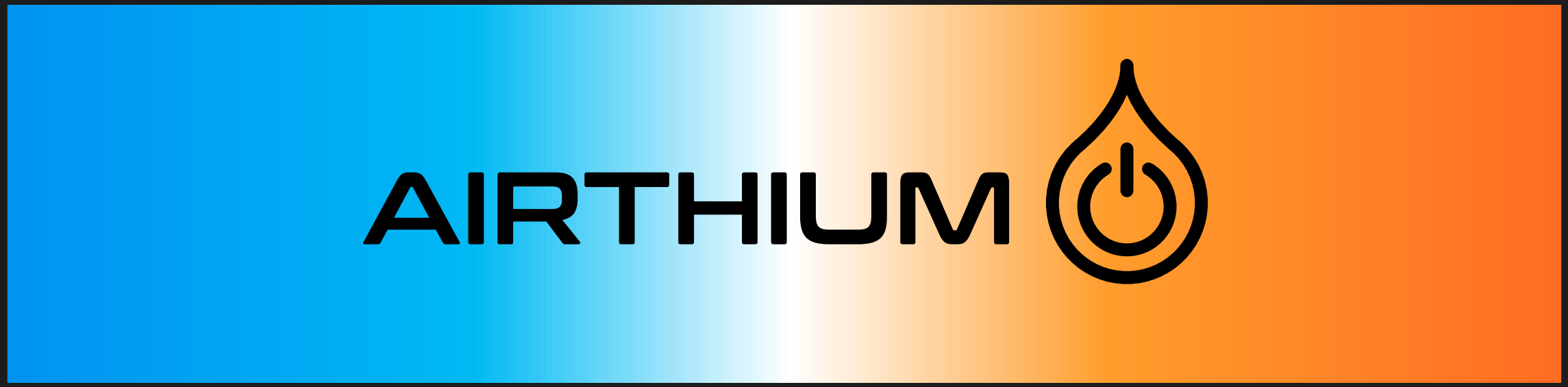

AIRTHIUM

AIRTHIUM

Decarbonizing industrial heat cost-effectively

Who needs industrial heat?

