



DECARBONX
BY ANGARA



United Nations Global
Compact Member



Equity round to accelerate sales in a
**PATENTED AI-POWERED
PRAGMATIC TECHNOLOGY
TO DECARBONIZE HEAVY INDUSTRIES**

Our TRL 8+ technology can enable 1 GtCO₂ /per year reduction at scale



2 MIN
video

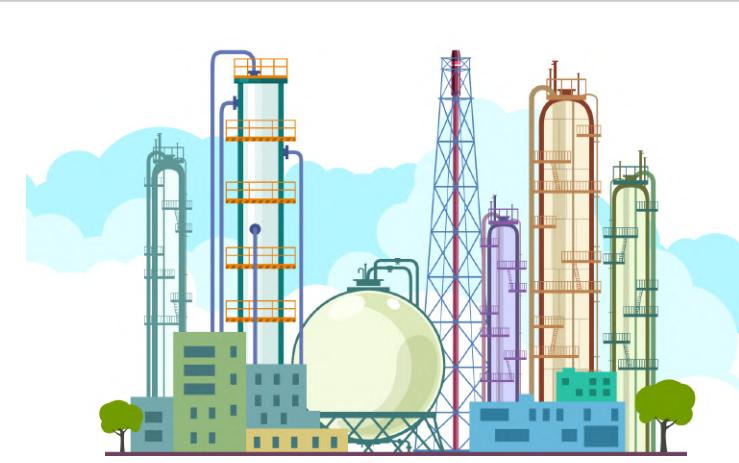
Less CO₂
Already Now
Higher Margins

ANGARA's commercial technology is one of the most practical solutions for reducing CO₂ emissions on the scale of hundreds of millions of tonnes

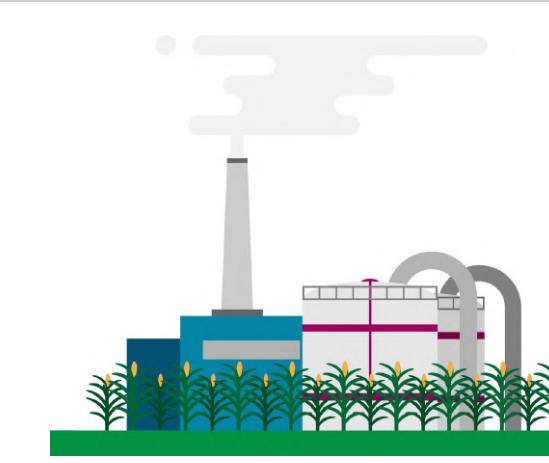
1. The value ➤ Our patented AI-powered technology keeps heat exchangers clean and efficient.
As a result, our clients abate CO₂ emissions by 20-40% and profitably
2. The market size and traction ➤ We unlock a \$50 bln./year market through the digital disruption of an old segment.
Already >10 paid projects, incl. with global majors done. **Revenues >\$1 million**
3. The business model ➤ Subscription-based integrated technology suite provided as a turn-key service.
Outsourcing-driven digitalized business model. No CapEx required to scale
4. The clients and impact ➤ We work with **clients in Europe and the Gulf** with current decarbonization needs.
Our DNV-validated-TRL 8+ tech can lead to 400 million tCO₂ /year in refining alone
5. The round ➤ We are raising **funds to grow the team** for larger client-wide implementations with global majors. No CapEx is required. Please, see **Slide 21** for more details



REFINERIES



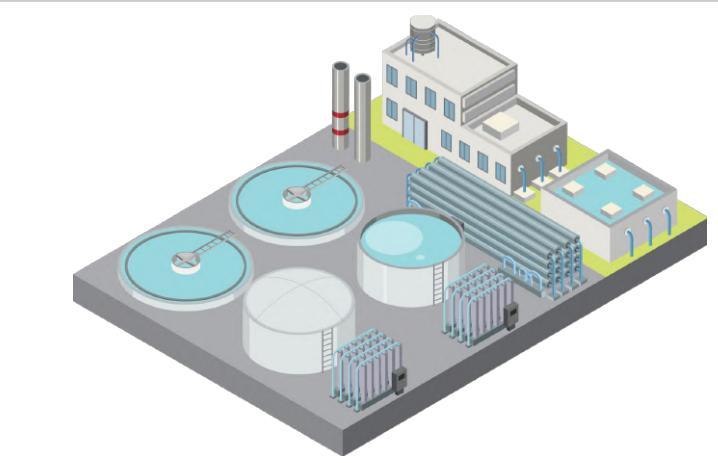
PETCHEM & CHEM PLANTS



BIOFUEL REFINERIES



GEOTHERMAL PLANTS



DESALINATION, WATER TREATMENT

ANGARA has solved a painful problem that costs our clients \$100+ billion every year and results in 1 billion tonnes of CO₂ emissions

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UNRESOLVED PROBLEM

Plants in heavy industries use



billions of heat exchangers.



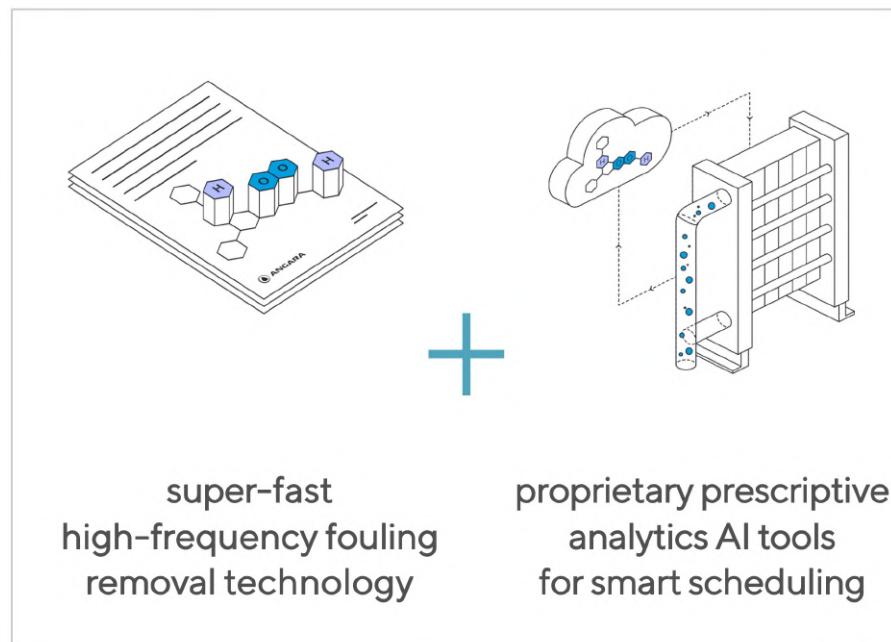
Fouling in them leads to heat transfer ↓



The degradation in heat transfer is offset by the additional use of fossil fuels, resulting in higher costs and CO₂ emissions

