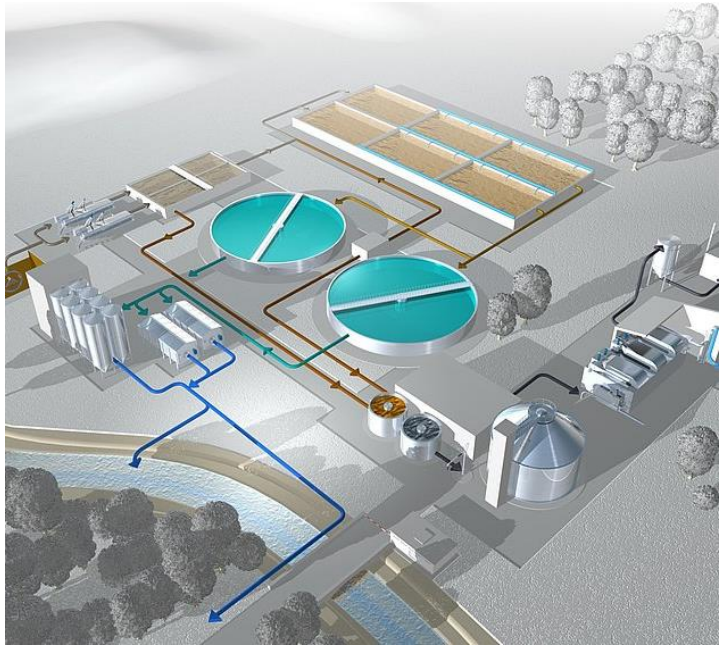
The Path to Net-Zero for Wastewater Treatment

Series A Investment
Variolytics GmbH
12.03.24

Did you know ?



Wastewater Treatment

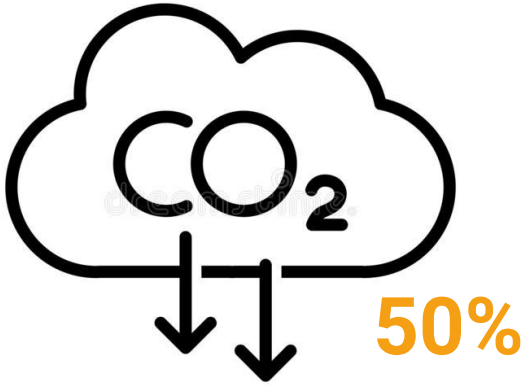
=

CO_2e

Aviation Industry

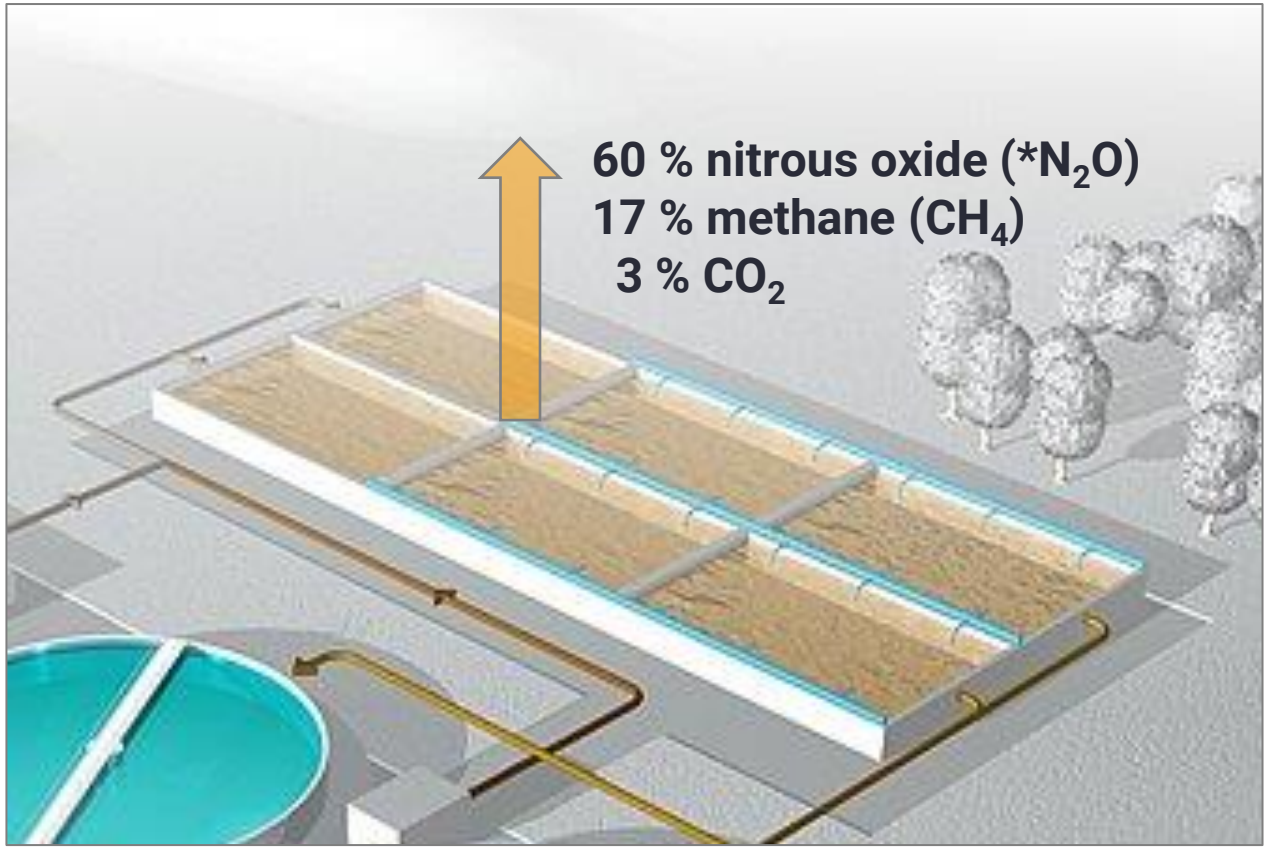
Good News for Wastewater !

Variolytics Technology



Problem: 80% of total GHG from direct emissions

No analytical system available to monitor & control direct green house gas (GHG) emissions



Why GHG emissions?

1. **Incorrect Operation**
   Nitrous oxide is produced due to incorrect operation of the biology.

