

DECARBONX

BY ANGARA

Profitable and Pragmatic Decarbonization for Heavy Industries

by utilizing Swarm AI to enable millions of heat exchangers to become smart and autonomous

Investor Deck | 2024

Member:



United Nations
Global Compact

Selected to Showcase at:



crunchbase

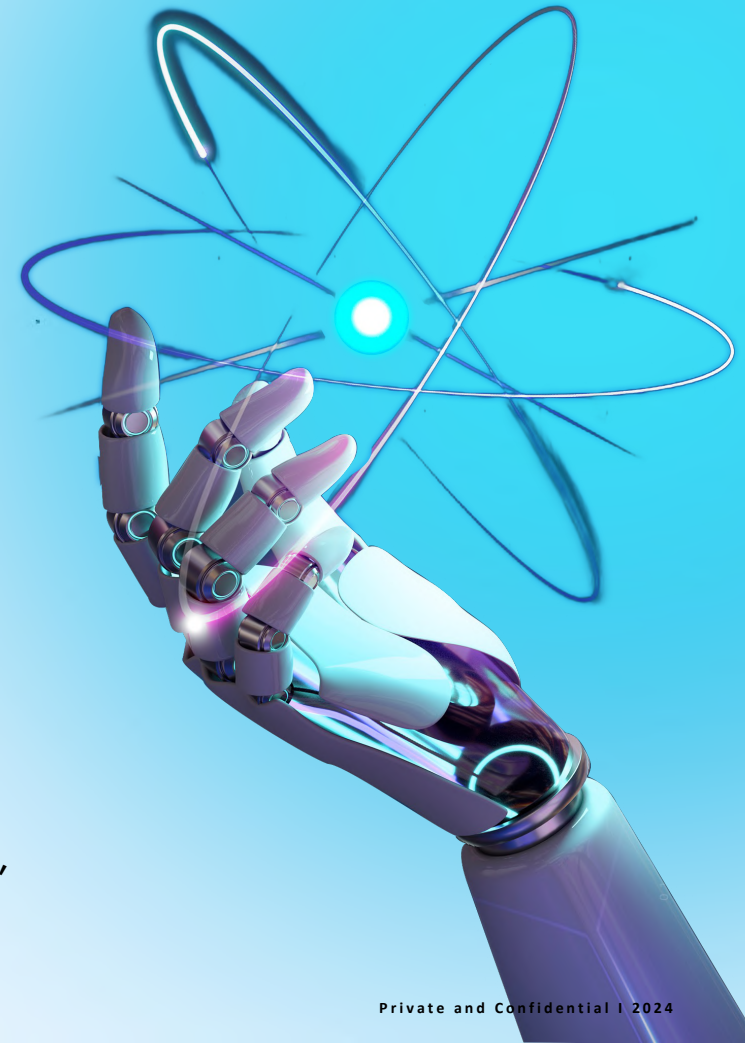
**World's Top 15 Funded Startups in
Artificial Intelligence + Carbon**



Company Overview

ANGARA

- A UK private company with subsidiaries in the Netherlands and Bahrain, ANGARA Global, with plans to expand to the US and Southeast Asia
- Spearheads **SWARM AI to enable millions of heat exchangers to become smart and autonomous**, resulting in cleaner and more efficient operations.
- When heat exchangers operate cleanly and efficiently, the result is a significant reduction in energy consumption and CO₂ emissions.
- The large impact of 400 million tonnes of CO₂ /year reduction potential, validated by DNV, led COP28 Committee to **award us a COP28 Technology Presenter** role.
- Recognized globally, we were named among the **TOP 15 funded Artificial Intelligence & Decarbonization startups** by CRUNCHBASE and nominated to the prestigious **AI 50 List 2024 by FORBES**.
- Our deep expertise and algorithms in monitoring, diagnosis, prediction, and maintenance are revolutionizing the realm of heat transfer.
- We are raising an equity round of \$5 million to reach profitability in early 2025, and with additional funding of up to \$30 million we will be able to expand internationally





Fouling In Heat Exchangers Of Heavy Industries Reduces The Efficiency Of Heat Transfer, Resulting In Additional Consumption Of Fossil Fuels

This culminates in additional significant costs and excessive CO₂ emissions.

The extraction of fouling proves to be a laborious and protracted undertaking, as fouling accumulation occurs under conditions of high temperature and pressure.

**Losses Due to Fouling
Each Year**

\$ 100 Billion

**Avoidable CO₂ Emissions
Each Year**

1 Billion Tonnes

Solution

DECARBONX BY ANGARA

The world-leading assessor and registrar
DNV validated:



1. **Commercially mature at TRL 8+**,
2. “Angara’s business model [that] allows **fast scale-up to meet surging clients’ demand**”,
3. The big size of the improvement potential:
400 million tonnes of CO₂ / year in refining alone,
4. **Its high safety** for labor, environment, and equipment.

ANGARA’s AI-Enabled Solutions –

- Automated Identification and Communication of Maintenance and Performance Degradation Issues

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DECARBONX can -



Precisely Predict : (Which, When and What)

DECARBONX can precisely predict which of the heat exchangers must be cleaned, when they must be cleaned for best performance, and how exactly this shall be done



Implement The Prediction: (The How)

Besides powerful predictive capabilities, we have patented Fouling Fracturing technology that allows us to remove fouling 2-7 faster anytime thanks to its Ultra-Fast Speed non-disassembly capabilities.

The contractor cleans the fouling under our technology platform. In sum, we act as a **“UBER for Heat Exchangers”**

Our Products

ANGARA



1. Predictive Analytics Service

based on our AI-Enabled Asset Management System

- Service that helps customers monitor the health of their process equipment and identify potential problems before they become major issues.
- The system helps automate the timely and accurate recommendation for each heat exchanger. Some customers have tens of thousands of units.