OUR SOLUTION

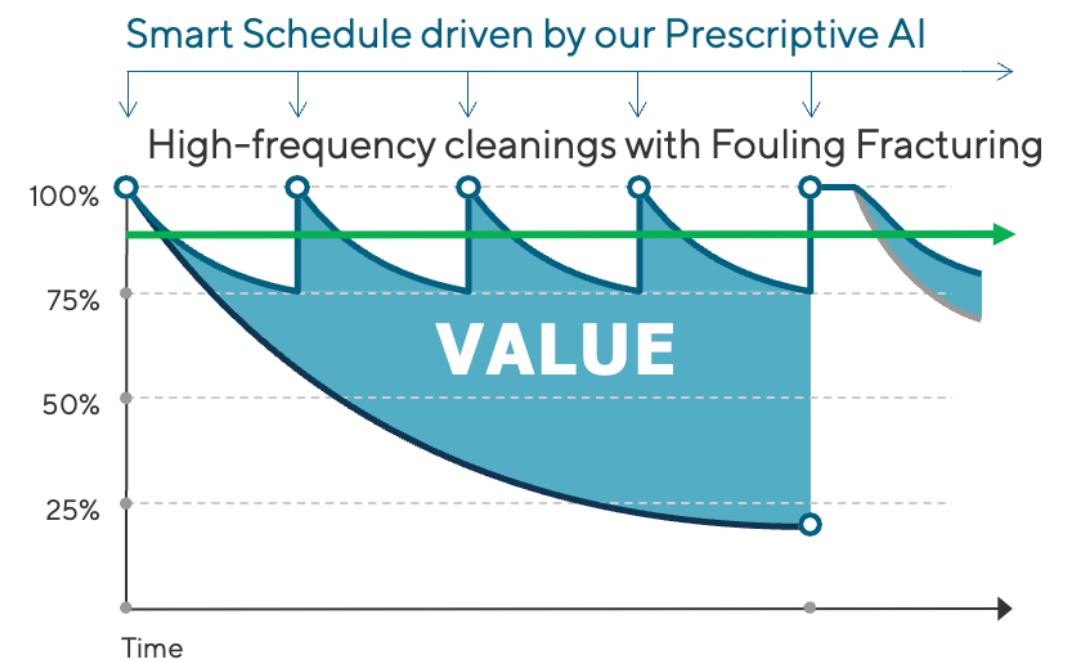
Our subscription-based suite
of innovative AI technologies



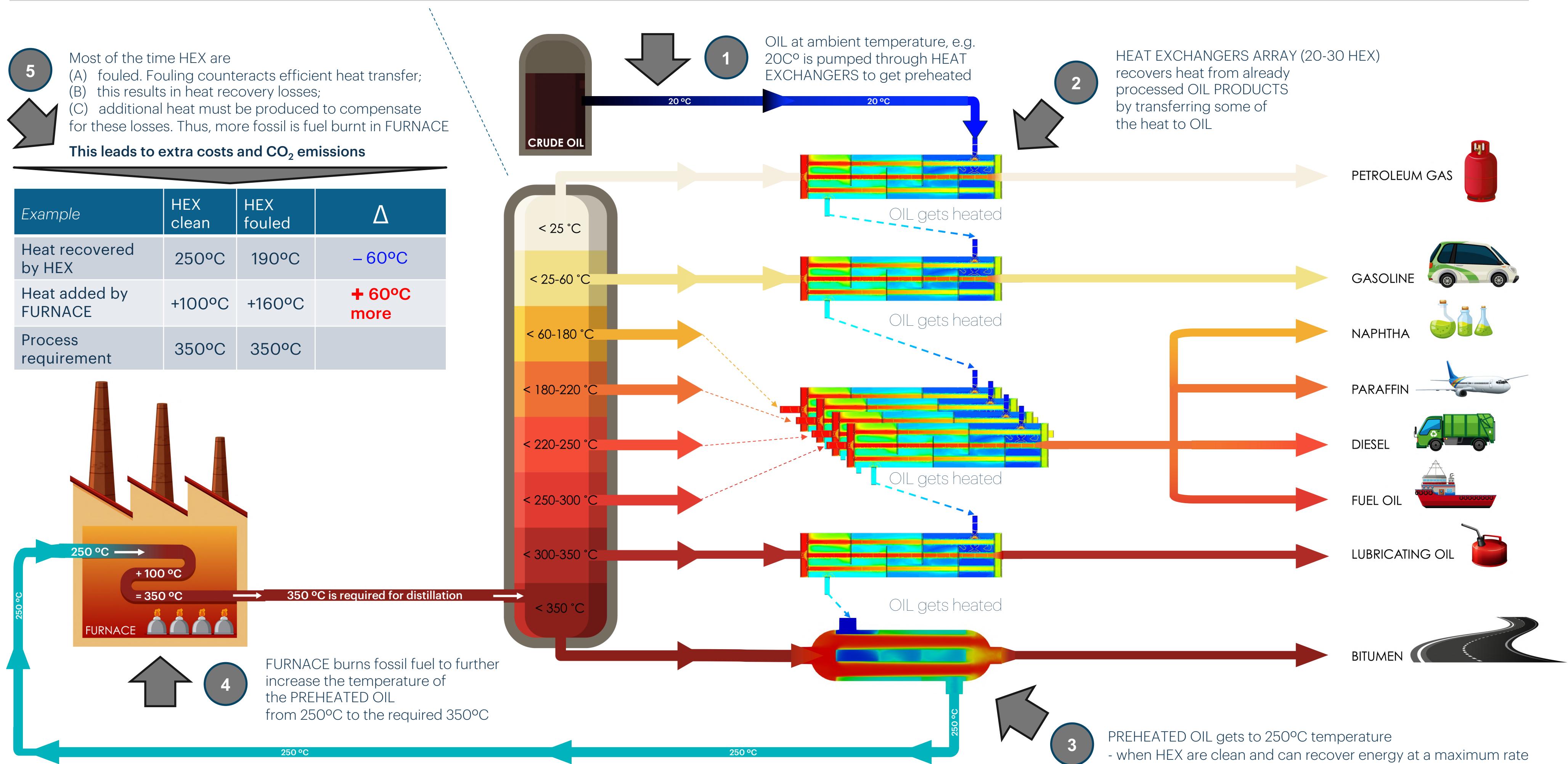
helps our clients to run their heat
exchangers cleanly and efficiently.



As a result, it opens up a \$50 bln.
'Blue Ocean' market opportunity.