2. **Missing Sensors**
   No signals to use for optimization due to missing sensors

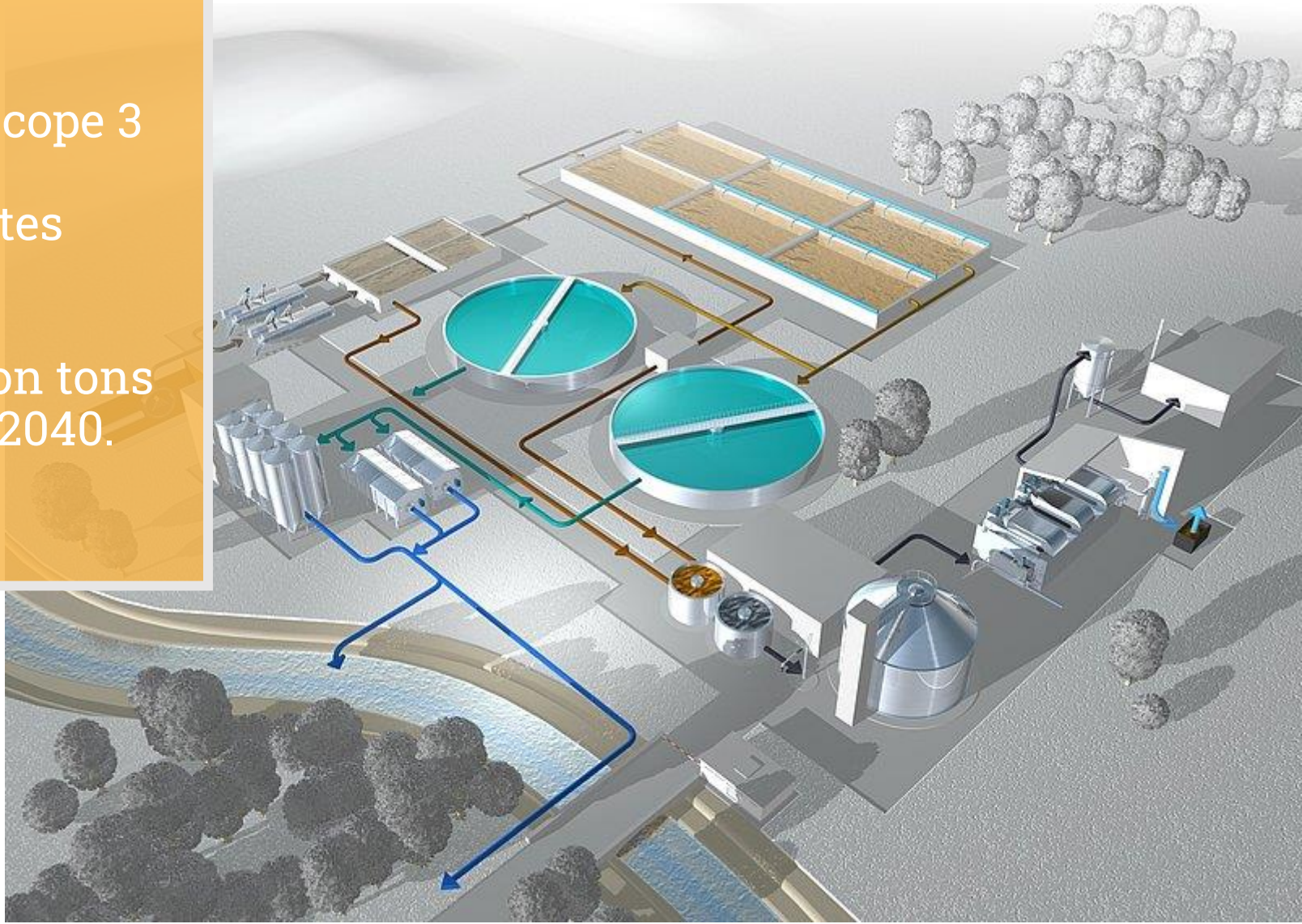
Requires EMISSION measurements.

Requires NEW control strategies.

* Nitrous oxide is 273 times more greenhouse active compared to CO_2. Therefore, it is referred to CO_2 as equivalent (CO_2e). Nitrous oxide also depletes the ozone layer.

EU Climate Goal
Net-Zero by 2040

- ✓ EU Green Deal - ‘Fit for 55’ – Scope 3
- ✓ New UWWTD of 2024 mandates emission monitoring in EU.
- ✓ Reduction target of 4,86 million tons CO_2e (37,32%) in DE sector by 2040.



Solution: Measure and optimize with **EmiCo.**

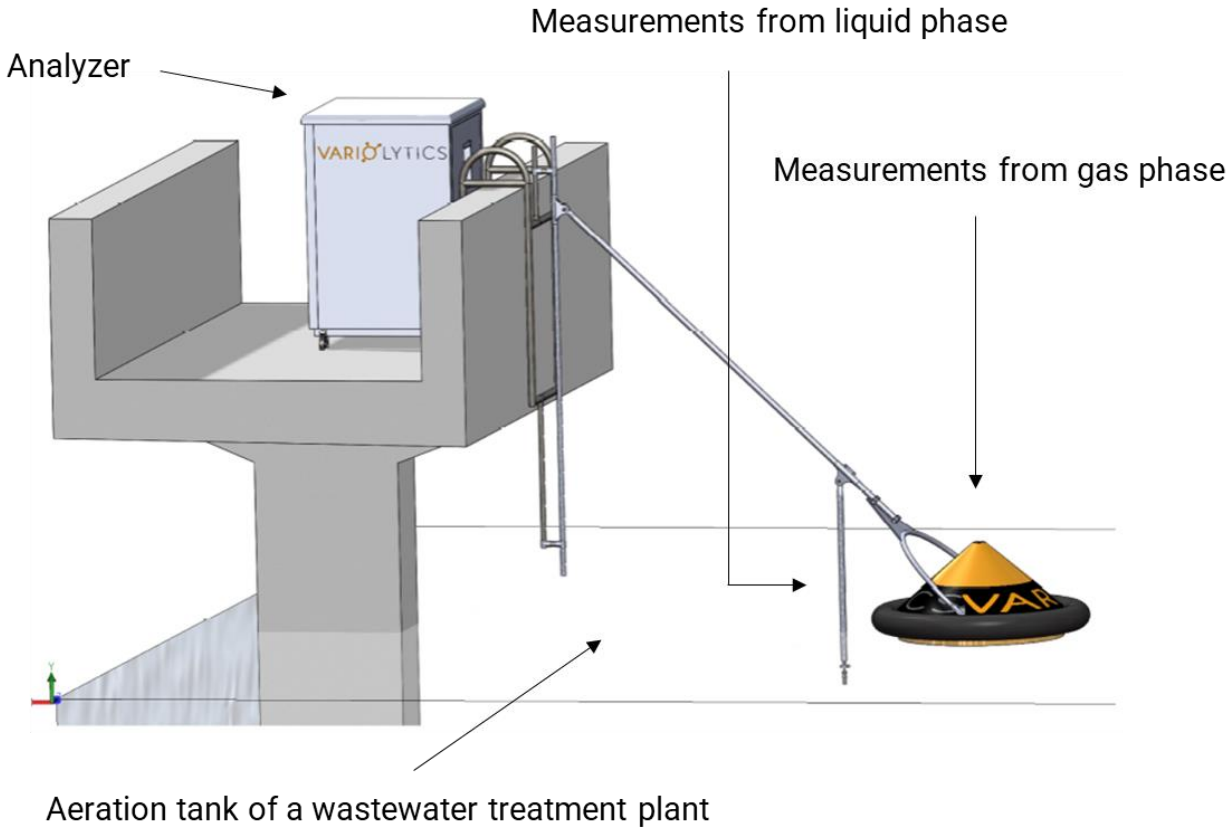
One package for customers to monitor and reduce direct emissions.

