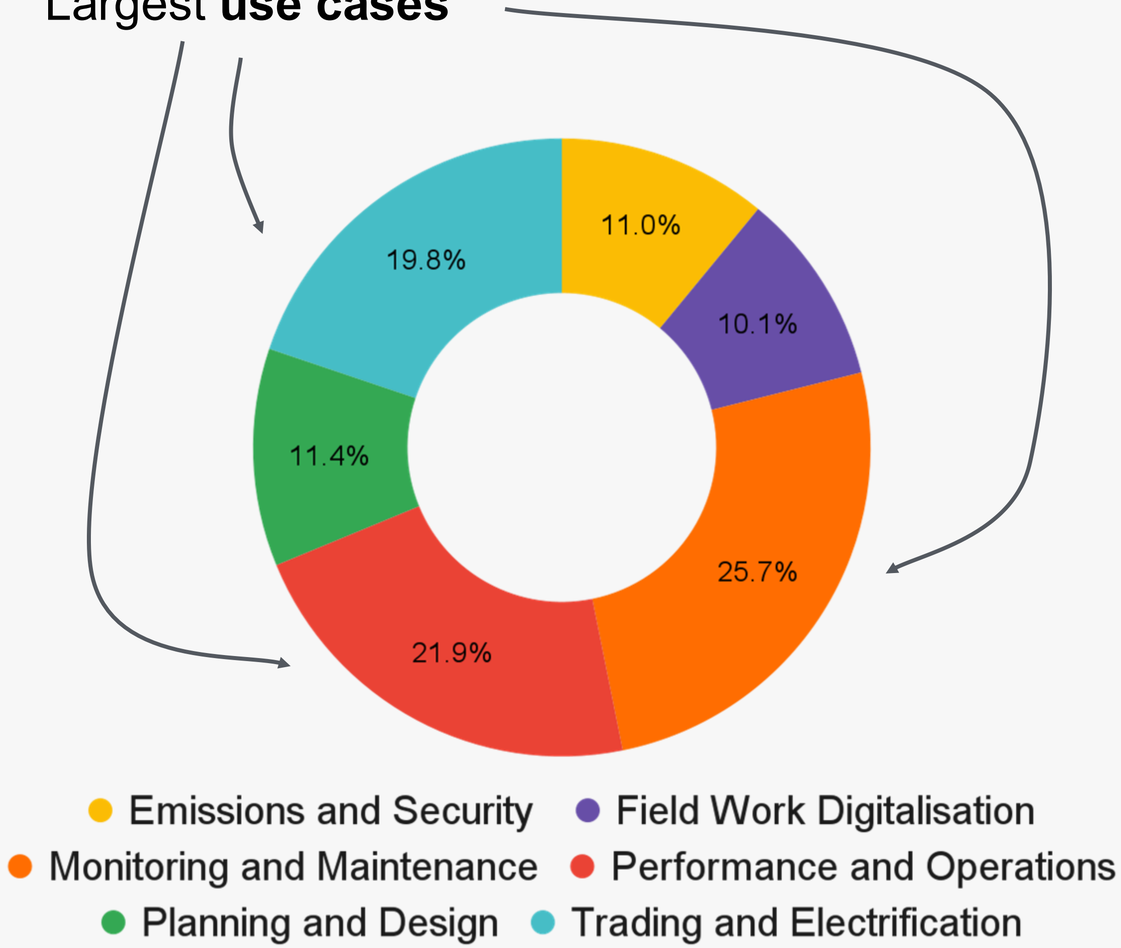
Distribution by Application and Hardware-to-Software

Largest **use cases**



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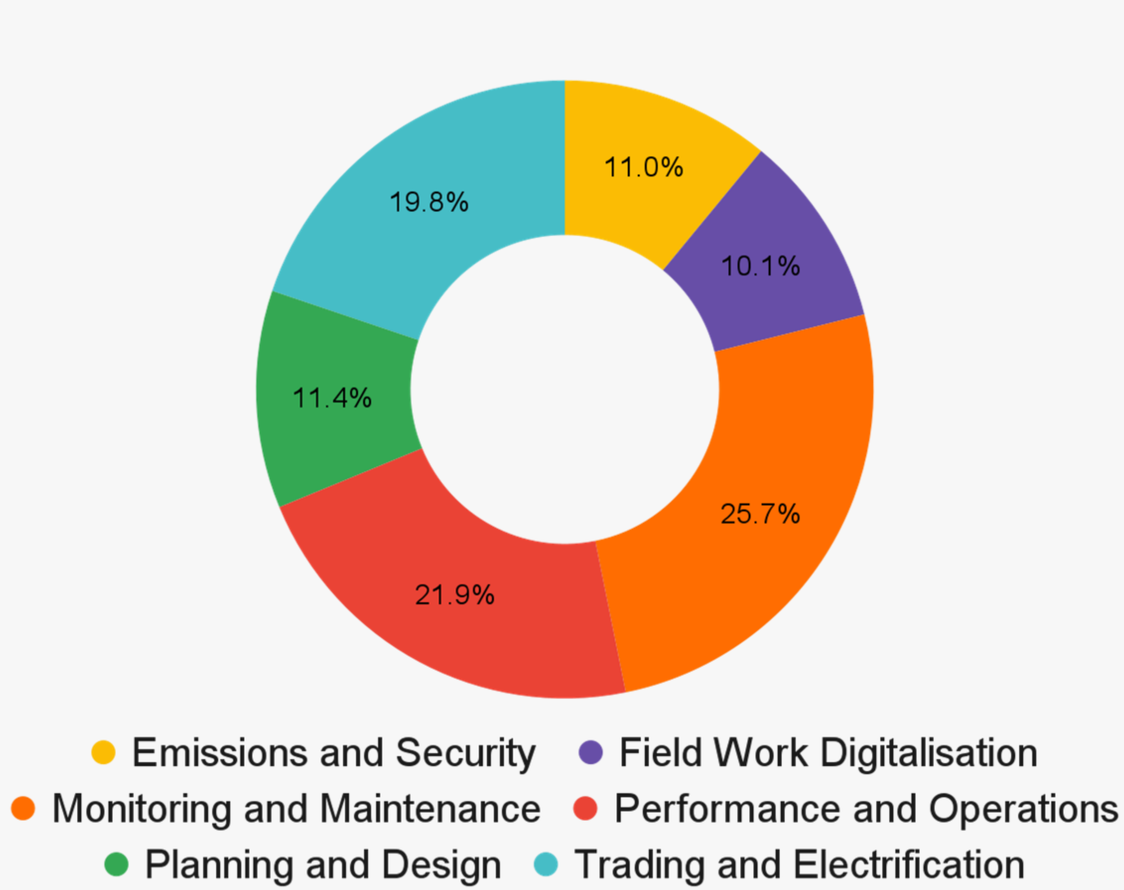
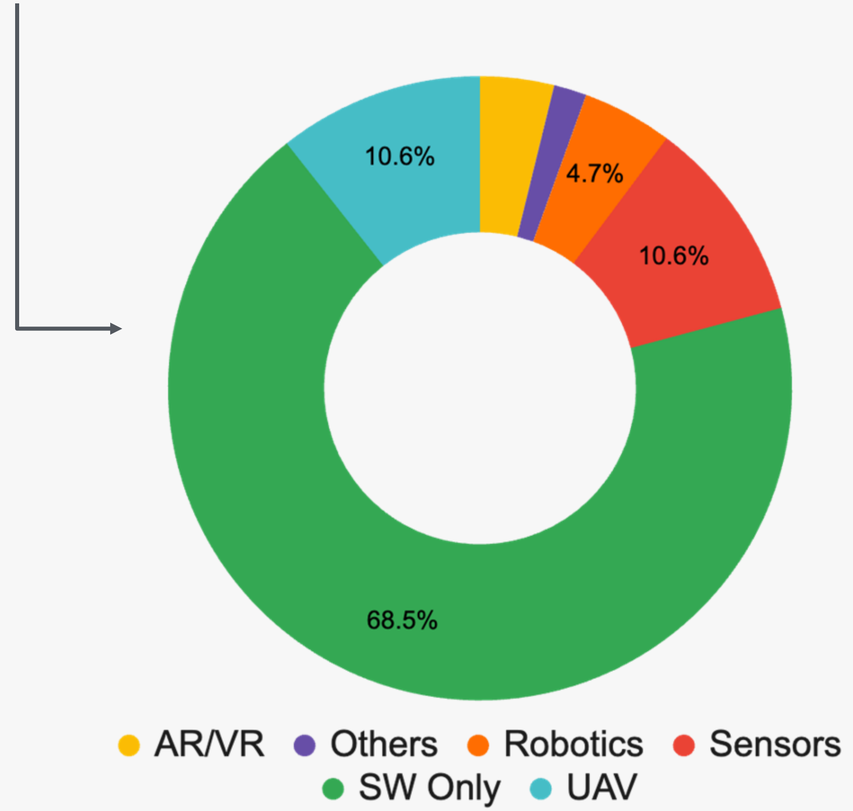
Distribution by Application and Hardware-to-Software

Majority is only software and tends to be **hardware-agnostic**





Reach out for more funding data

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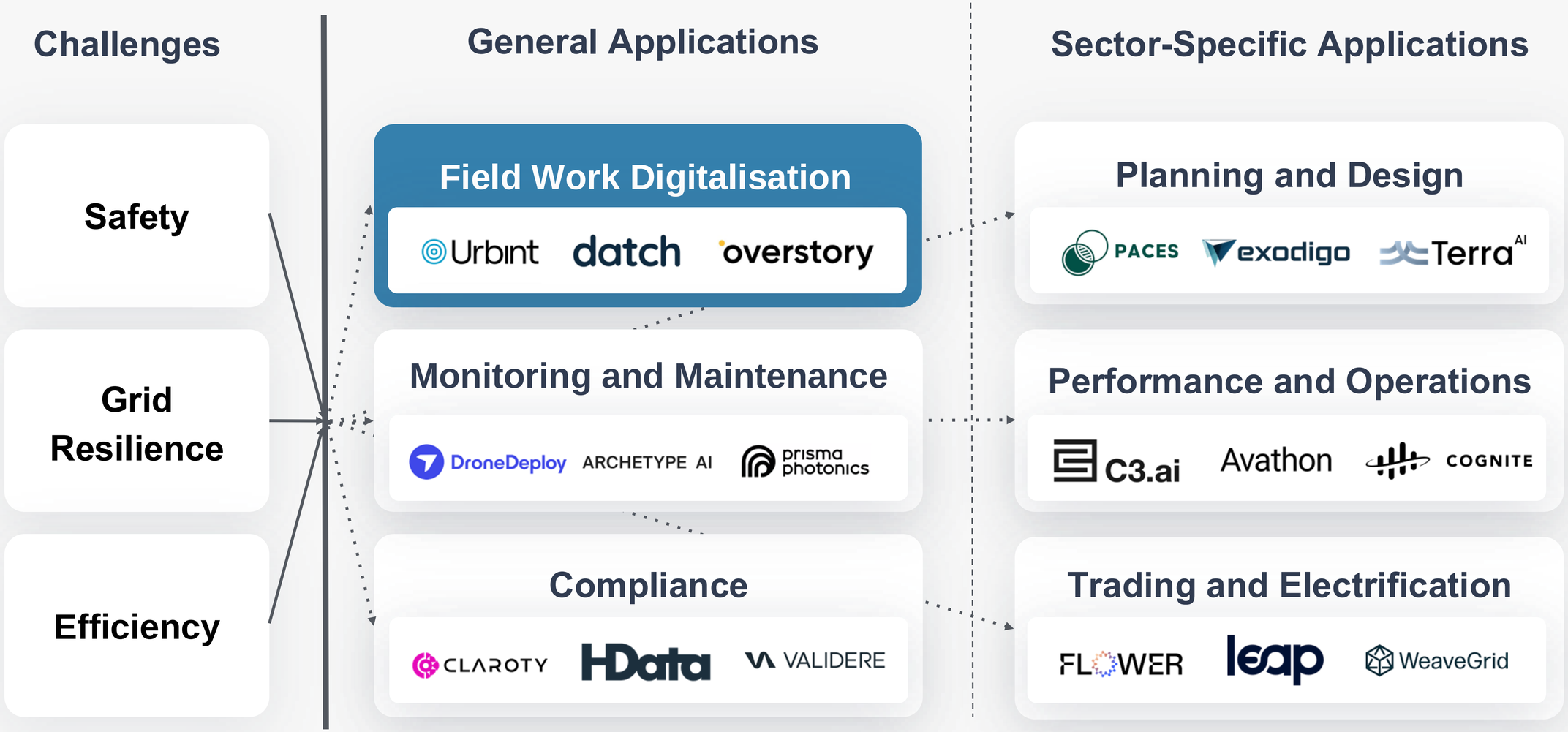
Challenges and Applications



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Field Work Digitalisation - Datch

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datch

Founded 2018

Stage Series A

Funding $31M

Country US

contact

Portfolio

Challenge

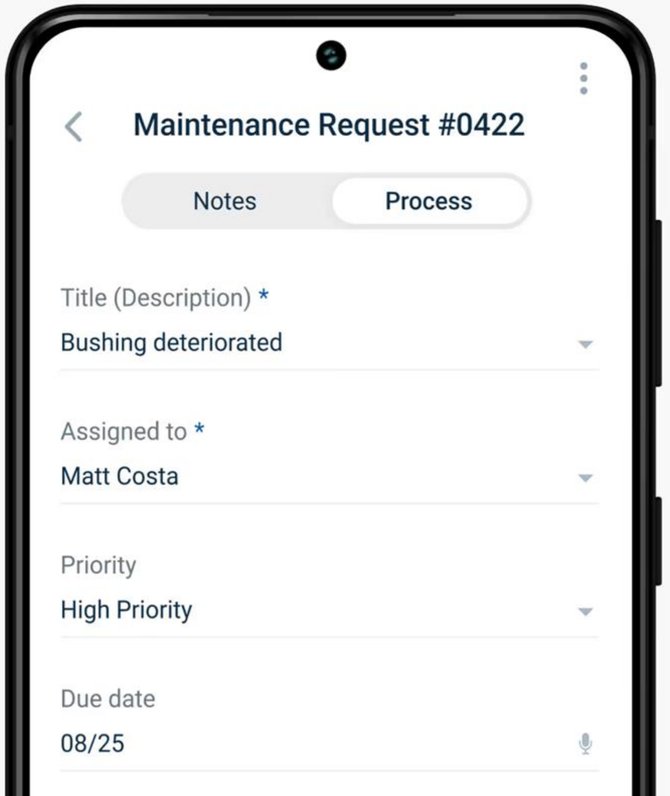
- Compliance requires data
- Data might get lost or is unstructured
- Tasks can be left unassigned

Datch

- Data collection through NLP
- Gen AI to structure and recover
- 21% reduction in downtime

GenAI **NLP**

Hey Datch.
The bushing has deteriorated and needs to be replaced today.



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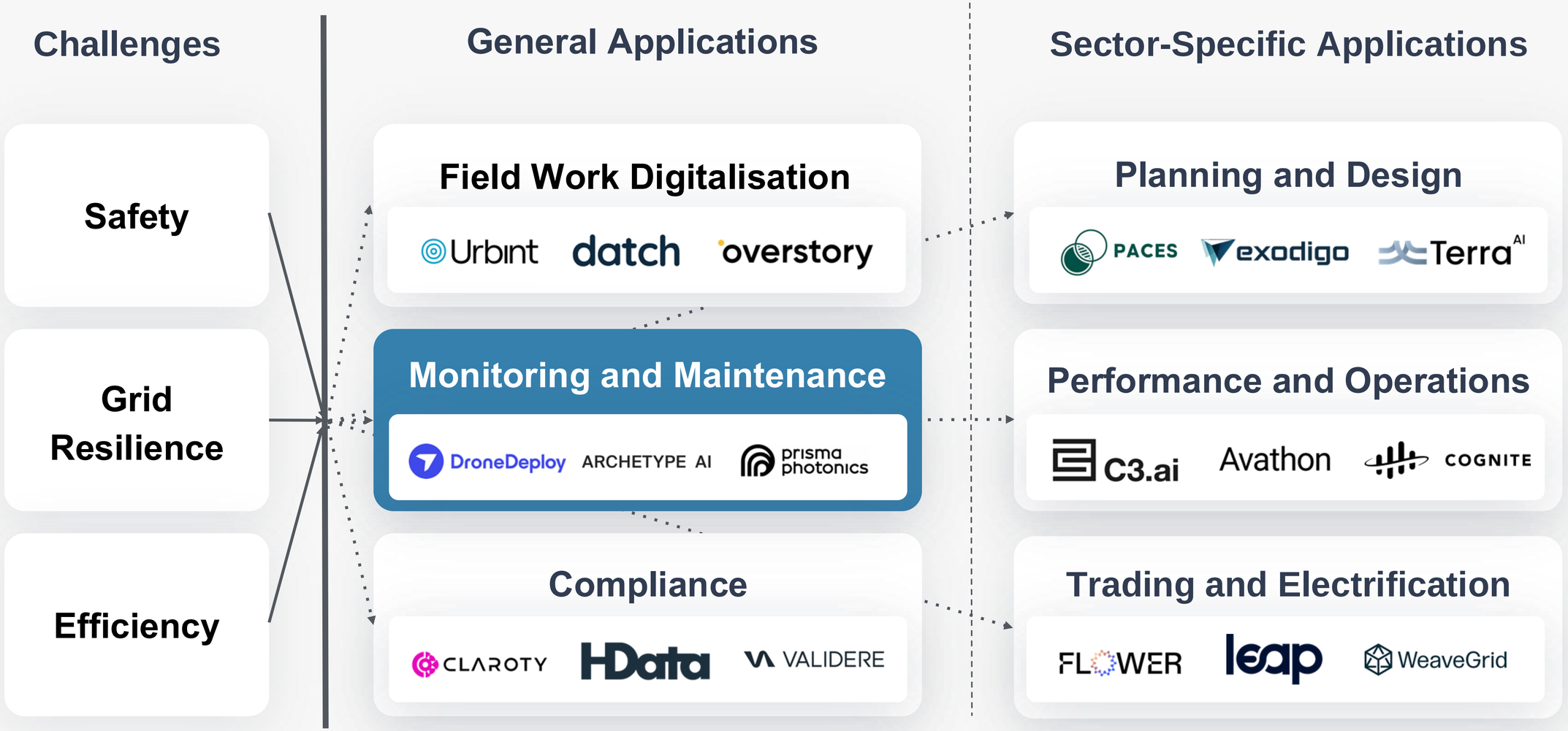
Challenges and Applications



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Monitoring and Maintenance - Archetype AI

ARCHETYPE AI

Founded 2023

Stage Seed

Funding $13M

Country US

Portfolio

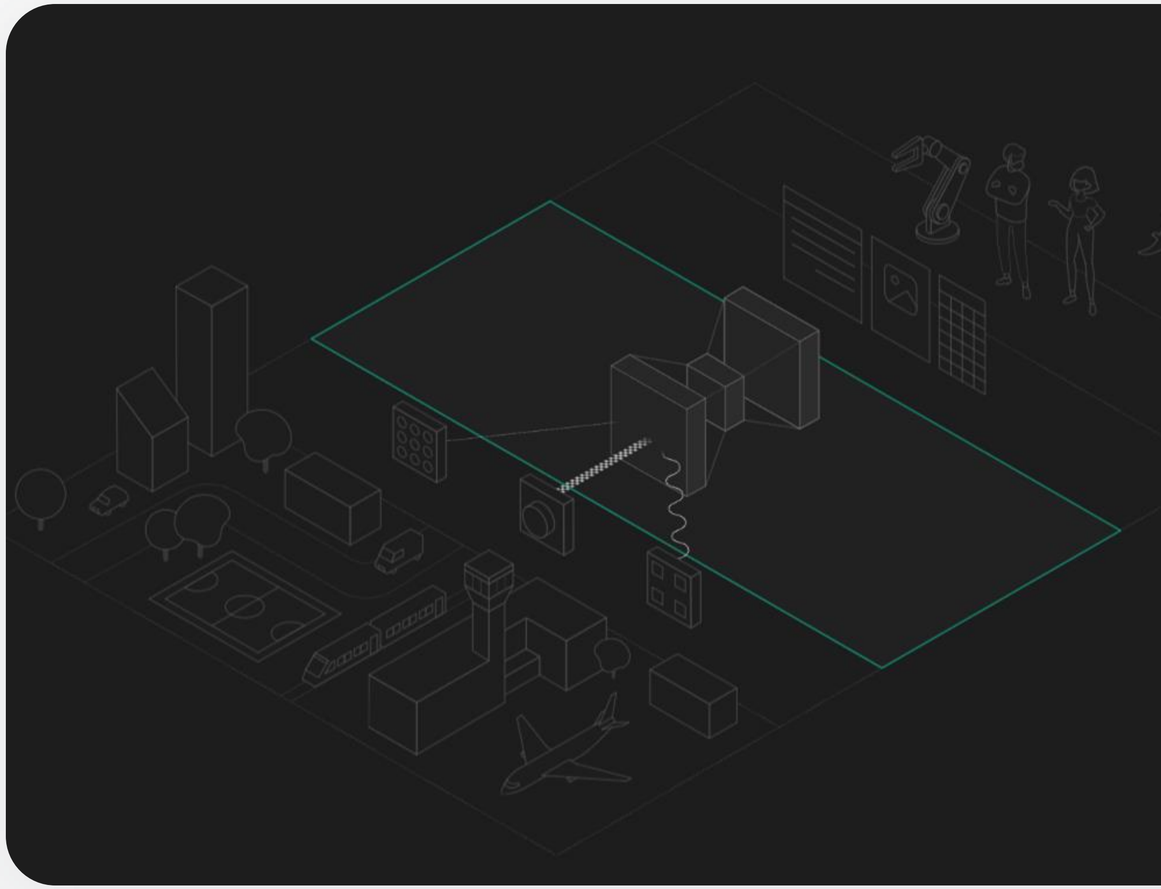
Challenge

- Preventing downtime

Archetype AI

- Generative AI physical foundation model
- Handles all sensor data and visualises it in any form

Physics **CV** **GenAI** **NLP**



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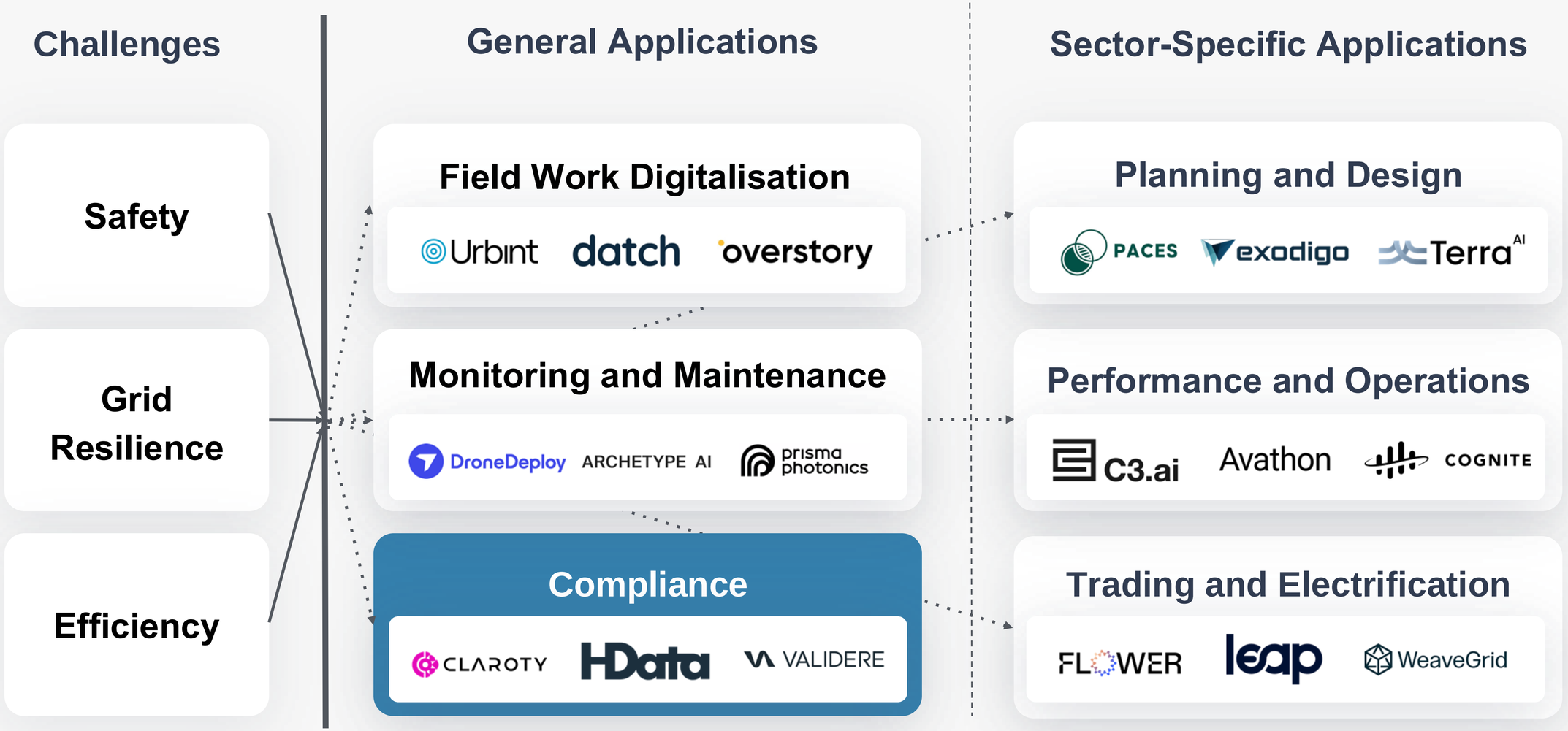
Challenges and Applications