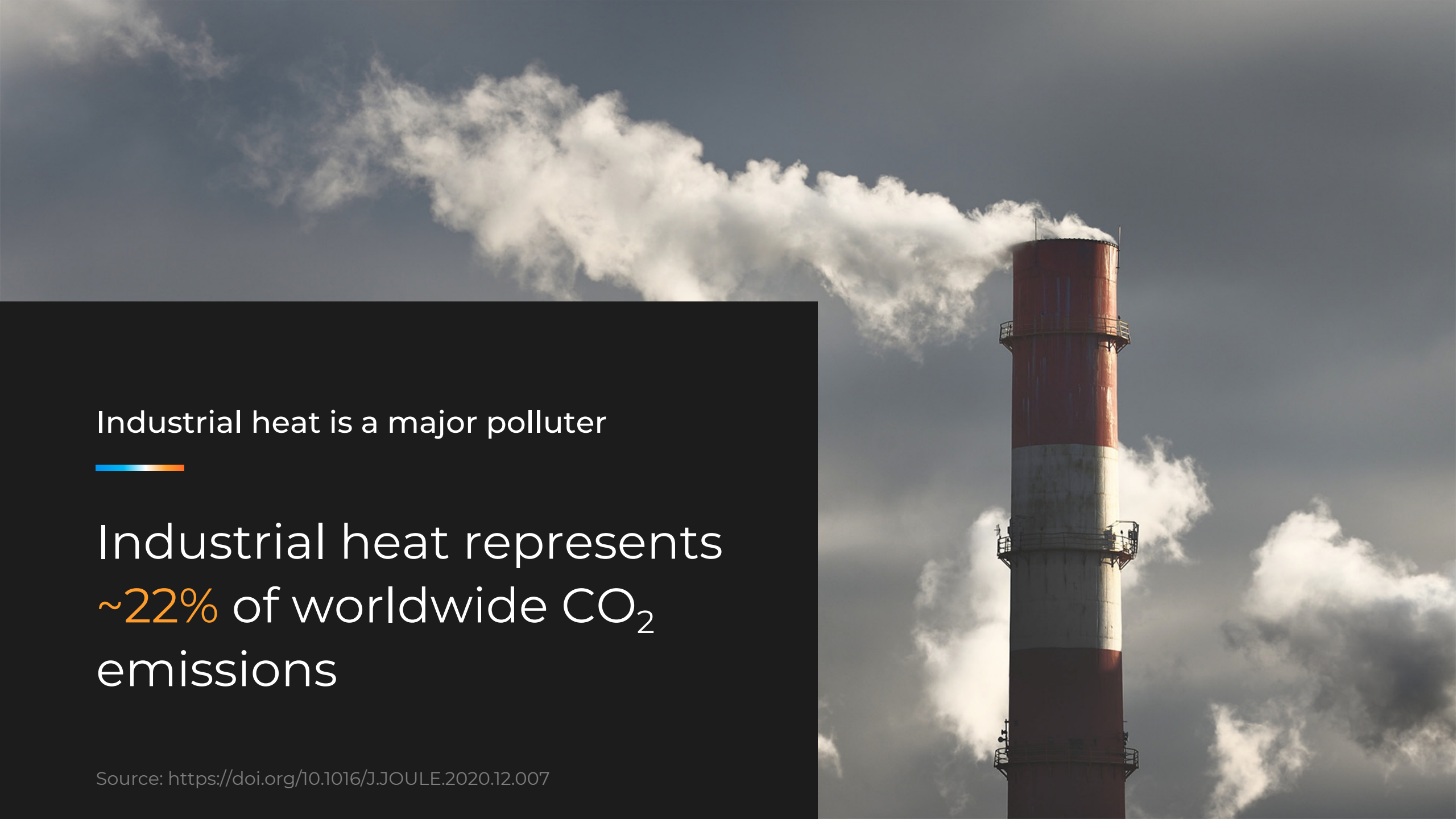
Steam

- ↳ Chemicals
- ↳ Paper
- ↳ Mining

Drying

- ↳ Food
- ↳ Minerals
- ↳ Chemicals

Cement, Metals, Glass



Industrial heat is a major polluter

Industrial heat represents ~22% of worldwide CO_2 emissions

Source: https://doi.org/10.1016/J.JOULE.2020.12.007

Today, decarbonizing industrial heat is expensive

Heat cost →

Heat pumps can provide cheap, carbon-free heat

But existing heat pumps have limitations

	Existing high temperature heat pumps
Max Temperature	160°C
Max lift	80°C
OPEX	$$$

Airthium opens up the TAM with 5x higher temperature lift support

	Existing HT Heat Pumps	Airthium HT Heat Pump
Max Temperature	160°C	550°C
Max lift	80°C	500°C
OPEX	$$$	$
TAM*	$17B	$30B

* Our 160-550°C segment is 17% of the worldwide industrial heat market

Source: https://www.iea.org/data-and-statistics/charts/industrial-heat-demand-by-temperature-range-2018