Benefits

- **GHG mitigation.**
- **Reduced energy cost.**
- **Water quality compliance.**
- **Reduced chemical demand.**

Traction

- **7 EmiCo Systems in operation**
- **4 countries**
- **5 EmiCo *lite* pre-orders**
- **6 emission reports**




EmiCo

Product Offering: Emission Control System

Hardware as an enabler for services and recurring revenue

HARDWARE

1. **EMICO**
   - i. Patented analyzer
   - ii. Gas & liquid measurements
   - iii. Best for optimization
   - iv. Price. €250;000

2. **EMICO *lite***
   - i. Cloud based architecture
   - ii. Gas measurements
   - iii. Best for monitoring
   - iv. Price: €28,000

SERVICE

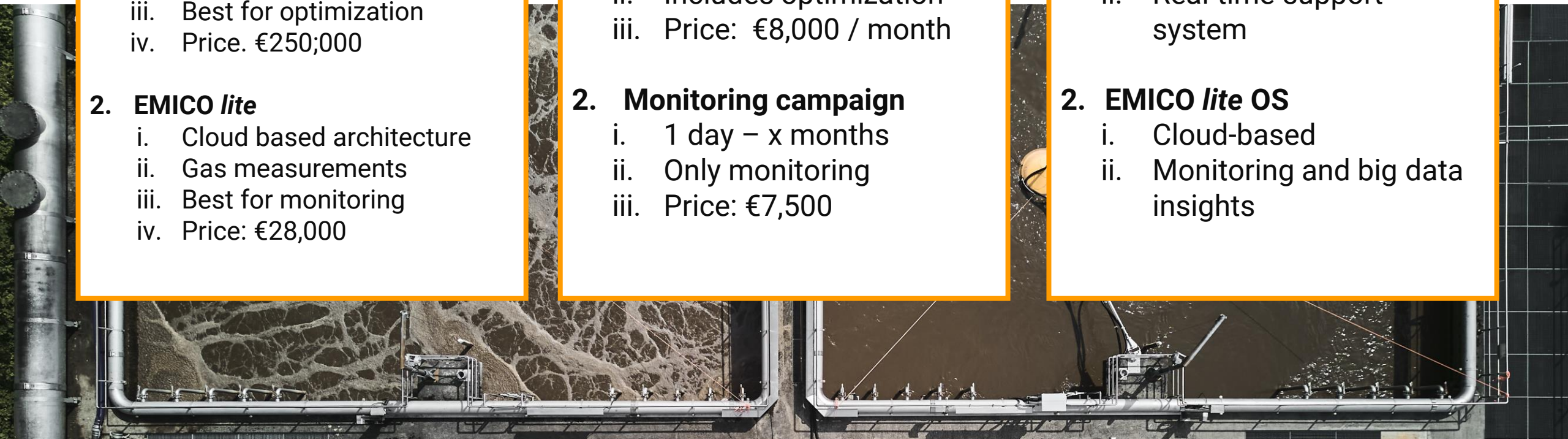
1. **Full-service rental**
   - i. 24 months contract
   - ii. Includes optimization
   - iii. Price: €8,000 / month

2. **Monitoring campaign**
   - i. 1 day – x months
   - ii. Only monitoring
   - iii. Price: €7,500

SOFTWARE

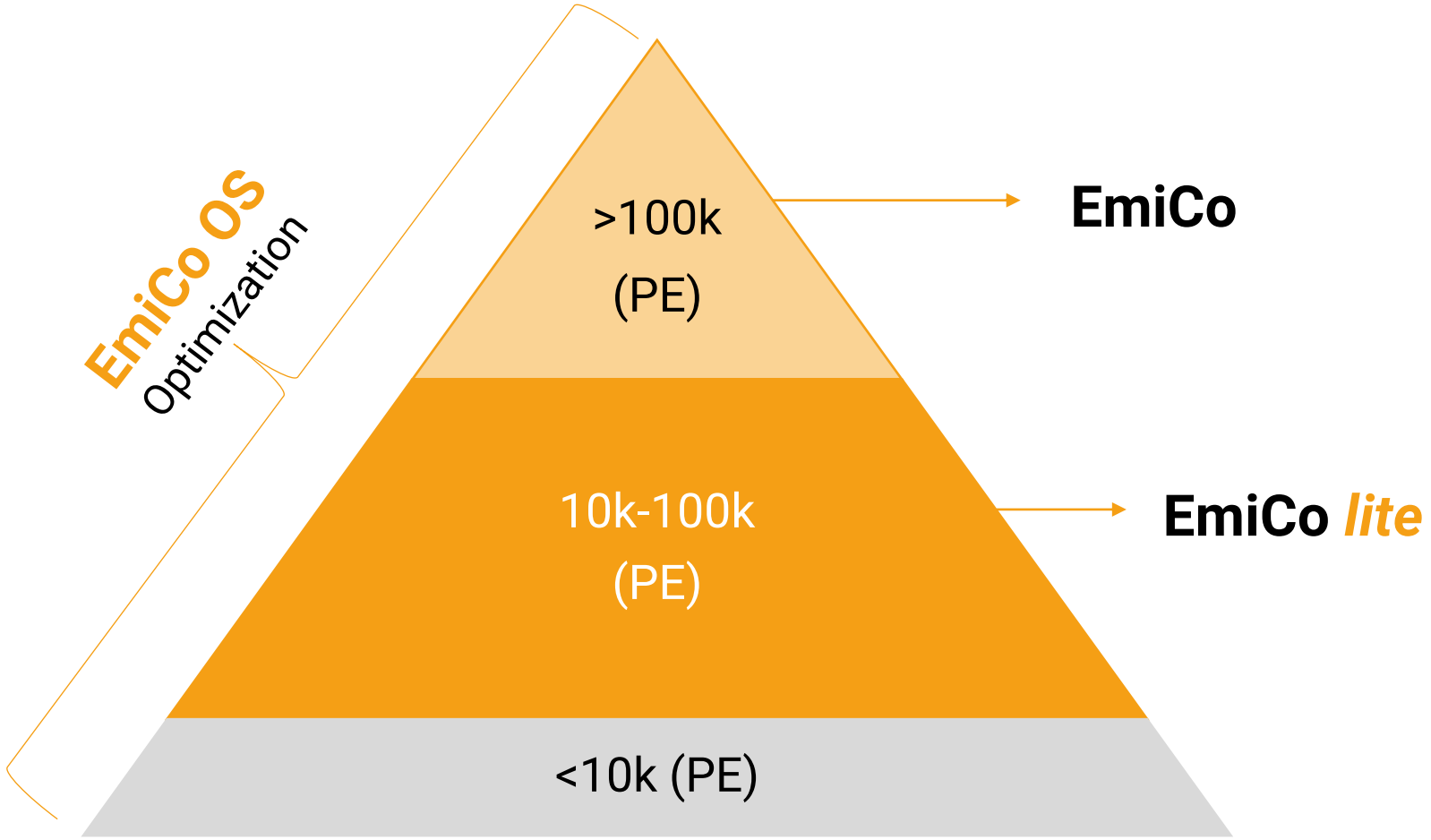
1. **EMICO OS**
   - i. On-premise
   - ii. Real-time support system