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Compliance - HData

HData

Founded 2020

Stage Series A

Funding $14M

Country US

Southern Company

Accelerated

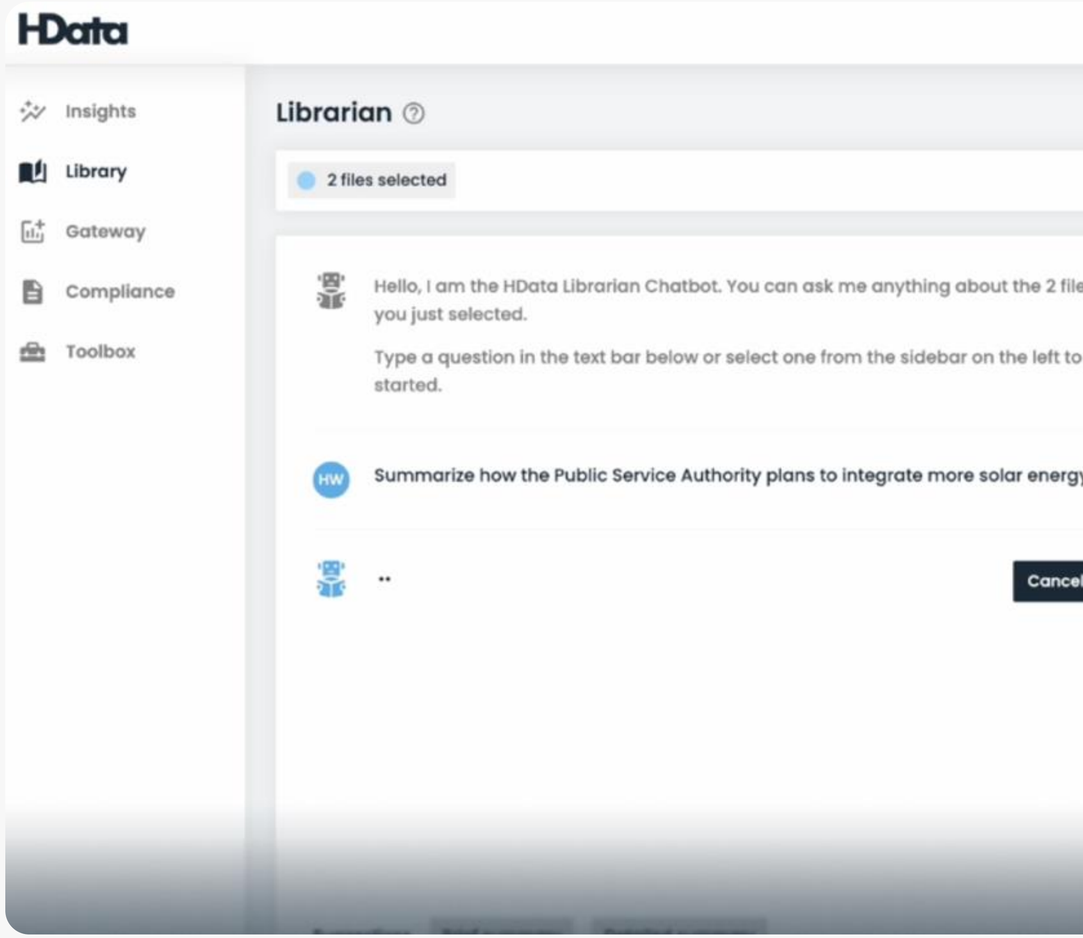
Challenge

- Data discovery and interpreting regulatory documents take time
- Manual FERC filings leaves room for mistakes

HData

- Automated data recovery and chatbot-like analysis
- Automated tagging and filings

GenAI **NLP**



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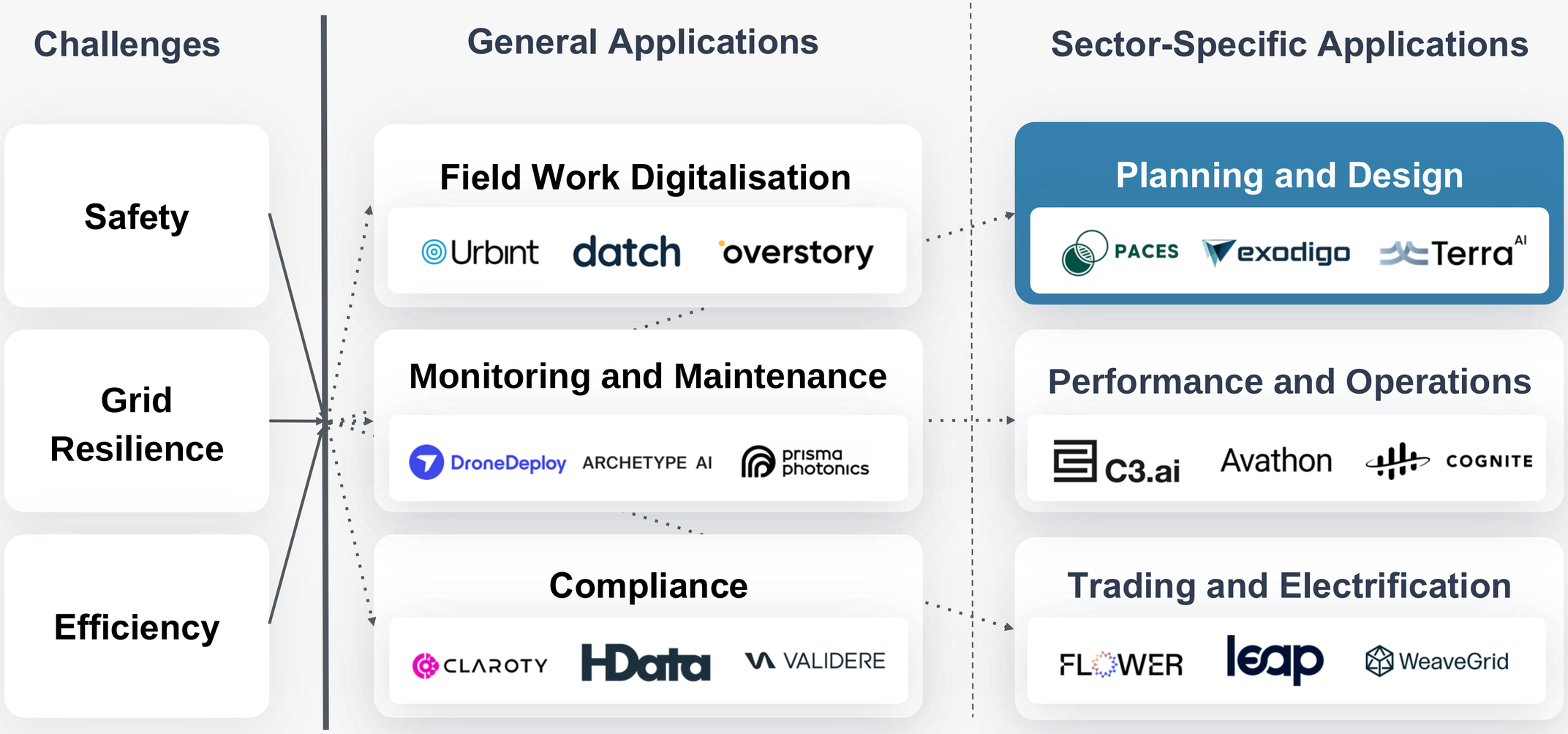
Challenges and Applications



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Planning and Design - Terra AI

PLUG AND PLAY ENERGY

Terra AI

Founded 2023

Stage Seed

Funding $3.4M

Country US

OMV

Portfolio

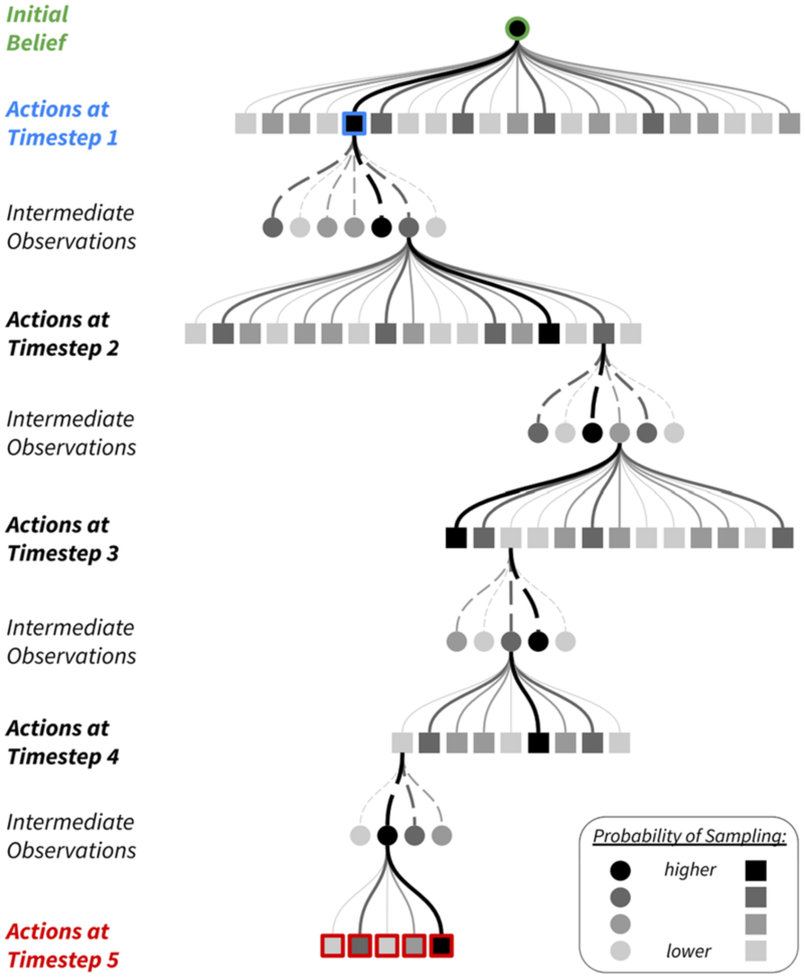
Challenge

- Resource uncertainties like weather, terrain or market

Terra AI

- Gen AI-powered planning of every step (measurement, installing,…)
- Intelligent agents repeats loop at every decision step

GenAI **Physics**



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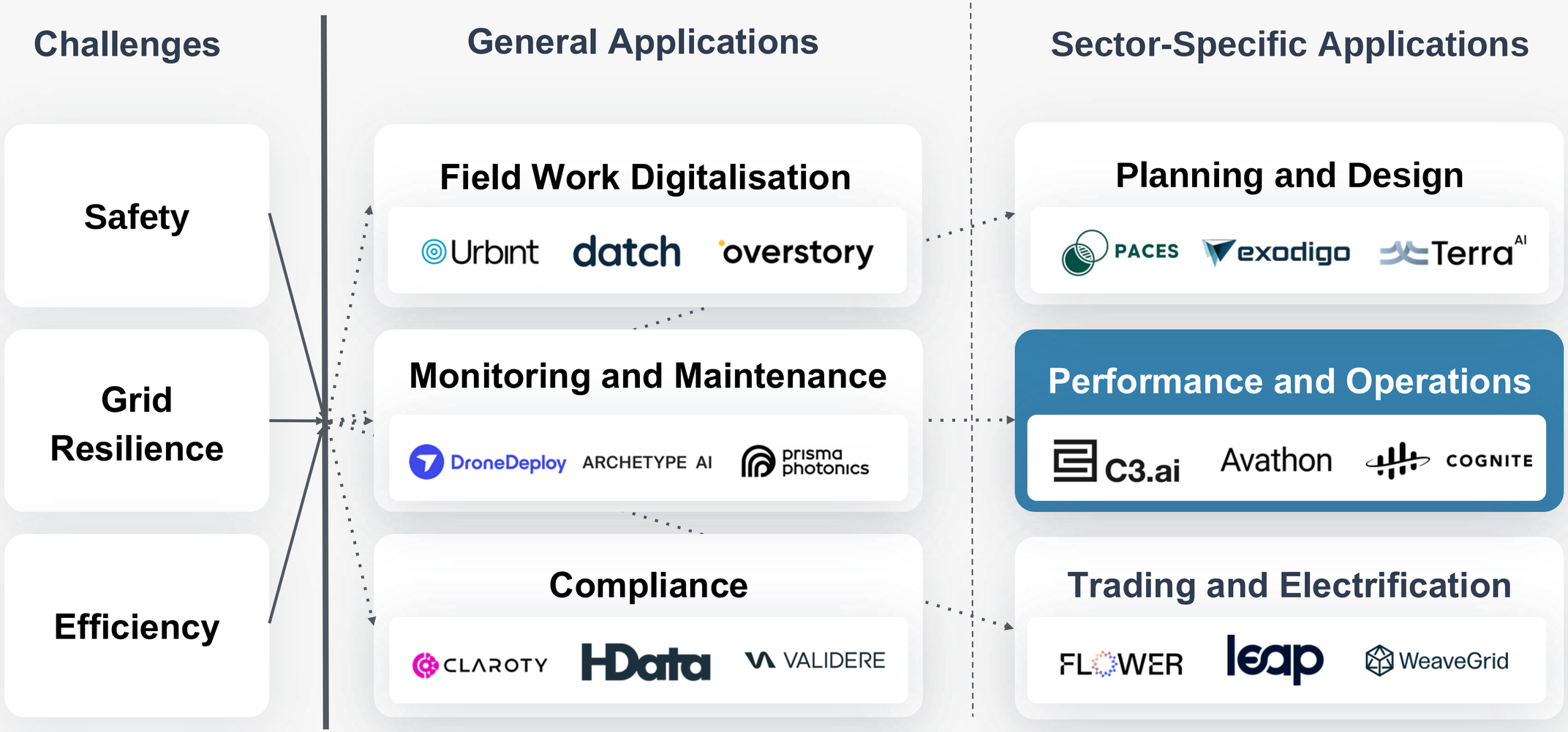
Challenges and Applications



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Performance and Operations - Avathon

PLUG AND PLAY ENERGY

Avathon

Founded 2013

Stage Series D

Funding $287M

Country US

Portfolio

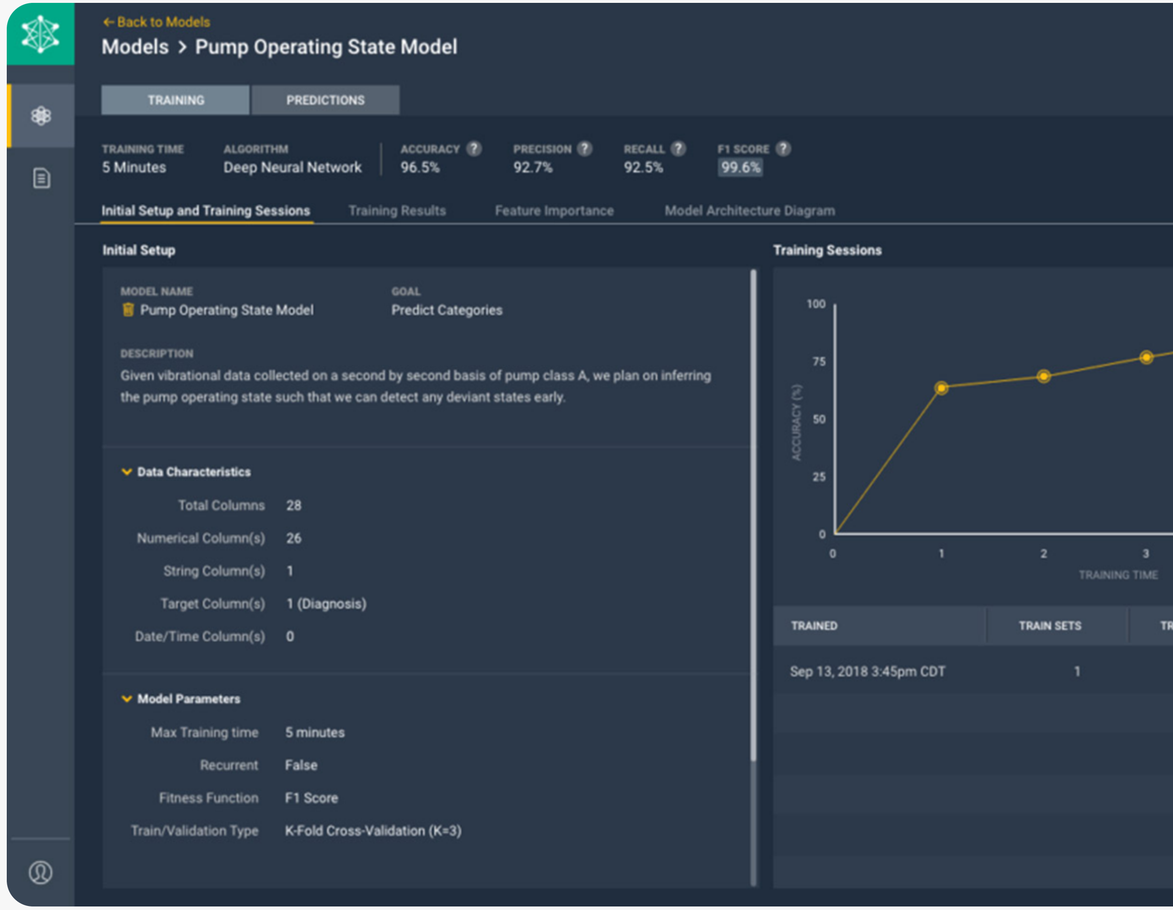
Challenge

- Optimizing supply/production
- Low data quality

Avathon

- Gen AI LLM models to turn any data into high fidelity insights in various formats
- 20x less data needed upfront

GenAI **Physics**



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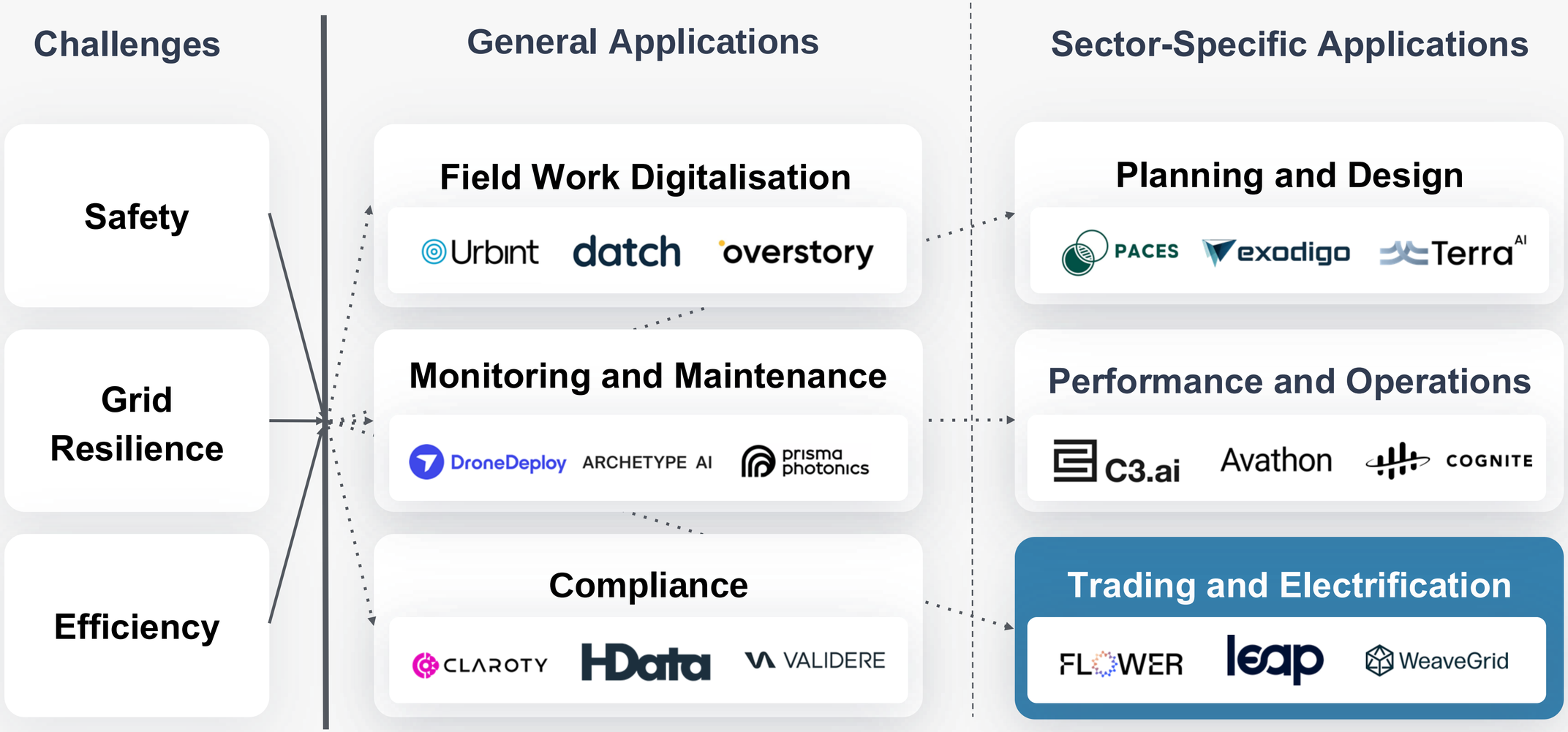
Challenges and Applications



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Trading and Electrification - WeaveGrid

PLUG AND PLAY ENERGY

WeaveGrid

Founded 2018

Stage Series B

Funding $50M

Country US

Dominion Energy®

Accelerated

Challenge

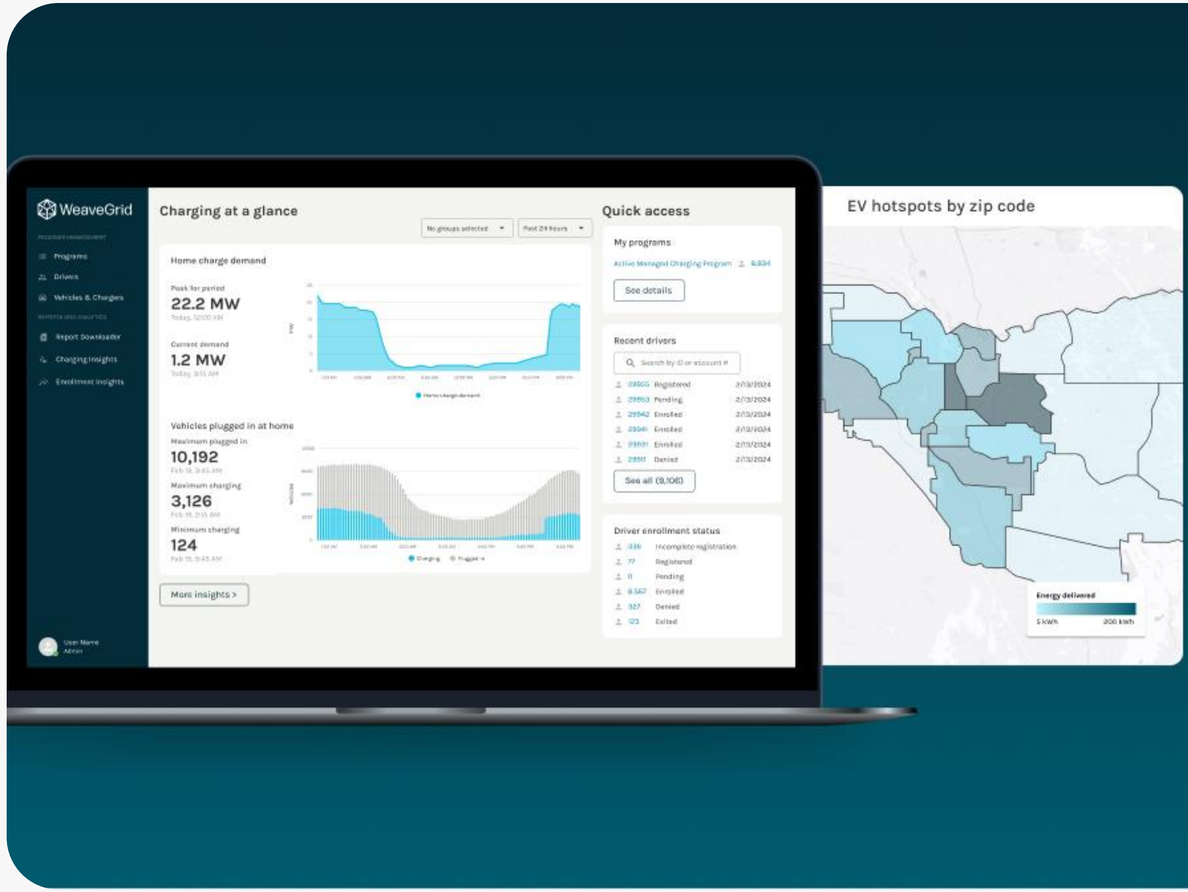
- Integration of EVs in the grid

WeaveGrid

- Reduces the cost of EVs using the grid by 70%
- Rewards off-peak charging
- Charging behaviour analysis
- Optimized distribution net

Predictive

Prescriptive



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AI and Digitalisation in Energy

Agenda

1. Adoption and Barriers of AI in Energy
2. Challenges and Applications in Energy
    a. Field Work Digitalisation
    b. Monitoring and Maintenance
    c. Compliance
    d. Planning and Design
    e. Performance and Operations
    f. Trading and Electrification
3. AI Adoption Roadmap
4. Final Remarks