AIRTHIUM
Industrial heat

Our technology

01. **Stirling engine (fluid = helium)**

↳ T = **100-550°C**, Load following, batch processes

02. **Fast near-isothermal compression**

↳ COP up to 3.5

↳ Up to **86% of Carnot efficiency**

03. **No sliding/rotating seals**

↳ 5x less maintenance

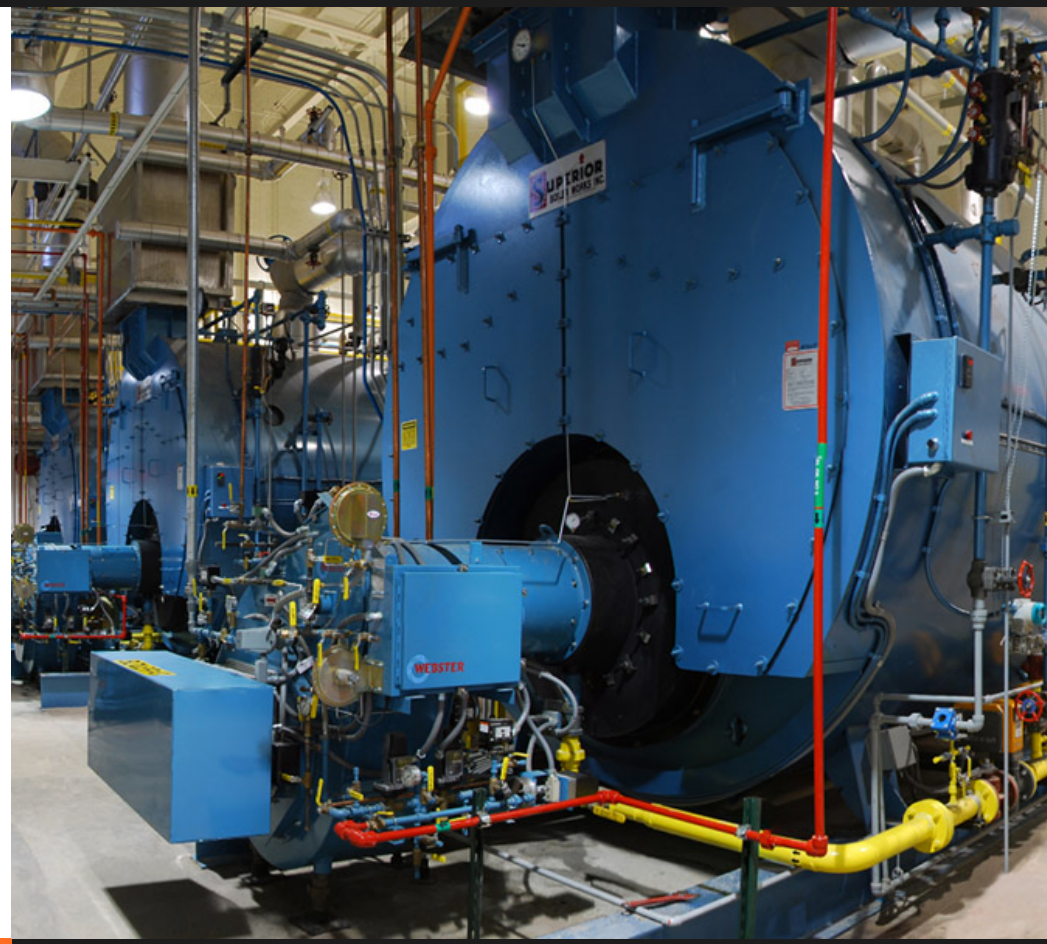
Case study 1:
Airthium's Heat Pump vs Electric Boiler

Heat source
= Waste heat at ~60°C

Heat supply
= Steam at 180°C

COP up to 2.3
= 2.3x more efficient

Up to 57%
electricity saving
vs resistive boiler



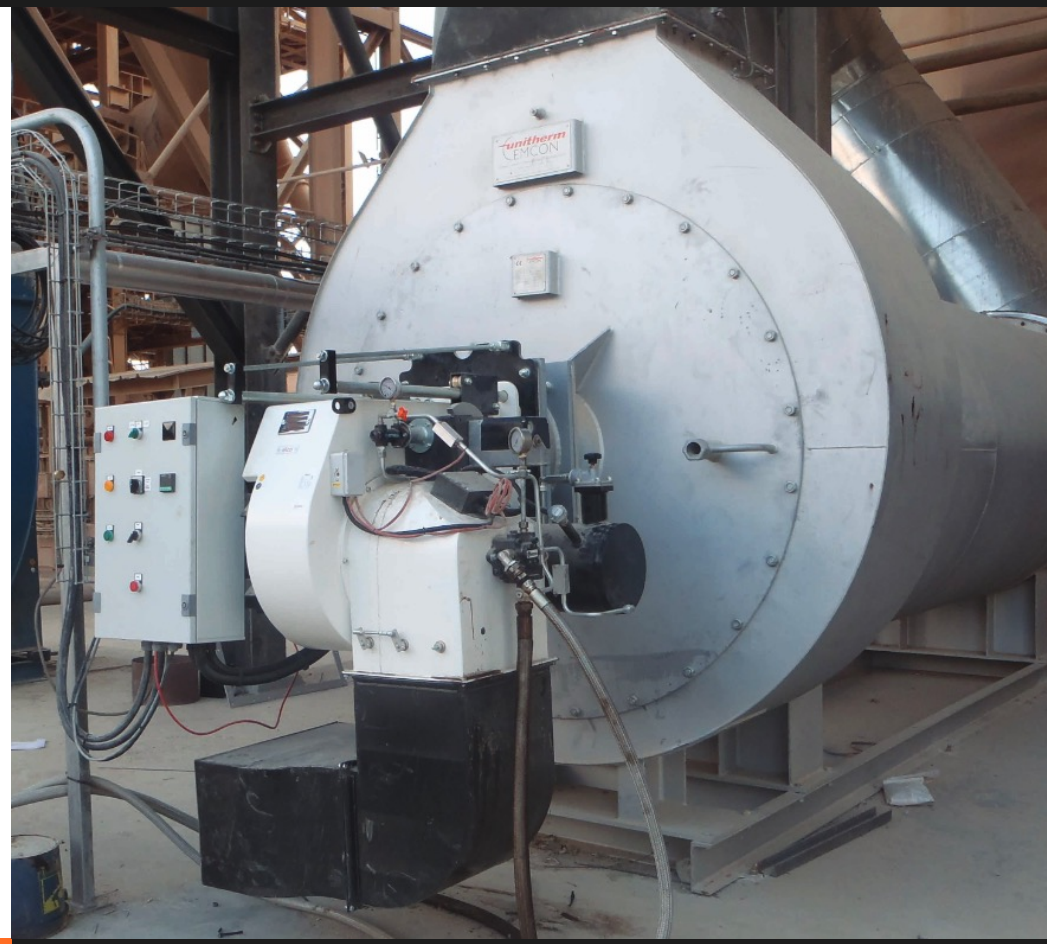
Case study 2:
Airthium's Heat Pump vs Electric Hot Air Generator