2. **EMICO *lite* OS**
   - i. Cloud-based
   - ii. Monitoring and big data insights



Market Segmentation: Emission Control System

Providing solutions that fit the budget and requirements of the different customer groups



PE = population equivalent capacity

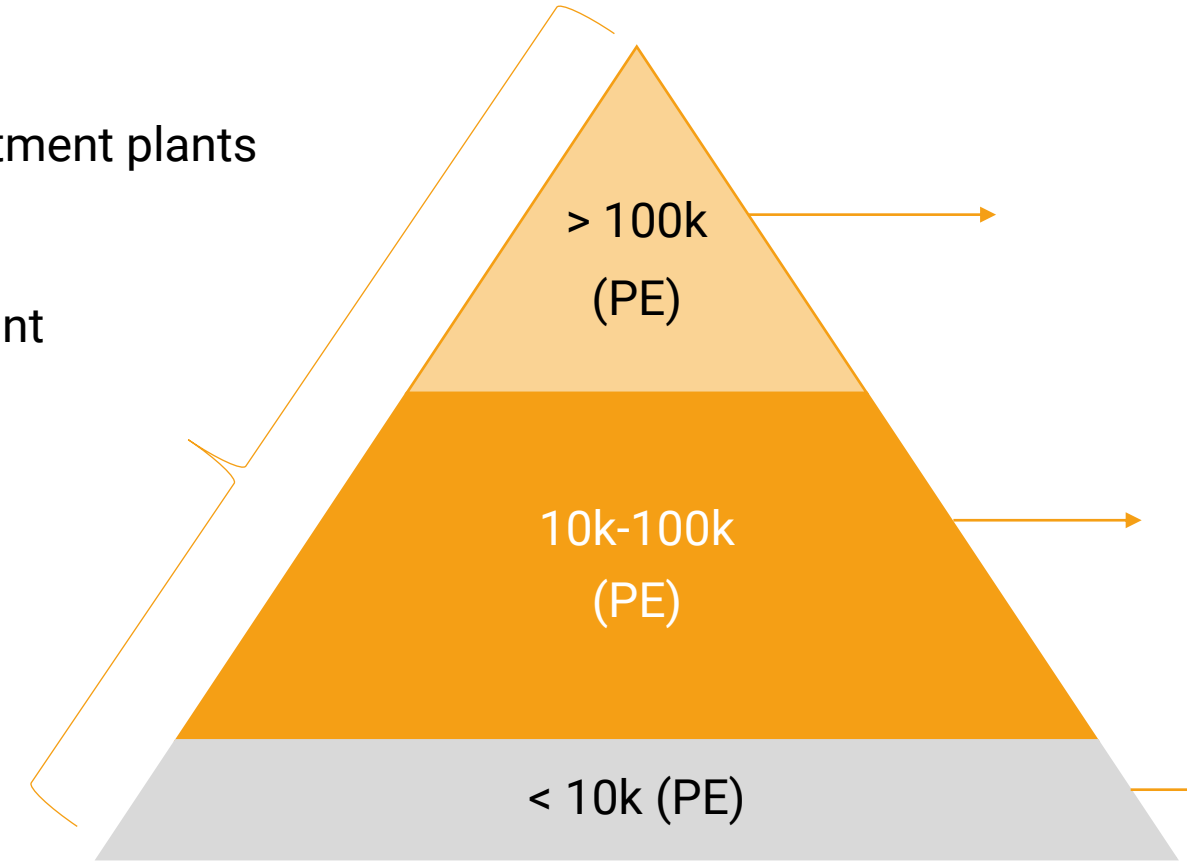
EU Market: Wastewater Treatment Plants

24% of the total number of treatment plants are responsible for 90% of the emissions

24,971 +
wastewater treatment plants

55 bil. m3
Treatment amount

17.5 mil.
Tonnes CO2e



Number	Treatment	Emissions
3% 750	**51%** 28 bil. m3	**50%** 8,8 mil. T Co2e
21% 5,243	***40%*** *22 bil. m3*	***40%*** *7* mil. T Co2e
76% 18,977	***9%*** 5 bil. m3	***10%*** *1,7* mil. T Co2e

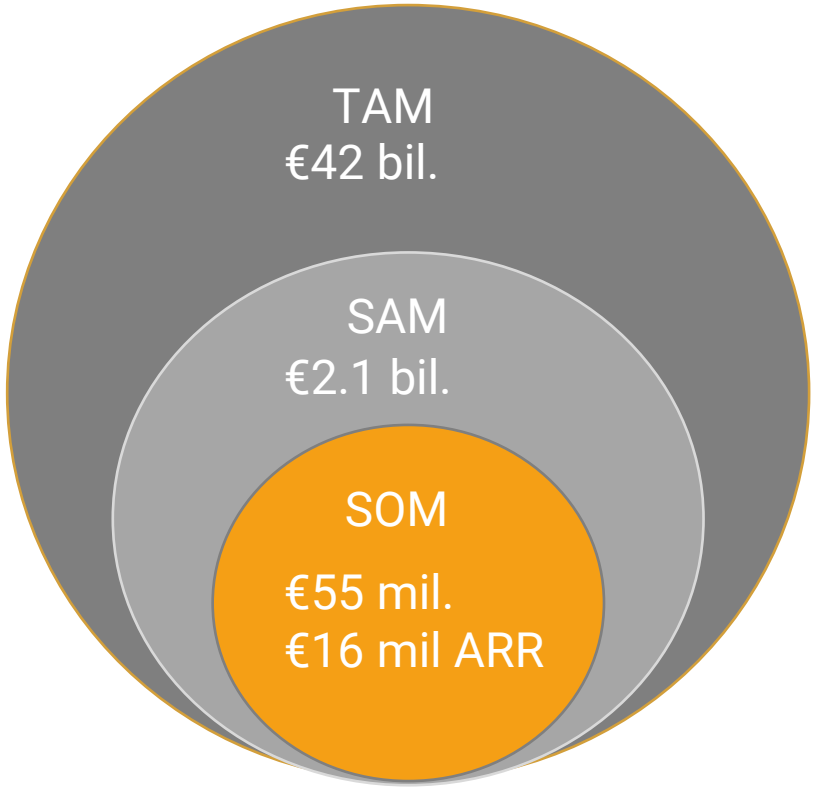
PE = population equivalent capacity

Source: Hydro WASTE database

Market: Wastewater Treatment Equipment $42 Billion / Year

Will grow from $28 billion in2020 at 4.2% CAGR till 2030 Source

Market by 2030



Serviceable Addressable and Obtainable Market

SAM → All treatment plants requiring emission monitoring and optimization services