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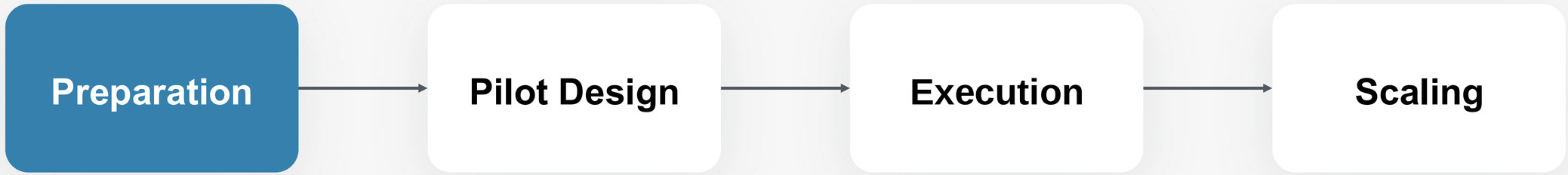
AI Roadmap





Source: TheAlphaForm, BuildCircle , OGx, IBM

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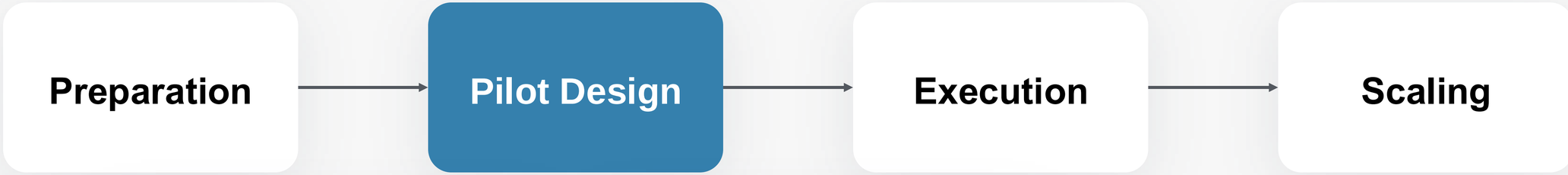
AI Adoption Roadmap



Field Work Digitalisation

Urbint datch overstory

Planning and Design

PACES exodigo Terra AI

Monitoring and Maintenance

DroneDeploy Avathon prisma photonics

Performance and Operations

C3.ai ARCHETYPE AI COGNITE

Compliance

CLAROTY HData VALIDERE

Trading and Electrification

FLOWER leap WeaveGrid

Source: TheAlphaForm, BuildCircle , OGx, IBM

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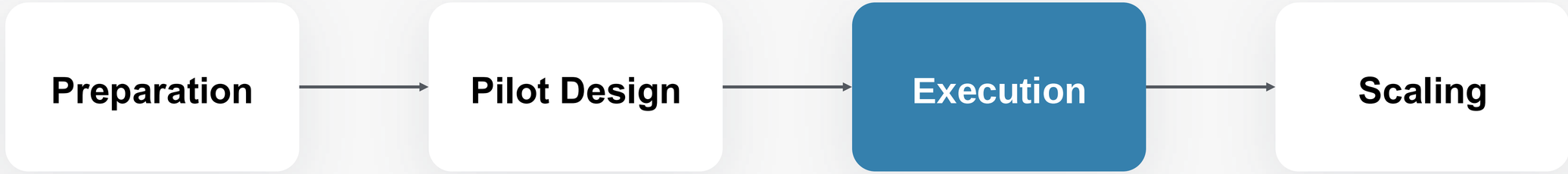
AI Adoption Roadmap



ROI	Costs/Revenue
Accuracy	Predictions
Integration	Time/Scalability

+ Qualitative Feedback

Source: TheAlphaForm, BuildCircle , OGx, IBM

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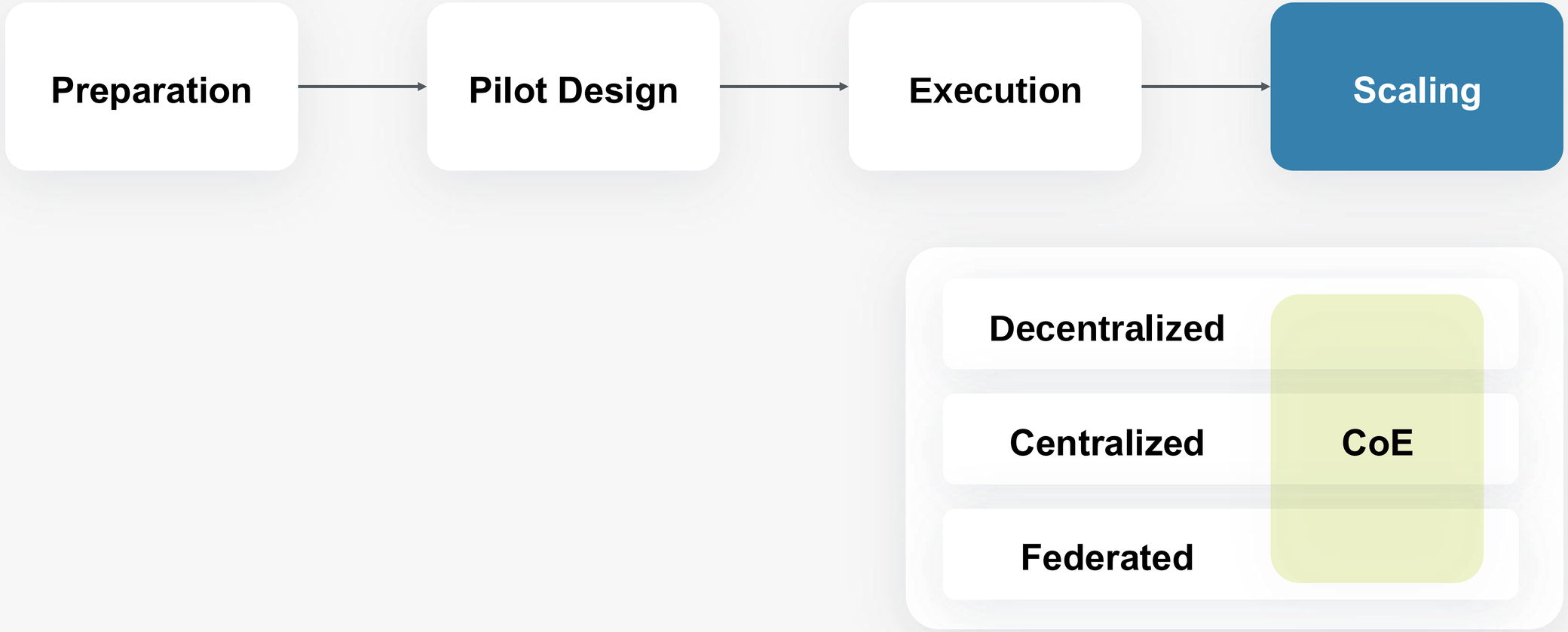
AI Adoption Roadmap



Source: TheAlphaForm, BuildCircle , OGx, IBM

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AI and Digitalisation in Energy

Agenda

1. Data Summary and Introduction
2. Applications Overview and AI Methodologies
3. Landscape and Opportunities in Energy
    a. Field Work Digitalisation
    b. Monitoring and Maintenance
    c. Compliance
    d. Planning and Design
    e. Performance and Operations
    f. Trading and Electrification
4. AI Adoption Roadmap
5. Final Remarks

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Final Remarks

- **Energy sector is on track but could deploy more advanced AI faster**
- **Generative AI is starting to break through in every subsector and has the potential to reduce the need for data, improve integration, and reduce complexities**
- **AI can improve safety and compliance (1), grid resilience (2) and efficiency (3)**
- **Monitoring & Maintenance and Performance & Operations are the biggest use cases**
- **Start adopting AI in 4 steps by defining your readiness and strategy (1), choosing your use case and partner (2), setting KPIs (3) and choosing your operating model (4)**

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PLUG AND PLAY

SV SUMMIT



KEYNOTE SPEAKER

Adrian Rami

VP of Products and Engineering

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The C3 AI Product Suite delivers…

High value use cases, with speed, and at scale

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Supply Chain Optimization

ESG Goal Forecasting

Precision Health

Predictive Maintenance

Production Schedule

Production Optimization

Customer Retention

Demand Forecasting

Sustainability

Anti-Money Laundering

Stakeholder Engagement

Yield Optimization

Inventory Optimization

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AI’s contribution to the global economy by 2030 enables Industry 5.0

Source: PwC, January 2024

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High-value and sustainable outcomes across industries



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C3 AI Applications in Energy and Manufacturing

C3 AI Asset Performance Suite

C3 AI Supply Chain Suite

C3 AI Sustainability Suite

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Large scale commercial and federal deployments









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U.S. Air Force designates C3 AI predictive maintenance solution as System of Record



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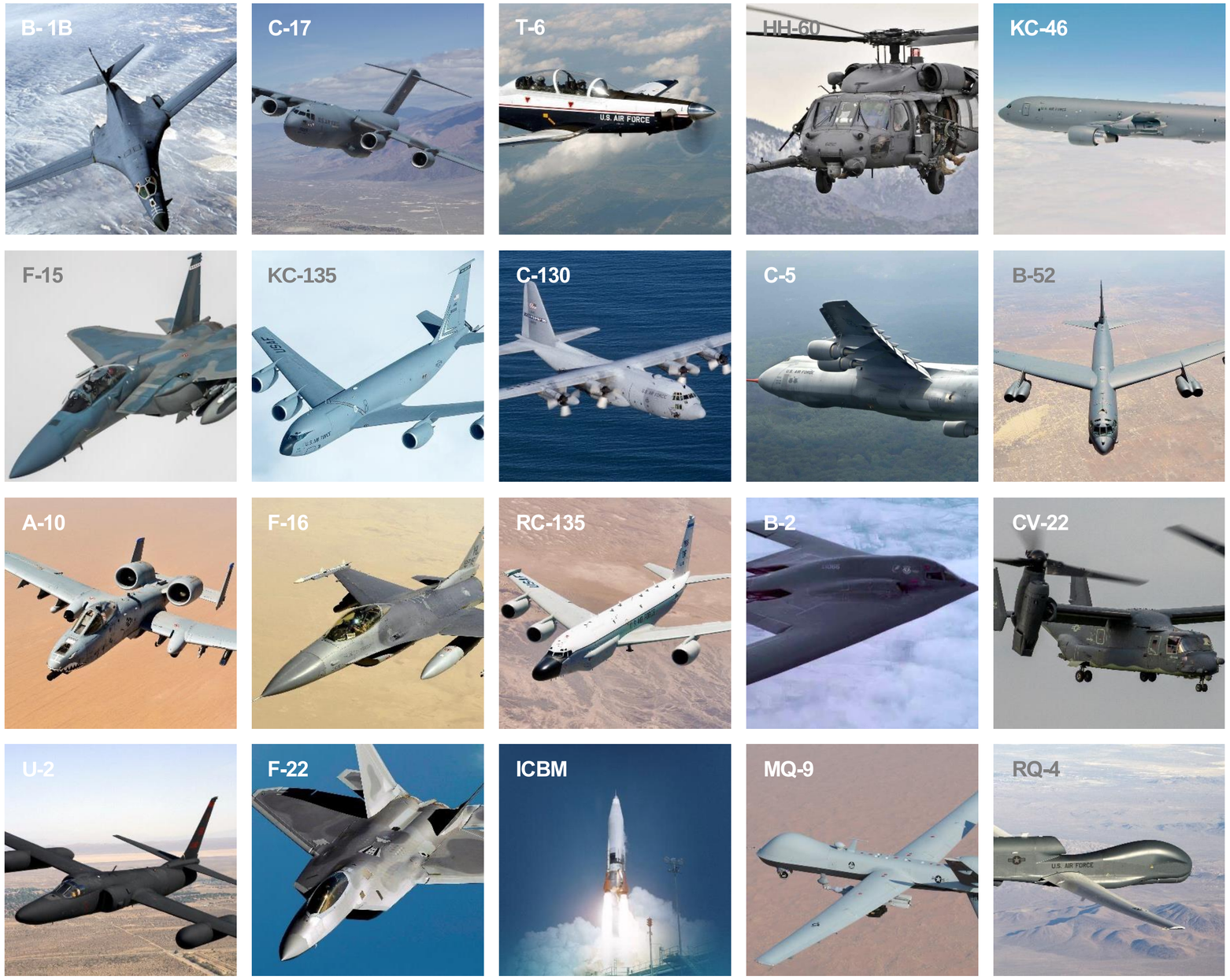
USAF Rapid Sustainment Office rollout



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25% increase in availability

B-1B

45 in-service[1]
18 effective aircraft[2]

Aircraft Equivalent Gained with AI

+3 aircraft to +5 aircraft

Budget Equivalent Gained[3]

+$950M to +$1,600M



The appearance of U.S. Department of Defense (DoD) visual information does not imply or constitute DoD endorsement.

1. AFGSC wraps up divestiture of 17 B-1 aircraft, moving toward B-21, Air Force GlobalStrike Command, Accessed August 2022, https://www.afgsc.af.mil/News/Article-Display/Article/2786795/afgsc-wraps-up-divestiture-of-17-b-1-aircraft-moving-toward-b-21/
2. US Air Force fleet's mission-capable rates are stagnating. Here's the plan to change that, Air Force Times, February 2022, Accessed August 2022, https://www.airforcetimes.com/news/your-air-force/2022/02/14/us-air-force-fleets-mission-capable-rates-are-stagnating-heres-the-plan-to-change-that/#:~:text=Mission%2Dcapable%20rates%2C%20the%20main,point%20in%20nearly%20a%20decade
3. About the B1-B, https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104500/b-1b-lancer/

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Maximizing production with a major oil producer



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Improving furnace health for a leading chemical manufacturer



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Reducing costs for a large natural gas supplier



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STARTUP PRESENTATION

General Galactic

General Galactic

Their proprietary system and reactor technology reduces the costs of carbon conversion, while leveraging high efficiency in a single pass.

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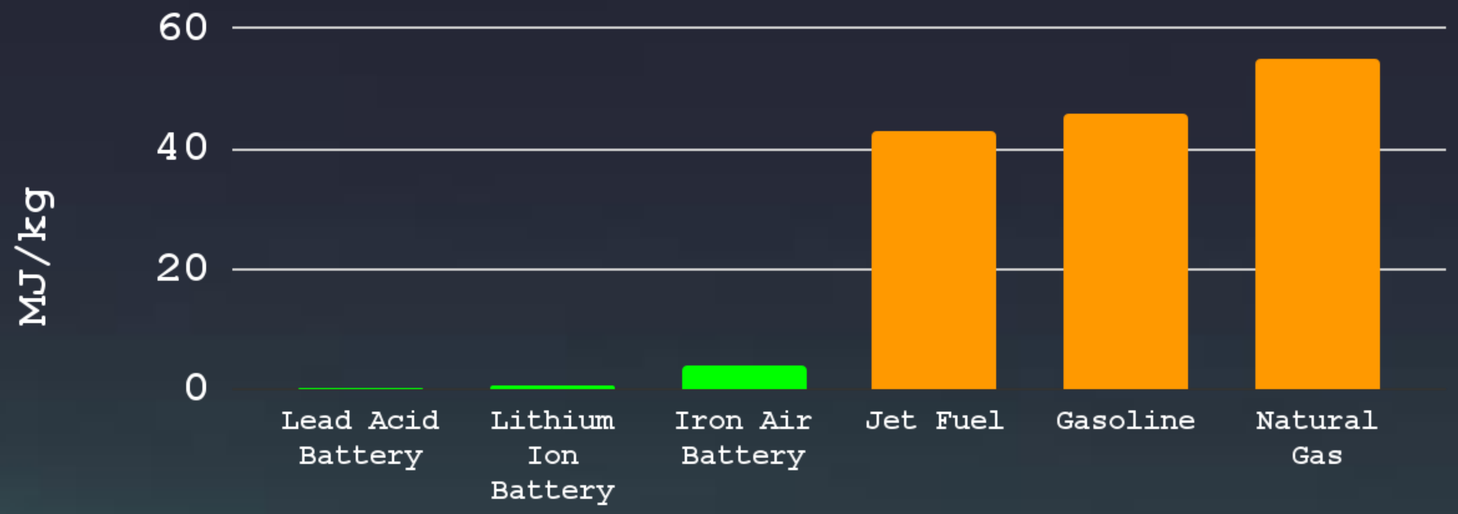
Join us at **pnptc.com**

GENERAL GALACTIC

TODAY'S CHALLENGE

Green energy = low density.

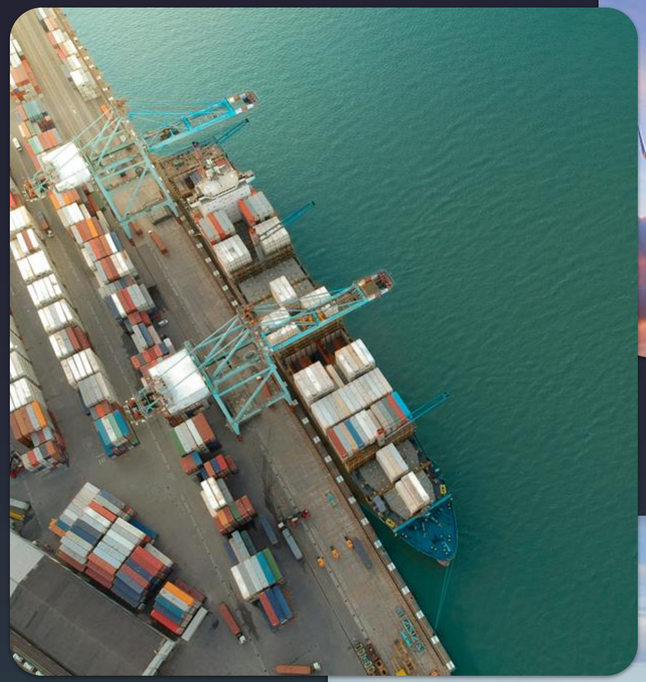


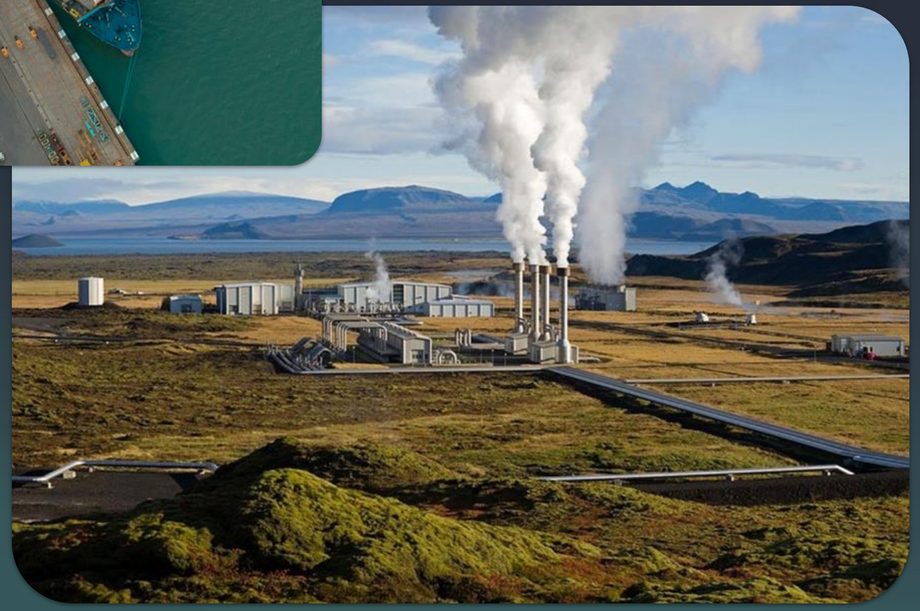
That means things that require high energy density (airplanes, ships, big industrial processes) cannot be green with today's technology. They remain dependent on fossil fuels.

OUR MISSION

Build a fossil-free future.

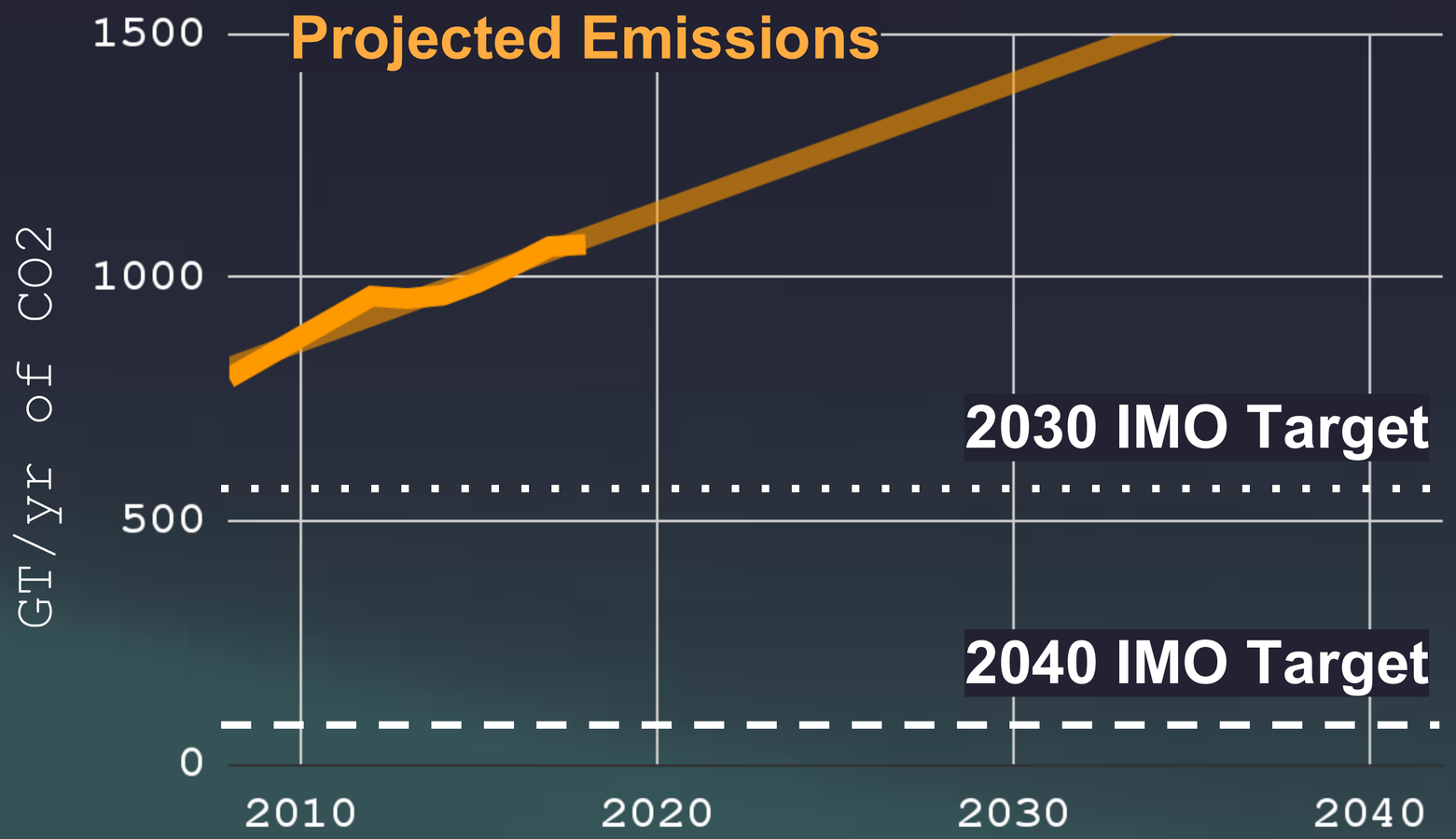






General Galactic will deliver fossil-free fuel to critical industries around the planet.

MARITIME INDUSTRY CASE STUDY



Despite new regulations, industrial emissions are projected to increase.

Industry needs a solution to meet climate goals.