How cleanliness of heat exchangers affect energy efficiency and CO₂ emissions



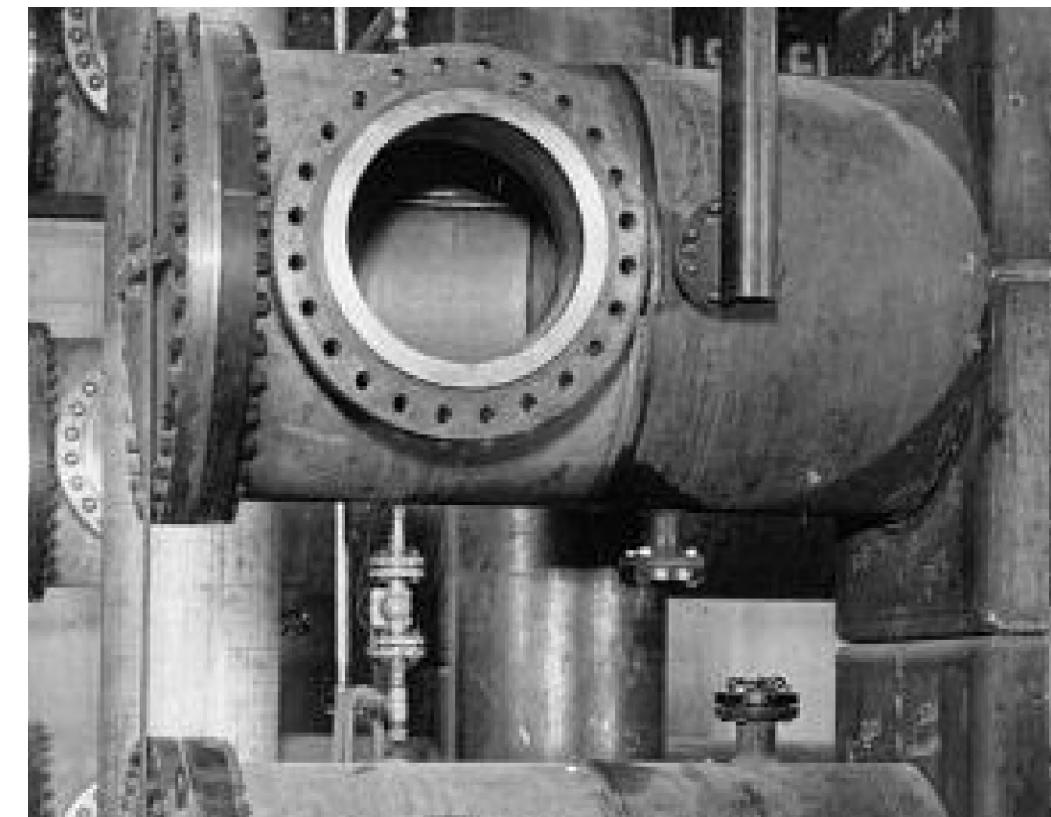
However, heat exchangers are still cleaned with age-old methods

The good old hydro blaster is still the main tool for removing fouling today

Hydro blaster in the 1920s



Hydro blaster in 2023



The status-quo cleaning routine is cumbersome, lengthy and requires production shutdowns

As a result, heat exchangers run fouled and therefore have lower efficiency for long periods of time between plant shutdowns

Dismantle and extract units



Load them onto a truck



Plan and bring specialized equipment



Bring them to a dedicated zone: cleaning yard



- Several alternatives for fouling removal are available
- Yet, even the most advanced ones – only marginally improve the overall process effectiveness

yet, mostly – with manual hydro blasters



Or with automated hydro blasters



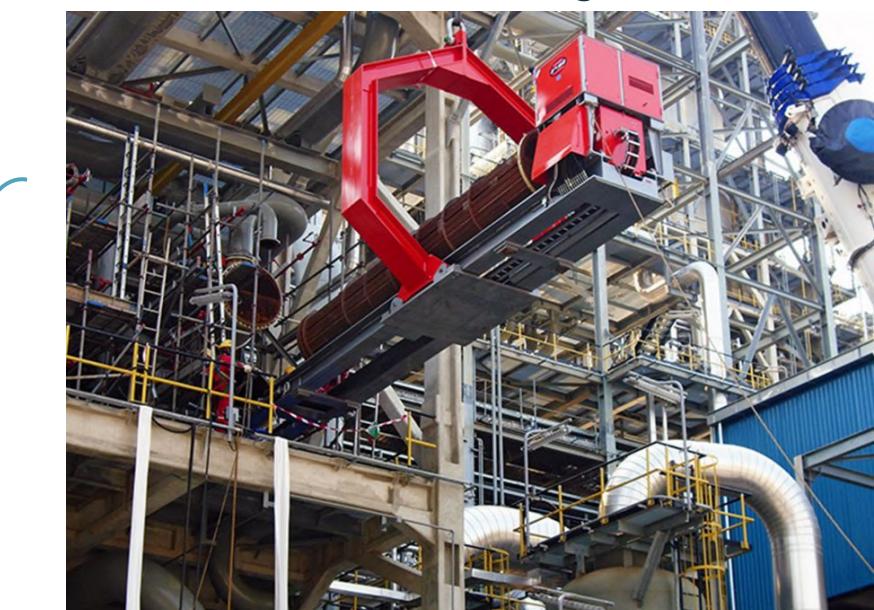
Clean with an ultrasonic bath



Do everything in reverse order



Install heat exchangers



Run pressure tests



Our patented technology is ultra-fast clean-in-place so production never stops, and efficiency can be restored at any time

Our 3-step Fouling Fracturing technology replaces conventional 10-step routine with this simpler clean-in-place process

[2 minute overview video](#) 



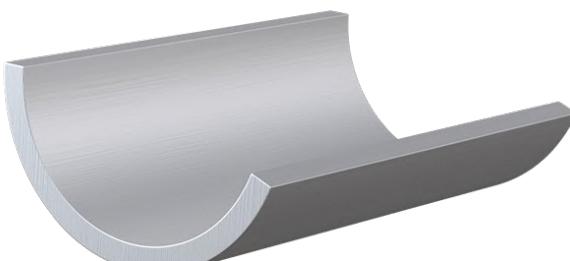
Tailored recipe penetrates deep into the hard fouling structure and releases oxygen bubbles

1



Oxygen bubbles fracture the fouling from inside 'mechanically', with the pressure of expanding O₂ breaking the solid structure

2



Fouling debris is washed away by the flow

3



Now, we can restore the cleanliness and efficiency of heat exchangers
ANYTIME
with NO DISASSEMBLY

5-7 TIMES FASTER

Our technology has been recognized by the industry and highly acclaimed by leading experts

DECARBONX
BY ANGARA

An award winner of



<https://techtour.com/events/2021/11/event-tech-tour-energy-2021.html?pagId=5468624>

A regular speaker at the landmark industry events:



ERTC

Named Top 3 globally



OIL AND GAS START-UP COMPANY OF THE YEAR
FINALIST 2020

Recognized as a finalist in



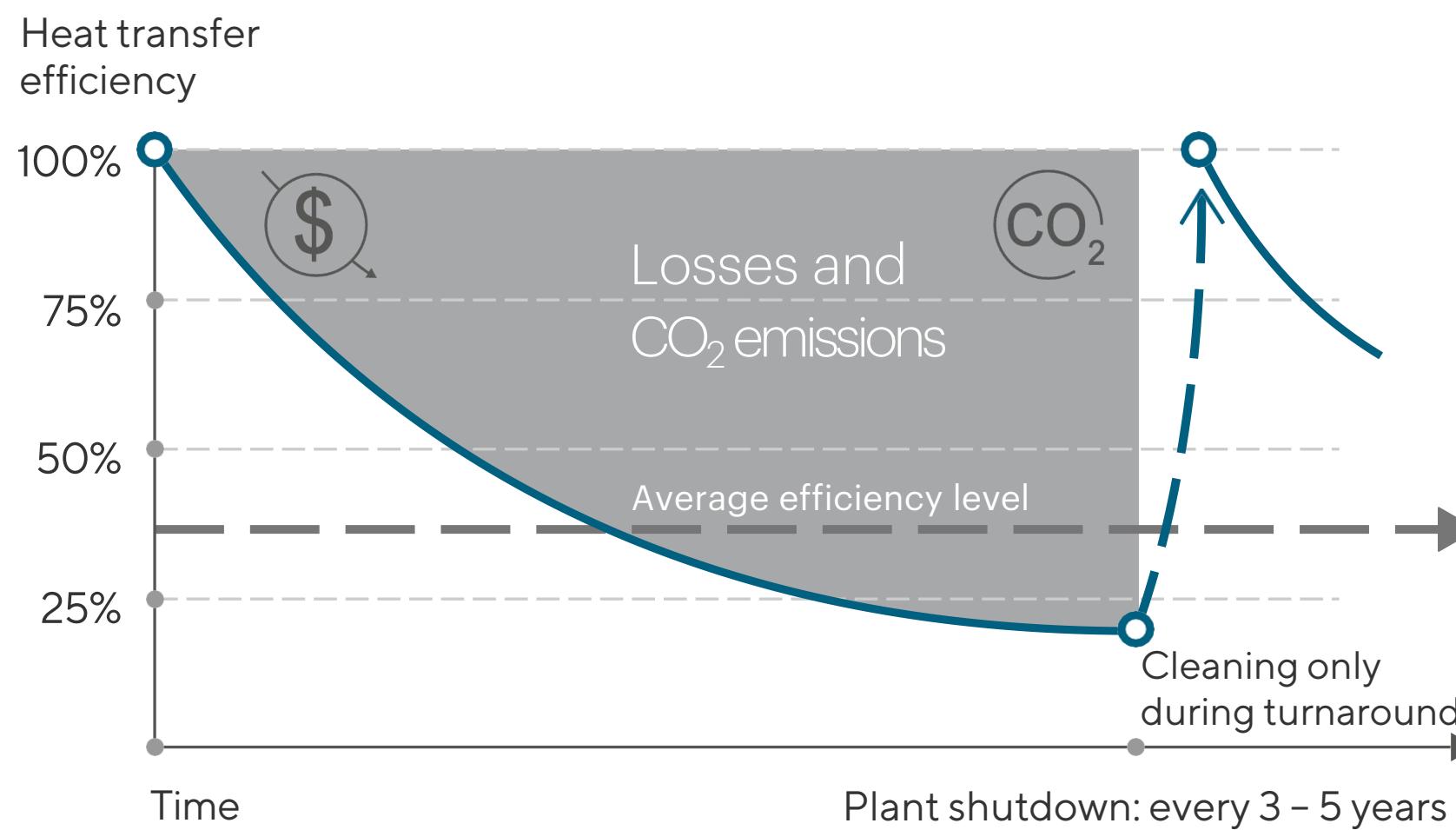
Angara is UN
Global Compact Member



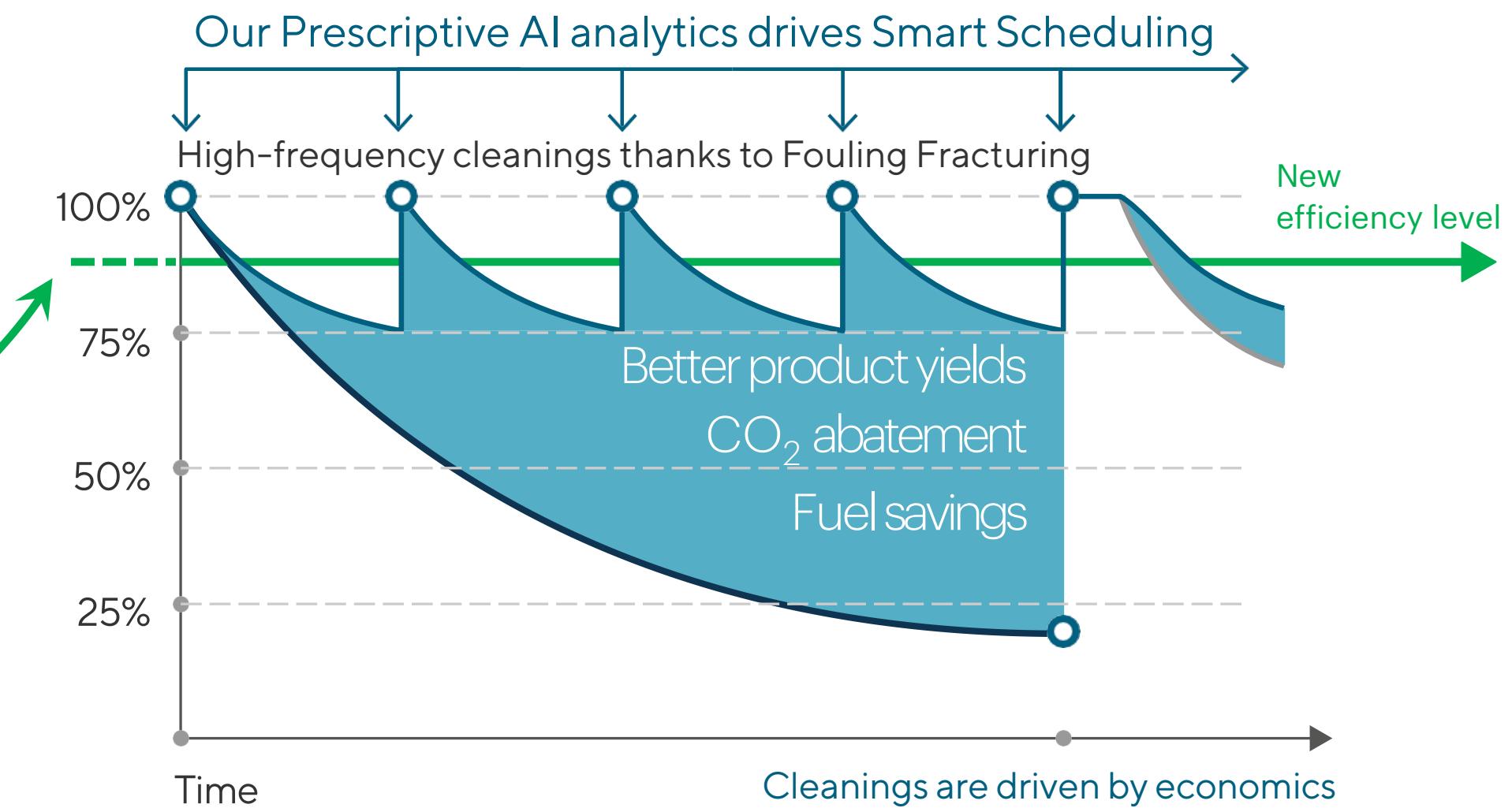
We are changing the paradigm of heat exchanger maintenance