Heat source
= Waste heat at ~60°C

Heat supply
= air at 200°C

COP up to 2.1
= 2.1x more efficient

Up to 53%
electricity saving
vs resistive HAG



Competition

Technology	Rankine HTHP	Stirling	Mechanical Vapor Recompression	Solar Thermal	Biofuels	AIRTHIUM
Max temp (°C)	160	180	275	400	500	550
Reliability	$$$	$$$	$	$	$	$
Efficiency	++	+	++++	+++	+++	+++
Lift (°C)	80	150	30	400	500	500
Cost	$$	$$$	$	$$$	$$$	$
TRL	9	7	9	9	9	4

Go to Market Strategy

Airthium

Designs & manufactures the engines at scale

→

Integrators & EPCs

Integrate and sell our engines into complete solutions

→

Service partners

Provide maintenance in each market

→

Airthium

Provides control software & collects customer data and usage patterns

The Airthium team

12 Team members | 4 Advisors

Andrei KLOCHKO
CEO/CSO, Co-founder

Ph. D. plasma physics, Ecole Polytechnique

Franck LAHAYE
COO, Co-founder

Ex-Sales Director EMEA, Intelsat. Entrepreneur

Gaetan LERISSON
CTO

Ph.D., Post-doc fluid mechanics, EPFL

+9 employees

4 Engineers | **1** Scientist
3 Sim. Eng. | **1** admin

6 PhDs in the team

Jonathan HOWES
Technical Advisor

Former CTO
Isentropic Ltd. (2004-2016)