2. Dynamic Fouling Removal Solution

based on ANGARA's Fouling Fracturing technology

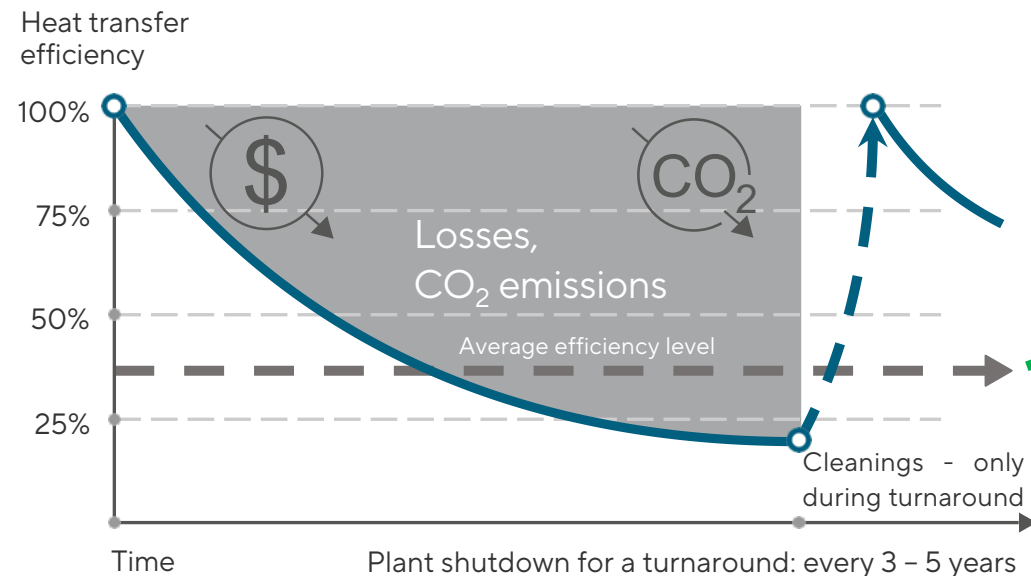
- We organize the process of fouling removal as a turn-key solution for a Client by engaging established Chemical Blenders and Cleaning Contractors (Industrial Services Providers) to deliver the service.

In essence, we act as a *"UBER for heat exchangers"* when it comes to fouling removal. This ensures flexibility and allows for greater scalability.

We help our customers save energy by enabling their equipment to run cleaner and more efficiently

OLD WAY:

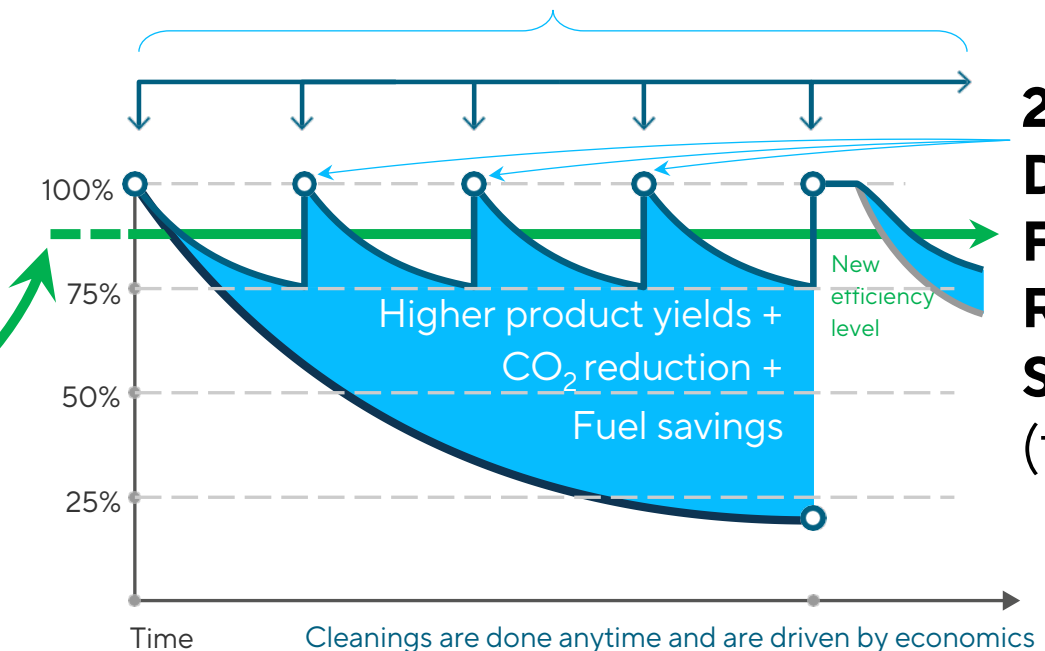
remove fouling - once every few years



NEW WAY with ANGARA:

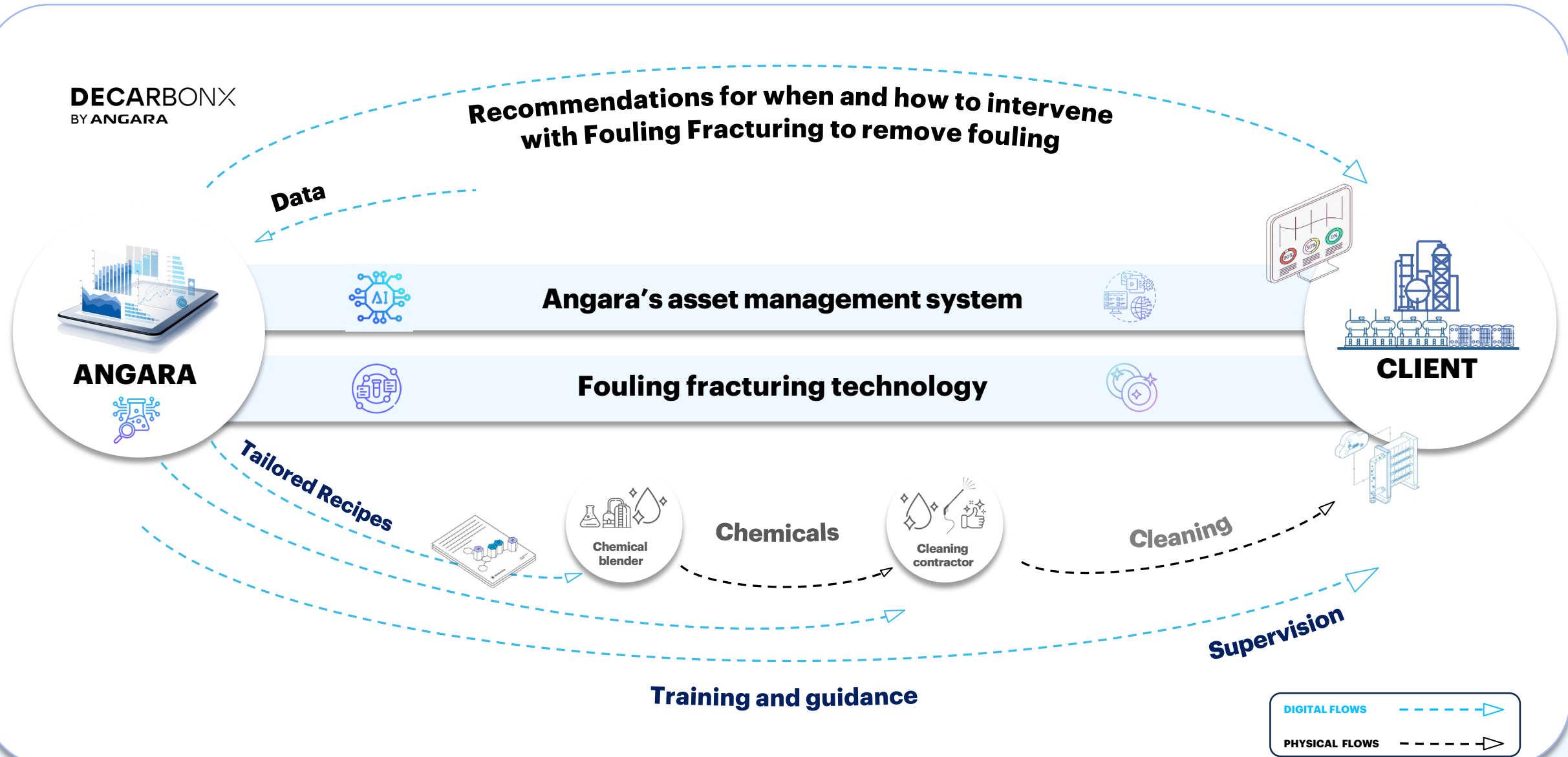
maintain continuous cleanliness for optimal heat transfer efficiency

1. Predictive Analytics Service (Which, When and What)



2. Dynamic Fouling Removal Solution (the How)

How It Works



Customer Benefits

- **Cost-Saving Solutions for Our Clients:**

| Without DECARBONX | With DECARBONX |
|---|---|
| Internal Oil Usage in Refineries | Reduction in Internal Oil Usage of Refineries |
| Up to ~6% of total Oil Barrels produced | Up to ~2.5% of total Oil Barrels produced |

Results

| | 2023 | 2024 -> |
|---|---|--|
| Plants | 3 Plants | 18E Plants |
| HEXs under our analytics service | 750 | ~13,000E |
| Est. Realised Client Benefits | \$ 20Mn/Year ~1.5 Mt CO ₂ | \$ 150Mn/ Year ~10 Mt CO ₂ |

ANGARA

- **Client Efficiency Numbers:**
- **Numbers for an EU Client 150k/b per day refinery**

| Savings on Carbon Allowances per Year | Energy Savings on Fuel |
|---------------------------------------|------------------------|
| Upto ~\$ 34 Mn | Upto ~\$ 57 Mn |

- **Numbers for a Petro Chemical Client**

Use of ANGARA's tech resulted in +4% in yield = 3,000 Tonnes of NGL/Year/Heat Exchanger for the client

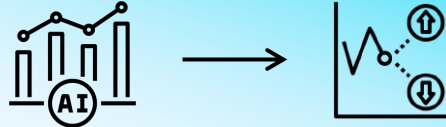
Log Mean Temperature Difference in Cryogenic Heat Exchangers

| Before Fouling Removal | After Fouling Removal |
|------------------------|-----------------------|
| 20.63°C | 2.54°C |

ANGARA's Business Model is a combination of or one of the following:

1. One-Time Setup Fees + Subscription
2. Gain Share or Subscription or Negotiated Price for each Cleaning – depending on a client's specific situation

An Existing Client's Pricing Example :



Monitoring Service Setup*

One-off payments at the setup:

- 1st Class: \$ XX,XXX / Heat Exchanger
- 2nd Class: \$ Y,YYY / Heat Exchanger
- 3rd Class: \$ NNN / Heat Exchanger

* Price levels are for illustration purposes

Monitoring and Prediction and Providing Recommendations *

Subscriptions on a recurring basis:

- 1st Class: \$ A,AAA / Heat Exchanger / Year
- 2nd Class: \$ B,BBB / Heat Exchanger / Year
- 3rd Class: \$ CCC / Heat Exchanger / Year

