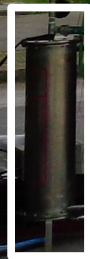
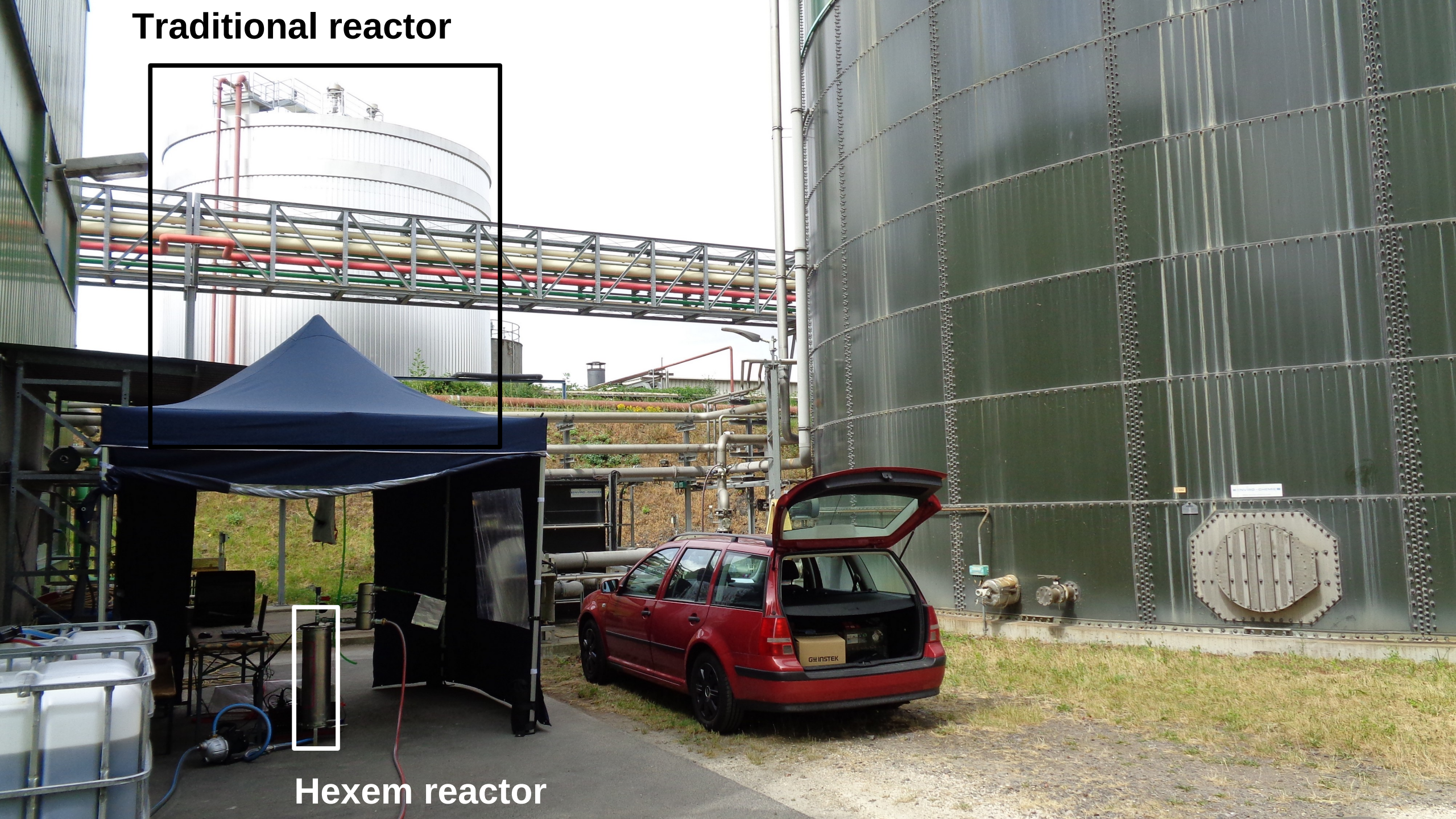




Slides presented to Solar Impulse, August 29, 2023

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Traditional reactor



Hexem reactor

Example Cheese Maker



Wastewater / year:

► 150,000 m³ = CHF 500k

Natural gas / year:

► 420,000 m³ = CHF 500k

CHF 1.2 / m³

= 36% of gross margin

Customer persona processes 70 million liters of milk per year.

Growth Limitation

Cannot expand because the public treatment plant is at limit.

- ▶ Expansion impossible:
 - Real estate cost
 - Infrastructure cost
 - 2+ years for permits
 - Operation
- ▶ Example: 32,000 m² for 150,000 m³ dairy wastewater.