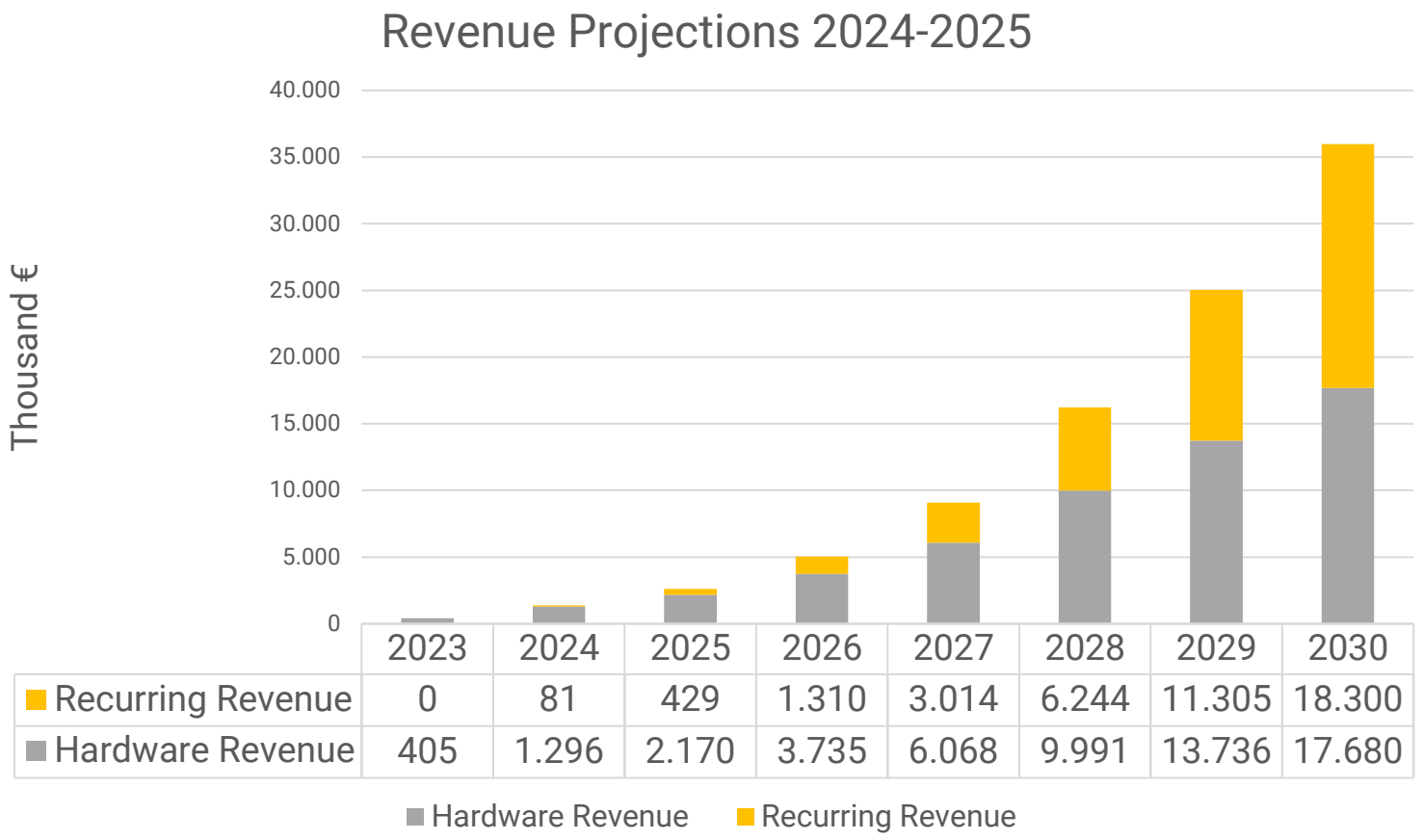
- 21,300 (24% of all treatment plants by 2030)
- Spending on average €100,000 for hardware implementation and €13,500 recurring services
  - **€2.1 bil.** for hardware implementation
  - **€287 mil.** ARR

SOM →1,200 deployments by 2030 - 2.6% of SAM hardware and 5,1% ARR.

- Key market for deployments is EU
- 100 EMICO sales
- 1100 EMICO lite sales
  - **€55 million** for hardware implementation
  - **€16,2 million** ARR

Financial Plan

Recurring revenue through software offering overtakes hardware revenue by 2030



	2023	2024	2025	2026	2027	2028	2029	2030
Recurring Revenue	0	81	429	1.310	3.014	6.244	11.305	18.300
Hardware Revenue	405	1.296	2.170	3.735	6.068	9.991	13.736	17.680

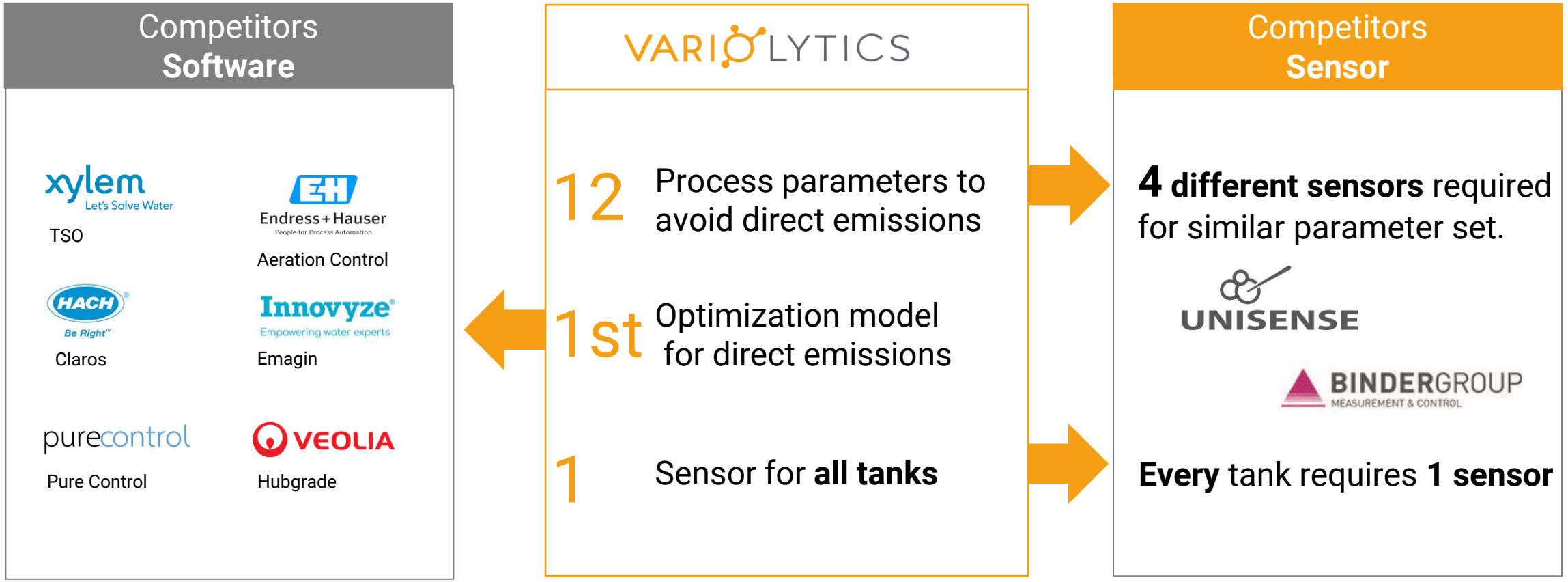
Deployments (cum.)								
EmiCo	6	10	17	28	43	61	80	100
EmiCo *lite*	0	10	24	58	138	332	650	1.100