Dynamic Fouling Removal

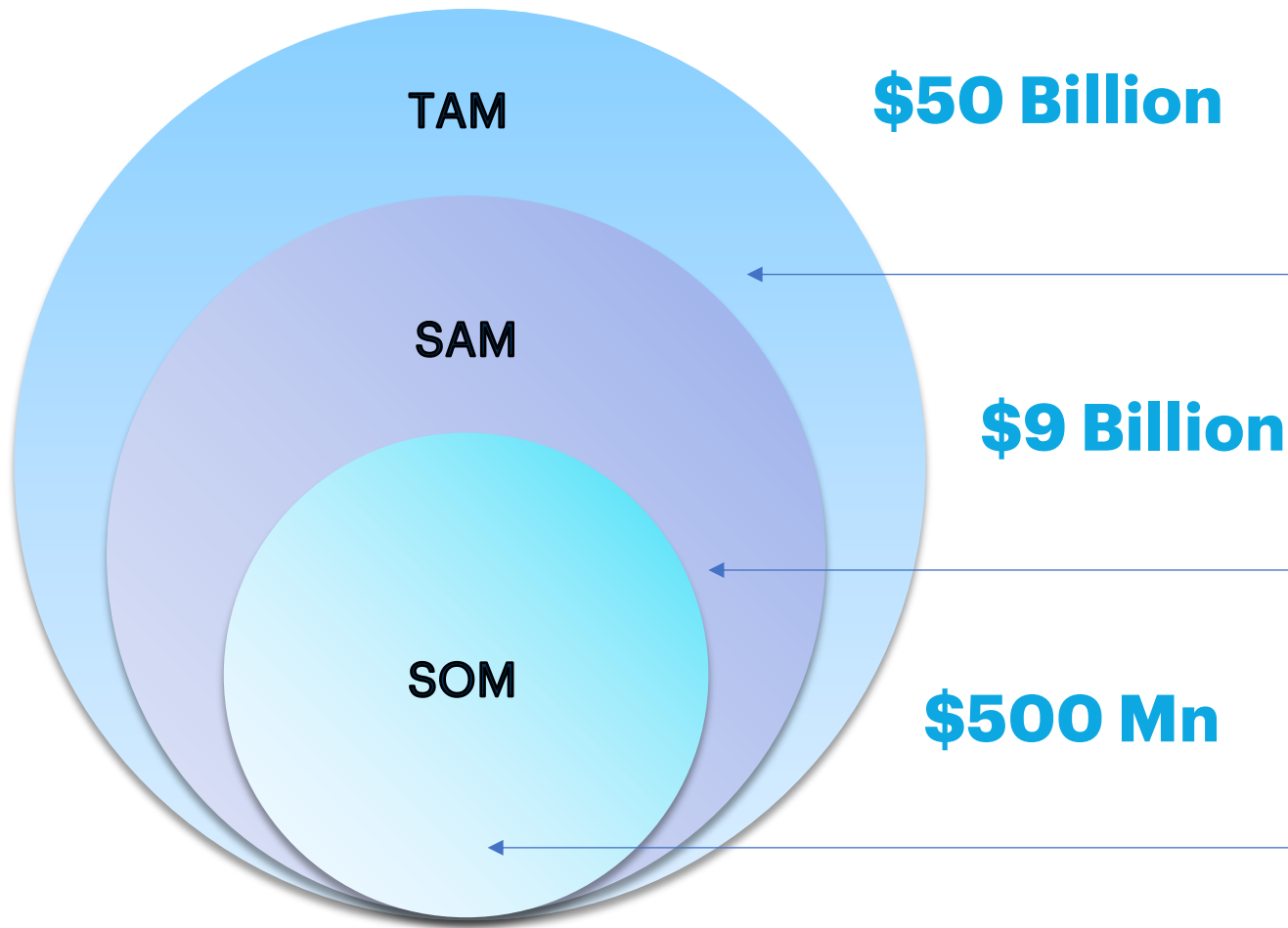


Implementation of Recommendations

- Regular Payments:
- 30% of the gain achieved - when Angara delivers service in full
- 10% of the estimated gain - when Clients act upon Angara's justified Recommendation

Market Size

ANGARA



Total Addressable Market

- \$50B is assumed as 1 / 3 of the \$150B savings that can be achieved for clients by 2030 annually.
- The current losses due to fouling are at \$100B. They will grow to \$150B by 2030.
- To achieve the savings, the cooperation of Technology Providers like ANGARA, Industrial Service Providers, Equipment Producers, EPCs is implied. However, they will all benefit from this new market

Serviceable Available Market

After the exclusion of certain geographical markets that, in our opinion as of now, would be impractical for ANGARA's penetration

Serviceable Obtainable Market

ANGARA Global aims to generate \$ 500 Mn in Revenues by 2030.

IP Strategy

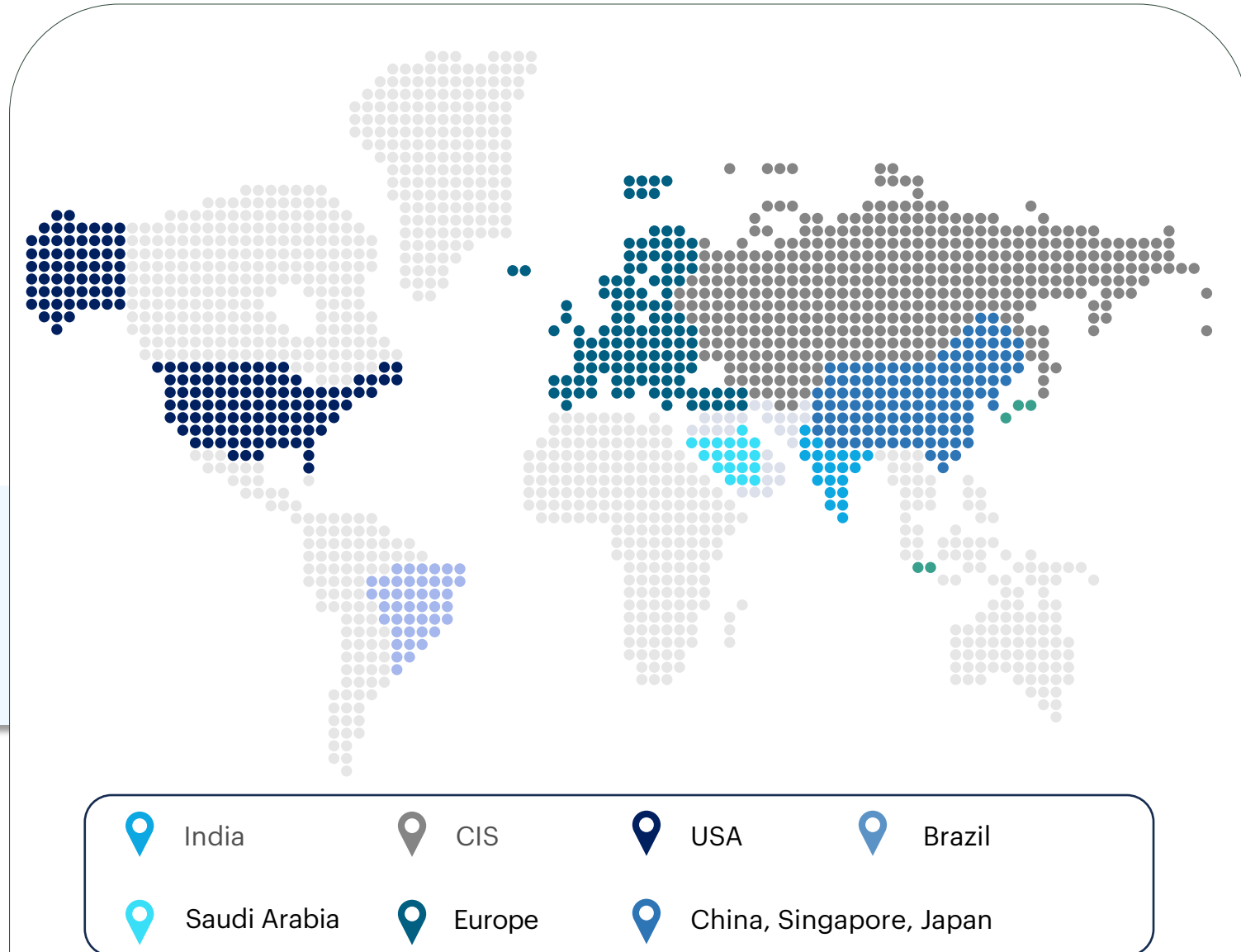
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- **33 Patents for the core technology are already granted in USA, Europe, CIS, KSA**
- Other jurisdictions like **the UAE, India, China, etc.** are pending
- A number of new applications are in preparation
- We plan to have a **patent portfolio of 50+ patents and PCT applications by 2025.**