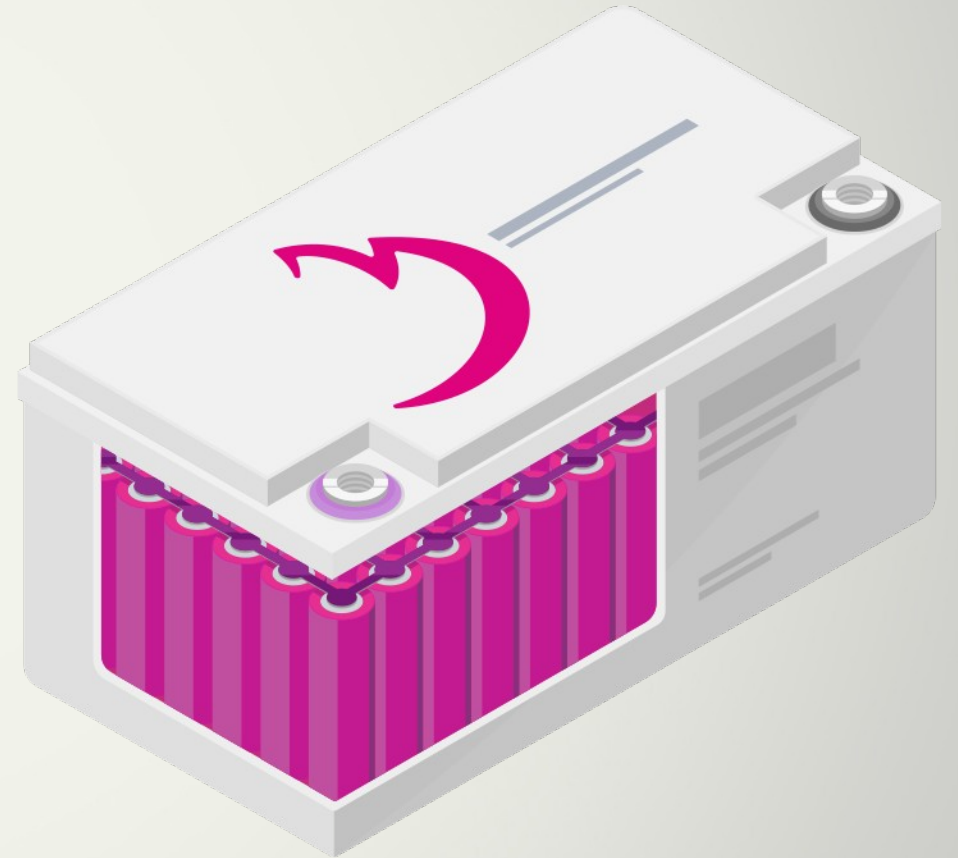
Hexem's Vision

Our vision is to provide a **plug-and-play** solution that is

- ▶ **Simple**
- ▶ **Compact and**
- ▶ **Scalable.**

Land use reduction:

From 32,000 m² to <3,000 m²



Hexem's Technology

Performance

Prototype worked at ~10% of its full capacity:

50-2,500 L biogas / m³ / day

2-25 kg / m³ / day COD removal from whey (34%)

34% sludge reduction.