Key Information

- **Break-even by Q4 2026**
- **Capital requirement of €1.8 million to offset losses**
- **Margins increase, as recurring revenue takes off**
- **€3 million EBIT by 2027**

Competitors: No commercial solution for direct emissions.

Existing optimization services (software competitors) only offer energy optimization



* Software providers are also **potential partners**

Founders & Investors: Strong Technical Expertise

Highly motivated team of 12 people, with reliable partners by their side

Management Team

DR. MATTHIAS STIER (42)

CEO & Founder

A bio-process engineer and expert in biotechnological and chemical reactions

STEFFEN GÖRNER (46)

CTO & Founder

A process engineer and designer with extensive experience

JOHANN BARLACH (34)

CFO & Founder

A business economist with a background in supply chain management and bus. Dev.

FINE WOLFF (34)

CAO & HR

Is a marketing communications specialist & business psychologist

Lead Investors

DR. JÖRG GEBHARDT

BUSINESS ANGEL

A physicist, entrepreneur and expert in AI models for optimization of wastewater treatment plants

FTTF

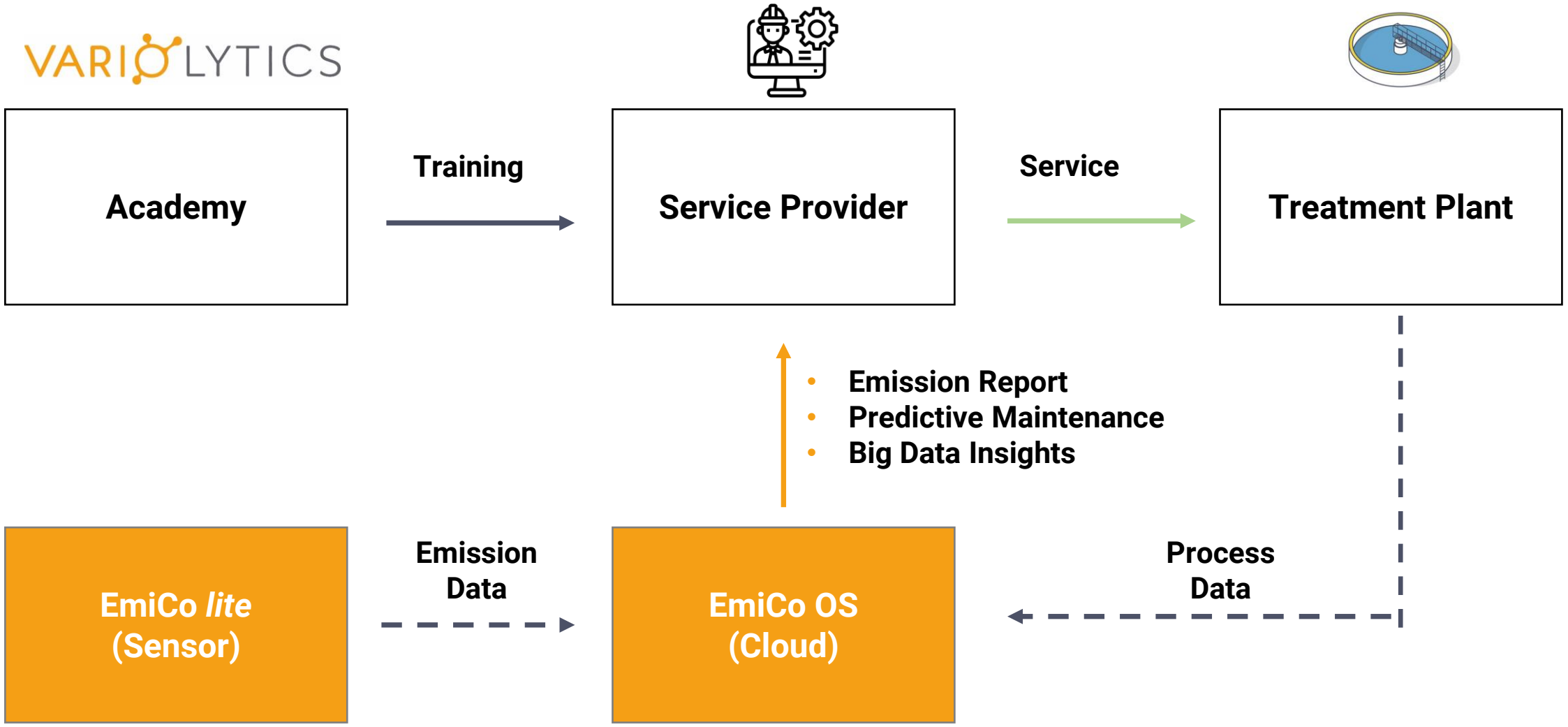
The Fraunhofer Technology-Transfer Fonds (FTTF) provides early-stage funding for start-ups using Fraunhofer Technology

High-Tech Gründerfonds

HTGF is a Germany based VC with over 700 investments, focused on high-tech early-stage start-ups

Scaling with Partners and EmiCo *lite*

New revenue opportunity for local service providers and fast scalability for Variolytics



2030 GOAL: Decarbonizing largest treatment plants in EU

Enable wastewater treatment sector a fast and efficient path to net-zero

1,200
treatment plants
decarbonized by **2030**

=

1.85
million tonnes CO2e
SAVED / year

10.5%
reduction of
wastewater
emissions in EU

Details: Series A Investment

- Commitment for Series A:
  - European Investment Bank (€2,000,000)
  - Follow-on Current Investors (€500,000-1,000,000)
  - **Open Ticket: €1,000,000 – €2,500,000**
- Total Investment: **€4-5 million**
- Timeline:
  - Closing Q4 2024