Our Prescriptive AI analytics determines when it makes sense to clean (Smart Scheduling), and Fouling Fracturing allows cleaning – without shutting down the plant

OLD WAY: Remove Fouling – once every few years



NEW WAY: Maintain Continuous Cleanliness

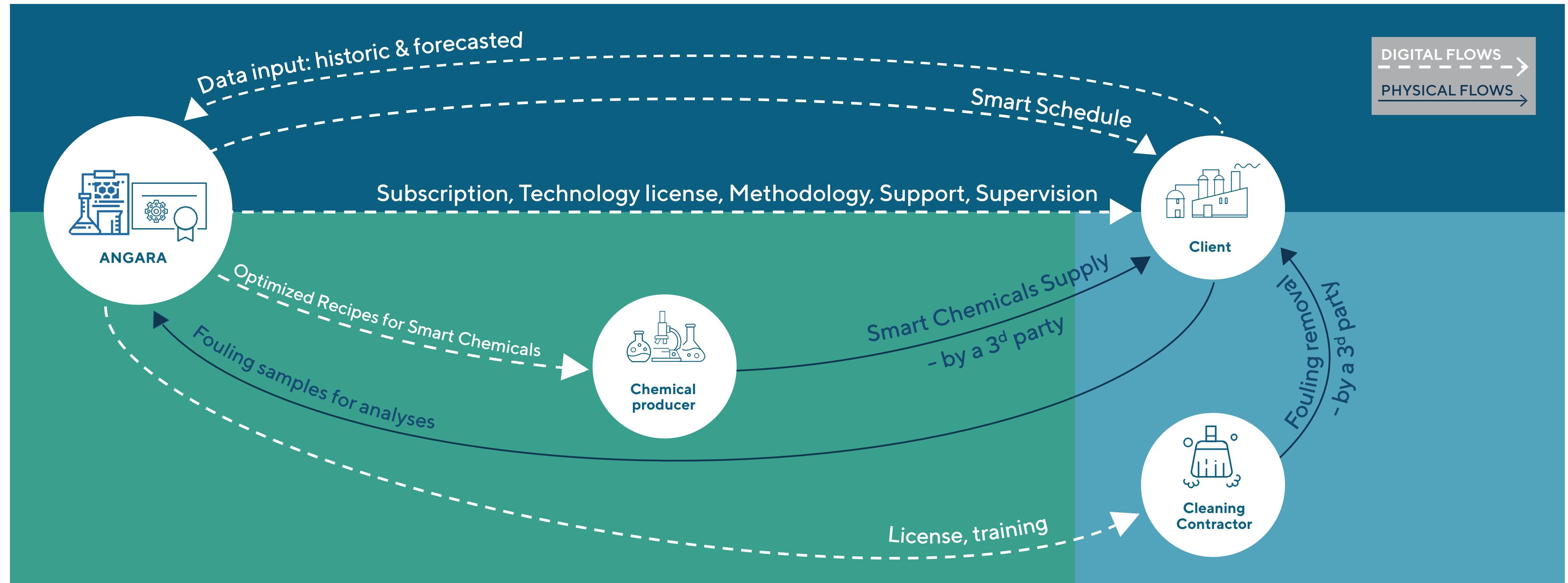


We deliver our solution to clients with a scalable digitalized business model

We focus on two things:

1. The organization of the whole solution delivery, and
2. Our in-house AI-powered digital tools to generate Smart Schedules and Smart Recipes

Angara leverages the existing ecosystem of Chemical Producers and Cleaning Contractors



In Europe, our supply chain and partner network are completely set up, and our partners include well-established players of EUR 500 mln. revenue scale

Our main offering is a subscription-based turn-key service

We help our clients to bring their existing heat exchangers to a new efficiency level – quickly and with no CAPEX

Client's benefits

- **Fast results:**
within 12 months
- **Substantial impact:**
5-15% of CO₂ reduction
- **Risk-free:**
 - The technology is DNV validated at TRL 8+.
 - It is proven in many projects
- **Economically attractive:**
 - CapEx-free.
 - Pricing is based on savings actually delivered to a client
- **Predictable:**
3-year Service Level Subscription Agreement

HEX Care offering

Smart Schedule driven by our Prescriptive AI

High-frequency cleanings with Fouling Fracturing

100%

75%

50%

25%

Time

VALUE

WE ARRANGE FOR OUR CLIENTS
THE NEW LEVEL OF CONTINUED
CLEANLINESS SERVICE
OF THEIR EXISTING EQUIPMENT
WITH OUR TECHNOLOGY
AS THE ENABLING FOUNDATION

Additionally, our technology enables mass upgrade to more efficient HEX

This drives our next-stage offering, HEX CARE PLUS (details are on the next page)

Type	Size	Efficiency When Clean	Market Share	
UPGRADE TO WELDED PLATE	6x smaller than Shell and Tube	Much more efficient	< 10% 	<p>ADDITIONAL BUSINESS OPPORTUNITIES, e.g.:</p> <ul style="list-style-type: none"> – HEX As A Service – Energy As A Service
FROM SHELL AND TUBE		> 90% 		<p>STRATEGIC PARTNERS:</p> <ul style="list-style-type: none"> – HEX producers – EPC Contractors – Banks, infrastructure funds