Reactor

<5 Liter whey volume

semi-continuous, up to 3 bar

Power

1.2 V, 50-150 mA

software controlled

Gas composition

CH₄ 5-80%

H₂ 0-80%

CO₂ 10-60%

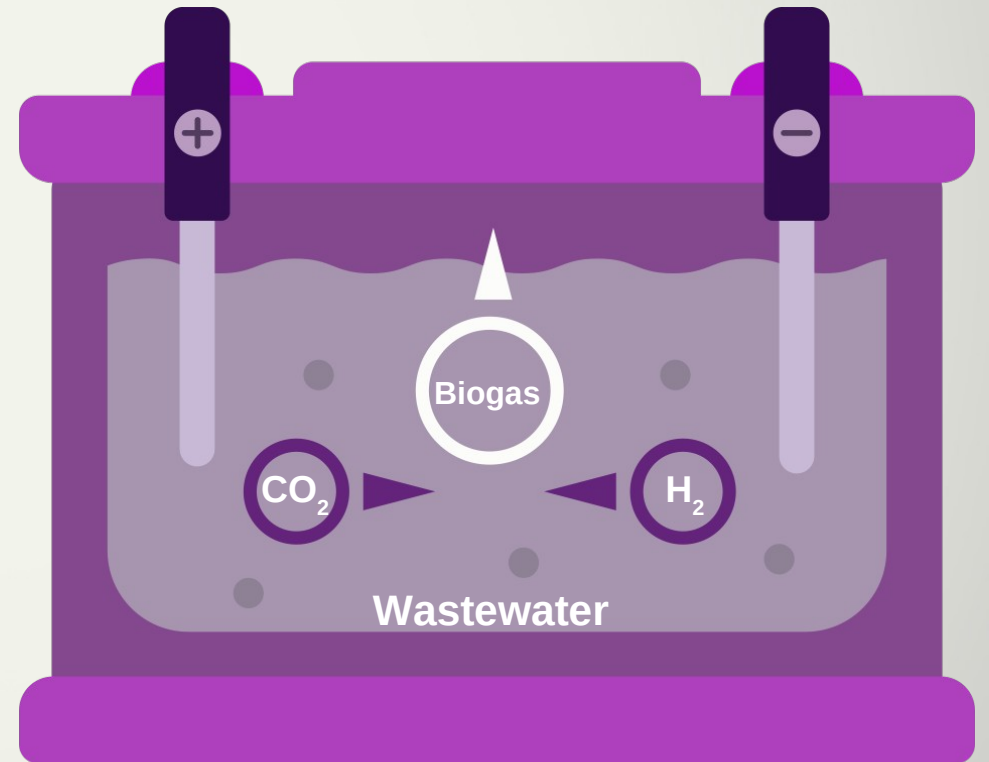
N₂ ~4-8%



Patents

Reaction control (US grant 11505481B2, EU & CA pending)

Nitrogen removal (US grant 11691901B2, EU, CA & IN pending)



Unique Selling Proposition

150,000 m³ / year

CHF 2.3M purchase price

+ CHF 200k / yr gas

+ CHF 500k / yr wastewater

– CHF 100k / yr consumption

= CHF 800k / yr total benefit

= 4 years breakeven

150,000 m³ / year

CHF 300k annual rent

+ CHF 200k / yr gas

+ CHF 500k / yr wastewater

– CHF 400k / yr rent & cons.

= CHF 300k / yr total benefit

= CHF 6M in 20 yrs lifetime

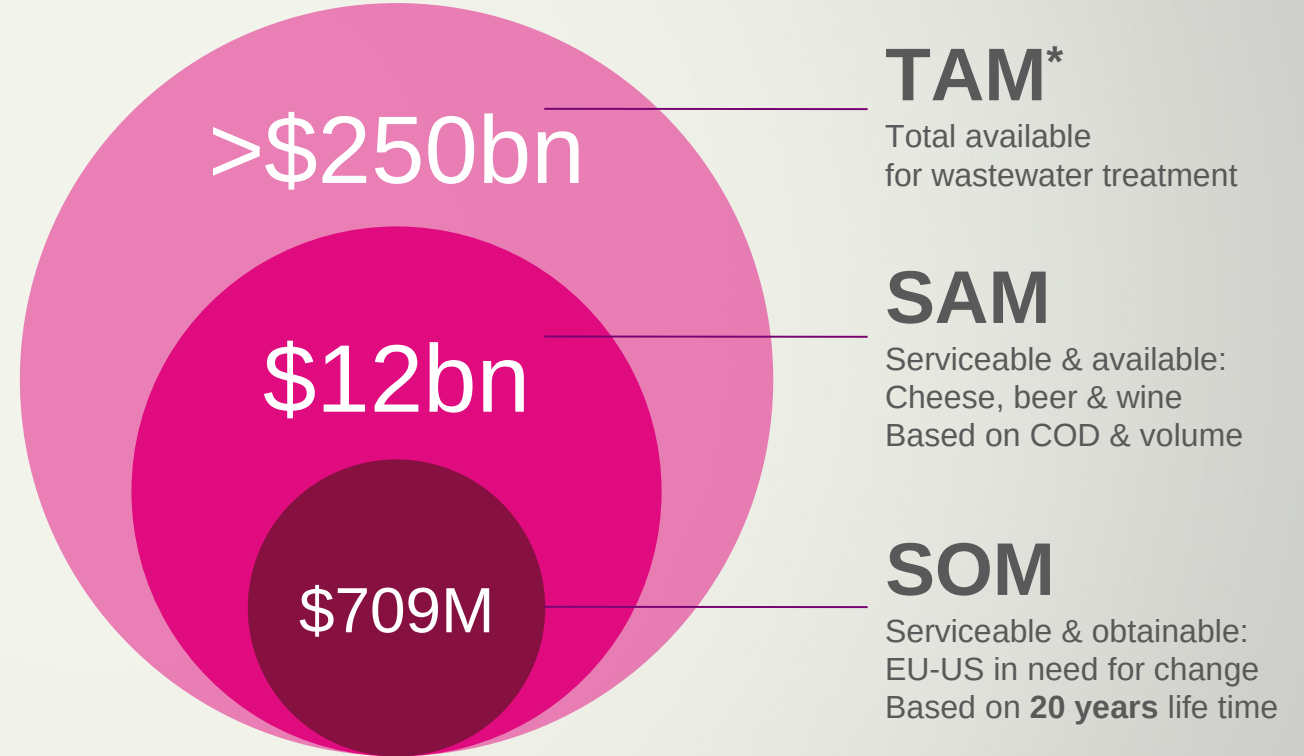
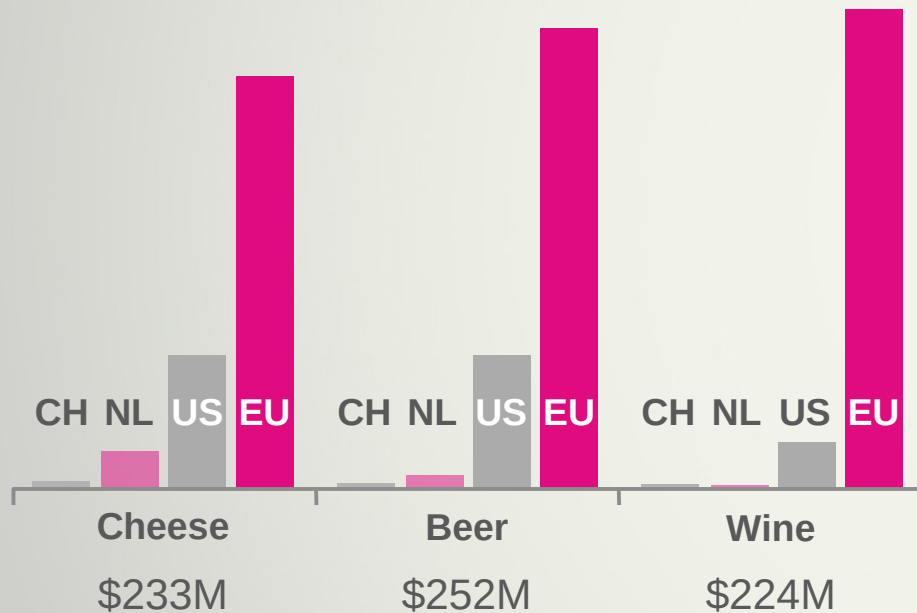
Customer benefits