Capital Allocation

1. Personnel
   - Sales
   - Account Management
   - Production
   - Software Engineering
   - Data Scientists
2. Regional Sales Offices
3. New Product R&D

Create a Greener Future Together

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Supported by:

Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz

Funded by the European Union

#jetztklimachen unterstützt vom KLIMA INNOVATIONS FONDS

Back-up

VARIOLYTICS

Investment Case

- ✓ New EU Wastewater Directive creating mandatory demand in 2024
- ✓ EmiCO technology validated and positioned to become market leader
- ✓ Hardware as enabler for software-based recurring revenue model
- ✓ Launch of EmiCo lite → highly scalable new product line, to meet EU regulation
- ✓ Strong IP through patented technology and data
- ✓ Experienced team
- ✓ Committed Investors
- ✓ Award winning & Funded by EU

EU Regulation: New Requirements for Direct Emissions

Urban Wastewater Treatment Directive

→Current Text: March 1st 2024, 2022/0345(COD

Article 21: Monitoring

→(d) the greenhouse gases, **including at least CO2, N2O, CH4**, emitted from urban wastewater treatment plants of 10 000 p.e. and above by means of analysis, calculations or modelling where appropriate

→(296) Microplastics and relevant micropollutants should be monitored, where relevant, in storm water overflow discharges and in discharges of urban runoff from separate systems with a representative sampling programme allowing for concentration estimation in view of water quality modelling., where relevant, supported by calculations and modelling. **GHG emissions should be monitored**

Variolytics will be part of the German delegation to develop the methodology for monitoring direct emissions

Variolytics Origin– Founded in 2020 as a Fraunhofer spin-off

A successful transfer from academic research to commercial technology

2017-2019

TECHNOLOGY R&D

1. Research
2. Patent Application
3. Incubator Program
4. Founders Meet

2019-2021

RESEARCH TRANSFER

1. Business Plan
2. EXIST Application
3. Product Development
4. Spin-off

2020-2023

EARLY YEARS

1. Pilot Customers
2. Market Validation
3. Early-Stage Funding
4. Core Team

2023 - PRESENT

GROWTH STAGE

1. Product-Market Fit
2. EIC Application
3. Revenue Growth
4. Late-Stage Funding

Fraunhofer IGB

eXIST

VARIOLYTICS

European Innovation Council

EmiCo. Product Offering		EmiCo.		
		MS	**FTIR**	**LITE**
Features	Price (from)	250.000 €	180.000 €	28.000 €
	Measuring points (up to)	10	20	2
	Temperature	✓	✓	✓
	Aeration intensity	✓	✓	✓
Phase	Gas	✓	✓	✓
	Liquid	✓	x	x
Measuring range	N_2O	0 – 100%	0 – 3%	0 – 3%
	CH_4	0 – 100%	0 – 3%	0 – 3%
	CO_2	0 – 100%	0 – 5%	0 – 5%
	O_2	0 – 30%	Optional	Optional
	N_2	0 – 100%	x	x
Detection limit	N_2O	<5 ppm / 5µg/l	<0,5 ppm	<15 ppm
	CH_4	<5 ppm / 5µg/l	<1 ppm	<20 ppm
	CO_2	<5 ppm / 5µg/l	<1 ppm	<20 ppm
	O_2	<5 ppm	Optional	Optional
	N_2	<5 ppm / 5µg/l	x	x
Maintenance	Auto-calibration	✓	✓	x
	Costs	10.000 €	5.000 €	5.000 €
	Interval	Annually	Annually	5 Years

AI Optimization

Inputs Plant

- Ammonia
- Nitrate
- Oxygen
- COD
- Phosphate
- Dry Weight

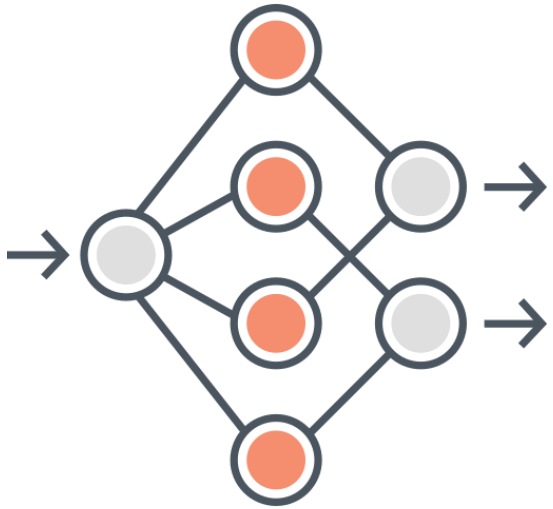
Inputs EmiCo

- Nitrous oxide
- Methane
- Oxygen
- Carbon dioxide
- Nitrogen
- Aeration intensity
- Temperature

Setpoints

- Aeration
- Recirculation
- Dosage
- Sludge Handling

Simulation



Prognostic Values

- Oxygen
- Nitrogen
- Phosphate
- Nitrous oxide
- Methane

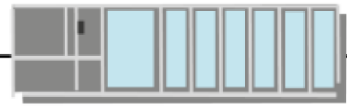
Comparison and Evaluation

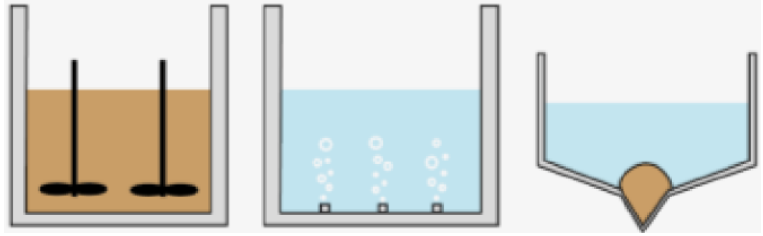
Selection

Genetic algorithm through setpoint control

Mutation

Process Optimization





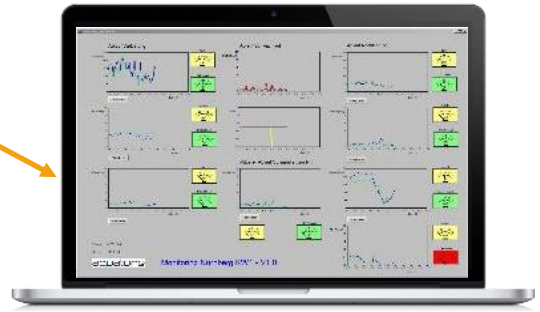
Implementation: Monitor – Model - Optimize

Three steps to energy optimization and GHG emissions reduction in 12 months

Step 1: Turn On the Lights

Deploy and begin data collection with EmiCo

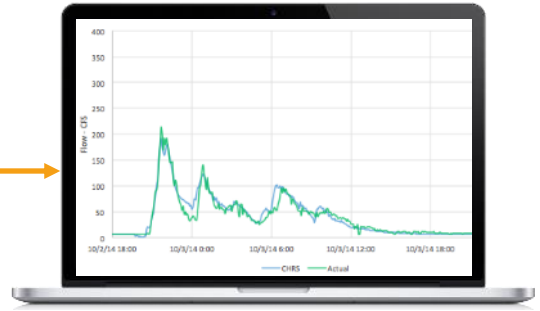
3 months



Step 2: Create Digital Twin

Build model by combining 12-36 months of historical process data with EmiCo data.