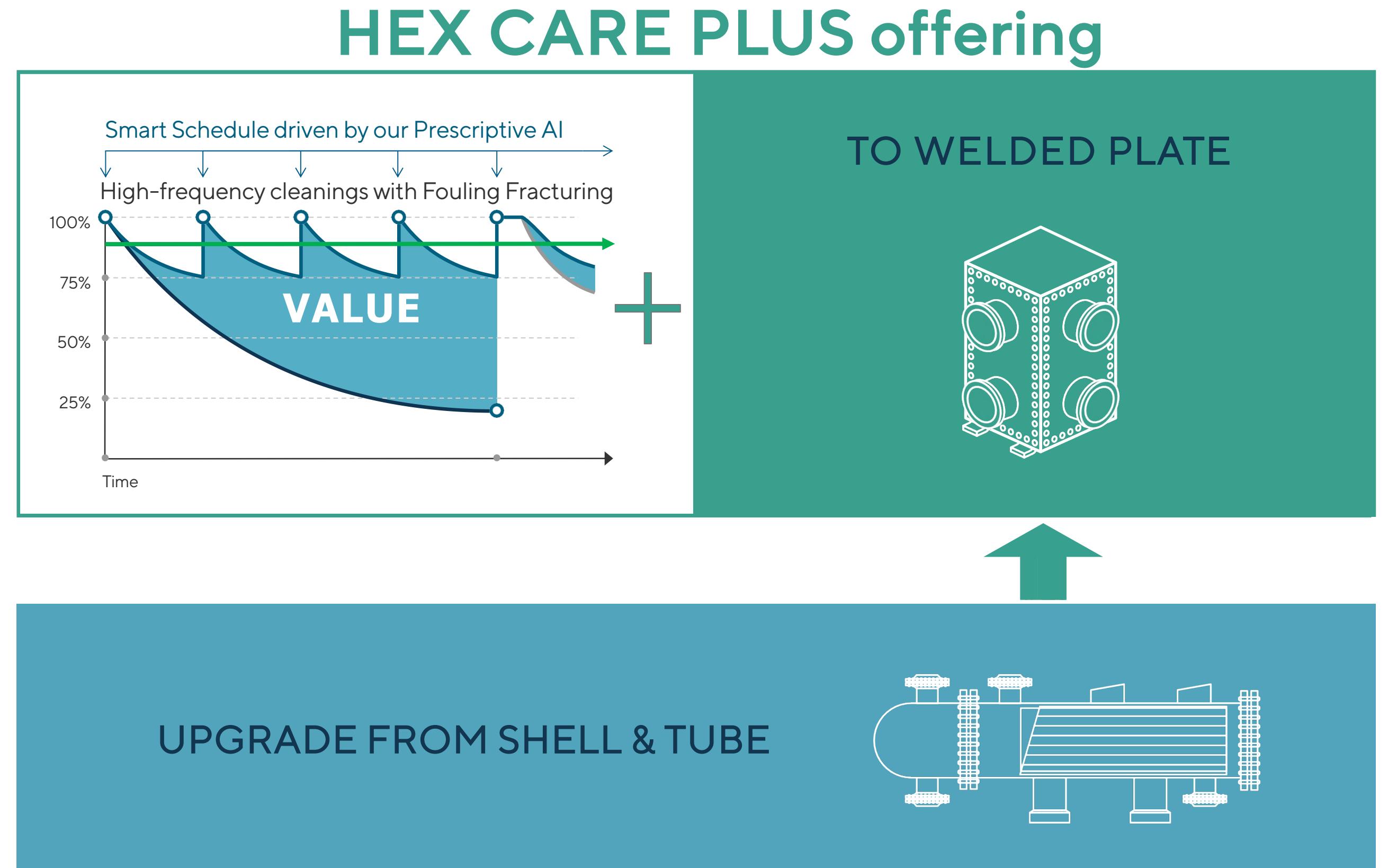
NOTE: ESTIMATED MARKET POTENTIAL IN UPGRADE PROJECTS - \$100 BILLION CUMMULATIVELY OVER 7- TO 10-YEAR PERIOD

A longer-term subscription offering with equipment upgrade

Upgrades are done by EPC contractors with 3^d party hardware. Banks or infrastructure funds provide financing

Differences from HEX CARE

- **More benefits for all:** further 10-25% CO₂ reduction
- **Longer-term contracts:** 5- to 10-year
- **Strategic partnerships with global players:** equipment producers, EPCs, banks
- **Yet, it takes more time to deploy:**
May take 2-3 years until a window opens for HEX replacement/upgrade
(requires shutdown of a plant)



The value we deliver for our clients is generated from substantial energy savings and CO₂ emissions reduction

OIL REFINERY EXAMPLE

EU Client, 100 kbd refinery

	HEX Care	HEX Care Plus	Total Prize
CO ₂ emissions reduction (thousand tCO ₂ /year)	180	300	480
Savings on carbon allowances (\$ million/year)	13	21	34
Energy savings on fuel (\$ million/year)	16	41	57
Total Savings (\$ million/year)	29	62	91

Source: Angara's Proprietary Global Modeling Tool. Energy Cost @ \$11.38/MMBtu. Carbon Credits (ETS EUA) @ \$70/tCO₂

For reference:

The current energy mix cost for EU refineries @ \$20-23/MMBtu.

S&P Global Commodity Insights estimated LNG price on Northwest Europe ex-ship (DES) basis, at \$31.641/mmBtu on Dec. 1, 2022

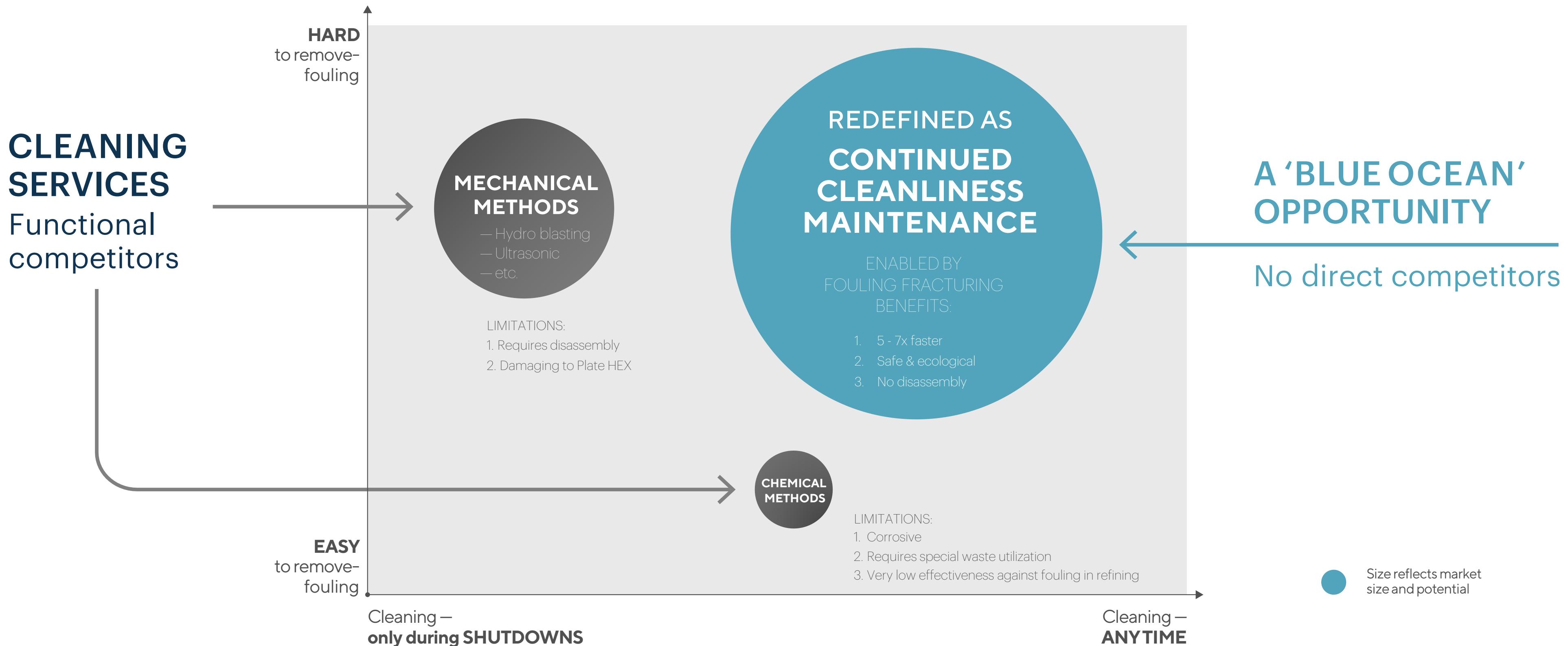
December 7, 2022 Carbon Credits price (ETS EUA) was @ \$93.8/tCO₂. Please, see <https://carboncredits.com/carbon-prices-today>