Water treatment & biogas combined

- ✓ **20x smaller solution**
- ✓ Flexible & modular deployment
- ✓ Nitrogen removal included
- ✓ Efficient process control
- ✓ Electrode refurbishing service

- Customer persona now pays CHF 500k for wastewater treatment.
- CHF 1.2 to 3.8 / m³ (CHF 1.2 / m³ used) and CHF 0.38 / kWh
- The gas comes from wastewater organic matter.

Our Market



Serviceable and obtainable markets in Europe and the United States.

Hexem's Market



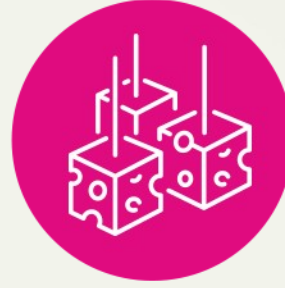
Food



Breweries



Wineries



Dairies



Chocolate



Olive mills



Biofuel



Pharma



Electronics



Paper mills



Cruise ships



Textile

Hexem's technology works best with high strength wastewater in the food and beverage industry.

Our Competition

	Hexem CH	Cambrian US	AquaCycle US	Wastewater Fuels UK	Paques NL	Trea-Tech CH	Bioelectric BE
Wastewater Treatment	Yes	Yes	Yes	Yes	Yes	Yes	—
Nitrogen Removal	Yes	—	—	—	—	—	—
System Rental	Yes	—	—	—	—	—	—
Cost	✓ ✓	✓ ✓	✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓ ✓
Space Reduction	>20x	>20x	—	Unknown	—	—	—
Efficiency	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓
Energy Output	Methane, Electricity	Electricity	Electricity	Hydrogen	Methane	Methane	Electricity
Market Experience	✓ ✓	✓ ✓	✓ ✓	✓	✓ ✓ ✓	✓	✓ ✓
Overall	Strong	Good	Good	Weak	Serious	Good	Good