CORE PATENTS

- **AlfaPEROX** for Fouling Fracturing (chemical patents).
- **Cognitive Cleaning methodology** and business methods

UK-based expert IP company Metis Partners analyzed our already granted patents and appraised them at \$23 million



Target Markets

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We already commercially service clients in these markets – the focus of the current round

We will apply our technology to these markets after the next major round



Refining



Chemicals & petrochemicals



Geothermal



Fertilizers



Biofuels



Water

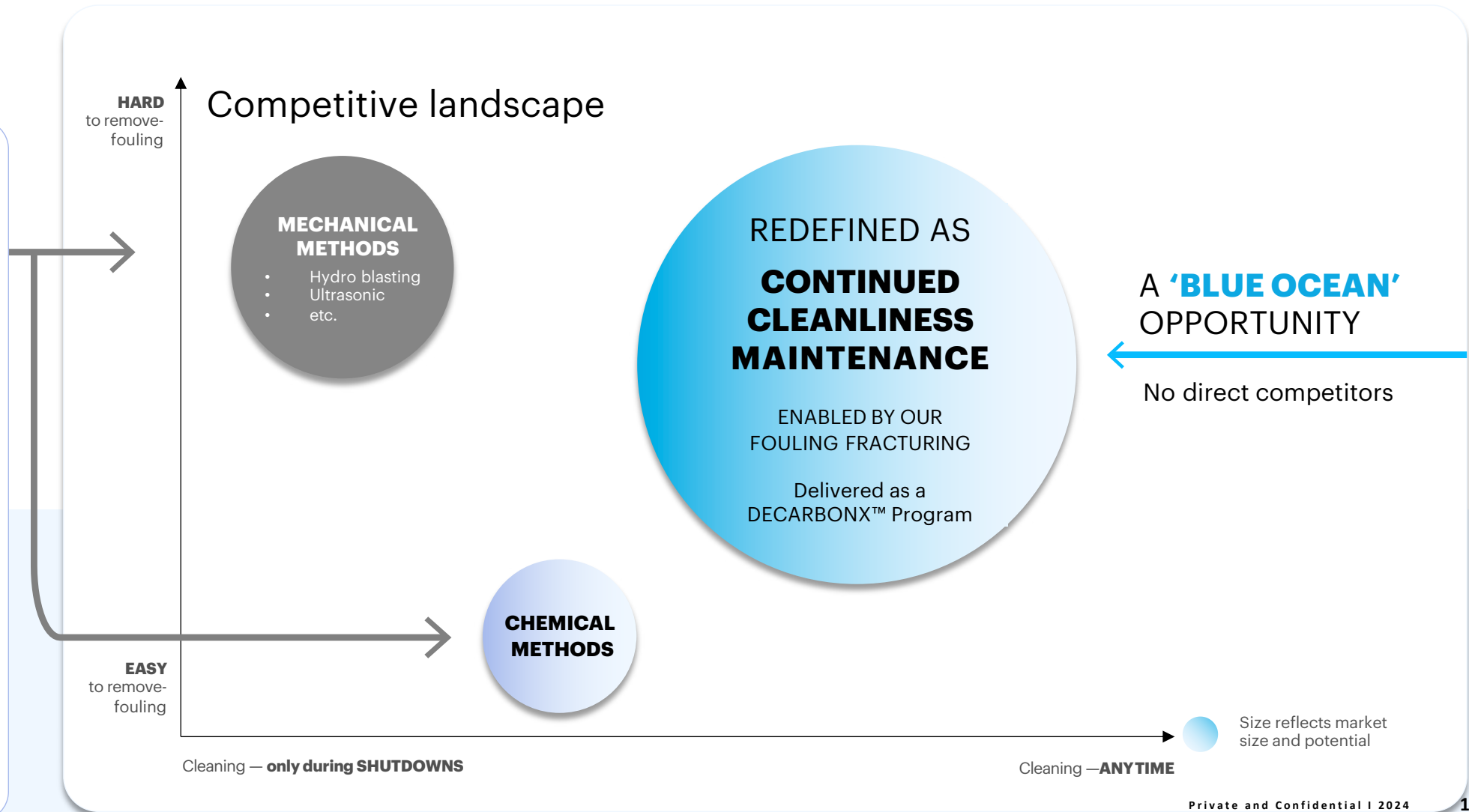
Currently Serviced Markets Landscape

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When it comes to our Fouling Fracturing technology platform, we involve incumbents in cooperation, instead of competing with them

CLEANING SERVICES

Functional competitors becoming partners, e.g.:



Competitive position in heat transfer asset management systems

| |  |  |  |  |  |  |  |  |
|--|---|---|---|---|---|---|---|---|
| Maintenance Platform |  Decarbonization-Centered Maintenance | N/A | N/A | N/A |  Reliability-Centered Maintenance |  |  Reliability-Centered Maintenance |  Reliability-Centered Maintenance |
| Enterprise Standard |  Generation 4.0 | ✗ | ✗ | ✗ | ✗ | ✗ |  Generation 3.0 |  Generation 3.0 |
| Center of Excellence |  | ✗ | ✗ | ✗ |  Generation 3.0 |  Generation 3.0 |  Generation 3.0 |  Generation 3.0 |
| Asset Sustainability Risk Process-Aware Monitoring (PAM) Risk-Based Monitoring (RBM) Data-Driven Monitoring (DDM) | Unit/ Production/ Plant Unit/ Production/ Plant Unit/ Production/ Plant | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ |
| Asset Integrity Risk Process-Aware Monitoring (PAM) Risk-Based Monitoring (RBM) Data-Driven Monitoring (DDM) | Unit/ Production/ Plant Unit/ Production/ Plant Unit/ Production/ Plant | ✗ ✗ Unit/ Production | ✗ ✗ Unit/ Production | ✗ ✗ Unit | ✗ Unit/ Production/ Plant Unit/ Production/ Plant | Unit/ Production/ Plant Unit/ Production/ Plant Unit/ Production/ Plant | Unit/ Production/ Plant Unit/ Production/ Plant Unit/ Production/ Plant | Unit/ Production/ Plant Unit/ Production/ Plant Unit/ Production/ Plant |
| Risk-Mitigation Technology |  | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ |
| Market share | ○ | ◐ | ○ | ◑ | ◑ | ● | ● | ● |

Powerful Software

- Our AI-Enabled DCM Asset Management Software can monitor performance and predict when the heat exchangers need to be cleaned with much higher accuracy than our competitors
- More importantly, we provide clients with data-driven actionable, and practical recommendations that our competitors do not

Strong Patent Portfolio

- ANGARA's **33 granted patent portfolio** seeks to protect both its Cognitive Cleaning and Fouling Fracturing technology and getting patents in other territories
- We plan to have a patent portfolio of **50+ patents and PCT applications by 2025**



Fouling Fracturing Technology

- We have a proprietary Fouling Fracturing Technology that enables anytime fouling removal to actually implement the recommendations
- The Technology was proven in many client projects and officially validated by reputable 3^d parties to be safe and very effective – a critical prerequisite in for risk-averse heavy industries

Quickly Growing Data Sets for AI

- ANGARA's has a vast and continuously growing data sets and fouling samples repository to feed our AI/ML core to generate constantly improving predictions and actionable insights for our customers
- As a next step, we can provide our customers with insights to improve performance in other areas of their operations - i.e. fouling (scale)-related issues in other types of equipment besides heat exchangers

Traction

| We are a Revenue Generating Company | Number of Heat Exchangers under our Analytics commercial service | Gross Margin Expansion * for client refineries |
|---|--|---|
| \$1 million in 2023 \$4.7 million in 2024E | ~ 1000 Heat Exchangers | 15%-20% |


Part of J.P. Morgan’s Green Economy Banking


J.P. Morgan Green Economy Banking supports ANGARA in engaging strategic clients and partners and is committed to raising funds in the next, larger round for global expansion


Our Partnership with Climate Trade


Engaged with Climate Trade, ANGARA strategically aligns with a market leader specializing in Carbon Offsets and related products. Angara holds immense potential to contribute a substantial supply of CO₂ emissions abatement, serving as the essential 'feedstock' for these offsets


Our Clients and Prospects Include


























Awards and Acknowledgments

ANGARA



2019

- Finalist in Innovations in Oil and Gas Digital Technology Award – Asian Downstream Summit 2019
- Finalist in S&P Global Platts – Global Energy Awards



2020

- Finalist in S&P Global Platts – Global Energy Awards for the second time
- Oil and Gas Startup Company of the Year – ADIPEC



2022

- Europe Energy Transition TechTour Award Winner
- Finalist in S&P Global Platts – Global Energy Awards in the Rising Star nomination

An award winner of



2023

- Selected to showcase the technology at COP28 UAE.
- CrunchBase named ANGARA one of the world's [15 best-funded startups](#) at the intersection of Artificial Intelligence and Decarbonization.



2024

- ANGARA was nominated by Forbes and Sequoia to the [FORBES AI 50 List 2024 \(Pending\)](#). No other Climate and Energy focused Company has made it, ANGARA aims to be the first one on the list.