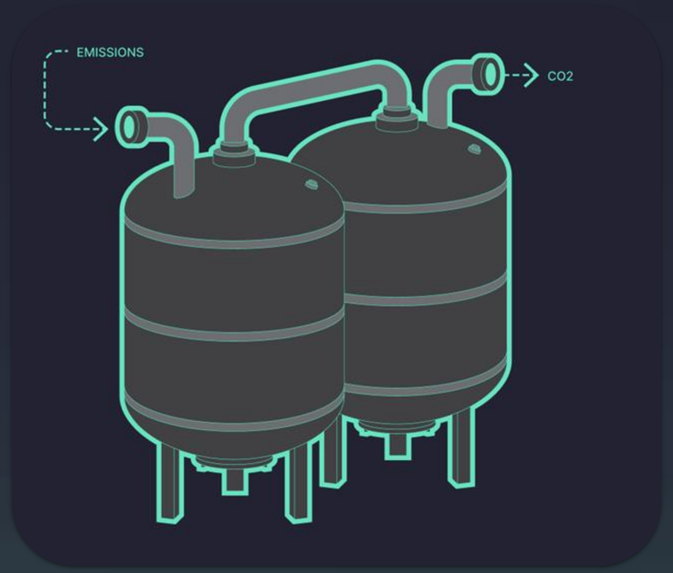
e-Natural Gas

e-Methanol

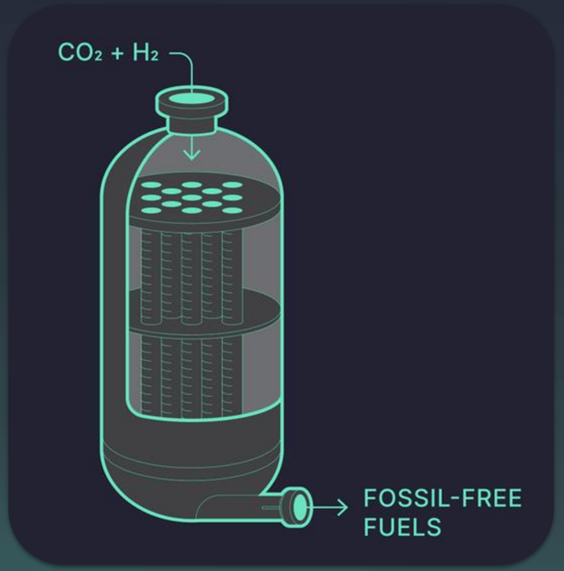
e-SAF



1) Point-source capture



2) Direct CO_2 upgrading & Hydrogen generation



3) CO_2 hydrogenation for fuel production

Our CO2 capture & conversion technology delivers fossil-free fuel at low-cost

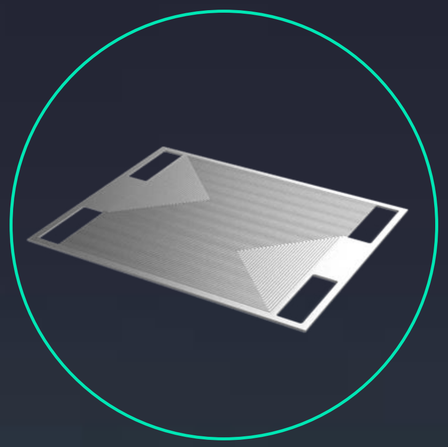
Our novel CO2 capture & conversion technology delivers fossil-free fuel at the lowest cost



Dual-Function Catalyst & Sorbent

CO2 capture and conversion with 99+% selectivity

EXCLUSIVE LICENSE



Ultra-Low-Cost Electrolyzer

Intermittent hydrogen production at low cost

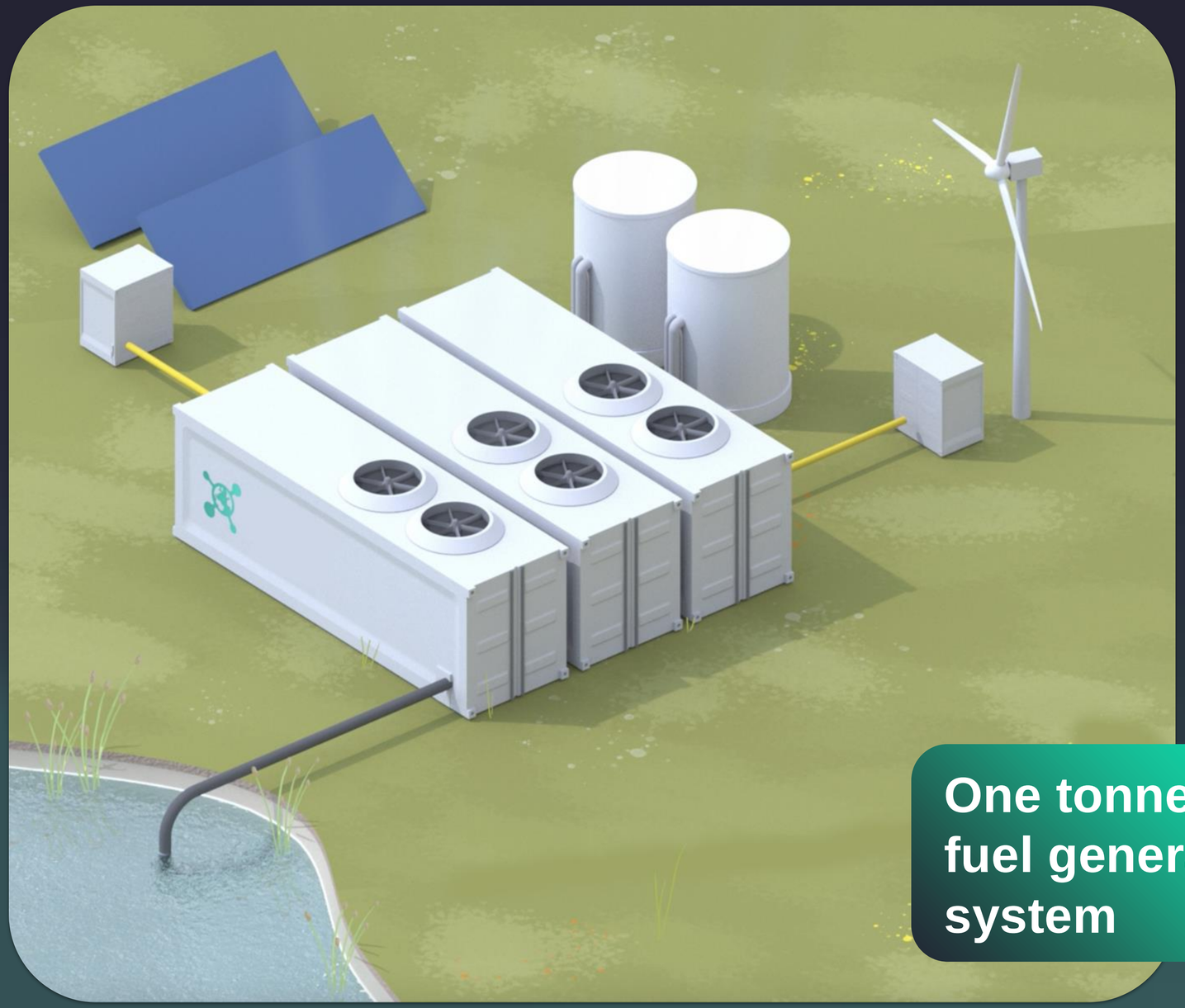
TRADE SECRET



Compact & Scalable CO_2 Reactor

High single-pass efficiency enables direct offtake

PATENT PENDING

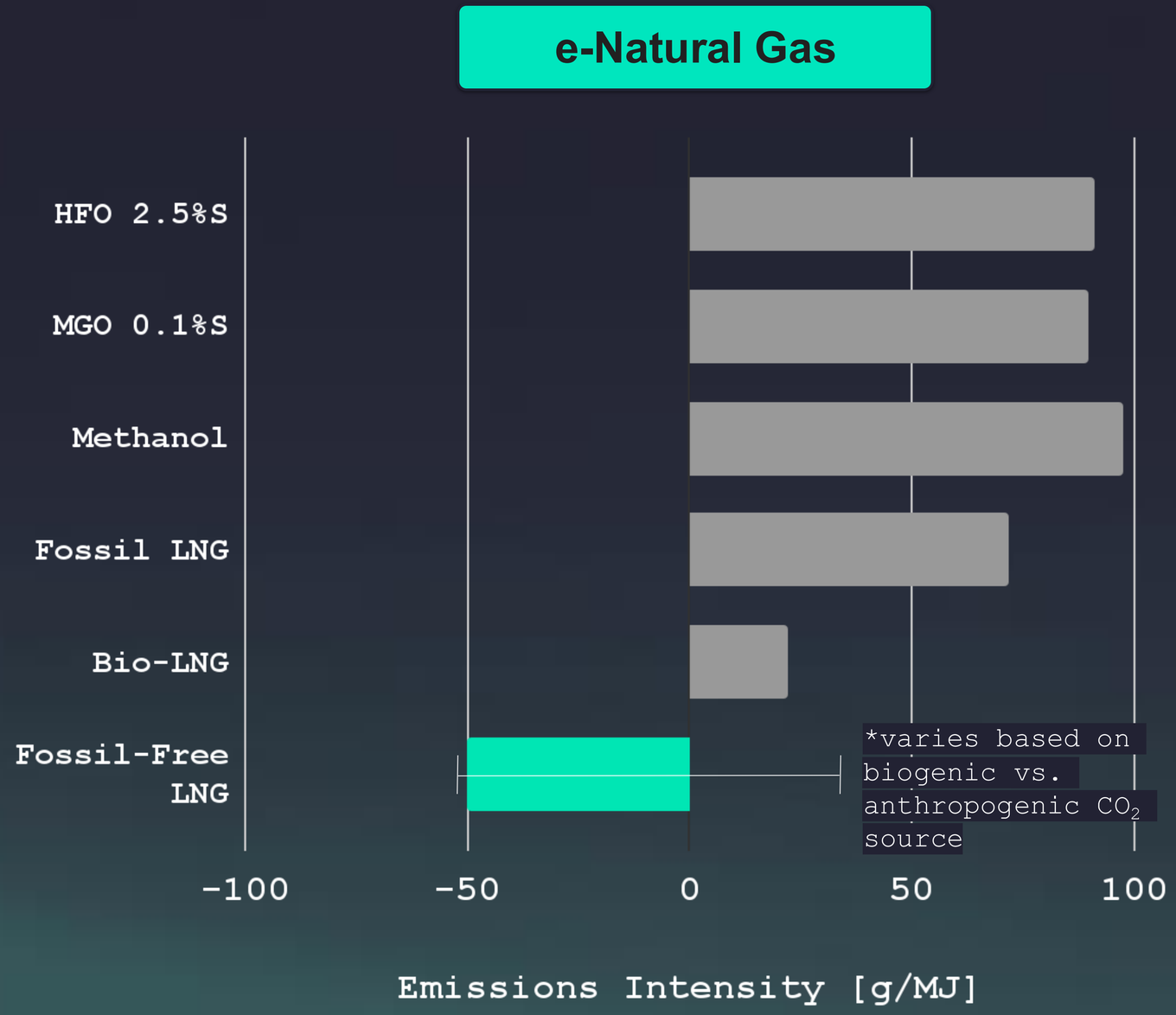


Modular on-site production enables the lowest costs of feedstocks and fuel.

One tonne-per-day fuel generation system

As low as -50 g/MJ CO_2e emissions intensity (EI)

including transport, distribution, liquefaction & storage



Fossil-Free Fuel is a scalable solution to achieve carbon-neutrality

=

Identical energy density and compatibility as traditional fuels

↑

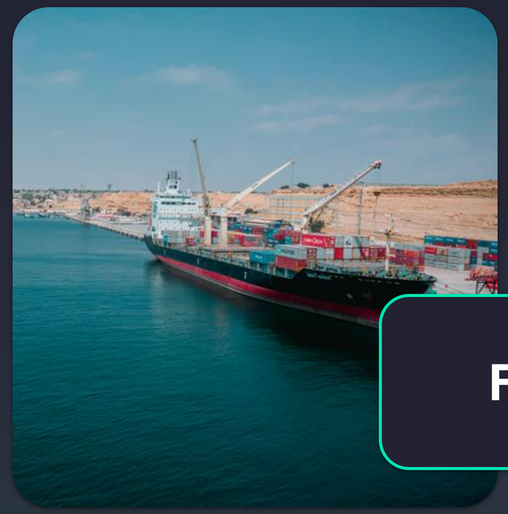
More feedstock availability and lower product variability than bio-fuels

0

Zero sulphur (SO_x), nitrous oxides (NO_x), or black carbon emitted

How you can work with us to future-proof your business:

Now accepting offtake reservations for 2026+



e-Natural Gas

e-Methanol

Fuel Blending



SAF

Methanol Upgrading



Carbon Credits



Tech Co-development

Backed by leading scientists and investors.

LEADERSHIP TEAM



Halen Mattison
CEO

SpaceX Engineer



Luke Neise
CTO

NSF Researcher



Dr. Badawi Dweik
Sr. Tech Consultant

CTO of Giner



Michael Adeyi
Founding Engineer

Fuels Researcher

TECHNOLOGY PARTNERS

OAK RIDGE National Laboratory

NREL Transforming ENERGY

INVESTORS

Refactor

BOX GROUP

climate capital

PLUG AND PLAY

PATHBREAKER VENTURES

Ready to scale with you.

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LOA CARBON

LOA Carbon

Advanced carbon utilization technologies that transform CO_2 emissions into valuable carbon-based products

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LOA CARBON

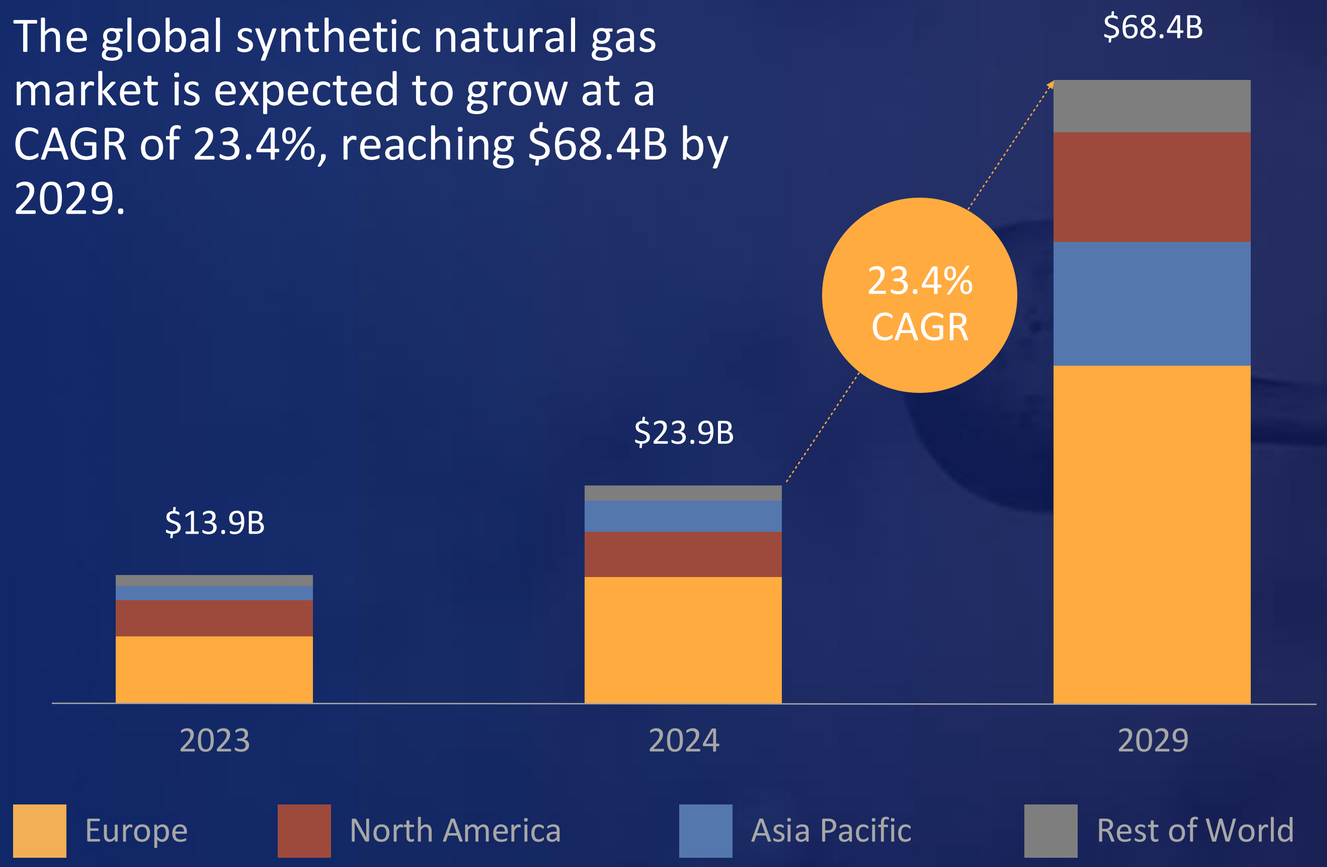
Fossil-Free Hydrocarbons



Certified B Corporation

E-fuels have entered the chat.

The global synthetic natural gas market is expected to grow at a CAGR of 23.4%, reaching $68.4B by 2029.



What is driving this growth?

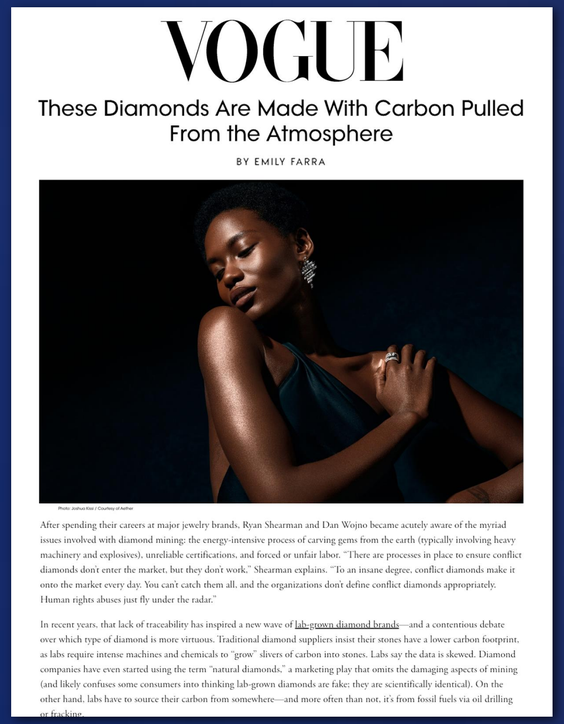
- Deployment of renewables
- Grid interconnect challenges
- Availability of green hydrogen
- New regulations
- Changing energy market



We began producing e-methane from captured CO_2 over four years ago.

Pictured: Loa Carbon's 30 Tonne/Year UHP Methane Pilot Plant

We commercialized our tech right away.



VOGUE

These Diamonds Are Made With Carbon Pulled From the Atmosphere

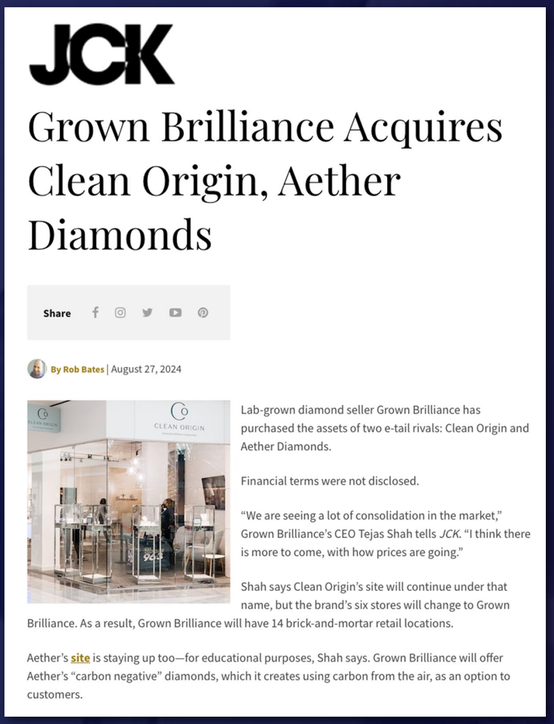
BY EMILY FARRA

Photo: Joshua Kissi / Courtesy of Aether

After spending their careers at major jewelry brands, Ryan Shearman and Dan Wojno became acutely aware of the myriad issues involved with diamond mining: the energy-intensive process of carving gems from the earth (typically involving heavy machinery and explosives), unreliable certifications, and forced or unfair labor. "There are processes in place to ensure conflict diamonds don't enter the market, but they don't work," Shearman explains. "To an insane degree, conflict diamonds make it onto the market every day. You can't catch them all, and the organizations don't define conflict diamonds appropriately. Human rights abuses just fly under the radar."

In recent years, that lack of traceability has inspired a new wave of lab-grown diamond brands—and a contentious debate over which type of diamond is more virtuous. Traditional diamond suppliers insist their stones have a lower carbon footprint, as labs require intense machines and chemicals to "grow" slivers of carbon into stones. Labs say the data is skewed. Diamond companies have even started using the term "natural diamonds," a marketing play that omits the damaging aspects of mining (and likely confuses some consumers into thinking lab-grown diamonds are fake; they are scientifically identical). On the other hand, labs have to source their carbon from somewhere—and more often than not, it's from fossil fuels via oil drilling or fracking.





JCK

Grown Brilliance Acquires Clean Origin, Aether Diamonds

Share

By Rob Bates | August 27, 2024

Lab-grown diamond seller Grown Brilliance has purchased the assets of two e-tail rivals: Clean Origin and Aether Diamonds.

Financial terms were not disclosed.

"We are seeing a lot of consolidation in the market," Grown Brilliance's CEO Tejas Shah tells *JCK*. "I think there is more to come, with how prices are going."

Shah says Clean Origin's site will continue under that name, but the brand's six stores will change to Grown Brilliance. As a result, Grown Brilliance will have 14 brick-and-mortar retail locations.

Aether's site is staying up too—for educational purposes, Shah says. Grown Brilliance will offer Aether's "carbon negative" diamonds, which it creates using carbon from the air, as an option to customers.

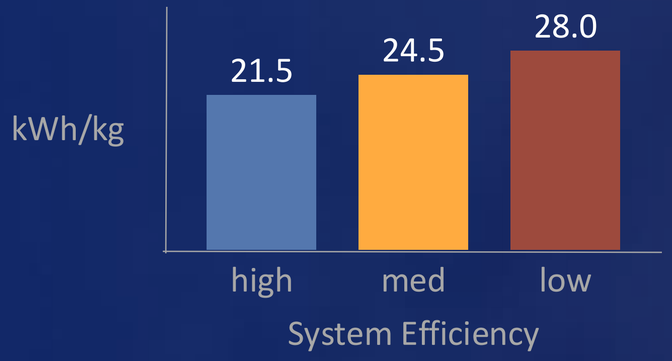
Sold consumer brand and licensed tech to Grown Brilliance.
Pilot plant will deliver enough gas to produce ~2M carats of rough diamond/year.

LOA

We are building a 10,000 tonne/yr commercial pilot in Upstate NY.

- Located directly on National Grid pipeline
- 57 MW cogeneration plant on-site
- 10,000 tonnes of waste CO_2 utilized
- 200,000 MMBtu of e-methane produced
- 20k tonnes of CO_2 emissions eliminated

If we want to see this tech scale quickly, we need to keep CapEx down.



Key Metrics

- Targeting $0.38 CapEx/MMBtu
- 5.15 tonnes of CO_2 emissions eliminated for every tonne of e-methane consumed



Natural gas infrastructure isn’t going anywhere anytime soon.

LOA

CARBON





PLUG AND PLAY

STARTUP PRESENTATION

HOLOCENE

Holocene

Harnessing organic chemistry for scalable Direct Air Capture

#PNPTCSiliconValley

Join us at **pnptc.com**

Holocene

Plug n Play SUMMIT
2024

ANCA TIMOFTE, CEO & CO-FOUNDER



HOLOCENE

HOLOCENE – AT A GLANCE

Since our start in late 2022, our team has built the foundation to be a long-term leader in direct air capture

TEAM

Founded from a historic lineage of CDR RD&D + commercial homes

COMPANY

15

Employees and counting, across 5,000 square feet of industrial space.

CAPACITY

10s

Of tonnes of carbon removal capacity per year from our pilot facility

FUNDING

>$6M

Dollars ($) in funding awarded, exclusively non-dilutive, to-date

CUSTOMERS

>$10M

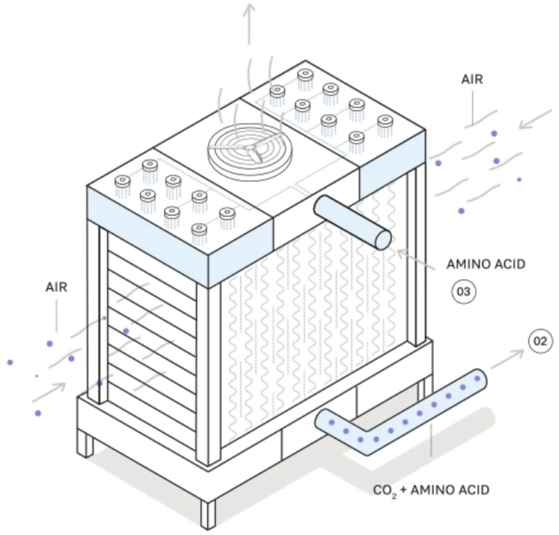
Secured customer contracts supporting our future CDR facilities

SUPPORTERS

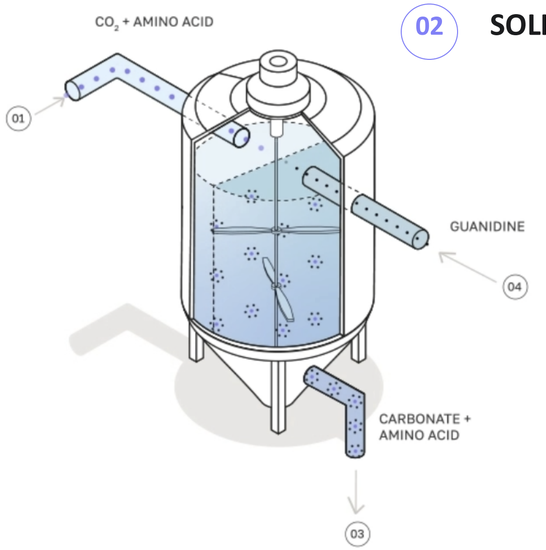
A deep, diverse, and steadfast bench of supporters and partners

4 unit operations, 2 continuous chemical loops

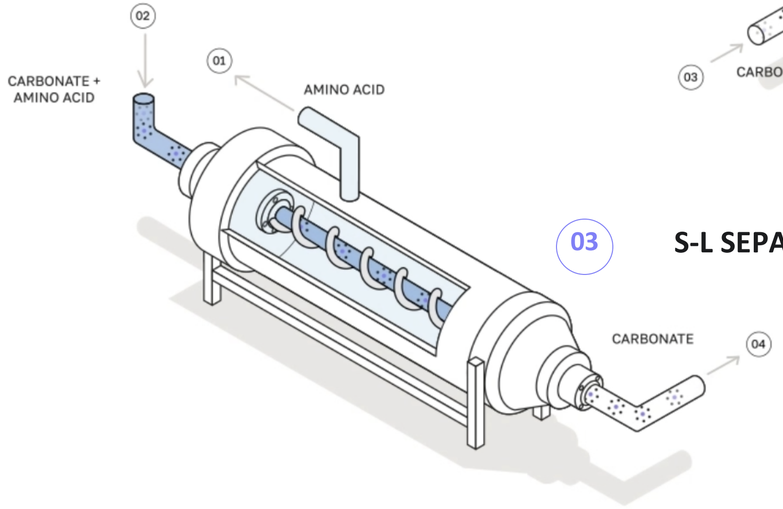
01 CO_2 ABSORPTION



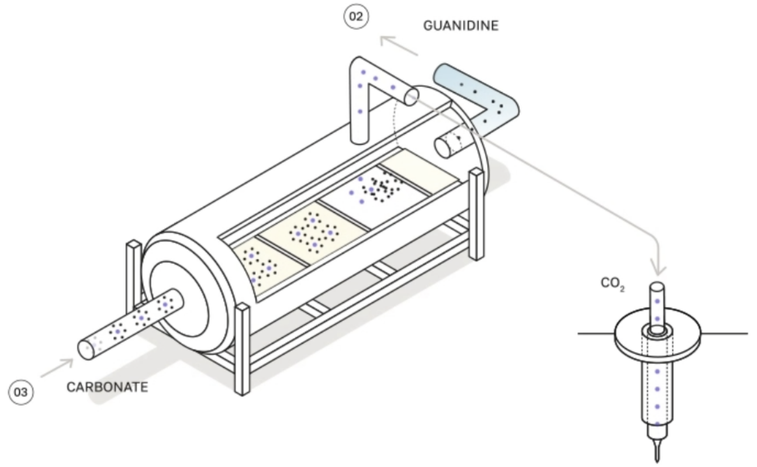
02 SOLID FORMATION



03 S-L SEPARATION



04 REGENERATION



HOLOCENE

Source: Holocene

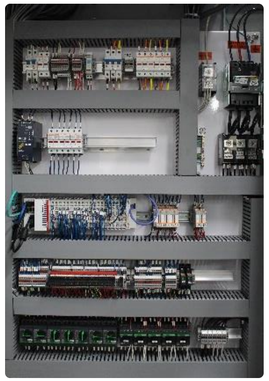
HOLOCENE'S INDUSTRIAL PILOT - 10 TONS CO2/Y

Scaling from grams of CO2 to tonnes in <18 months – setting the state for mega-tonne scale facility development.