Bioelectrical Systems

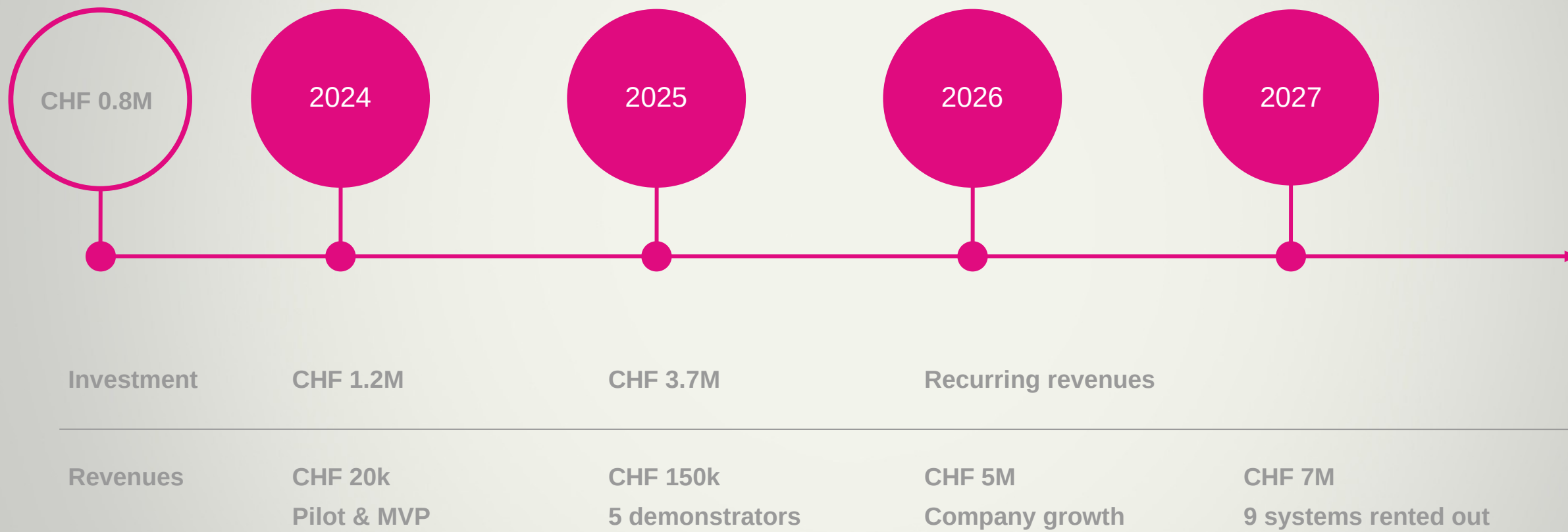
UASB[§]