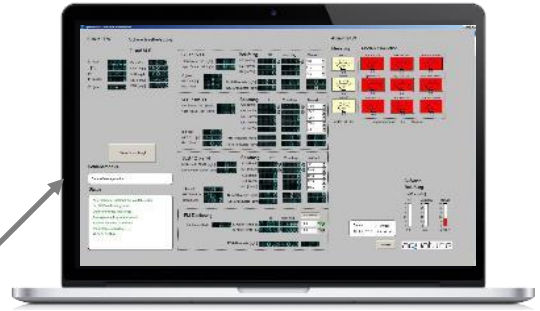
1 month



Step 3: Optimize

Run 1000s of scenarios and provide set-points with optimal process control strategy

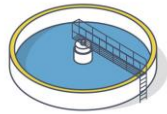
8 months



Partner Program with EmiCo *lite*

New revenue opportunity for local service providers, enabling larger follow-up projects

VARIOLYTICS



Academy

Training

Service Provider

Service

Treatment Plant

- **Emission Report**
- **Predictive Maintenance**
- **Big Data Insights**

EmiCo *lite* (Sensor)

Emission Data

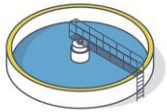
EmiCo OS (Cloud)

Process Data

Business Case: Emission Monitoring Service

Cloud-architecture enables fast analysis and report generation for service provider

VARIOLYTICS



Academy

Maintenance

Service Provider

Service

€6,000

Treatment Plant

- **Emission Report**
  €1,245 / Report

EmiCo lite
€28,000

Admin License

€960 / year

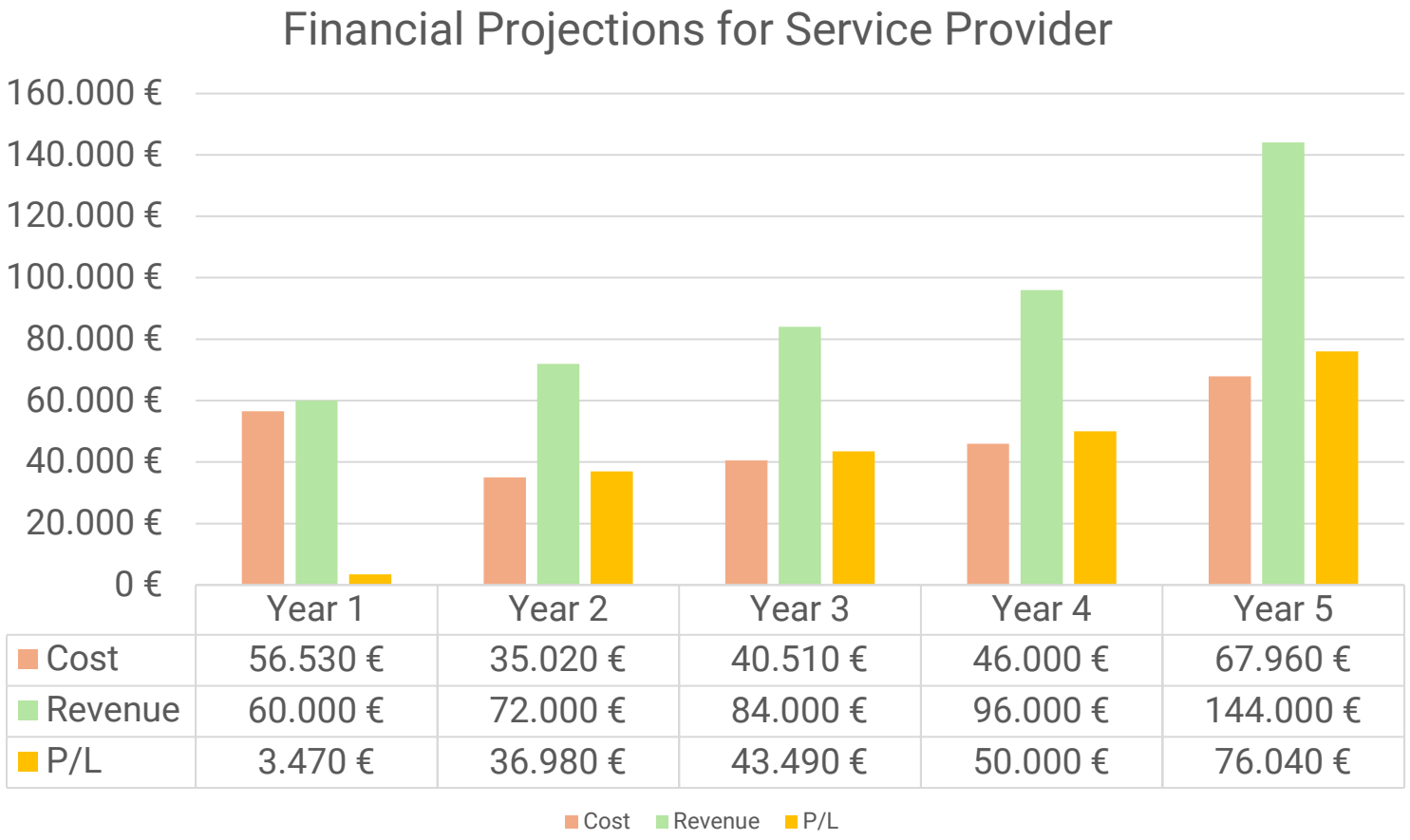
EmiCo OS (Cloud)

Customer License

€120 / year

Business Case: Emission Monitoring Service

Service providers break-even after 10 emission monitoring services and have an operating margin of 50%



	Year 1	Year 2	Year 3	Year 4	Year 5
Cost	56.530 €	35.020 €	40.510 €	46.000 €	67.960 €
Revenue	60.000 €	72.000 €	84.000 €	96.000 €	144.000 €
P/L	3.470 €	36.980 €	43.490 €	50.000 €	76.040 €

Customers	**10**	**12**	**14**	**16**	**24**

Key Inputs

- EmiCo lite purchase included in Year 1 costs
- 1 workday, priced at €1,500 per customer, assumed in cost calculation for service provider
- Revenue assumes €6,000 charged per emission monitoring service to customer

Variolytics DNA – Enabling Industrial AI.

Providing the Input data to unlock the power of AI

Industrial Process

- **Water**
- **Biotechnology**
-
- **Chemistry**
-
- **Semiconductor**

Sensor Selection

Sensor Integration

Data Pre-Processing

AI

- ✓ **Digital Twin**
- ✓ **Automation**
- ✓ **Optimization**