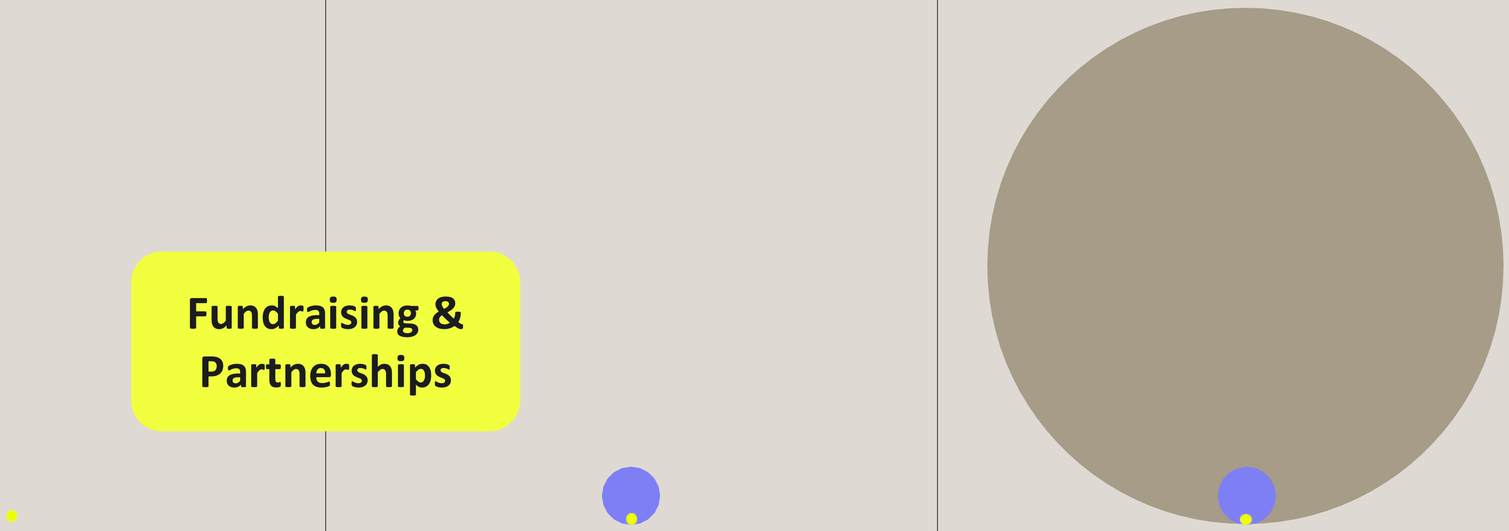






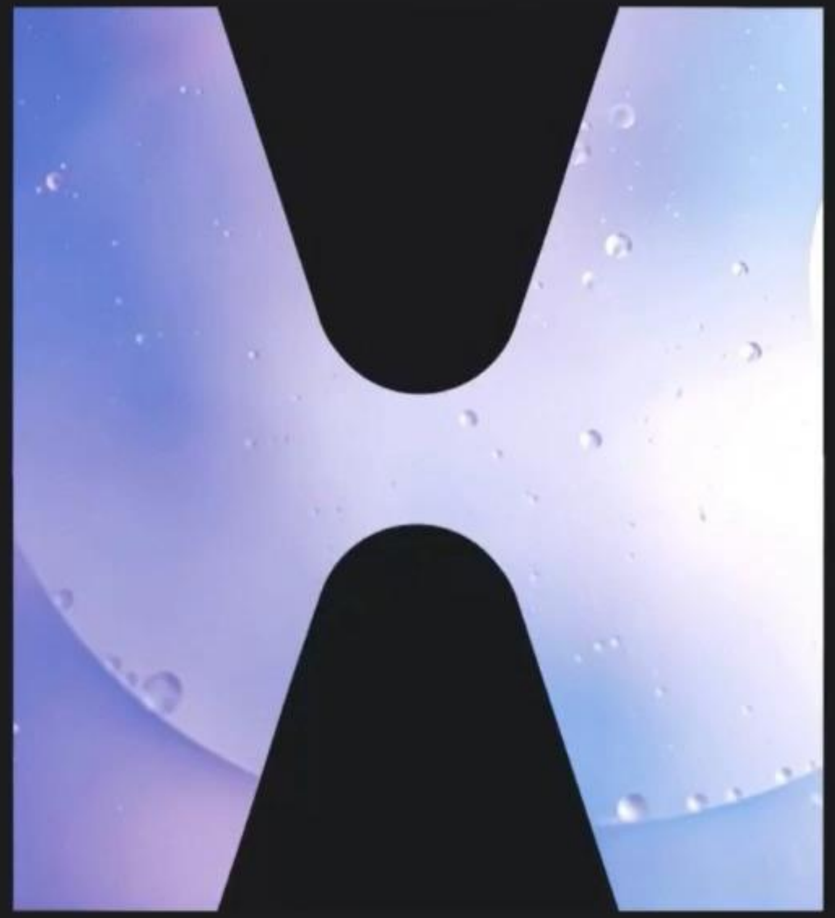
TECHNOLOGY DEVELOPMENT PATHWAY

We design our scaling pathway to balance market & technology parameters.



Facility Name	Industrial Pilot		Demonstration		Commercial+
Design Capacity (tonnes-CO_2/yr)	10	500X	5000	100X	500,000+
Online Date	Q2 2024	2.5YR	Q4 2026	3.5YR	Q2 2030
Tech Readiness	TRL 5/6/7*		TRL 7/8/9*		TRL 9+
Facility Objective	Fully integrated, industrial pilot running in relevant conditions		Directly scalable unit operations, key TEA parameters proven out		Commercially operating facility delivering CDR reliably to customers

Source: Holocene | *Range of TRL's provided to acknowledge (1) advancing facility performance during lifetime, AND (2) ranging TRL evaluations from independent experts.



anca@theholocene.co

PLUG AND PLAY

STARTUP PRESENTATION

mitico

Mitico

Mitico's carbon capture technology accelerates nature's chemistry to capture and purify post-combustion CO_2.

#PNPTCSiliconValley

Join us at **pnptc.com**

mitico

Low-cost, Modular, and Non-toxic carbon capture

clement@mitico.tech

© C-Quester, Inc DBA Mitico.

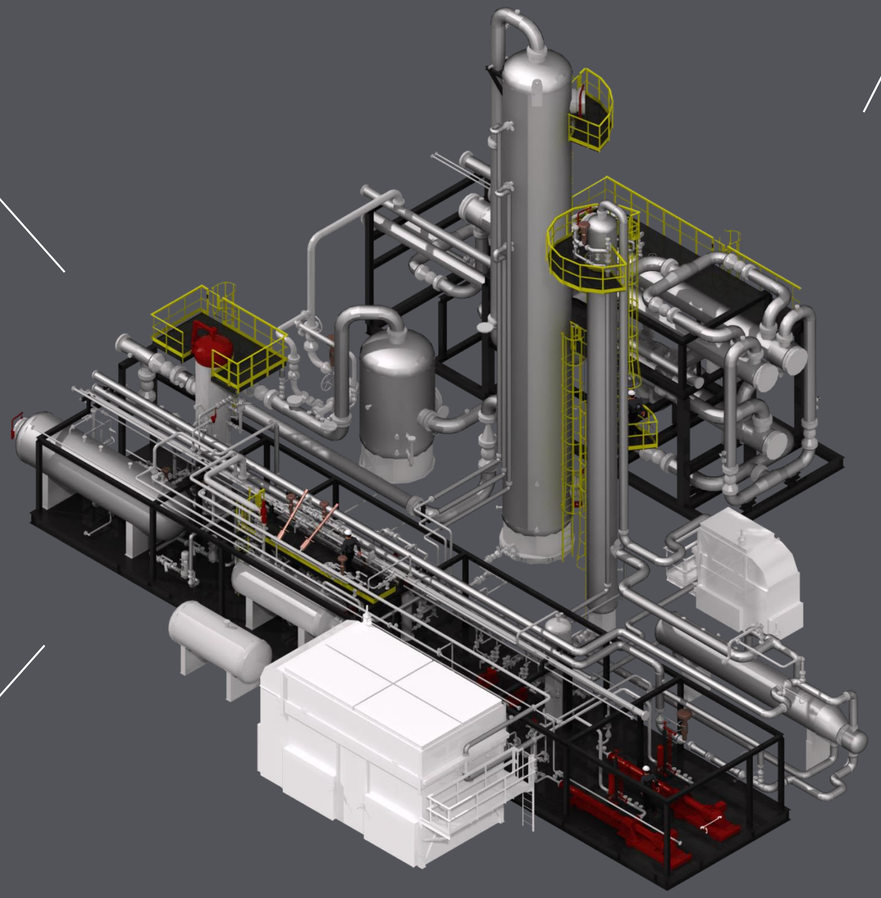


These emit GIGATONS of CO_2 every year

Carbon capture today…

Complex

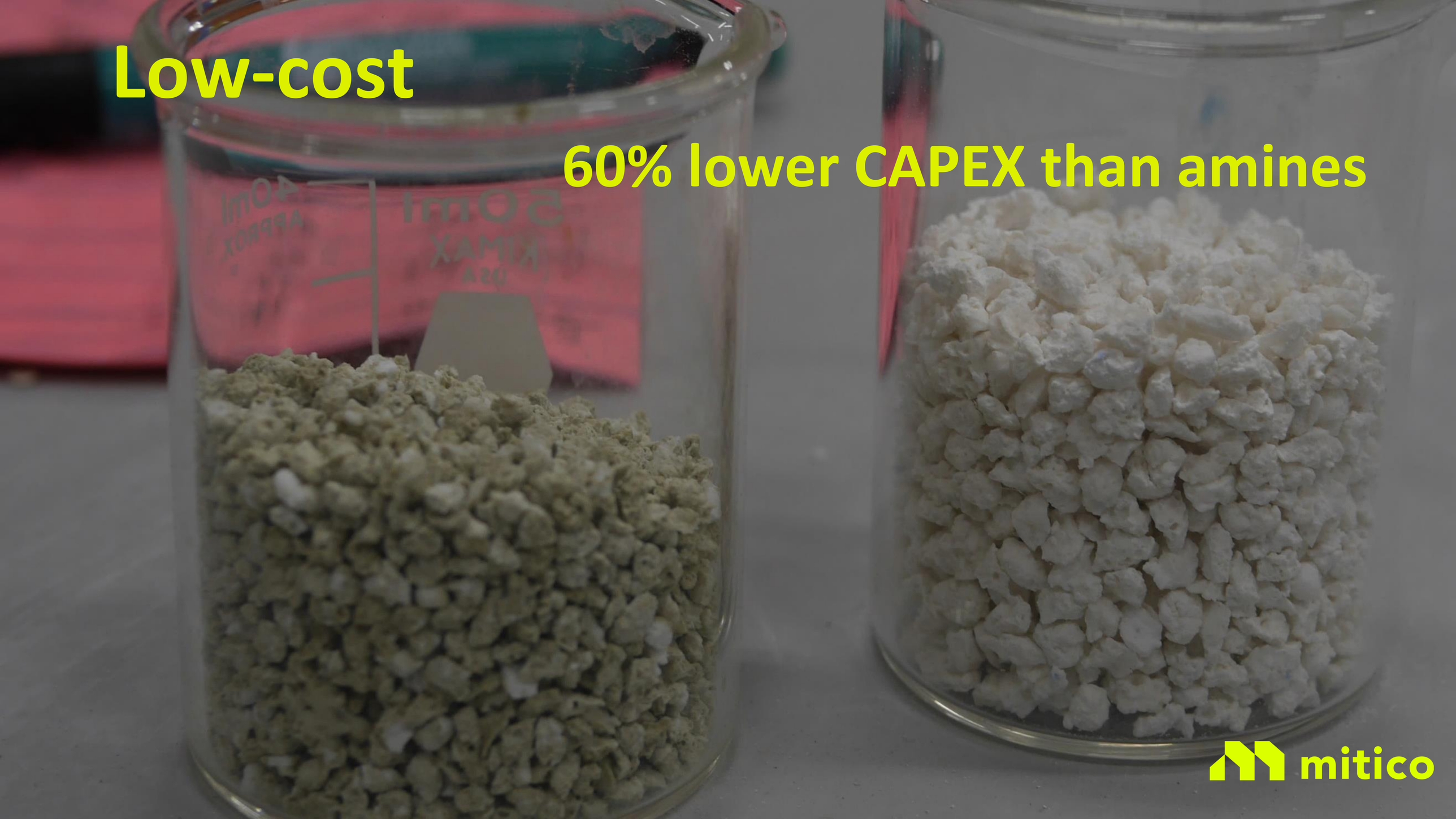
Bulky

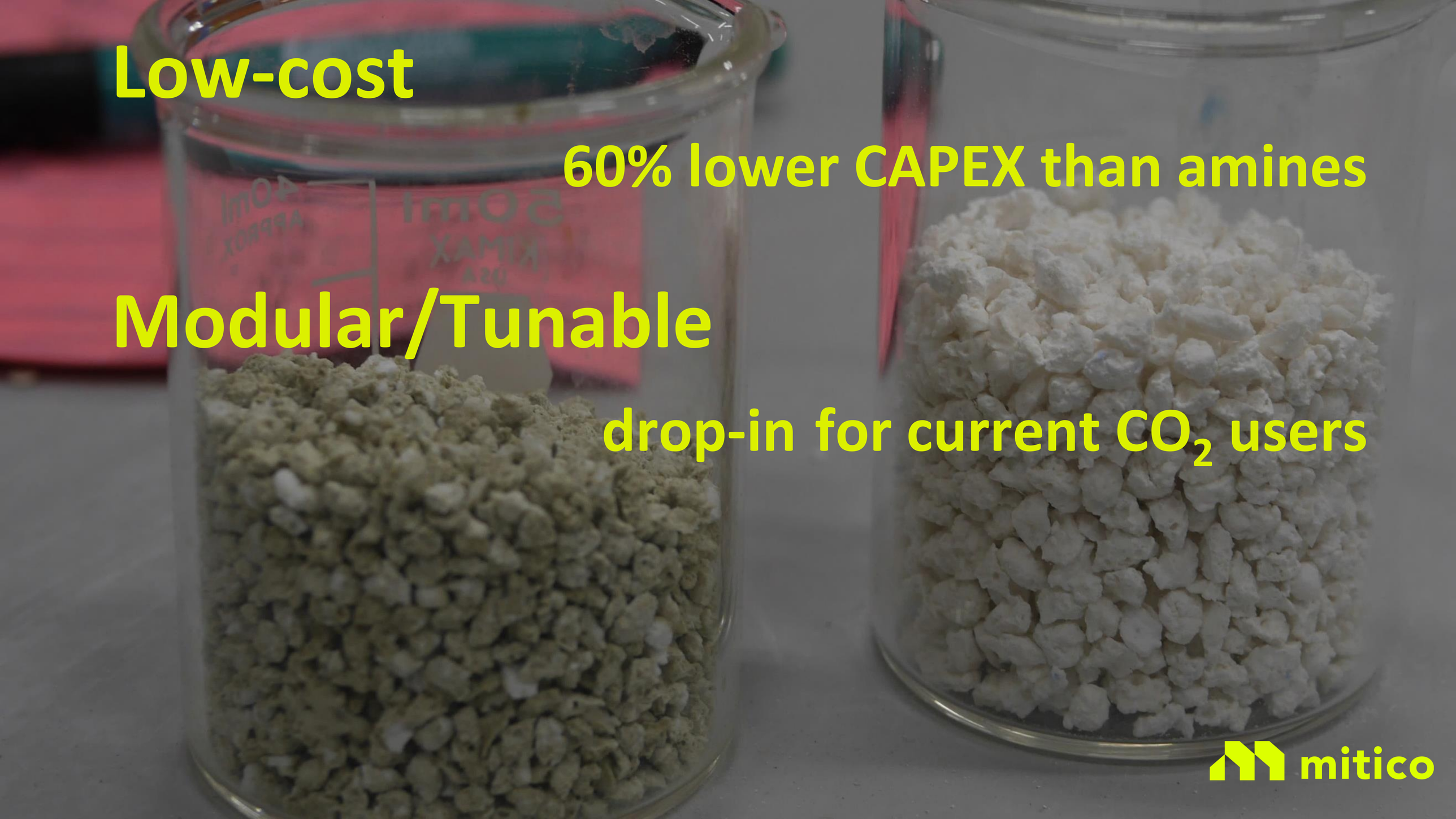


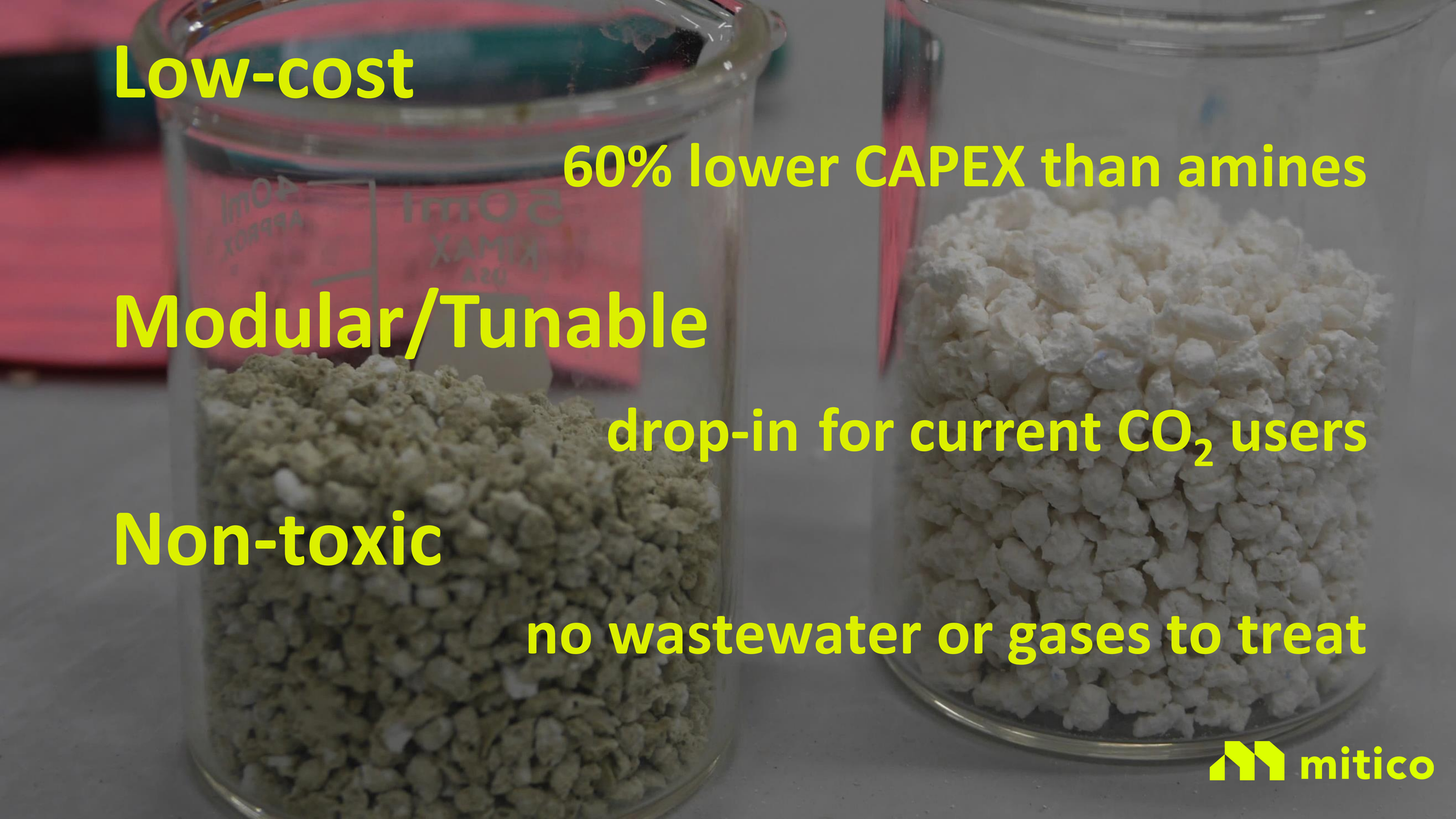


Expensive

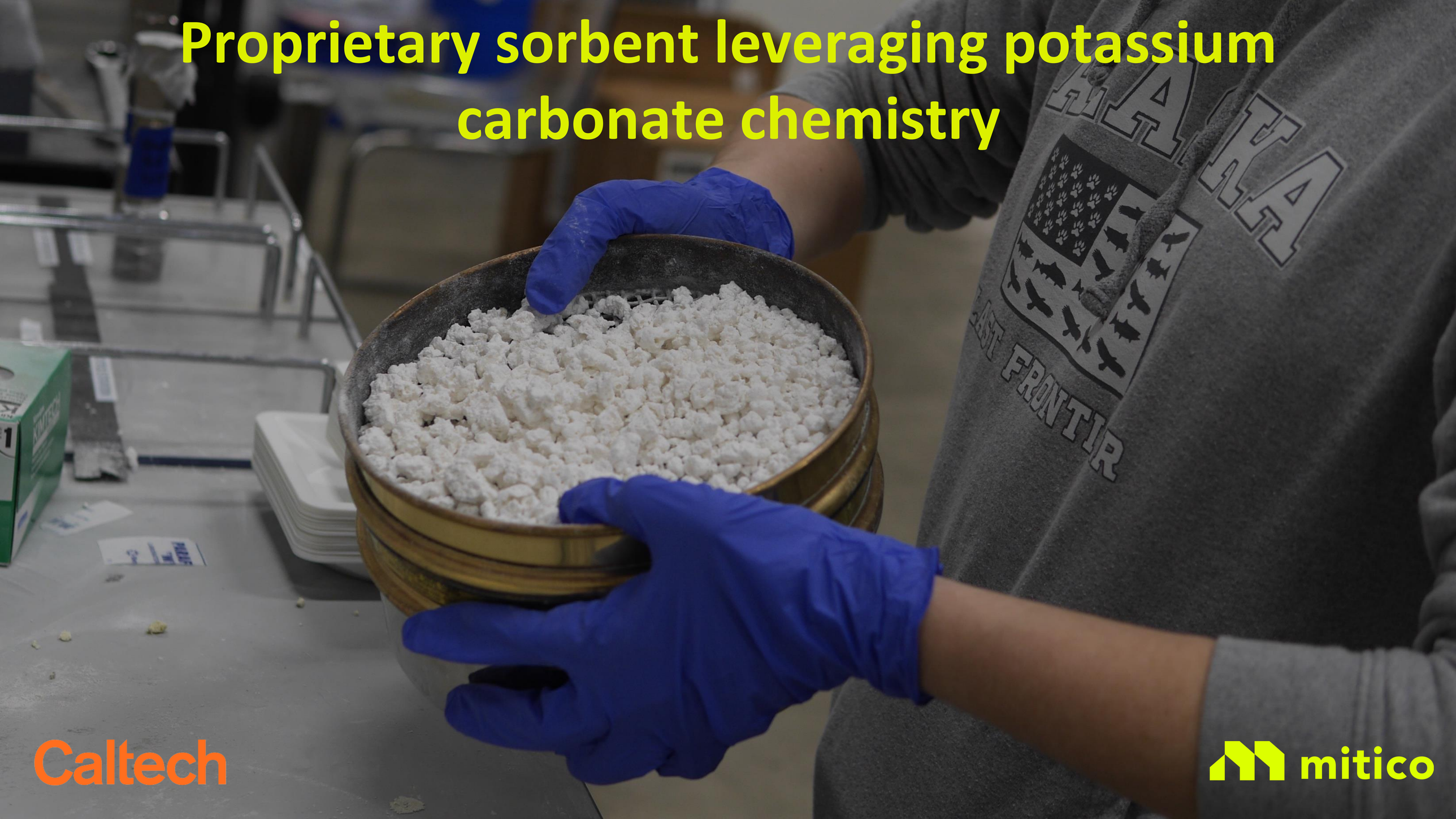
Hazardous


Low-cost
60% lower CAPEX than amines
mitico


Low-cost
60% lower CAPEX than amines
Modular/Tunable
drop-in for current CO_2 users
mitico