Jerome PECRESSE
Business Advisor

CEO
GE Renewable Energy

Philippe KAVAFYAN
Business Advisor

CEO
Aker Offshore Wind

Alex RAGUET
Finance Advisor

President
French Tech Austin

AIRTHIUM
Industrial heat

Our history

2016

Founded

ZODIAC AEROSPACE

INNOVATION 2030
CONCOURS MONDIAL D'INNOVATION

ArcelorMittal

ÉCOLE POLYTECHNIQUE

2017

Y Combinator
Pre-seed round

2019

Hosted by
Air Liquide

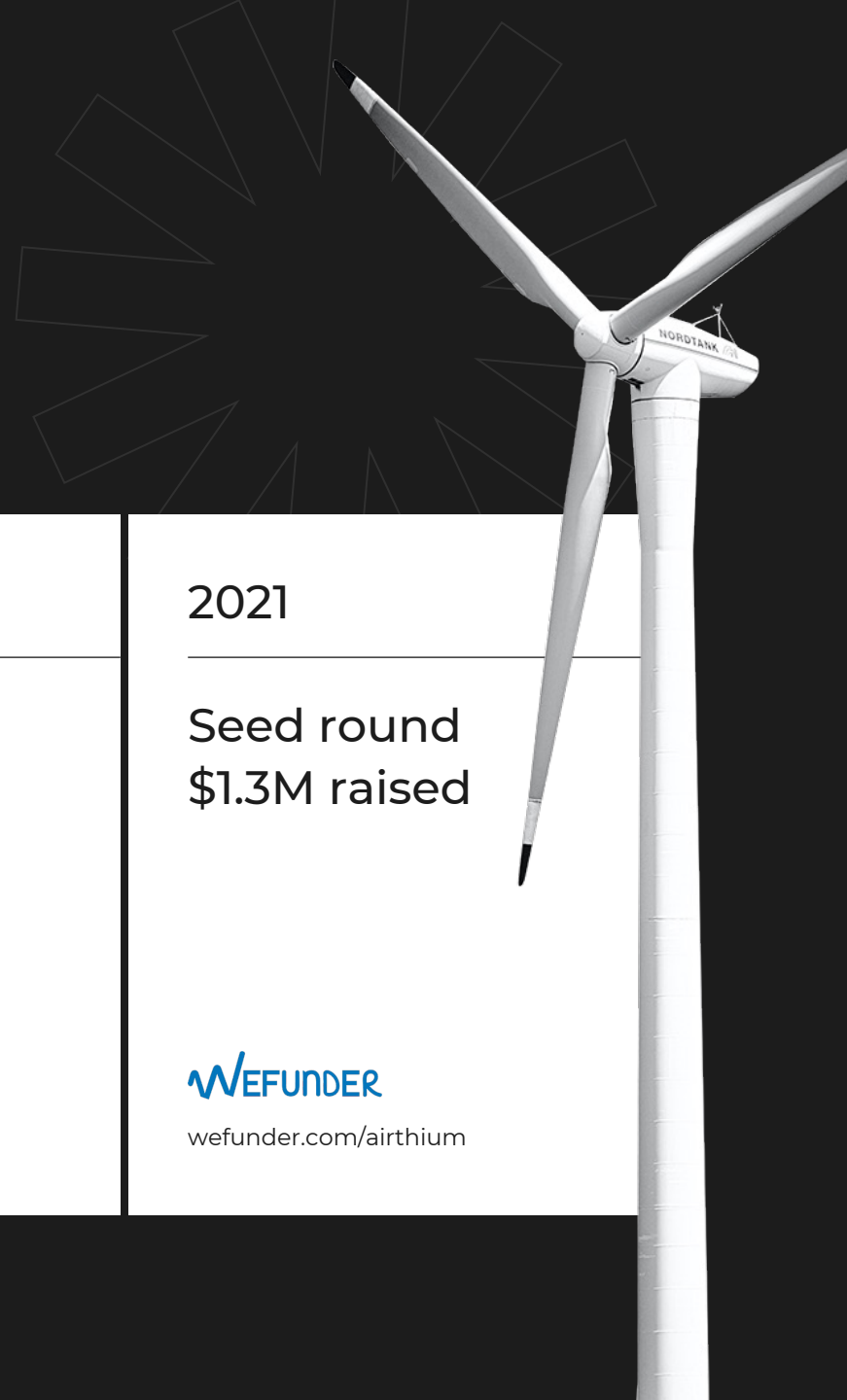
Air Liquide

2021

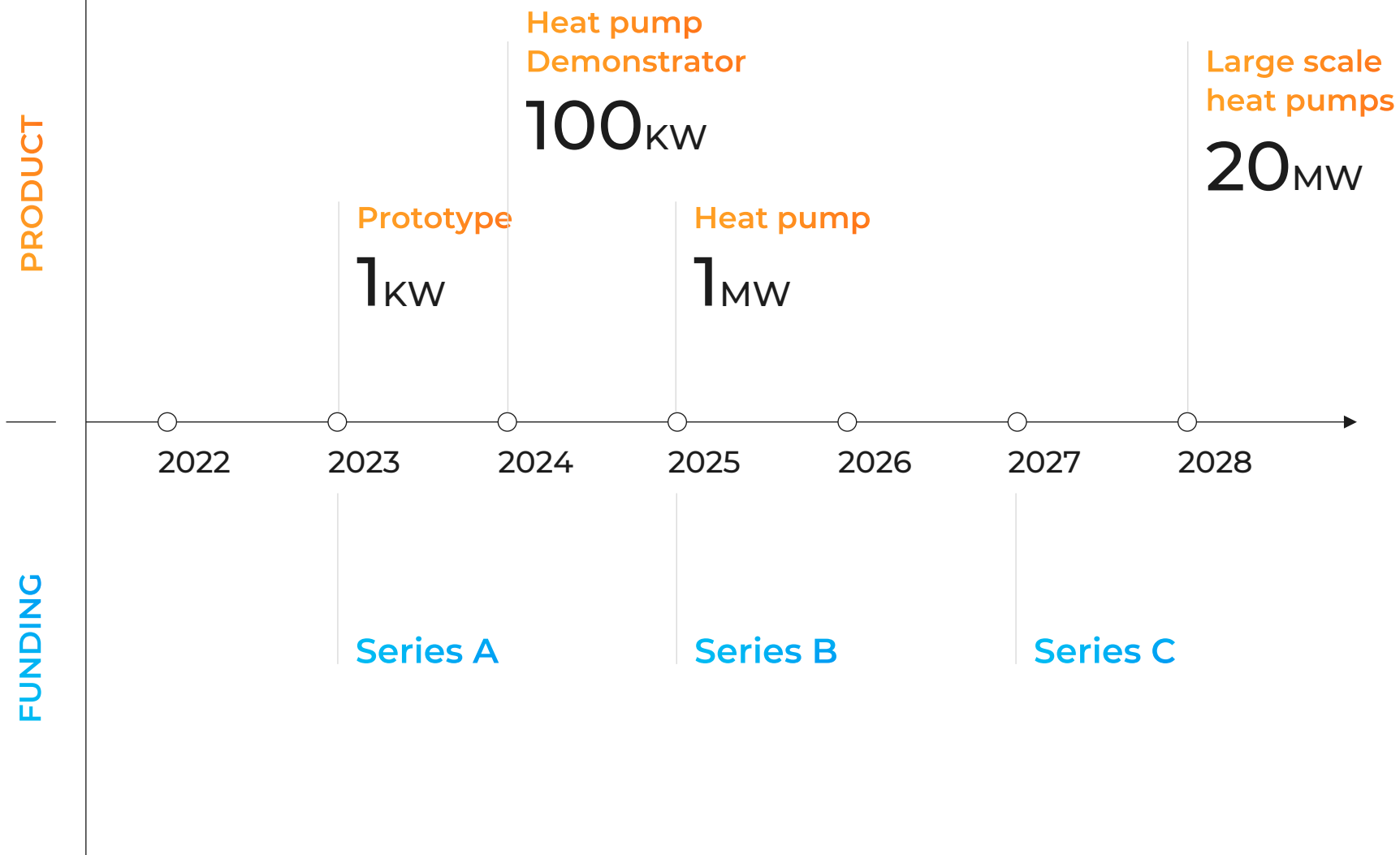
Seed round
$1.3M raised

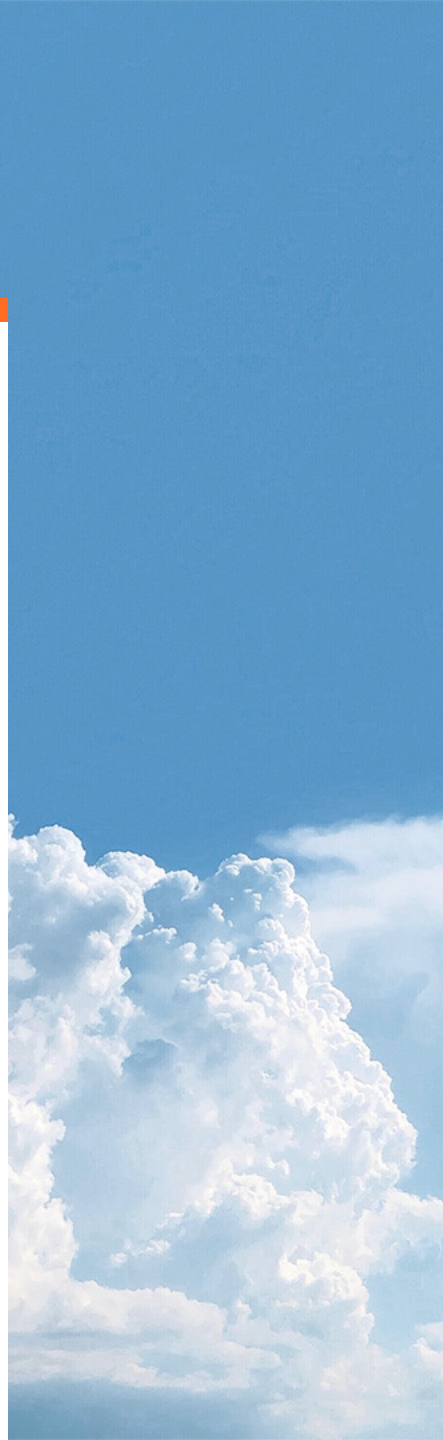
WEFUNDER

wefunder.com/airthium

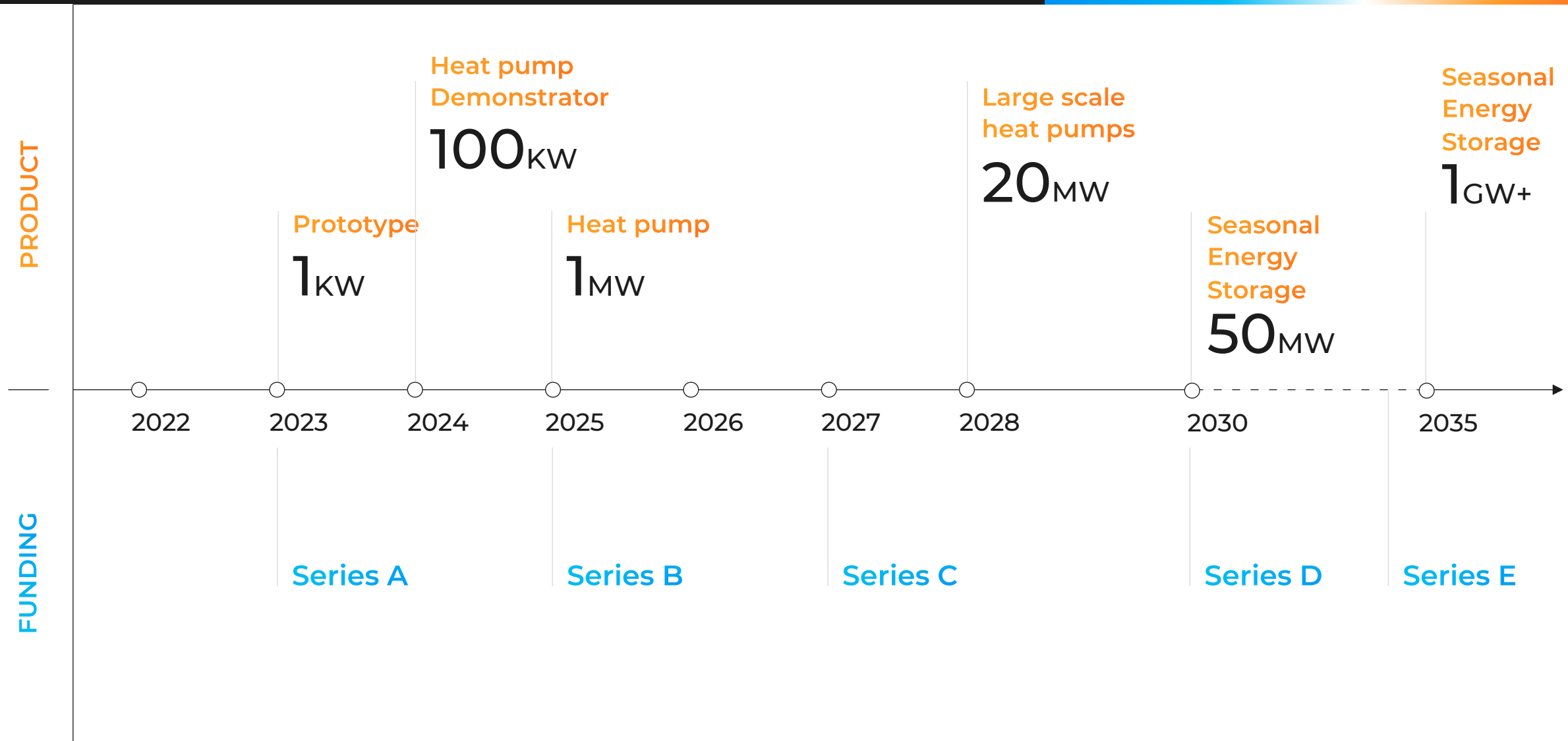


Our vision


PRODUCT
Heat pump
Demonstrator
100KW
Large scale
heat pumps
20MW
Prototype
1KW
Heat pump
1MW
2022
2023
2024
2025
2026
2027
2028
FUNDING
Series A
Series B
Series C



Our vision


PRODUCT
Prototype
1KW
Heat pump
Demonstrator
100KW
Heat pump
1MW
Large scale
heat pumps
20MW
Seasonal
Energy
Storage
50MW
Seasonal
Energy
Storage
1GW+
2022
2023
2024
2025
2026
2027
2028
2030
2035
FUNDING
Series A
Series B
Series C
Series D
Series E