Gasification

Classic AD

[§]Up-flow Anaerobic Sludge Blanket

Our Road Map

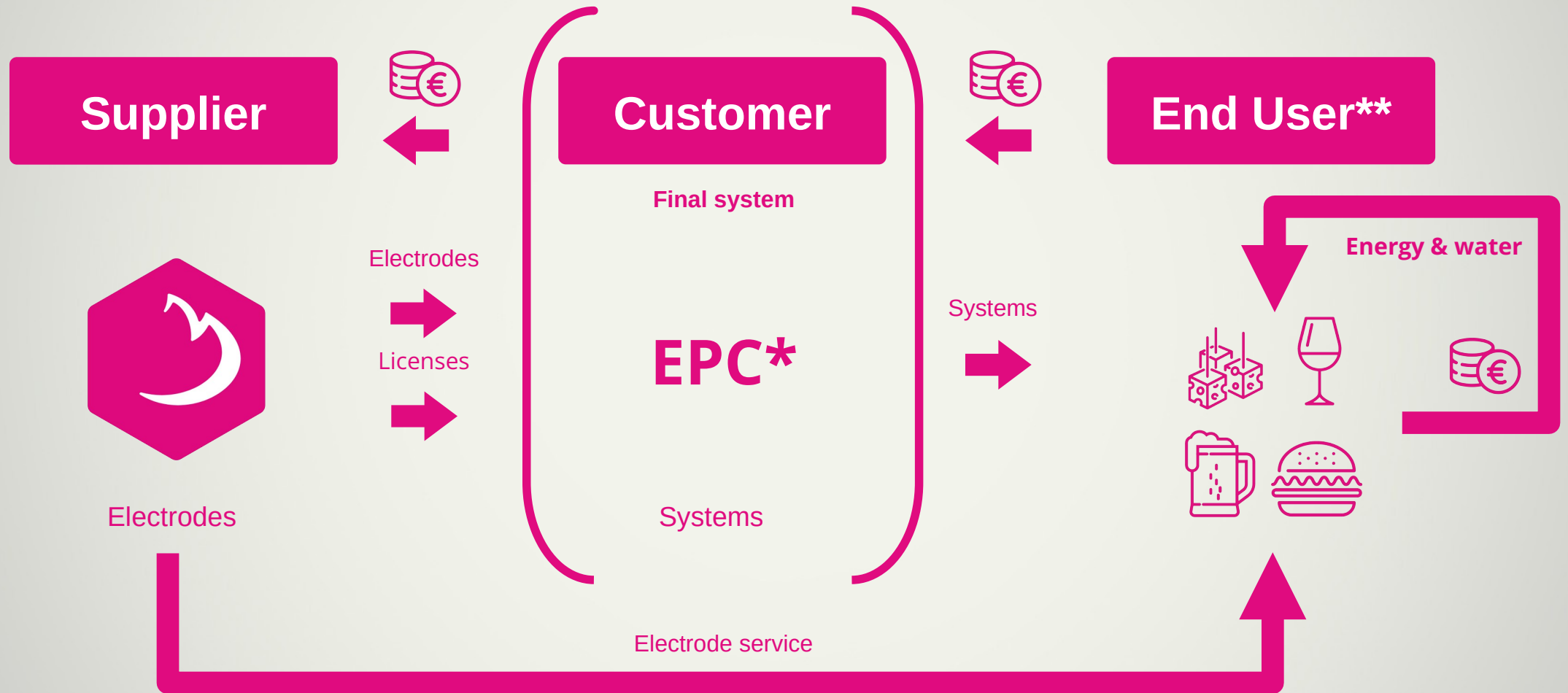


Projections

CHF 1,000	2024	2025	2026	2027	2028	2032
Revenue	18	150	4,000	6,900	15,000	201,000
New systems	1	4	6	9	12	32
Treated m³ x 1,000	2	80	300	700	1,200	7,300
CO ₂ tons saved	23	780	2,800	6,100	14,800	125,000
Employees	5	8	11	14	15	26
Investment	1,200	3,700	Exit			

Additional metrics are available on request.

Business Model



*Initially we will work with engineering procurement companies (EPC); **users always make a 20% downpayment

Hexem Team

Staff

Michael Siegert, CEO

- ✓ Serial entrepreneur
- ✓ University of Illinois & Penn State
- ✓ PhD in microbiology

Cédric Frantz

- ✓ Researcher at EPFL
- ✓ Experienced electrochemist
- ✓ PhD in material science

Romario Mabe

- ✓ Marketing intern
- ✓ Business developer
- ✓ MBA at Uni Lucerne

Advisors

Robert Jaworski, MBA

- ✓ CFO and COO of Datamotion
- ✓ Former CFO of Organica & PowerGenix
- ✓ PhD electrochemistry

Barbara Berson, MBA

- ✓ Director of UVOX
- ✓ Scaling & piloting experience
- ✓ 30+ years in the water sector

Prof. Jan van Herle, PhD

- ✓ Professor at EPFL
- ✓ Industrial scaling experience
- ✓ Electrochemistry expert

Hexem's Ask

CHF 1.2 million for our industrial demonstrators.





Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Innosuisse – Swiss Innovation Agency



Colleges and Institutes Canada
Collèges et instituts Canada



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Hexem's History



2015 – 2017 Cuasar.energy

- 2015 software development
- 2016 incorporation CAN
- 2017 working prototype
- **2017 patent #1 filed**
- 2017 company dissolved

• CIGCan grant:	\$18,000	
• NSERC grant:	\$19,000	
• Cuasar R&D:	\$81,000	
• Cuasar labor:	\$55,000	
• Cuasar SG&A:	\$45,000	
• Total:	\$218,000	+



2018 – now Frontis Energy

- 2018 next prototype
- 2018 patent #2 filed
- 2020 financing Hydrell pre-pilot
- 2022 patent #1 grant
- 2023 patent #2 allowable
- **2023 IP transfer to Hexem**

#1 WO2018193381A1

#2 WO2019079908A1

• Frontis IP:

\$81,000

• Frontis R&D:

\$9,000

• **Total:**

\$90,000

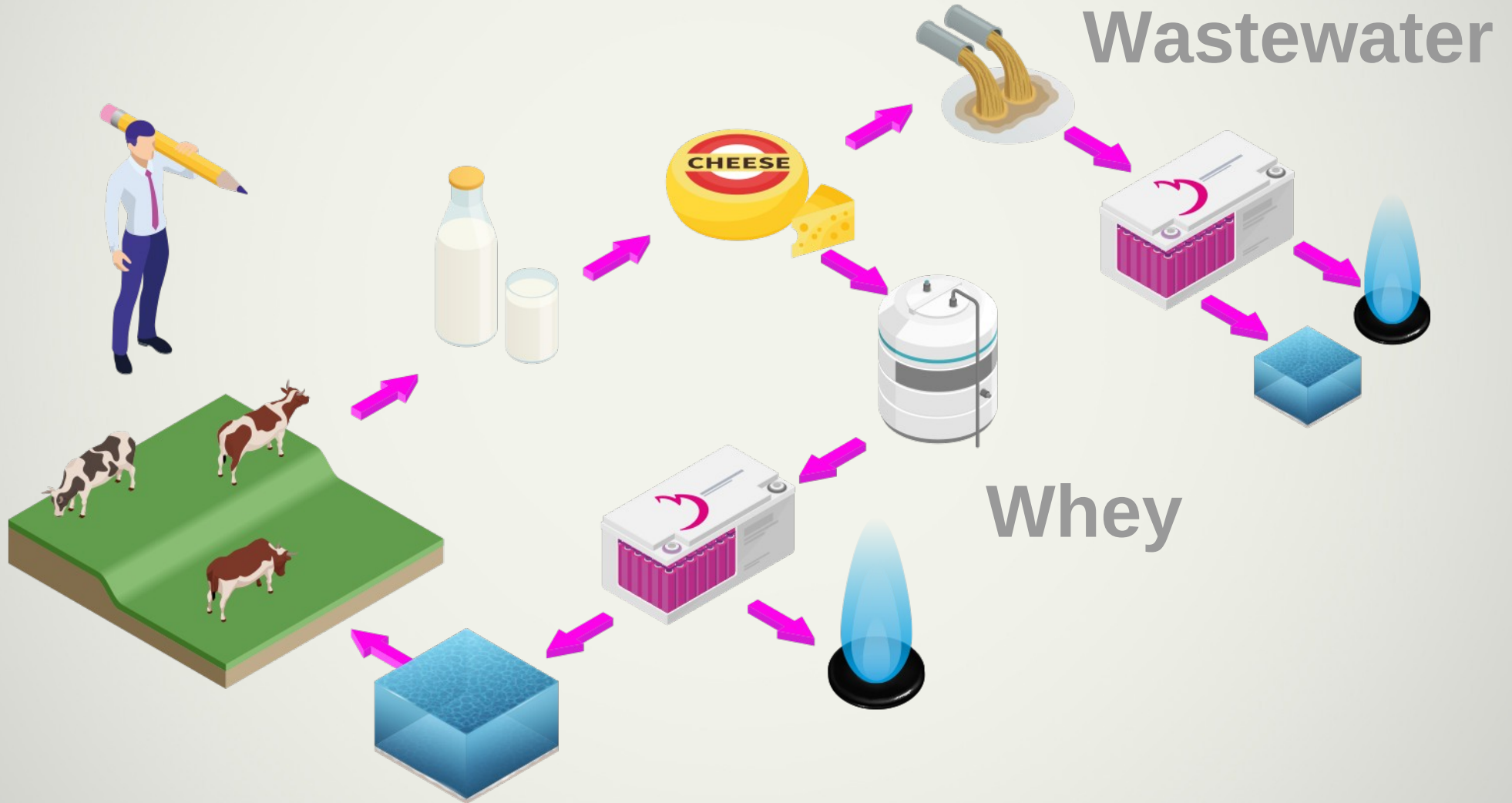


2020 – now Hexem SA

- 2021 SolarImpulse
- **2021 Holdigaz & EPFL (\$180,000)**
- 2022 Five Letters of Interest
- 2022 finished TRL5 prototype
- 2023 \$100k FIT loan
- 2023 MassChallenge finalist

• Innosuisse:	\$40,000	
• BlueArk:	\$86,000	
• Hexem R&D:	\$12,000	
• Hexem labor:	\$120,000	
• Hexem capital:	\$130,000	
• FIT capital:	\$100,000	
• Total:	\$488,000	→ \$796,000