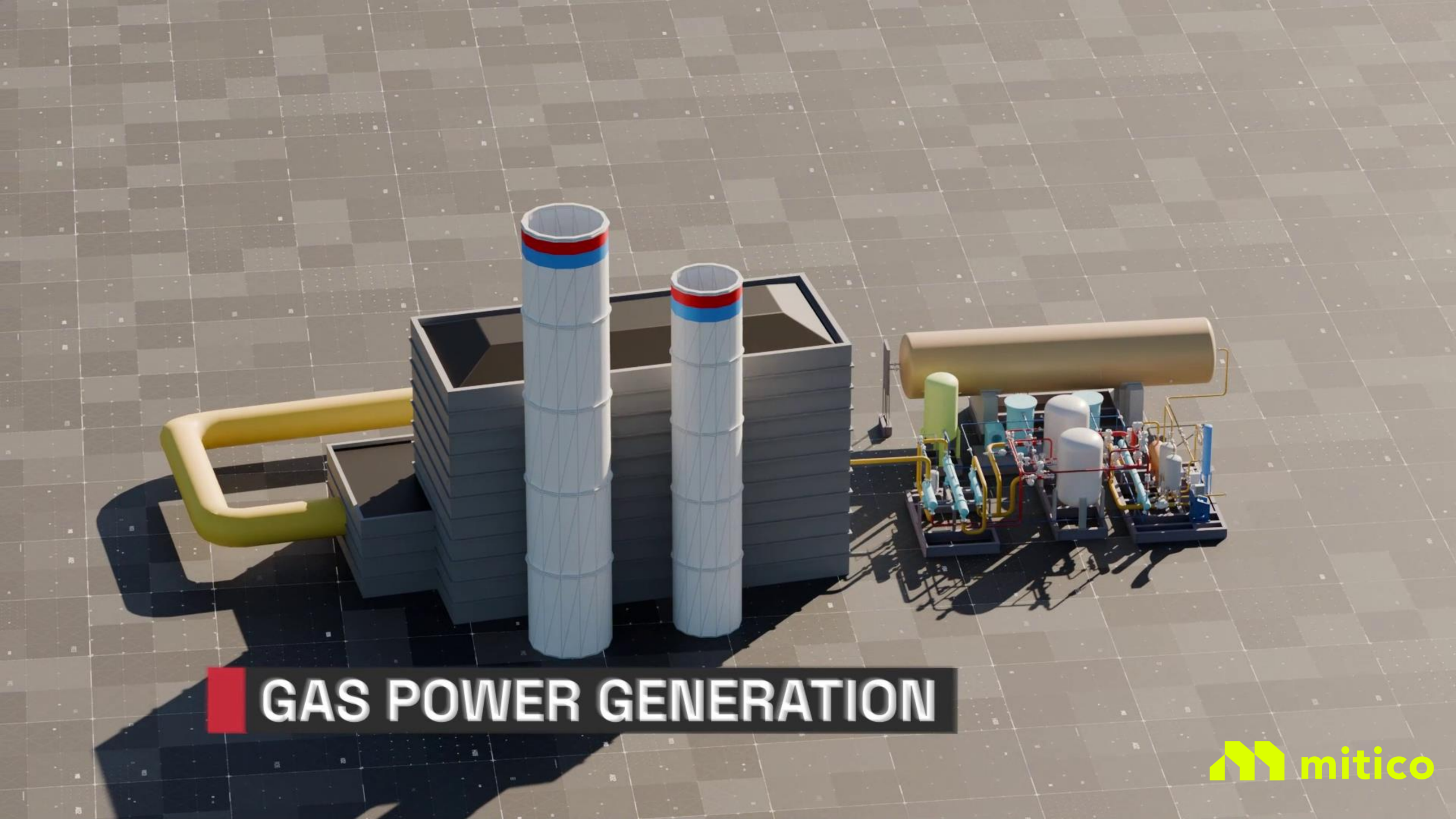

Low-cost
60% lower CAPEX than amines
Modular/Tunable
drop-in for current CO_2 users
Non-toxic
no wastewater or gases to treat
mitico

Proprietary sorbent leveraging potassium carbonate chemistry



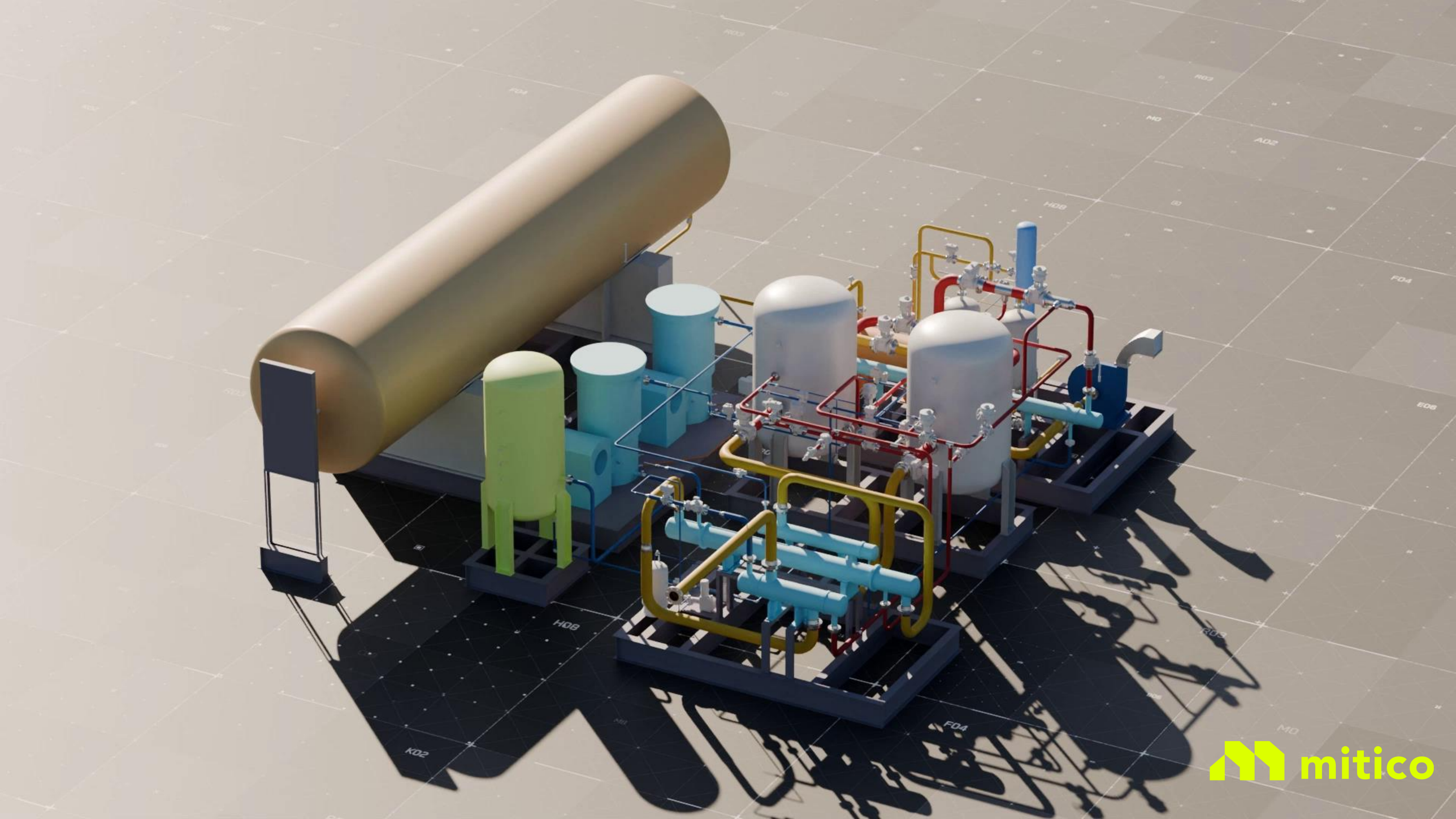
Caltech

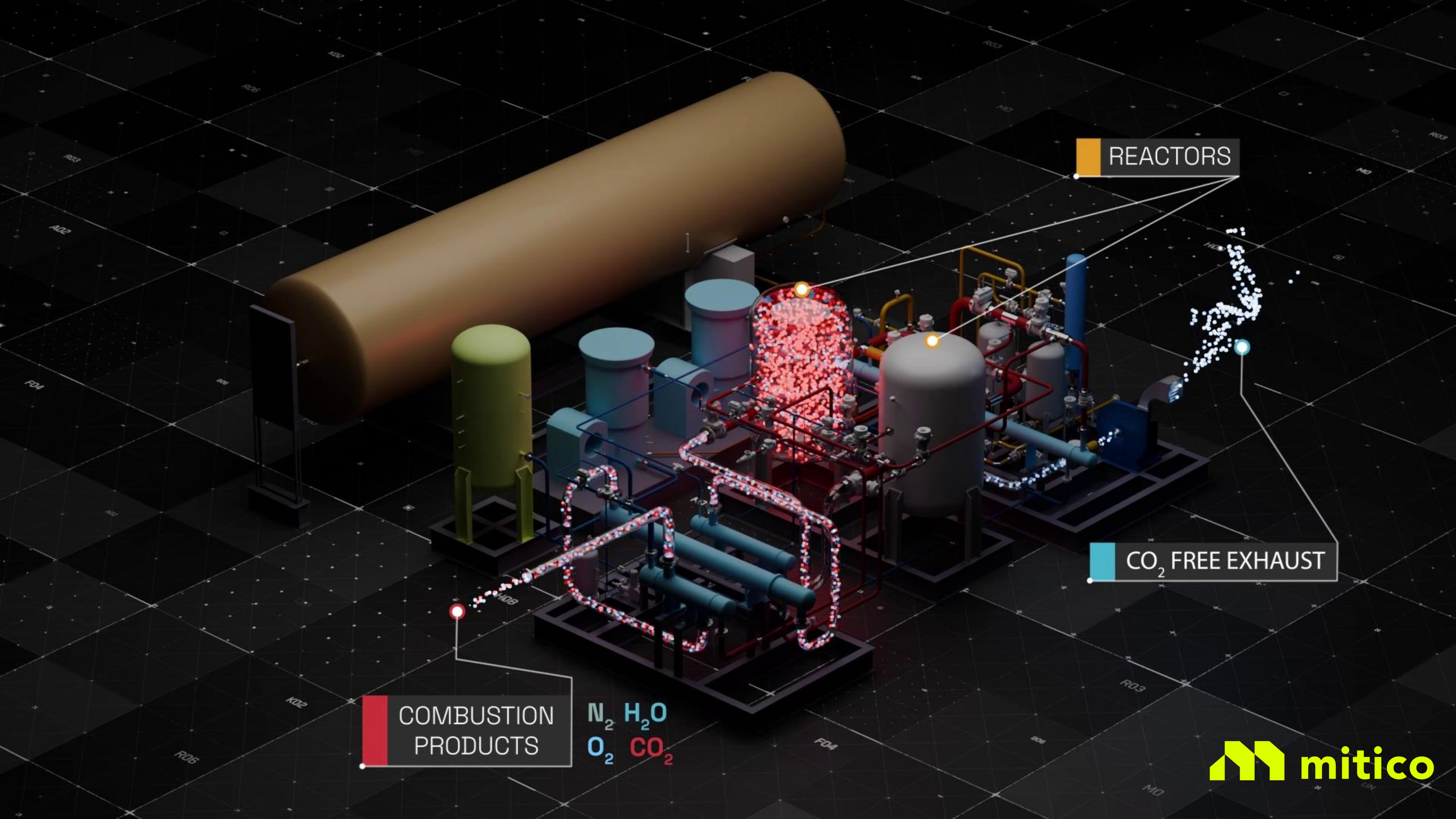
mitico

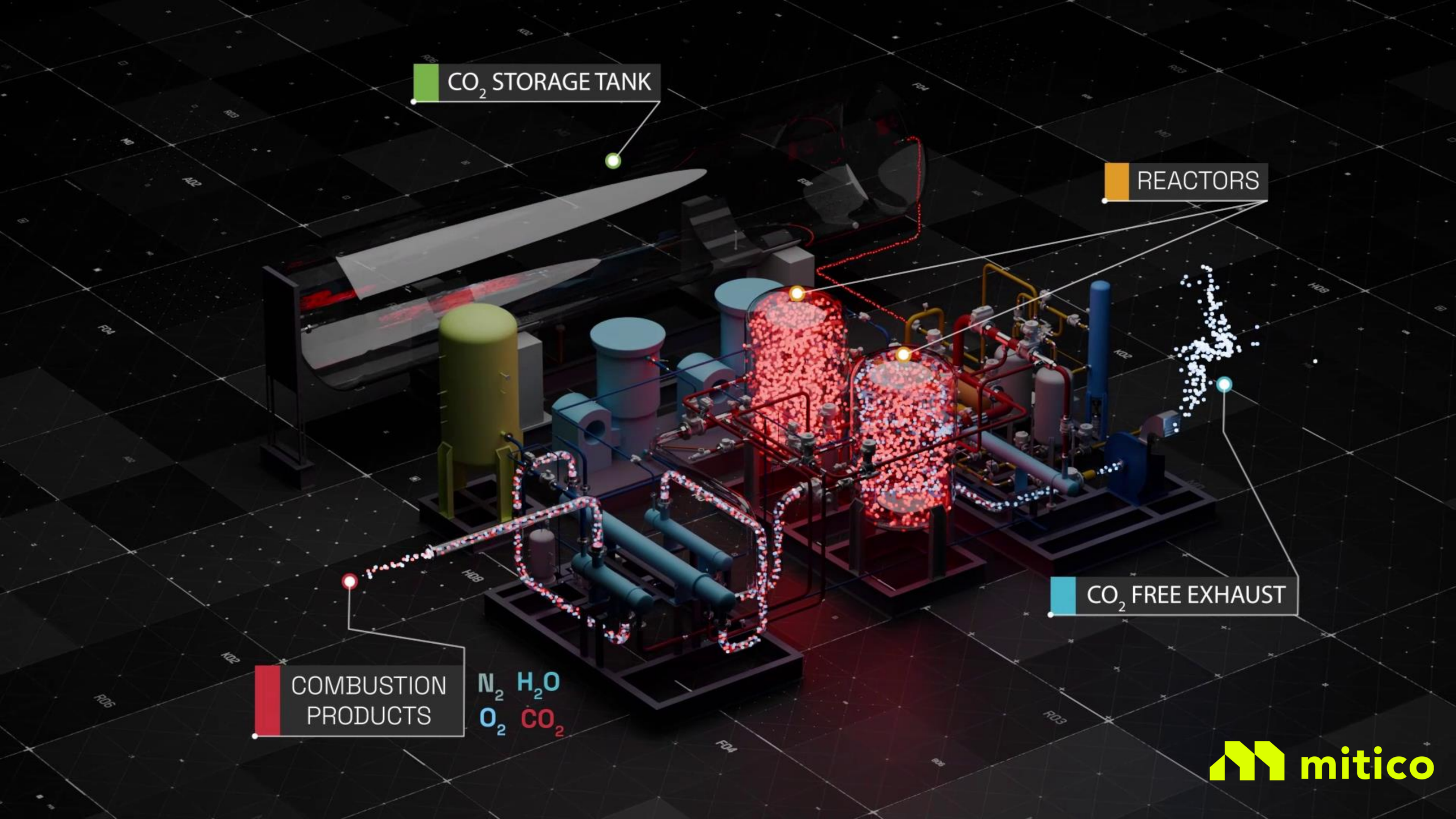

GAS POWER GENERATION

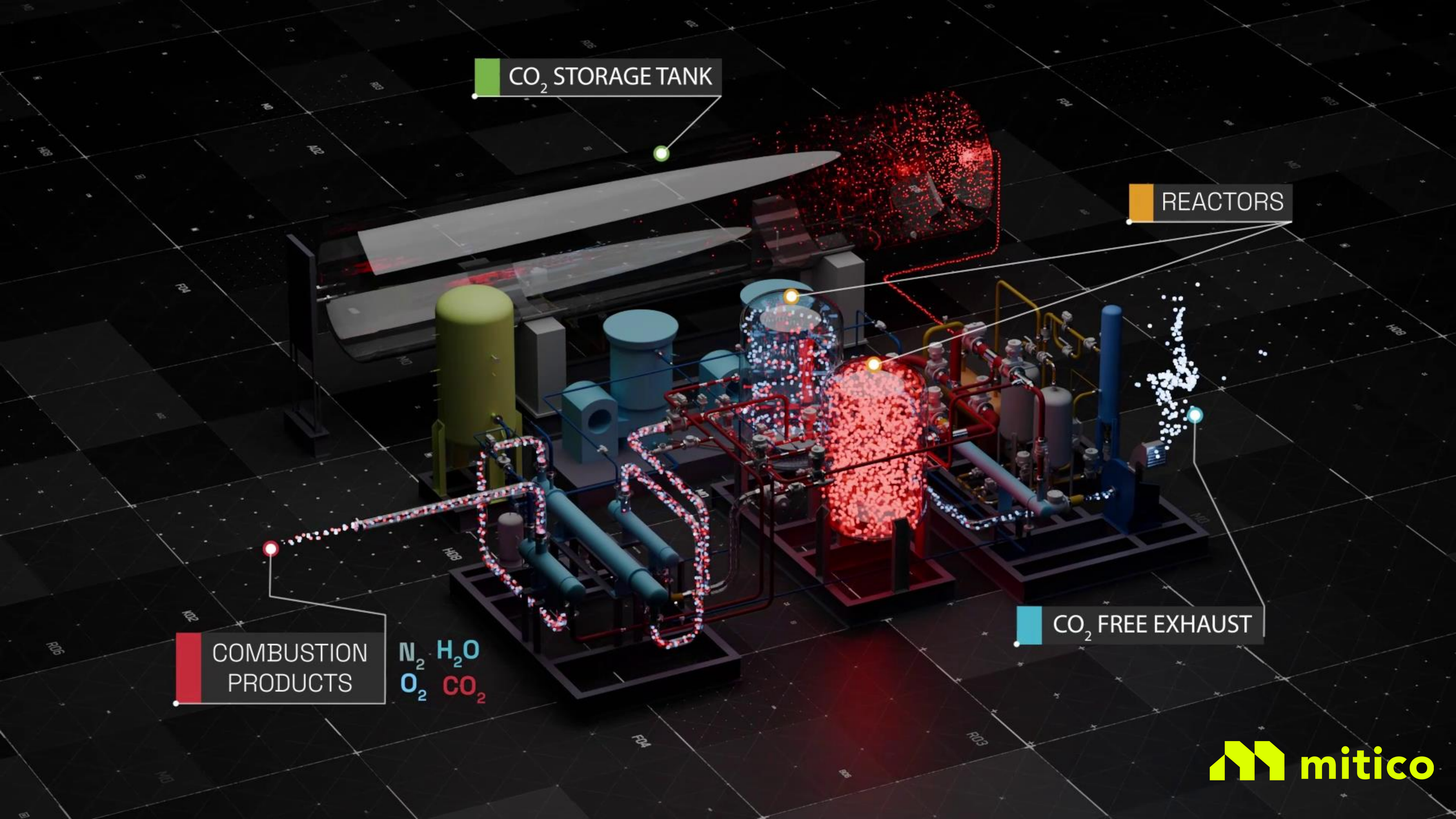

MANUFACTURING


PETROCHEMICAL


HD8
F04
K02
mitico

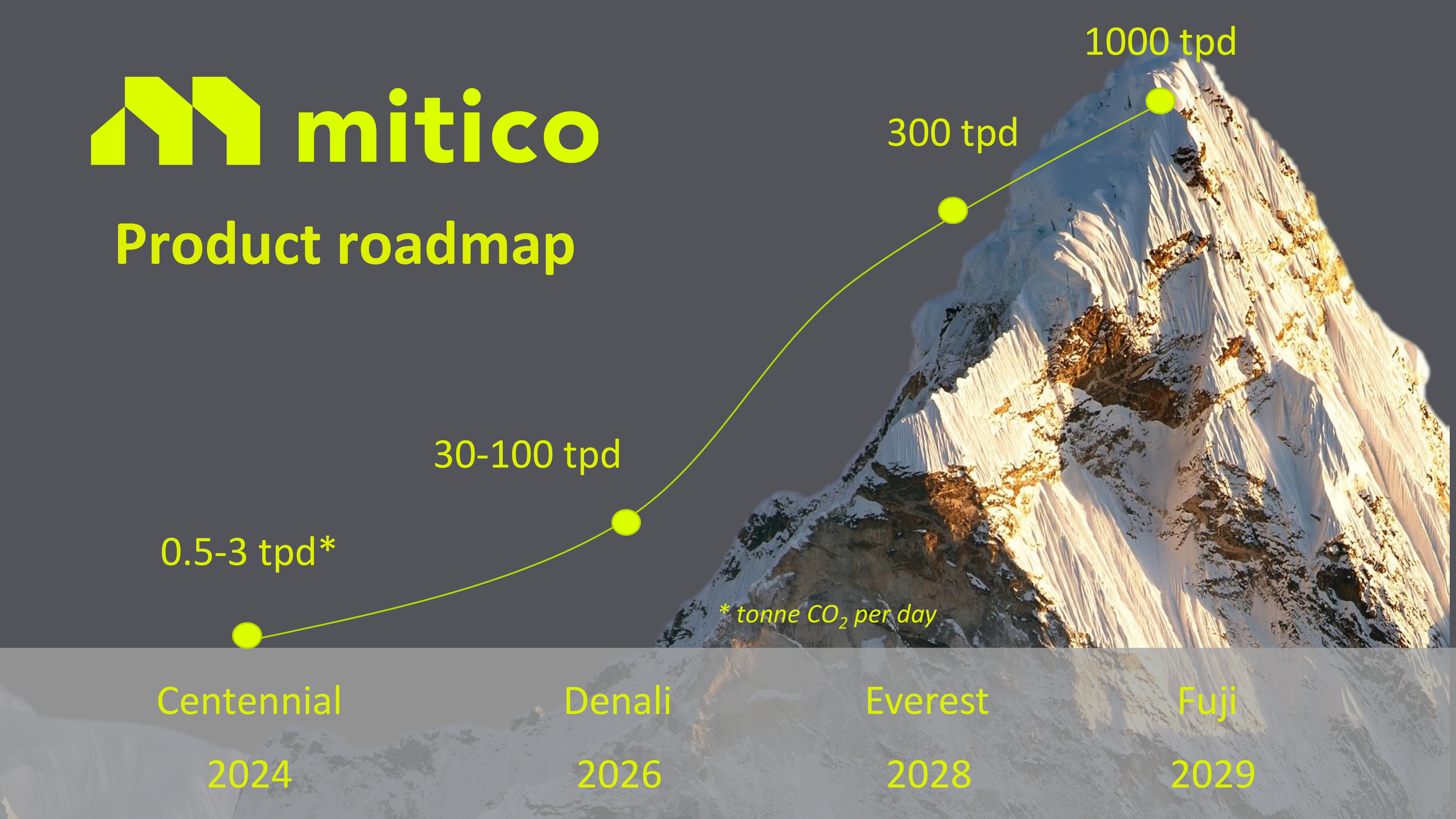

REACTORS
CO_2 FREE EXHAUST
COMBUSTION PRODUCTS
N_2 H_2O
O_2 CO_2
mitico


CO_2 STORAGE TANK
REACTORS
CO_2 FREE EXHAUST
COMBUSTION PRODUCTS
N_2 H_2O
O_2 CO_2
mitico


CO_2 STORAGE TANK
REACTORS
COMBUSTION PRODUCTS
N_2 H_2O
O_2 CO_2
CO_2 FREE EXHAUST
mitico

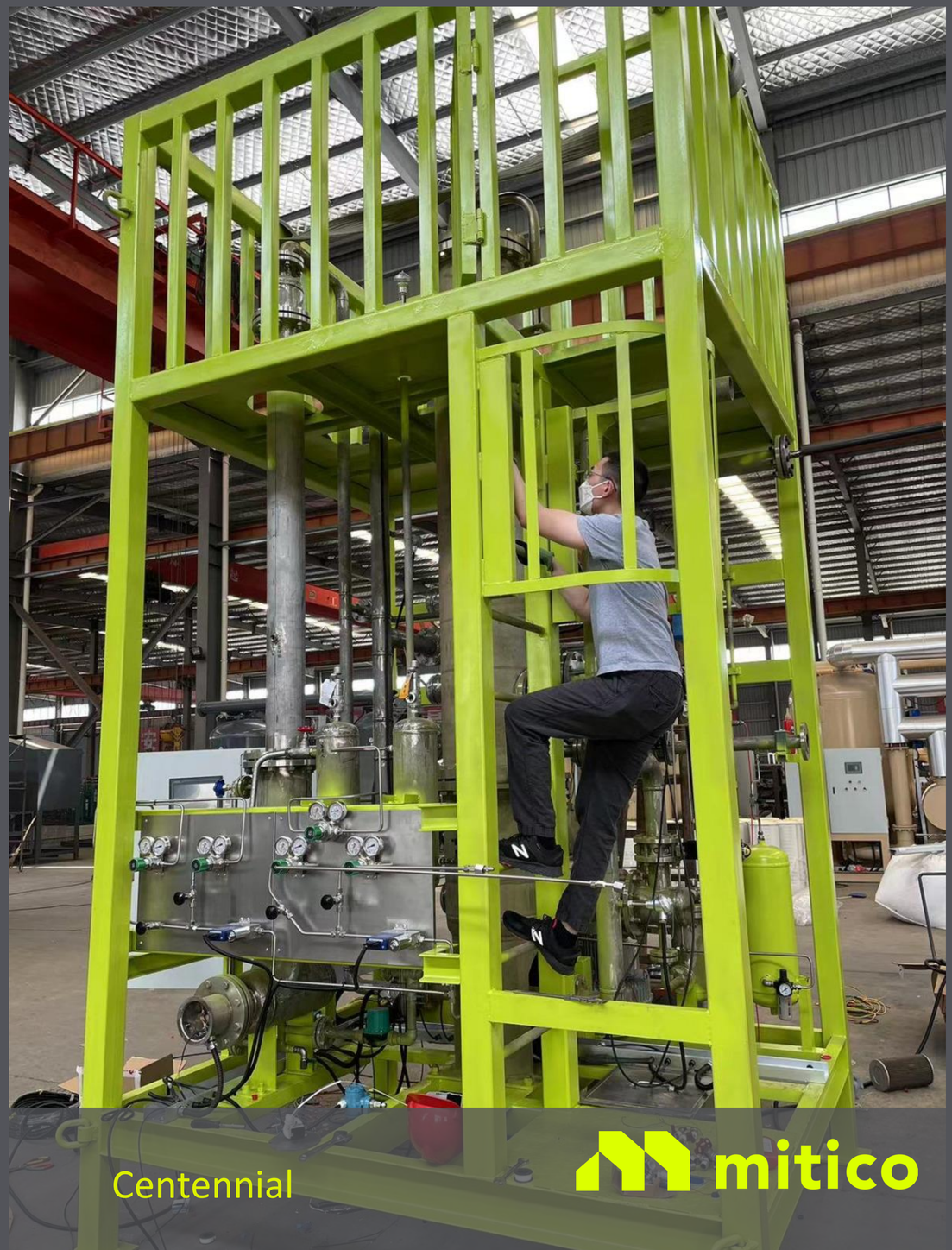
mitico

Product roadmap



Paid Field Demonstrator





Centennial

mitico

TEAM

Founders

Clément Cid PhD
CEO



Environmental technologies scale-up & commercialization

Alan Gu PhD PE
CTO



Chemical engineering technologies development

Léopold Dobelle
COO



Industrial engineering, prototyping and productizing

Advisors

Church Lewis



Ron Rogers



Peter Marx



Melany Hunt



Andy Gollach



Susan Schofer



© C-Quester, Inc DBA Mitico.