Stirling engine for Seasonal electricity storage

01. **Same Engine**

↳ Our Stirling engine will be scaled up

---

02. **Thousands of hours of storage, anywhere**

↳ Using green ammonia and thermal storage

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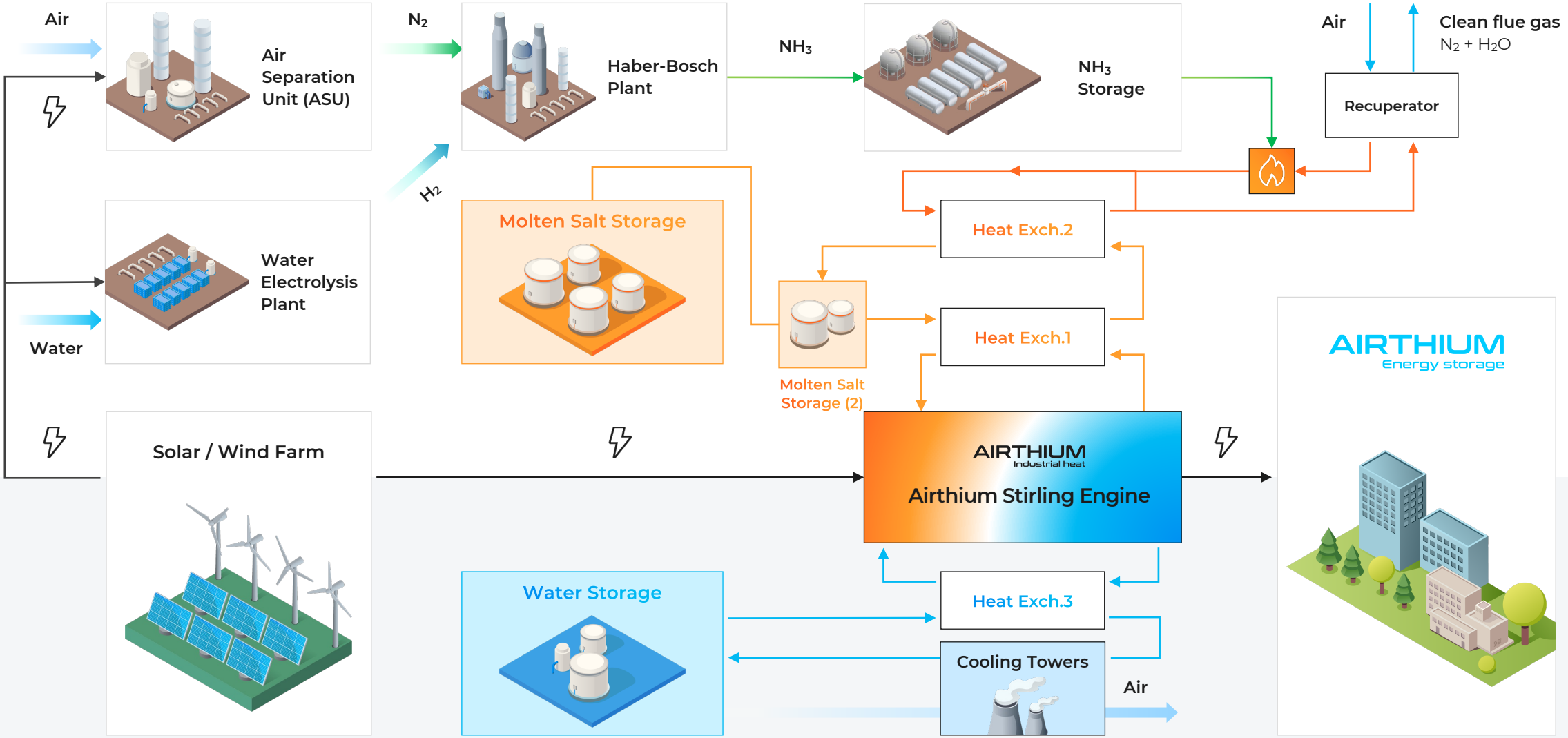
03. **100x cheaper than lithium-ion**

↳ $2/kWh capital cost

Stirling engine for Seasonal electricity storage



AIRTHIUM
Industrial heat

Decarbonizing industrial heat production cost-effectively

Heat pumps supplying **100°C to 550°C**, unlocking a **$13B/year** market for the first time

Invest now on wefunder.com/airthium