Cheese Value Cycle



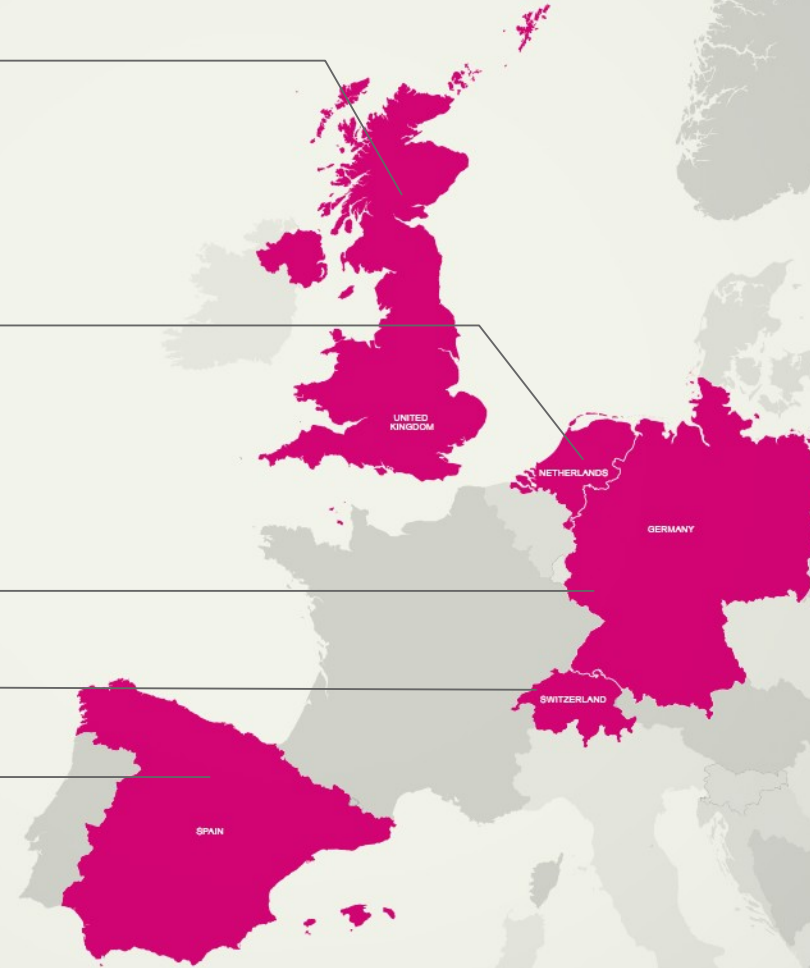
Cheese Maker Examples

Explanation	Dairy #1	Dairy #2	Dairy #3	Unit
Wastewater cost	2,700,000	15,000 (whey)	500,000	€/yr
Wastewater production	3,000	86 (whey)	400	m ³ /day
Chemical oxygen demand (COD)	24,000	6,900	2,800	kg/day
COD, ~80% removal efficiency	19,200	5,500	2,200	kg/day
Methane production potential (0.35 m ³ kg _{COD})	6,720	1,900	770	m ³ /day
Efficiency loss ~10%	6,050	1,700	690	m ³ /day
CO ₂ content 30%, methane 70%	4,240	1,200	480	m ³ /day
Potential gas production	1,550,000 (5%)	440,000 (30%)	175,000 (40%)	m ³ /yr
Caloric value (10 kWh/m ³)	15,500	4,400	1,750	MWh/yr
Monetary value (€ 2.5/m ³)	3,900,000	1,100,000	440,000	€/yr
Electric conversion (€ 380/MWh, 40% eff.)	2,400,000	700,000	270,000	€/yr

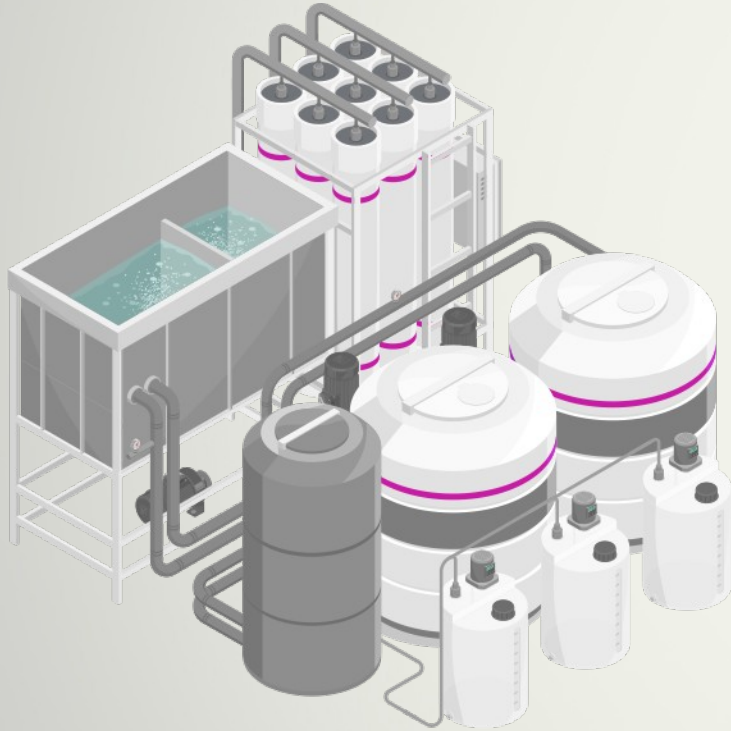
Data based on Dutch customer interviews.

Market Traction

- LOI, CHF 400
(Biofuel)
- 2x LOI ~CHF 0.5M
(EPC & biofuel, dairy)
- LOI ~CHF 0.7M
(EPC)
- LOI ~CHF 0.6M
(Utility)
- LOI pending
(Utility)



Our Technology



Biogas from wastewater

- ✓ Makes methane from wastewater.
- ✓ Wastewater is cleaned.
- ✓ Science based: $\Delta G = -nFE$ (thermodynamics)