Commercial partnership opportunity for installations in 2025:

1,000+ tonnes CO2 per year (5+ MW)



mitico.tech

clement@mitico.tech

PLUG AND PLAY

STARTUP PRESENTATION

AIRMYNE

Airmyne

AirMyne pioneers scalable, safe, and cost-effective DAC technology using low-temperature liquid solvent processes for permanent carbon sequestration.

#PNPTCSiliconValley

Join us at **pnptc.com**

AIRMYNE



Built for scale.

November 2024 | www.airmyne.com | mark@airmyne.com | sudip@airmyne.com

AIRMYNE

DAC only matters at industrial scale.

We come from industry.



Sudip Mukhopadhyay

- CEO

- Prev. Director of Innovation @ Honeywell
- Inventions led to $Bs in revenue
- 50 granted patents

Honeywell



Mark Cyffka

- COO

- Scaled a pilot facility @ BASF
- Inventions led to $90M exit
- 6 granted patents

Honeywell

BASF

Before AirMyne, we invented & scaled $Bs in new revenue.
We know what it takes to bring DAC to industrial scale.

Refinery-scale thinking, inverted for DAC.

Bringing DAC to refinery-like scale is possible. How are refineries designed?

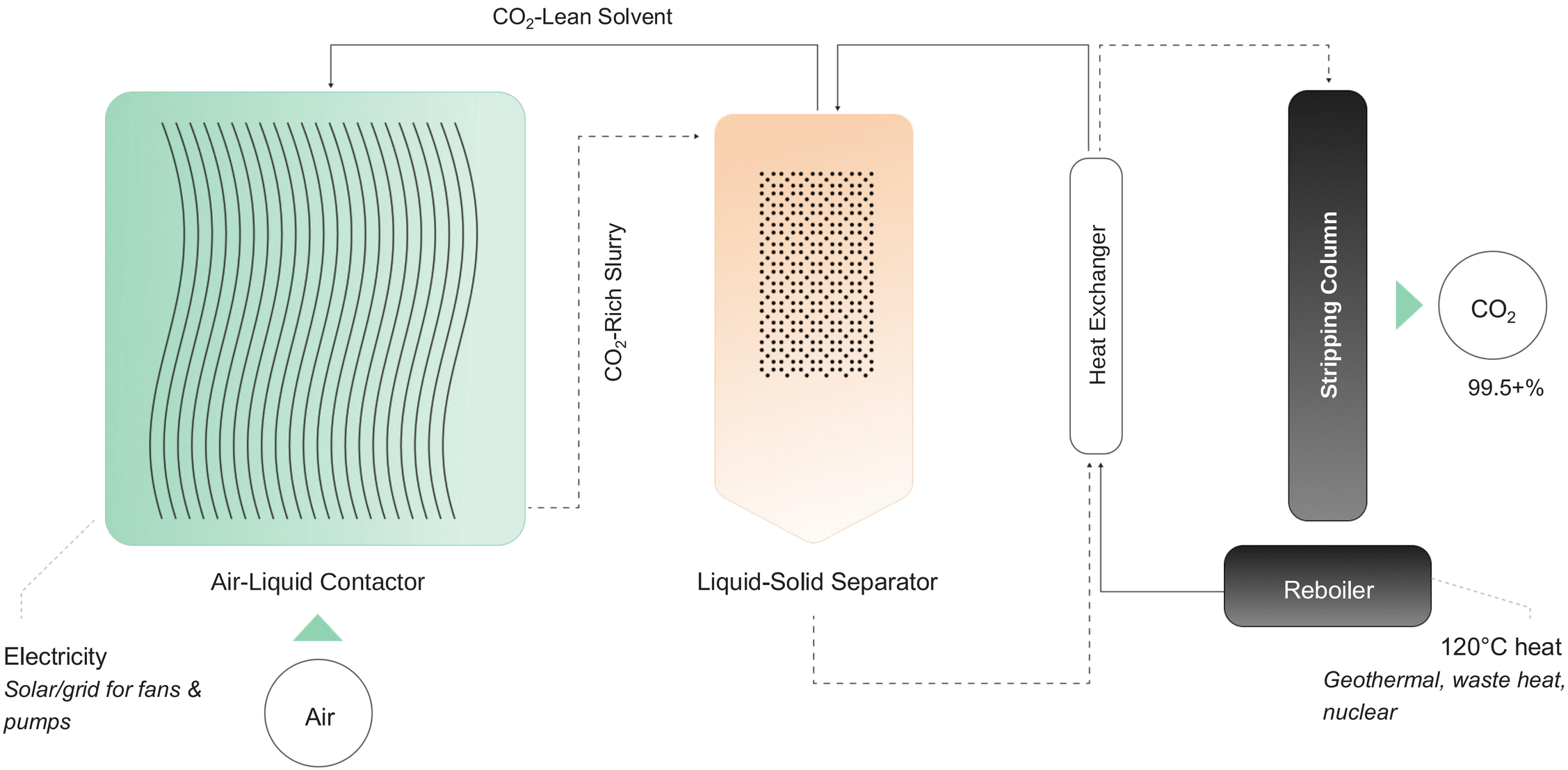


Oil Refinery

- **Continuous processes for best economics**
  Refineries run nonstop; batch processes are too costly
- **Pipes & pumps for low-cost material flow**
  Moving solids is costly; flowing fluids is much cheaper
- **Zero-risk materials with global supply chains**
  Cost-sensitive processes can’t afford supply chain failures
- **Opportunistic energy sourcing for lowest opex**
  Refineries use whatever local energy is abundant & low-cost

AirMyne's DAC process – built for scale.

Liquid capture. 120°C regeneration. Inorganic capture agent. 5 patents.



DOE & VC-backed, with a best-in-class team.

- Won 2 Department of Energy (DOE) grants with Fervo Energy & UC Berkeley
- Protected by 5 granted patents
- YCombinator winter class 2022
- Raised $6.9M seed round (Alumni Ventures, EMLES, Soma Capital, Collab Fund)
- Best in class team (19 total, spanning engineering & commercial functions)







AirMyne is on track to 500ktpy by 2034.

2024

- Set a scalable tech strategy with no supply chain barriers
- Core team hired
- Working prototypes built
- Secured essential IP
- Won first gov’t grants
- Planned first field studies

Wins

2026

- Field data shows path to <$200/ton costs at scale
- Build commercial team
- Decide the site & energy plan for commercial plant
- Secure demand for first commercial offtake
- Set financing strategy
- Secure major gov’t funds

Near-term targets

2029-2030

- FEED study completed
- Permitting completed
- Major sales push to secure offtake commitments
- Financing secured

2032-2034

First commercial plant fully operational at 500,000 tons per year at projected cost of <$200/ton.

AIRMYNE

DAC only matters at industrial scale.

We’re built for that.

AIRMYNE

Thank you.



www.airmyne.com | mark@airmyne.com | sudip@airmyne.com

PLUG AND PLAY

STARTUP PRESENTATION

Oxylus Energy

Oxylus Energy

Converts CO_2 directly into carbon-neutral fuels & chemical feedstocks using electrochemistry.

#PNPTCSiliconValley

Join us at **pnptc.com**

Oxylus Energy

the ***carbon conversion*** company

Perry Bakas; CEO | Co-Founder

perry.bakas@oxylusenergy.com

25 November 2024

Drop-in fuels are required for net-zero; yet there is a **profound cost issue**

Currently, green methanol is 3 - 6x the cost of fossil methanol

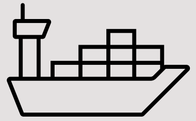
Today

Sectors:

- Chemicals



- Shipping



- Aviation



Conventional Fuels:

- Hydrocarbons are necessary
- **Large carbon footprint**
- Created in a 3-step process

Drop-in Fuels

Definition:

- **Low-carbon**
- Chemically identical
- No modifications

Examples:

- Green Methanol



- Renewable Natural Gas



Main Pain Points

Cost:

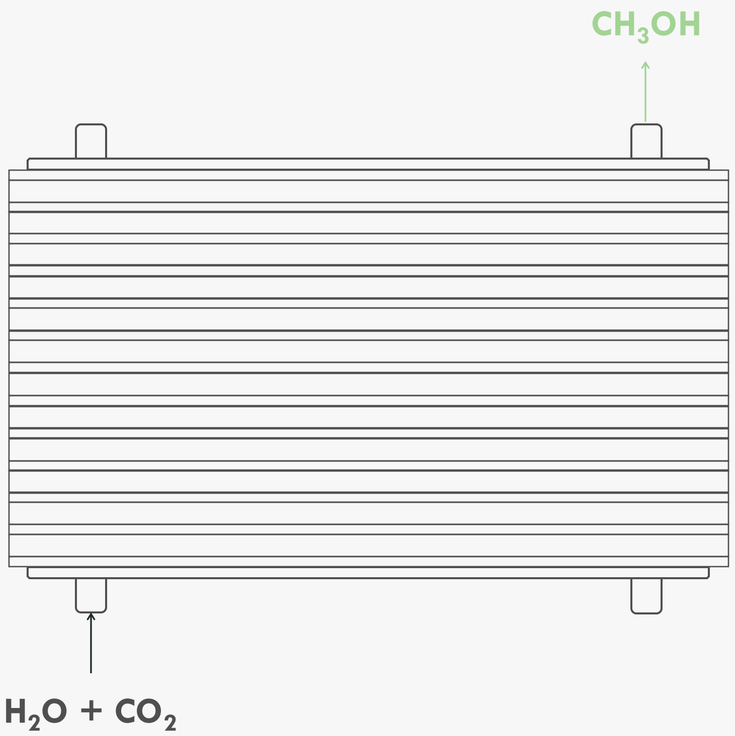
- 300 – 600% Green Premium

Availability:

- 1000x supply-demand mismatch by 2050

Source: Environmental Defense Fund, Methanol Institute, International Air Transport Association, McKinsey & Company, World Economic Forum, Bloomberg NEF, Company Information.

Breakthrough leads to methanol that is **price-competitive with fossil-methanol**



Simpler and cheaper process for methanol creation

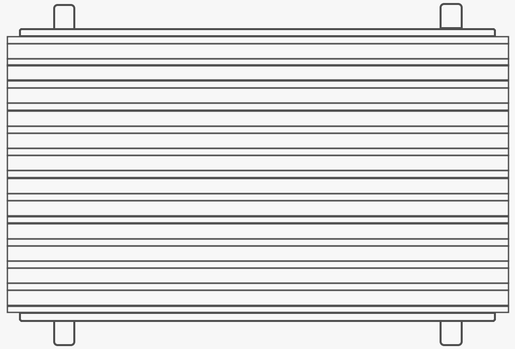
- **Catalyst discovered in 2019 at Yale University**
- This is the **only direct CO_2 to methanol pathway**
  - No green H_2 required
- Significant **reduction in lifecycle emissions** compared to conventional fuels (>95%)
- **Pathway to cost parity** with fossil fuels

Note: Catalyst discovered and improved by CTO Dr. Conor Rooney

Methanol is an energy-dense liquid hydrocarbon that **can <u>decarbonize industry</u>**

Customers: Market segment	Representative Companies				
High-value Petrochemicals	LEGO	Apple	patagonia	Louis Vuitton	P&G
Maritime	MAERSK	Alaska Airlines	Hapag-Lloyd	Carnival	msc
Aviation	jetBlue	Norwegian Cruise Line	United	SABA Sustainable Aviation Buyers Alliance	Emirates

Oxylus Energy



- **Lowest Cost**
- **Highest Efficiency**
- **Green Methanol Production**

Note: (1) Sustainable Aviation Fuel (SAF). (2) Purchase Power Agreement (PPA). (3) Methanol-to-Olefins (MTO). (4) Methanol-to-Aromatics (MTA).

Source: Company Information, Press Releases.

CONFIDENTIAL

Time to Market

Phase 1: Production Scale up *(2024 – 2026)*

Target Market: *Specialty Chemicals (cosmetics, paints, thermoplastics)*

- **Target Production Volume:** 10 tonnes per year

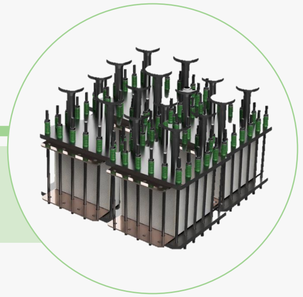


40 kW

Phase 2: Commercial Scale up *(2026 – 2028)*

Target Market: Specialty Chemicals and Maritime Fuels

- **Target Production Volume:** 300 tonnes per year

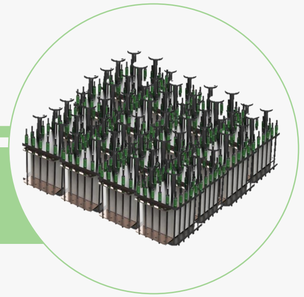


1 MW

Phase 3: Growth Phase *(2028+)*

Target Market: Maritime and Aviation

- **Target Production Volume(s):** 20,000 – 50,000 tonnes per year



25 - 100 MW

Key milestones over the past year

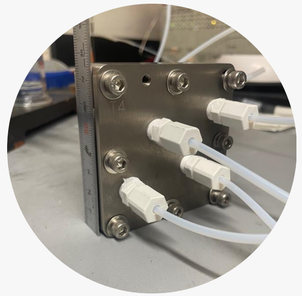
Technical / Commercial Progress

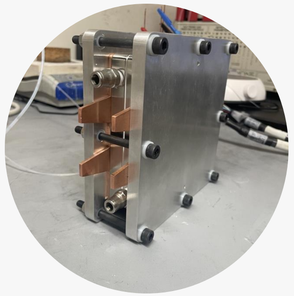
2024

Q3 | Q4 | Q1 | Q2 | Q3 | Q4

- 5 cm² reactor build complete
- LCA and TEA validation
- 100 cm² reactor build complete
- Joined Third Derivative
- **$4.5M Seed in July**
- 3,000 sq. ft wet lab build complete
- Headcount doubled
- Joined Top Pilot Accelerators

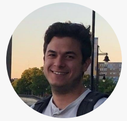






THIRD DERIVATIVE

TOYOTA VENTURES







C2V

CREATIVE DESTRUCTION LAB

Where corporate partners can help…

Seeking interested partners to accelerate scaling efforts

Corporate Partners

Looking For:
- CO_2 Supply for PILOT

Ideal Company Profile:
- Power generators
- Plant operators
- Petrochemical operators

Customers

Looking for:
- Methanol buyers

Ideal Company Profile:
- Value-added chemicals.
- Fuel: shipping, automotive, aviation, heavy engines

Hiring

Senior Process Engineer:
- Plant design

Scale-up Engineer:
- Electrolyzer / Fuel Cell Experience

Polymer Scientist:
- Membrane experience

founded by **engineers, scientists, & entrepreneurs** driven to solve the climate crisis

who we are

- over 10+ years of combined research experience & engineering
- 10+ academic publications in CO_2 conversion
- experience in SBIR, & grant raising
- 7+ years in climate tech across 4 startups
- experience in carbon capture, biofuels, and energy asset development



Harrison Meyer

COO | Co-Founder

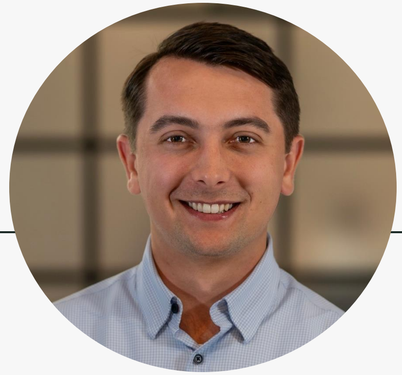
CCS Business Development — 44.01

MS: Civil Engineering — ASU

Fulbright Scholar — Fulbright

BA: Chemistry — Boston University

MBA/MEM '24 — Yale School of Management; Yale School of the Environment



Conor Rooney

CTO | Co-Founder

M.S.
PhD: Chemistry — Yale

BS: Chemistry — Pomona College

MS/PhD '24 — Yale Graduate School of Arts and Sciences



Perry Bakas

CEO | Co-Founder

Climate Ventures — Broadscale

Business Development — aes

BE: Mechanical Engineering — Vanderbilt School of Engineering

MBA '24 — Yale School of Management

world-class support with deep chemistry, engineering, & industry experience

bringing together next-generation talent with experienced leadership

team



Bo Shang, PhD Candidate, Yale Team Lead



Jose Alvarez Hernandez (PhD)
Senior Electrochemist

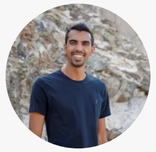


Shaoyang Lin (PhD)
Senior Electrochemist

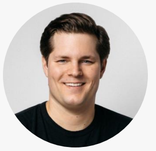


Albert Gang, B.S. Yale
Summer Intern

advisors



Karan Khimji, HBS 24'
CCO, 44.01



Pete Schork, Duke 12'
Principal, Broadscale Group



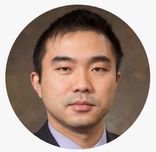
Mike Matson, PhD, Rice 12'
CCUS Director, BCG



Dan Kim, Yale SOM 97'
Chief Strategy Officer, NXT Clean Fuels



Feng Jiao, PhD, St. Andrews 08'
Professor, Washington University in St. Louis



Hailiang Wang, PhD, Stanford 12'
Professor, Yale University

Oxylus Energy

by the numbers

- ***30+ years in cleantech commercialization, alternative fuels, & carbon capture***
- ***40+ years of combined experience*** in electrochemistry, materials science, engineering, & membrane design
- ***35+ academic publications*** in CO_2 conversion, electrochemistry, nanoparticles, & membrane optimization

Oxylus Energy

Thank you!

Perry Bakas; CEO | Co-Founder

perry.bakas@oxylusenergy.com

PLUG AND PLAY

STARTUP PRESENTATION

SCITODATE

Scitodate

Tailored Market Intelligence and Strategic Insights through Hybrid Intelligence.

#PNPTCSiliconValley

Join us at **pnptc.com**

SCITODATE

From Complex Data to Business Impact

SCITODATE

What do we do?

SCITODATE
Scientifically Up-To-Date

At SCITODATE, we **help companies de-risk business decisions** by **validating critical assumptions** that underpin plans **to grow in new markets** or **invest in new technologies**

Our professional service provides **highly customized**, **fast** and **cost-effective market-** and **technology research** specialized in **Clean Energy verticals**

SCITODATE

But why do we do it? Let me tell you a real story...

A **tech instrumentation** company

Explore new markets, for their product portfolio, in **clean energy**

Validate assumptions like **TAM, SAM**, **product-market fit** based on the technical needs of market



*"Market research companies **do not understand what our product is** and **where opportunities could be**. They just give **high-level estimates** great for presentations, but **we need real, specific market data for a confident decision**"*

SCITODATE

We created a "simple" customized excel Data Bank...

Project Name	Source	Company	Country	Summary	Start Date	Delivery Date	Emission Reduction Type
Alternatives to Venting of Natural Gas	https://www.nationalgas.com/	National Grid	United Kingdom	An initiative focused on reducing greenh - Employing tandem recompression and - Developing large-scale Absorbed Natur	2010	2025	Other Emission Reduction
Carbon2Chem: Transforming CO2 Emissions from Steel Manufacturing	https://www.clariant.com/en/I	Clariant	Germany	- **Objective**: Convert CO2-rich gases f - **Method**: Utilize Clariant catalysts ar - **Impact**: Reduction of the plant's CO	2020	2025	CCUS
Carbon-neutral Hydrogen Peroxide Production at Evonik Marl, Germany	https://active-oxygens-sustain	Evonik	Germany	- Evonik Active Oxygens is transforming i - The initiative aims to use renewable ene - This transformation contributes to carb	2021	2040	Green Hydrogen / Amonia
2GW Green Hydrogen Electrolysis Plant at NEOM	https://www.thyssenkrupp.cor	Thyssenkrupp	Saudi Arabia	thyssenkrupp Uhde Chlorine Engineers is - The plant will use thyssenkrupp's 20 MW - Aims to produce hydrogen for conversio - Supports Air Products and partners to e	2021	2026	Green Hydrogen / Amonia

SCITODATE

We created a "simple" customized excel Data Bank...

Project Name	Source	Company	Country	Summary	Start Date	Delivery Date	Emission Reduction Type
Alternatives to Venting of Natural Gas	https://www.nationalgas.com/	National Grid	United Kingdom	An initiative focused on reducing greenh - Employing tandem recompression and - Developing large-scale Absorbed Natur	2010	2025	Other Emission Reduction
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Clean Energy Projects extracted: e.g.

2GW Green Hydrogen Electrolysis plant

@ NEOM

SCITODATE

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11 dimensions analyzed per project: e.g.

Source, Company, Project Delivery Date, Investment size, Opportunity

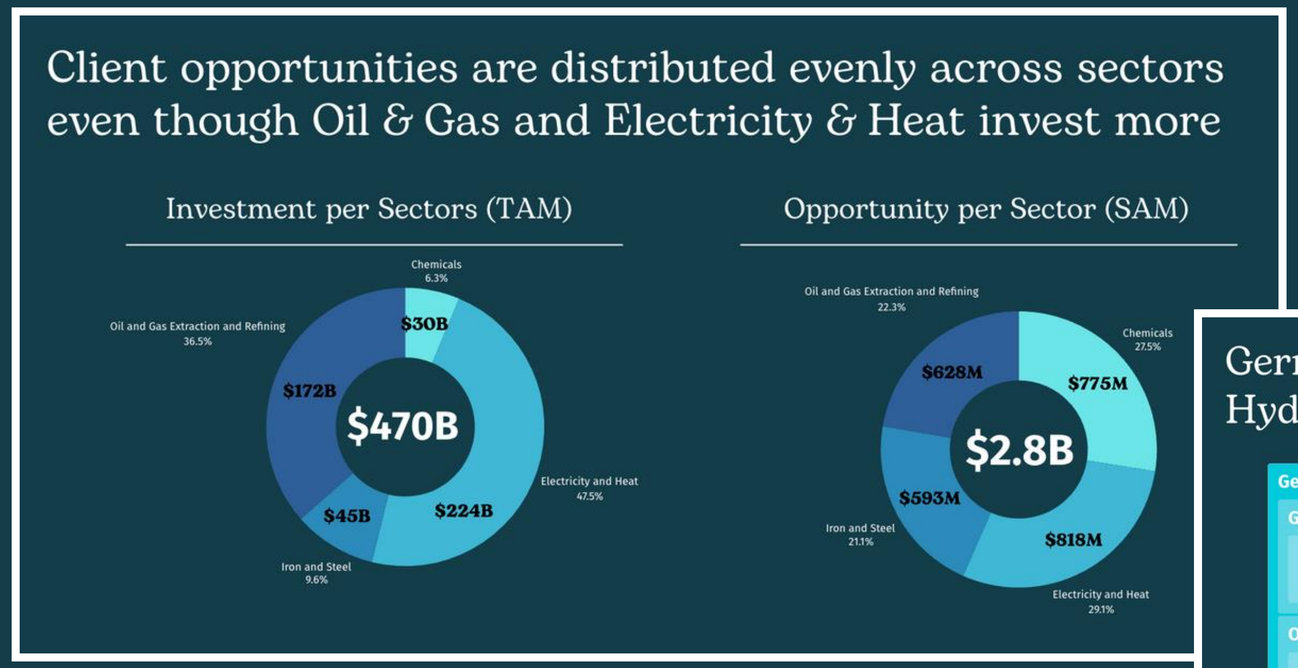
SCITODATE

We created a "simple" customized excel Data Bank...