We work together with our clients to achieve fuel savings and abate CO₂ emissions through the deployment of our DecarbonX Program

DecarbonX starts with a pilot and spans several phases, with depth and intensity building up over the years

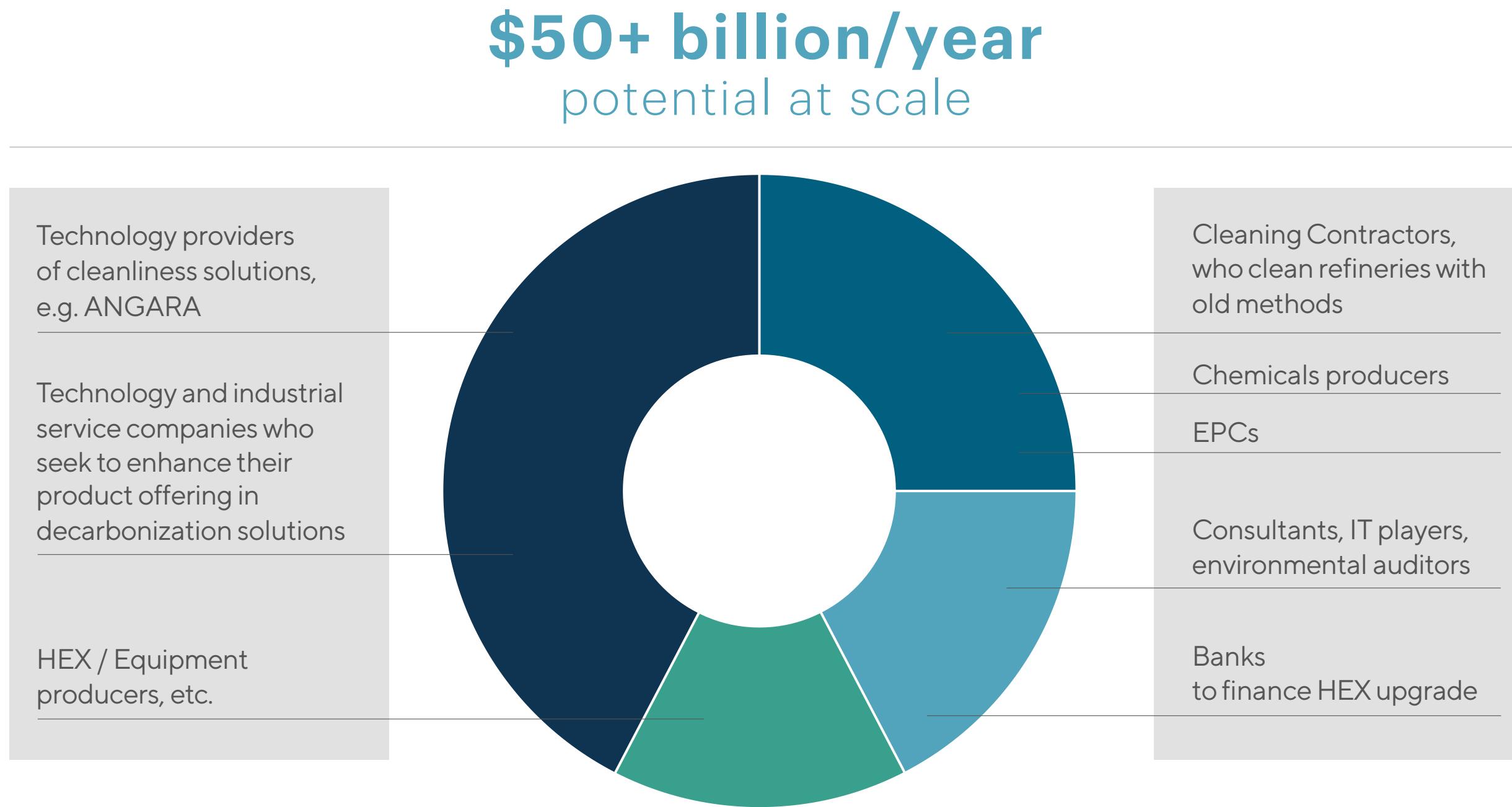


We unlock a multi-billion market opportunity by redefining the heat exchanger maintenance segment



The estimated size of this market opportunity exceeds \$50+ billion a year

The benefits from the change ANGARA triggers drive interest in partnering with us and shape our exit options



Examples of already engaged partners



The Leadership Team



Val Krivenko
Executive Board
Chairman,
Co-Founder



BRIGHT CAPITAL

Managing Partner of
Energy Efficiency Fund

McKinsey
& Company

Roland Berger

YPO



**Alec
Saltikoff**
Sustainability and
Energy Efficiency



JPMorganChase

Global Head of
Sustainability and Energy



WORLD
GREEN
BUILDING
COUNCIL

Vice-Chairman



REAL ESTATE BOARD OF NEW YORK



Co-Chair of Sustainability
Committee



Petra Koselka
CEO,
Board Director



Partner, Downstream Business
Consultancy
VP Shell Ventures



Strategy, M&A,
Corporate Director of AkzoNobel



Senior Advisor
Chair, Gold Chapter



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



CEO and Board Director



MD, Business Consulting Asia



Chairman of European Petroleum
Industry Association



Partner, Energy Practice



Associate Partner



Peter Petrov
Deputy CEO,
Board Director,
Co-Founder



Morgan Stanley

Executive Director



Executive Director



**Jaap Kalkman,
PhD**
Non-Executive Director,
Senior Advisor



ADQ / Abu Dhabi Developmental
Company –
Group Chief Investment Officer



Global Head
of Energy & Utilities



Head of Energy
and PE practice, ME



Partner



**Toby
Gati**
ESG



Special Assistant to the
US President



SVP



**Ed
Cherednik**
Chief Digital and
Sustainability Officer



Digital Transformation Executive



Account Executive



VP for Oil & Gas Europe



Regional Manager

The Leadership Team (continued) and Advisory Board



Ilia Rodin
Chief Development Officer, Board Director, Co-Founder



Partner



Alex Karavaikin
Oil & Gas



Partner in Oil & Gas



SVP, Finance, Planning, Performance Mgmt, Investments



Boris Maslo, PhD
Patents, IP Protection and Strategy



TOP 20 patent expert in the US in energy storage

CEO of Solarus USA

CEO, Board Director

President



Vlad Tuzov
Strategic Partnerships



Strategy and BD Director



THE BOSTON CONSULTING GROUP



Occo Roelofsen
Oil & Gas, Strategy



McKinsey & Company

Energy Insights by McKinsey



Senior Partner, Global Leader of the Global Oil & Gas Practice

Chairman

Committee for Entrepreneurship and Financing



Ian H. Fay
Finance



Group Head



Head of Energy & Natural Resources – Americas, MD



Rothschild & Co



Leo Mukhamedov
Digital



Chief Strategy Officer, EVO Europe, Member of the Executive Committee (ex)