Forbes

SEQUOIA

Our Leadership Team

ANGARA



Val Krivenko
Executive Board Chairman,
Co-Founder



UCLA



Alex de Valukhoff
CEO



Peter Petrov
Deputy CEO, Board Director,
Co-Founder



Toby Gati
ESG



Columbia University

BRIGHT CAPITAL

Managing Partner of
Energy Efficiency Fund

McKinsey
& Company



Managing Director for
Eurasia,

Global Sector Lead,
Oil & Gas



Country CEO

Morgan Stanley Executive Director



Executive Director



Special Assistant to the
US President



SVP



Miray Zaki, PhD
Investments



Panos E. Cavoulacos PhD
Non-Executive Director,
Senior Advisor



Jaap Kalkman PhD
Non-Executive Director,
Senior Advisor



Utrecht University



Ed Cherednik
Chief Digital and Sustainability
Officer



Senior Advisor - Private Sector, Food
Security, Climate Finance



Managing Director – Head of
Sustainability & Head of Africa



Chair – North America & Europe



CEO and Board Director



MD, Business Consulting Asia



Chairman of European Petroleum Industry
Association

Booz | Allen | Hamilton

Partner, Energy Practice



Associate Partner



**ADQ / Abu Dhabi Developmental
Company** –Group Chief Investment
Officer



Managing Director – Head of
Sustainability & Head of Africa



Head of Energy and PE practice, ME



Partner



Digital Transformation Executive



Account Executive



VP for Oil & Gas Europe











































Regional Manager

Private and Confidential | 2024

Our Leadership Team and Advisory Board

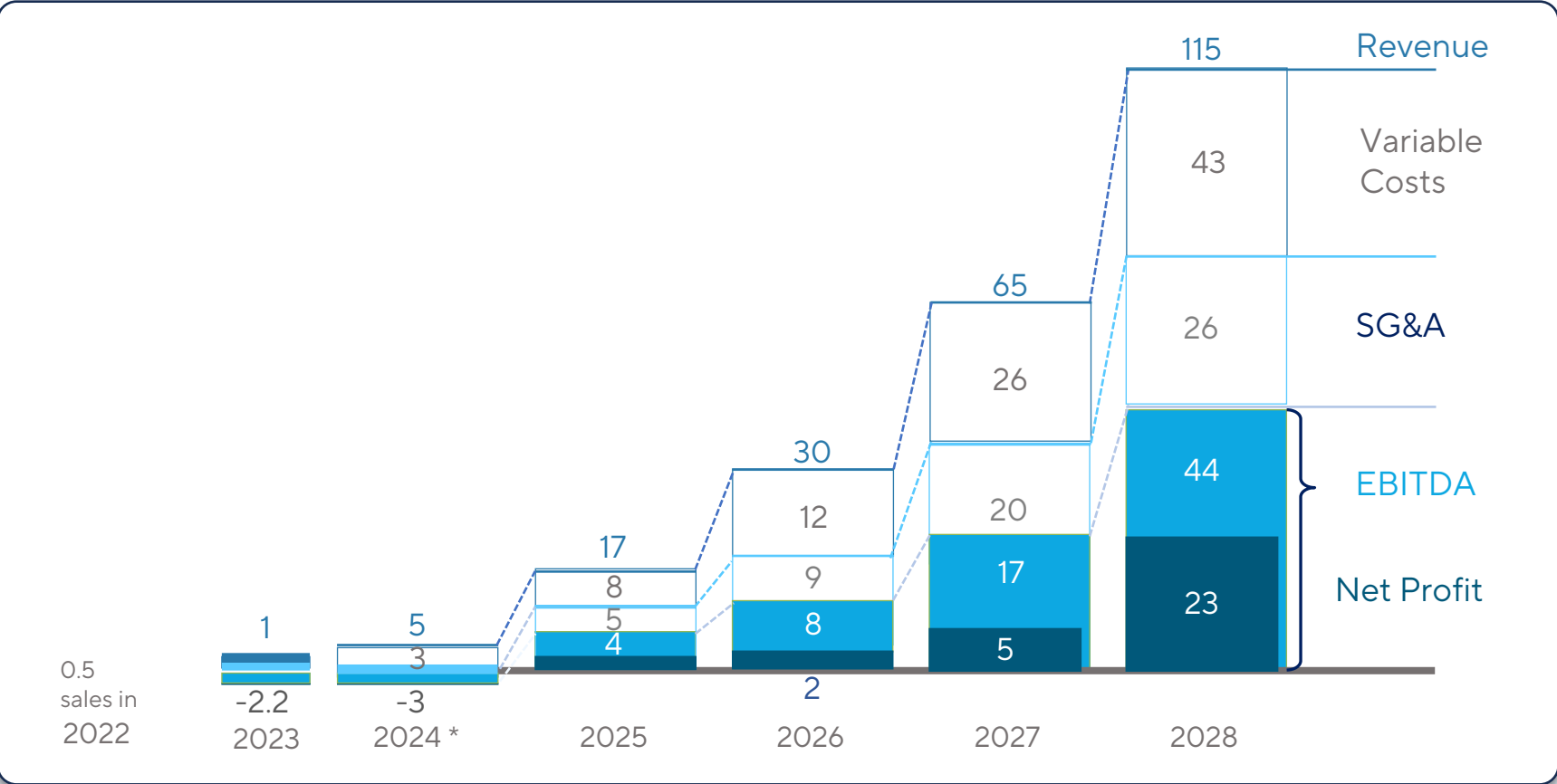
ANGARA

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Growth Roadmap

We are raising \$5 million, which will allow us to reach profitability in early 2025

Pro Forma Income Statement, \$ million



Main goals of this round:

- A Execute pilots faster - with already engaged clients;
- B Expand the team** to prepare for large-scale deployments with oil majors that are clients
- C Reach profitability within 12-18 months

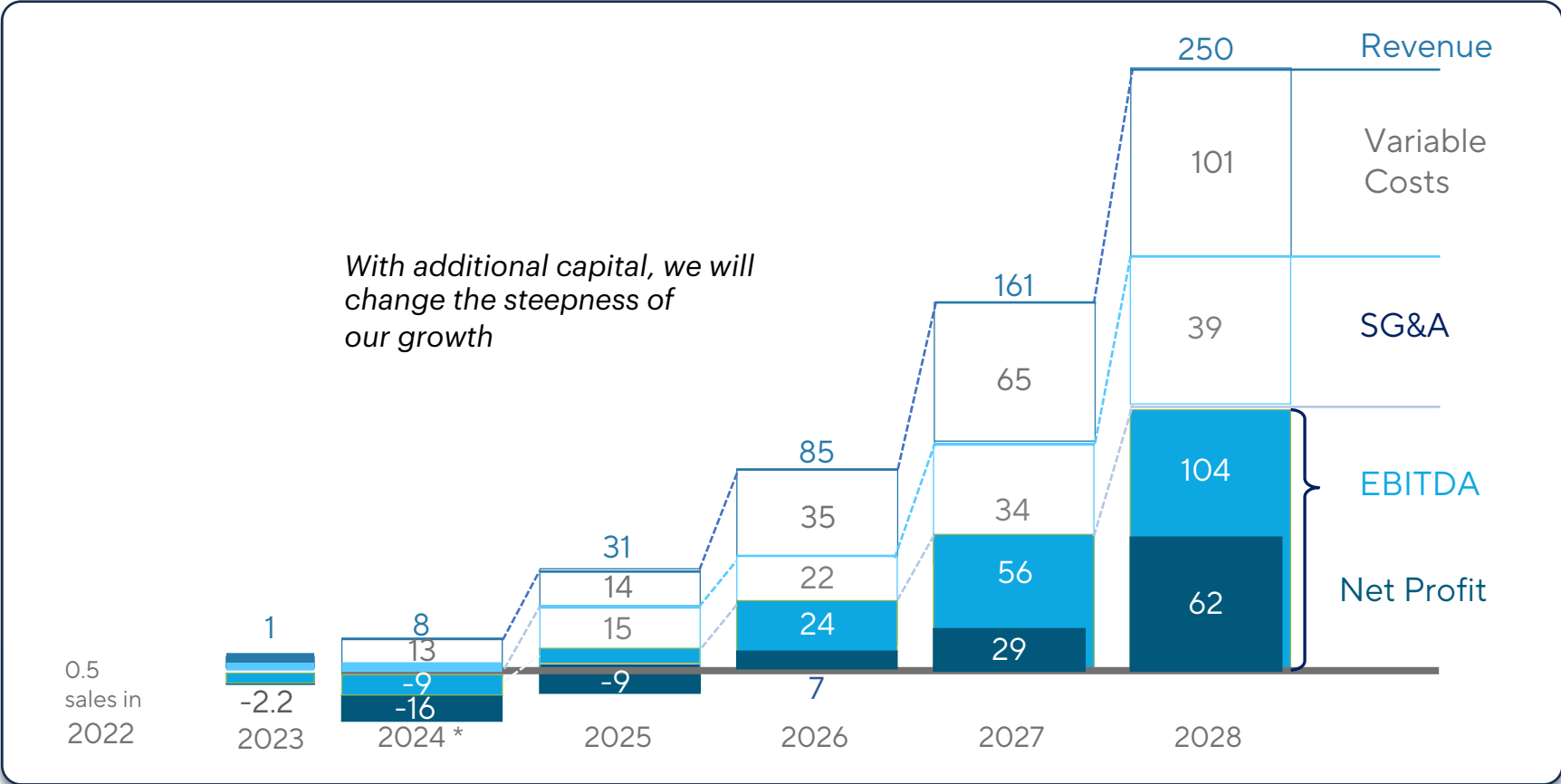
* Year 2024 is calculated as 12 calendar months after the \$5M round is closed