Project Name	Source	Company	Country	Summary	Start Date	Delivery Date	Emission Reduction Type	Investment Size	Investment Type	Technical Details and Challenges	Opportunity	Bottlenecks
Alternatives to Venting of Natural Gas								$30,000,000.00	R&D Investment	- Recompression technology to increase depressurization efficiency - Development of ANG storage to manage decompression gas. - Assessing potential for full-scale deployment at compressor stati	$1,200,000.00	- Concrete Composition Optimization (%10) Optimizing concrete composition is critical to develop durabl - Modular Foundation Transport Logistics (%15) Effectively transporting modular units for new ANG facilities - Advanced Carbon Capture Systems (%5) Developing advanced systems for capturing and storing natu - Hydrogen Storage Structural Safety (%5)
Carbon2Chem: Transforming CO2 Emissions from Steel Manufacturing								$30,000,000.00	Upgrade Existing Infrastructure to Reduce Emissions	- **Catalyst Efficiency**: Ensuring catalysts are effective and long-l - **Gas Purification**: Techniques for optimal exhaust gas purificat - **Synthesis Challenges**: Balancing reaction conditions to maxim	$1,620,000.00	- Advanced Carbon Capture Systems (%25) Develop and integrate systems that can efficiently capture C(- Catalyst Technology Integration (%20) Conversion of CO2 to methanol requires expertise in chemic - Chemical Process Decontamination Design (%15) Optimizing gas purification techniques is necessary to ensur - Industrial-Scale Electrolysis (%10)
Carbon-neutral Hydrogen Peroxide Production at Evonik Marl, Germany								$85,000,000.00	Upgrade Existing Infrastructure to Reduce Emissions	- Transition requires significant upgrades to production facilities to - Adoption of green hydrogen involves technological adaptations to - Regulatory compliance and third-party certification add layers of c	$2,630,000.00	- Concrete Composition Optimization (%5) Optimizing the composition of concrete for this new infrastru - Hydrogen Storage Structural Safety (%10) Essential for the manufacturing facility upgrades, particularly - Retrofitting for Hydrogen Input (%15) This is critical for effectively utilizing the surplus green hydro - Hydrogen Supply Chain Engineering (%20) The creation of a reliable hydrogen supply chain is foundatio
2GW Green Hydrogen Electrolysis Plant at NEOM								$650,000,000.00	New Clean Energy Infrastructure	- Implementation of 20 MW alkaline water electrolysis modules. - Scaling up manufacturing capacity for gigawatt projects. - Managing the integration of renewable energy sources for electr - Achieving efficiency in hydrogen production and ammonia synthe	$5,070,000.00	- Industrial-Scale Electrolysis (%30) Industrial-scale electrolysis is fundamental to the operation c - Grid Capacity and PV Integration (%20) Integrating the plant's hydrogen output with renewable energ - Hydrogen Storage Structural Safety (%15) Ensuring that hydrogen can be securely stored is critical to pr - Advanced Carbon Capture Systems (%10) Designing, configuring, and maintaining systems that capture

SCITODATE

...and compiled a report with essential data for the client





SCITODATE

Hard work that uncovered a hidden treasure for the client

1

Client-specific Data Bank created

1168

Individual **projects analyzed** in detail

+100k

Public sources linked to **projects**

$470B

Total investments in projects **analyzed**

$2.8B

Total **market opportunity** in new **Clean Energy markets** for the **client product portfolio**

SCITODATE

We are most proud of the value created for both companies



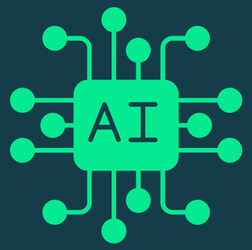
*"**SCITODATE technical understanding** of our portfolio and the **bottom-up customized analysis of the market** provided **factual validation** for our **assumptions** and allowed us to **secure the budget to take action**"*

300

New projects commissioned by the client with a **2 years commitment**, involving **+5 BUs** in the company

SCITODATE

So we keep developing our core differentiating assets to do even better



Top-tier data collection and **inference system** that powers our **customizable data extraction engine**.



Vast network of PhD experts in technical products and complex markets, **eager to provide meaningful data**—no fluff



Proven success with **27 business units** of major clients like **HP, Horiba, and Thermo Fisher Scientific**

SCITODATE

Let's start a pilot project and explore new possibilities together...



If you are looking to to **grow in new markets** or **invest in new technologies** in **Energy verticals** you are likely asking:

- Who **needs my solution**?
- What are **my competitors doing**?
- What's the **market size**?
- What is the **best technology to invest** in?

Let's discuss how we can help you decide with confidence creating your custom data bank to validate your most critical assumptions

PLUG AND PLAY

STARTUP PRESENTATION

ITSWARE

ItsWare

ItsWare is the Git for hardware, providing version control and management for physical assets.

#PNPTCSiliconValley

Join us at **pnptc.com**



ITSWARE

Digital insights for a physical world

RW (48) Cent

DO NOT TAKE

519 1 A

DO NOT TAKE

4639271

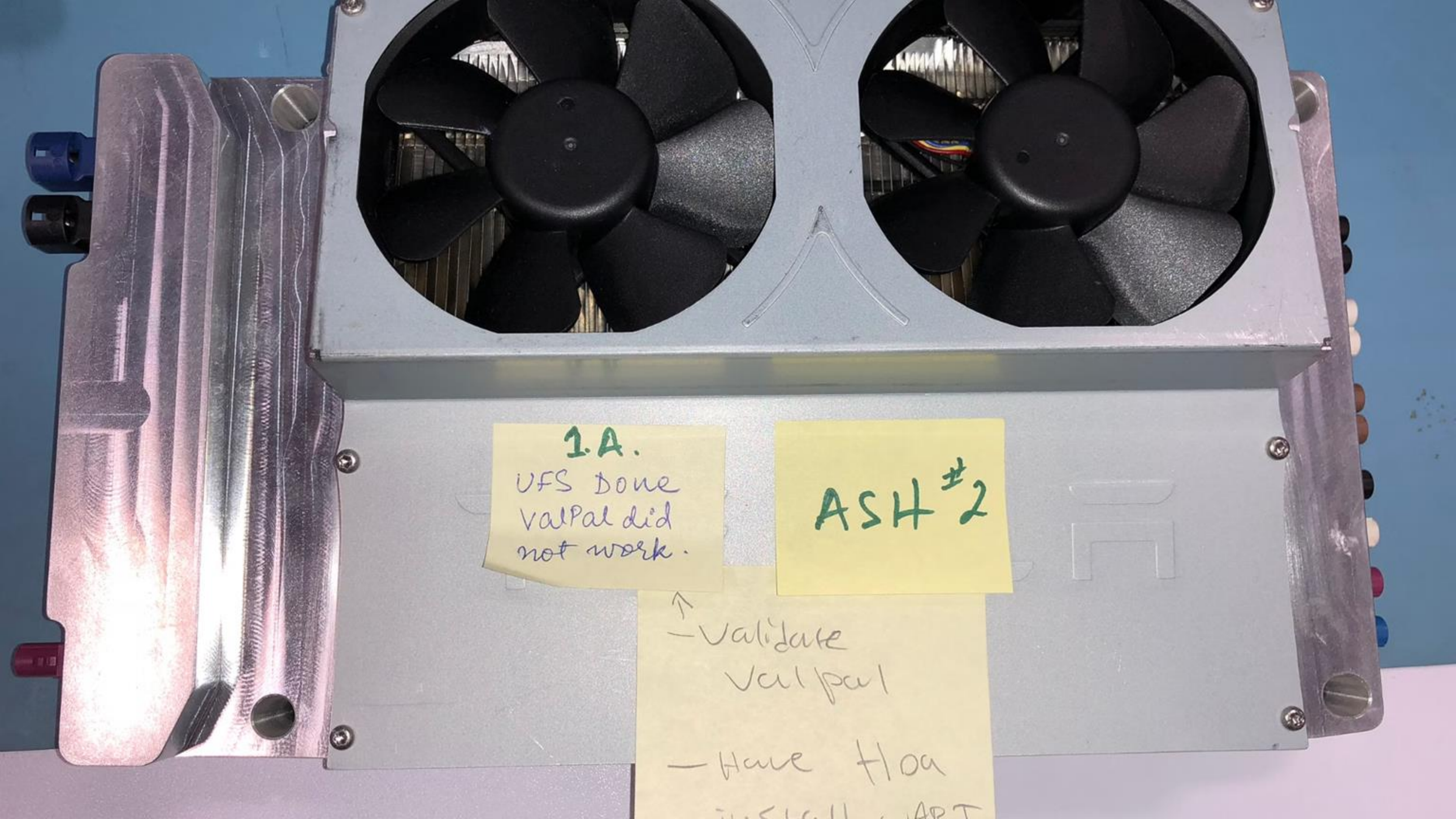
ERICSON MEN
TESLA INC
3500 DEER CREEK ROAD
PALO ALTO CA 94304
PALO ALTO CA 94304

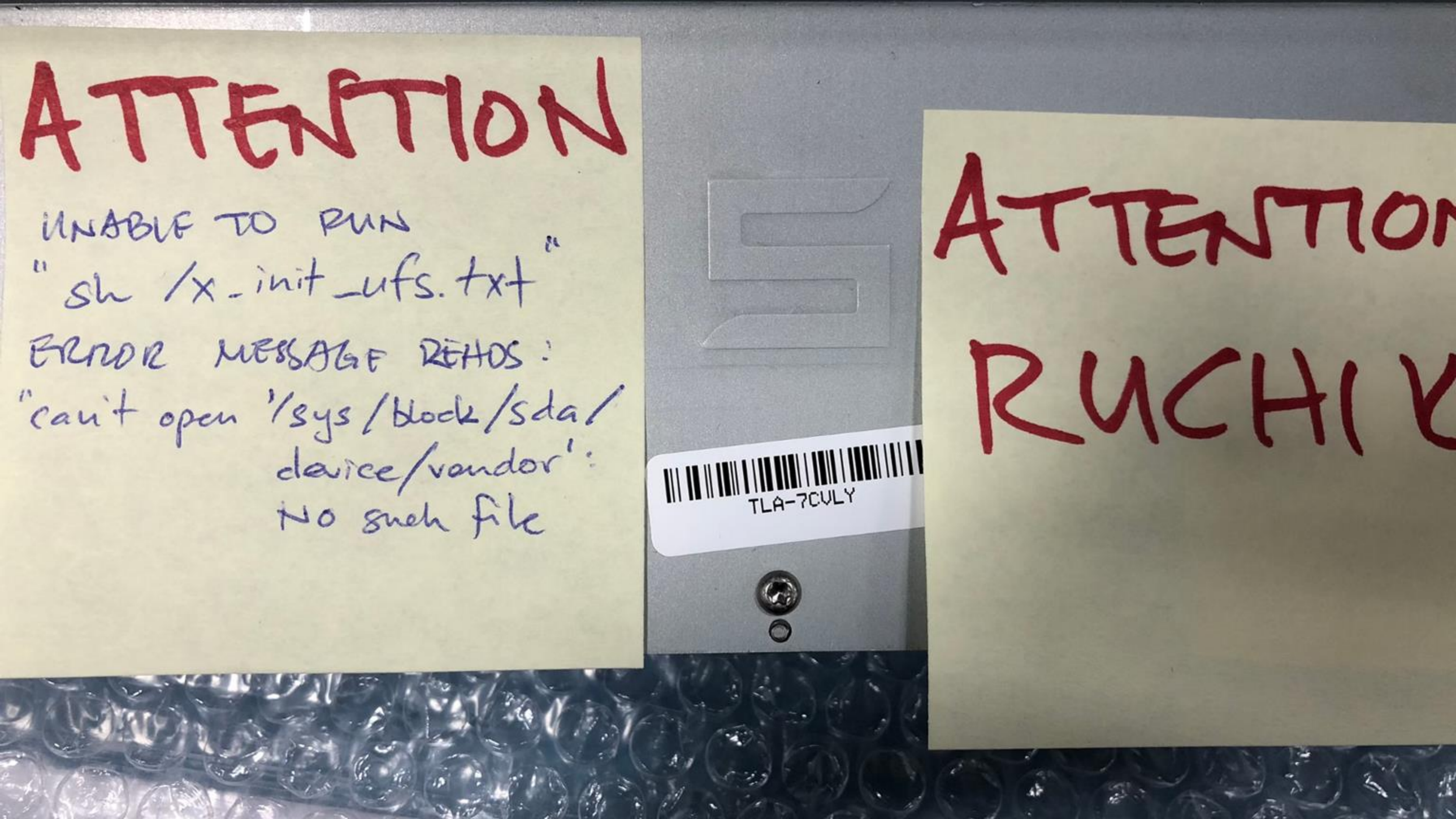
FedEx

(US)

WA HGTA

INTL PRIORITY


1.A.
UFS Done
ValPal did
not work.
ASH #2
- Validate
Valpal
- Have Hoa


ATTENTION
UNABLE TO RUN
" sh /x_init_ufs.txt "
ERROR MESSAGE READS:
"can't open '/sys/block/sda/
device/vendor':
No such file
TLA-7CVLY
ATTENTION
RUCHI K

The Problem

There is no API for stuff.

The Problem

Hardware companies lose tools & misplace assets, causing **millions in monetary losses** and thousands of hours of downtime annually.

DOT certified companies must maintain calibration logs of all tools in order to access **$130B of annual DOT contracts**.

- DOT certified companies currently track their physical assets through **handwritten logs that require warehouses to store**.

Our Solution

Physical assets tracked via software. Not pen and paper.

Automate and digitize calibration logs, inventory management, and access control

via our Asset Ownership API

RFID Cabinets

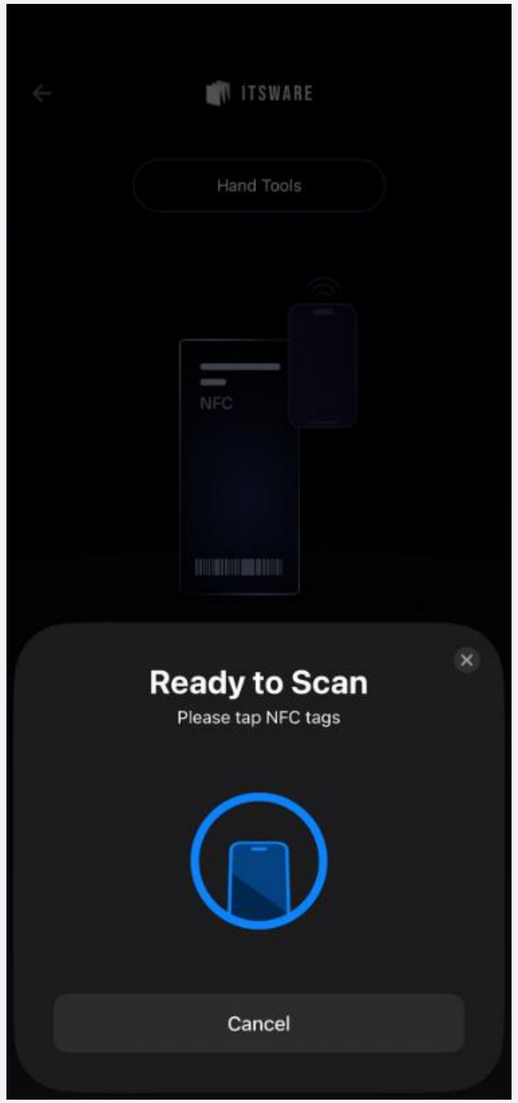
- Turnkey hardware.
- Physical data repositories.
- Turn any asset into a self-reporting data point for frictionless management.
- Automatic access, distribution, return, and item usage logging with no manual logging required by the user.



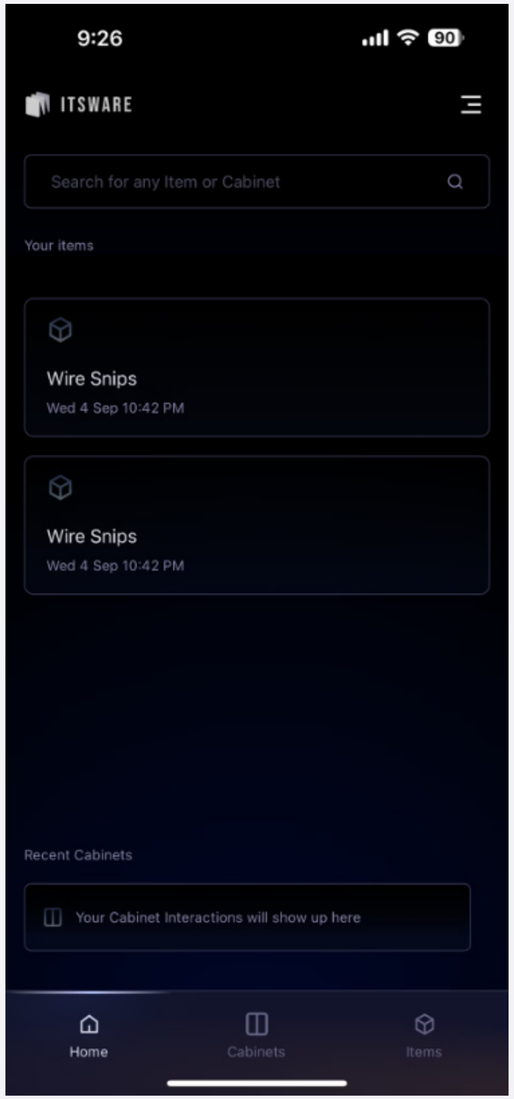
RFID Tags

- Interact with cabinets and phones.
- Direct link to item in ItsWare system.
- No additional scanning equipment required.
- Add new items to the database with any modern smartphone.

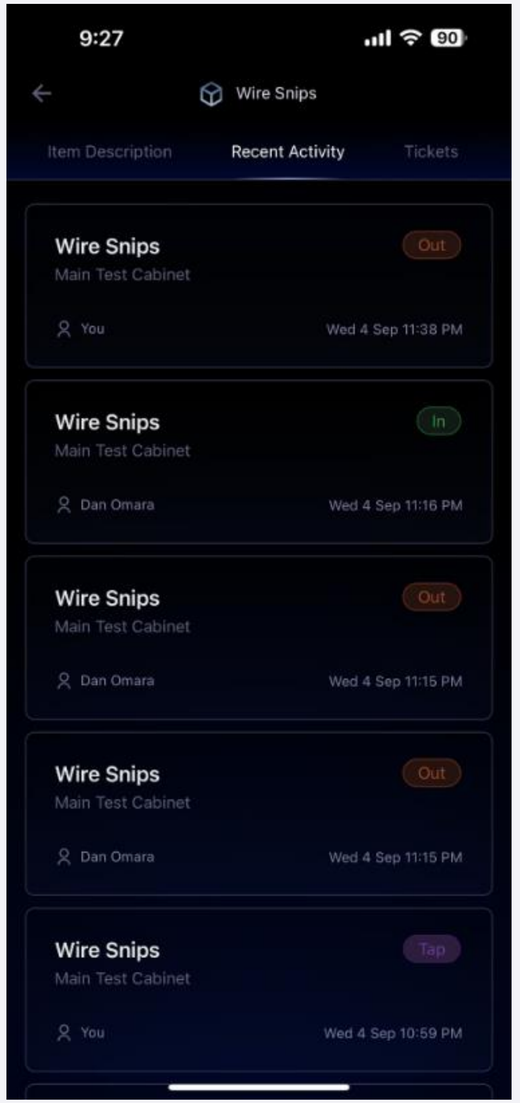




- Quickly add items.



- Quick access to items.



- Audit item history.

ITSWARE

Casey
Administrator

- Home
- Cabinets
- Items
- User Management
- Team Management
- Item Profiles
- Log Out

Home

Search for any item or Cabinet

Your items

Item Name	Last Seen	User
Wire Snips	Wed 4 Sep 11:38 PM	Administrator

Recent Cabinets

Your Cabinet Interactions will show up here

Market Opportunity



4300 robotics companies in the USA.

TAM = $60M (1k companies) to $260M ARR



6800 aerospace companies in the USA.

TAM = $60M (1k companies) to $400M ARR



1000 electric vehicle companies in the USA.

TAM = $30M (500 companies) to $60M ARR

Total Beachhead TAM = $150M - $720M ARR

Market Opportunity

Total Market Opportunity = $63B - $355B ARR

Construction



TAM = $45B to $240B ARR

Healthcare



TAM = $10B to $54B ARR

Manufacturing



TAM = $6.7B to $36B ARR

3PL



TAM = $228M to $1.2B ARR

Utilities



TAM = $600M to $3.3B ARR

Business Model, Revenue Streams

Recurring revenue via SaaS & HaaS

- Recurring revenue via SaaS & HaaS
- $5000/mo base hardware subscription.
  - 500 item tracking credits included.
  - Automated item tracking via cabinet.
  - RFID tags included.
  - $10/mo each additional item.

Growth Trajectory

Customers Secured











Customer Pipeline









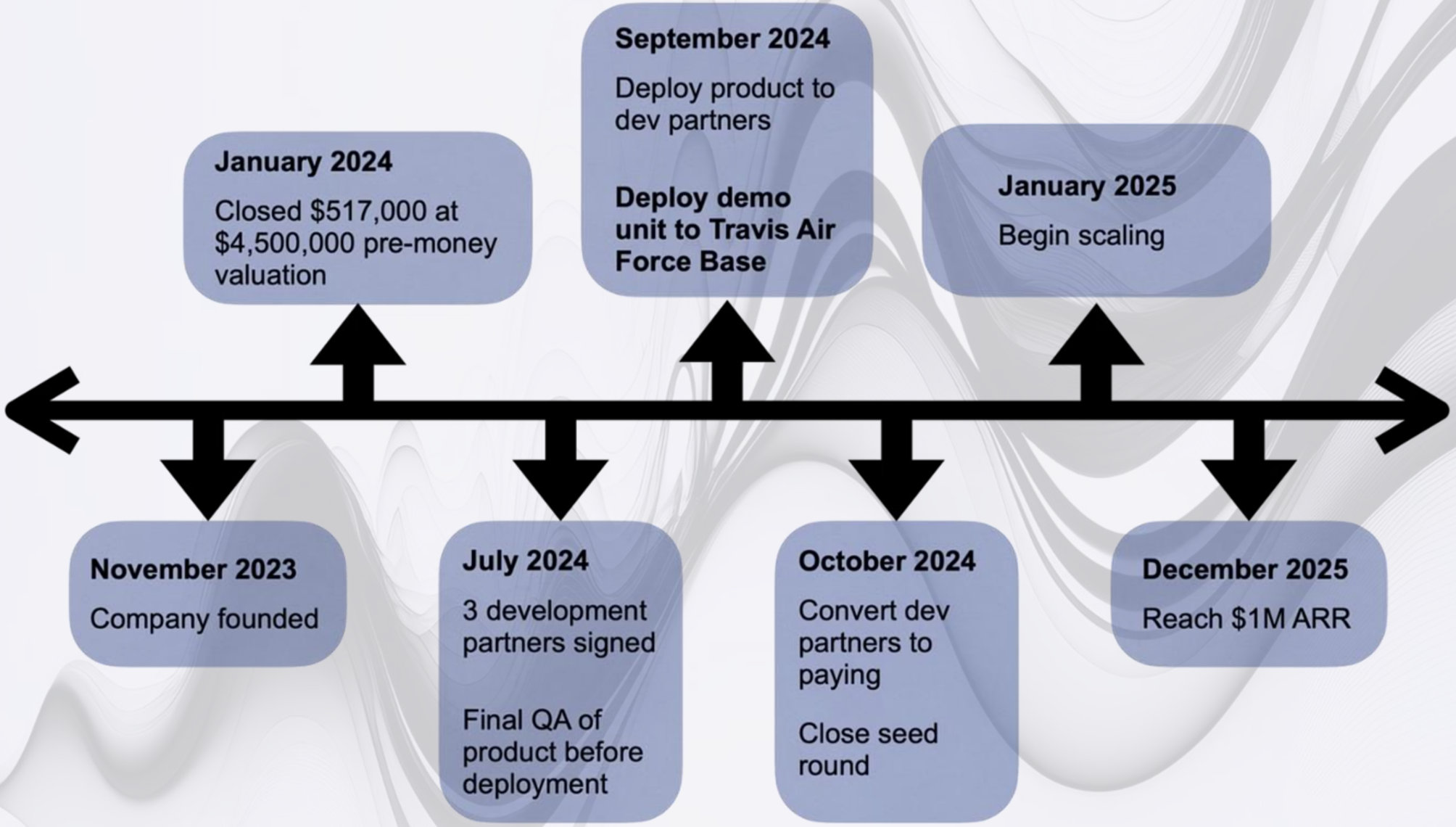






Average Contract Value = $60,000 ARR

Current Progress & Roadmap



Team



Casey Spencer

Co-founder, CEO

Hardware, Product

Project Manager at Tesla

Co-founder at Hindsight Optical



Armaan Saini

Co-founder, CBO

Business Development, Finance

AI researcher at UC Irvine

Co-founder at Hindsight Optical



Brian Bentow

Co-founder, CTO

Platform Development, Tech

Four successful exits

Co-founder, CTO at FinDox



ITSWARE

founders@itsware.com

PLUG AND PLAY

SV SUMMIT

Corporate PANEL



Wade Bitaraf

Founder

PLUG AND PLAY ENERGY



Francois Chadwick

Partner

KPMG



Rafael Moya

Innovation Manager

CPFL ENERGIA

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THANK YOU
FOR ATTENDING

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Lunch

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