Vice President for CIS, ME and Africa, IT BU



Boris Shrayer
Business Development



Morgan Stanley

Head of Commodities Client Marketing, Strategy and Research. MD



The best technology and a big moat around it ensure high investor returns

- **US AND EU PATENTS GRANTED**
- **GAINED MOMENTUM:**
a proven TRL 8+
decarbonization technology
- **POST-REVENUE:**
paying clients who trust us



BUSINESS MODEL, attractive for partnerships: they win from joining our ecosystem rather than trying to compete

- **EVERGROWING DATA & FOULING SAMPLES REPOSITORY** to 'feed' our AI/ML core to generate constantly improving actionable insights
- **ACCUMULATED KNOW-HOW:**
expertise and knowledge on what works and what does not work
- **REPUTATION & REFERENCE LIST**
of being a reliable and safe supplier
- **MULTI-DISCIPLINARY EXPERTISE**
of the team in the Chemical & Digital domains

We are raising \$5 million to move from paid projects to subscription-based deployments with global majors

Main use of funds

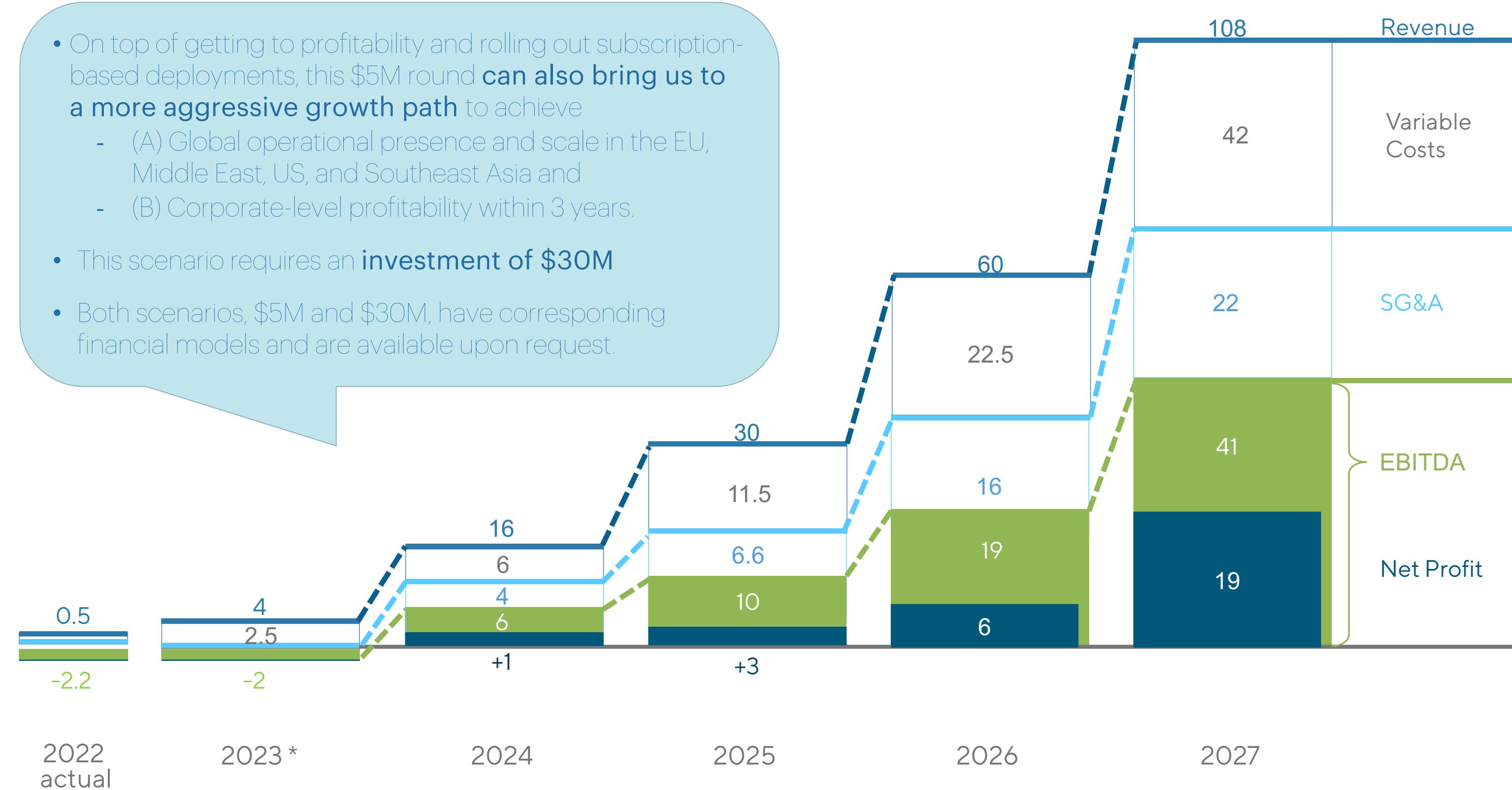
1. Team Expansion to speed up the execution of larger-scale deployments by creating several implementation teams in Europe and GCC

2. Travel costs: each implementation team can cover a few clients in parallel. However, at the initial deployment stage physical presence on the client's premises is important.

No CAPEX required

Pro Forma Income Statement, \$ million

- On top of getting to profitability and rolling out subscription-based deployments, this \$5M round **can also bring us to a more aggressive growth path** to achieve
 - (A) Global operational presence and scale in the EU, Middle East, US, and Southeast Asia and
 - (B) Corporate-level profitability within 3 years.
- This scenario requires an **investment of \$30M**
- Both scenarios, \$5M and \$30M, have corresponding financial models and are available upon request.



* Year 2023 is calculated as 12 calendar months after the \$5M round is closed

DECARBONX

BY ANGARA

World Trade Center Amsterdam

Strawinskylaan 555-T
1077 XX Amsterdam

VAL KRIVENKO

+316 2528 5786
+1(650) 471-9306
vkrivenko@angaraglobal.com

PETER PETROV

+973 3208-3998
+1 (773) 598-0618
ppetrov@angaraglobal.com



S&P GLOBAL PLATTS
GLOBAL ENERGY AWARDS
2020 FINALIST

12th annual
ASIAN DOWNSTREAM SUMMIT
2019
INNOVATIONS IN OIL & GAS
DIGITAL TECHNOLOGY AWARD
FINALIST



S&P GLOBAL PLATTS
GLOBAL ENERGY AWARDS
2019 FINALIST

جوائز آدیپک
ADIPEC AWARDS
EXCELLENCE IN ENERGY 2020

OIL AND GAS START-UP COMPANY OF THE YEAR
FINALIST 2020