** Team expansion to speed up the execution of larger-scale deployments by creating 4 implementation teams four FTEs each - in the EU and GCC. No CAPEX required

Disclaimer: These revenue projections are based on analysis and assumptions. While we aim for accuracy, actual results may vary due to uncertainties. Consultation with financial experts is advised.

\$30 million in funding will allow us to accelerate the rollout globally and in several market verticals in parallel

Pro Forma Income Statement, \$ million



Main goals of this round:

- A Expand the team for large-scale deployments and execute pilots faster with others
- B Enter other verticals: biofuels, geothermal, desalination, fertilizers, water etc.;
- C Expand operations globally - to the US and SE Asia

* Year 2024 is calculated as 12 calendar months after the \$5M round is closed

** Team expansion to speed up the execution of larger-scale deployments by creating 4 implementation teams four FTEs each - in the EU and GCC. No CAPEX required

Disclaimer: These revenue projections are based on analysis and assumptions. While we aim for accuracy, actual results may vary due to uncertainties. Consultation with financial experts is advised.

Current Funding Round

\$5 Million Capital

Investors can invest directly in equity or through a **Convertible Loan** -

- The Loan will bear the **interest rate of 15% p.a.**
- Investors will benefit from a valuation cap that will be in place till the loan is converted to Equity.
- ANGARA has raised \$ 750,000 in this round already from a Private Investor.

**Expanding
our Team**



**Facilitate faster
deployment of
large-scale
projects**



**Facilitate New
Market Entry
preparation**

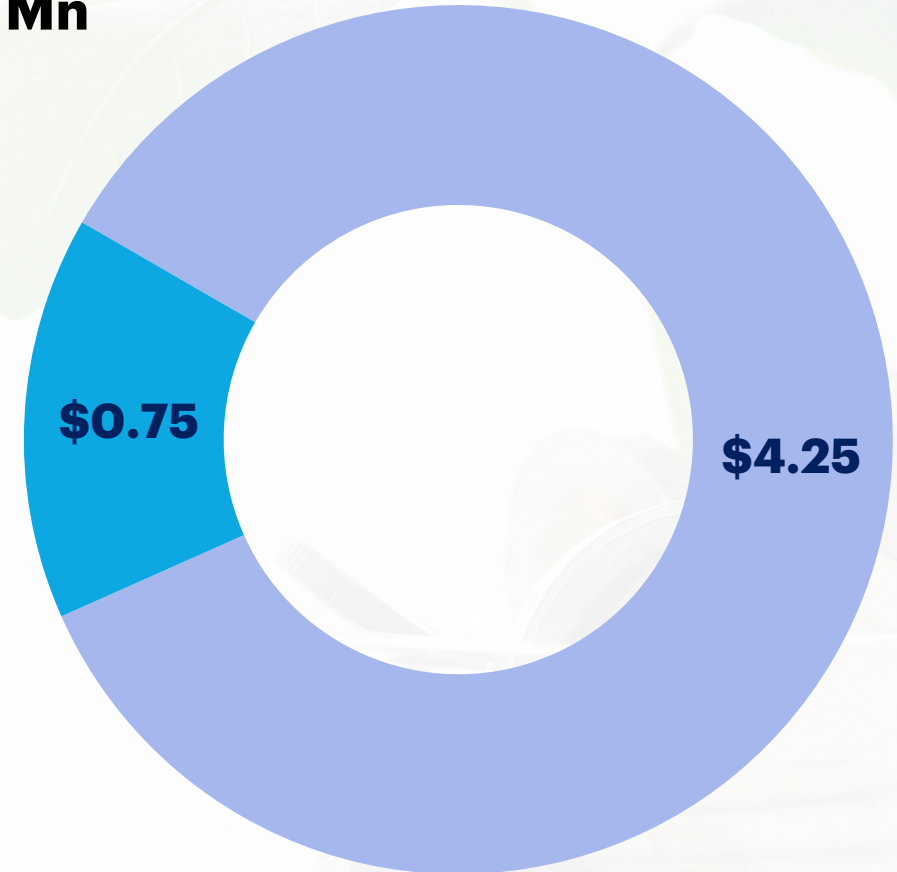


**Make ANGARA
profitable by
early 2025**



ANGARA

In \$ Mn



■ To be Raised ■ Already Raised



Merger and Acquisition

ANGARA's Investors can exit in a M&A sale that can happen in the following Scenarios –



Scenario 1:

ANGARA can look to get acquired by a strategic partner in **\$200 – 250 million** valuation. For this scenario to play out, we will need to grow to \$ 10 - 20 Mn in revenues in the next 24 Months.



Scenario 2:

ANGARA can get acquired at an aggressive valuation of **\$1 -2 Billion**.

For this scenario to play out, we will need an additional \$25-30 million in funding to grow to new markets and new segments and engagement of LBO partners.





Contact Information

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DECARBONX
BY ANGARA

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ANGARA

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