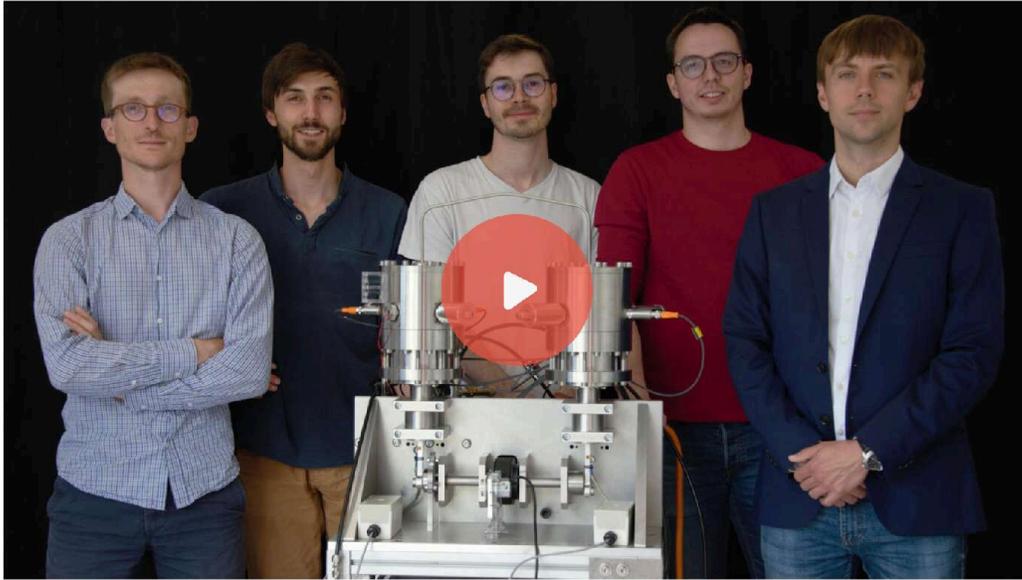


A Breakthrough Engine to Outsmart Fossil Fuels

[PITCH VIDEO](#) [INVESTOR PANEL](#)



airthium.com Austin TX

[Hardware](#) [Infrastructure](#) [Technology](#) [Hard Tech](#) [Moonshots](#)

Highlights

- 1 🌍 Cutting 30% of the world's CO2 emissions by mastering efficient heat \leftrightarrow electricity conversion
- 2 🏆 Led by Y Combinator alumni and 6 PhDs; advised by the CEO of GE Renewable Energy
- 3 🏆 Award-winning clean energy engine delivering record efficiency, low costs & zero carbon emissions
- 4 🔥 Innovative industrial heat pump that eliminates the need for fossil fuels in factory processes
- 4 🔥 Innovative industrial heat pump that eliminates the need for fossil fuels in factory processes
- 5 📊 Unprecedented seasonal battery powering the grid and lasting 100x longer than alternatives
- 6 ⚡ Positioned to revolutionize the \$56B/yr industrial heat market & \$125B/yr seasonal storage market

Our Team



Andrei Klochko Co-Founder, CEO, and CSO



2017 Y Combinator alum. PhD in Plasma Physics from Ecole Polytechnique. Inventor of the core technology that drives the Airthium heat engine.

We can only impact climate change if we make solar and wind better than fossil fuels in *every* way. The lack of cheap seasonal energy storage, and low-cost green heat, are the last barriers holding renewables back from engulfing the world and stopping CO2 emissions. By unlocking renewables, we are tapping a \$125B/year business opportunity.



Franck Lahaye Co-Founder and COO

2017 Y Combinator alum and seasoned entrepreneur. Former EMEA Sales Director at Intelsat, one of the world's largest telecommunications satellite operators. Ran a satellite capacity brokerage company for several years.



Gaetan Lerisson CTO

Former researcher at Swiss Federal Institute of Technology Lausanne. PhD in fluid mechanics from Ecole Polytechnique. Masters in Mechanical Engineering from Ecole Nationale Supérieure de Paris-Saclay.



Houssam Houssein Multiphysics Simulation Engineer

PhD in applied mathematics from Sorbonne Université. Former engineer at STRUSIM. Civil engineering and pure mathematics M2 master degrees from Ecole Centrale Paris and Université Paris-Diderot.

Why Airthium?

Airthium is building a heat engine that can dramatically — and cost-effectively — cut CO2 emissions and pollution. With our engine, industries of all kinds, as well as the electrical grid, will finally operate sustainably. Our award-winning technology has the potential to eliminate 30% of the world's CO2 emissions.

The fossil fuel crisis is worse than ever

The world is in crisis. We're using more and more energy every year, and contributing to life-threatening pollution in the process. Industrial users are the biggest polluters. Everyday factory operations require electricity and heat. Even factories that produce solar panels, wind turbines, and batteries require massive amounts of power and heat to operate.

The problem: today, electricity and heat primarily come from fossil fuels, including coal, natural gas, and oil. It is simply cheaper to pollute, because there is no technology that can make green heat and electricity cheaper at scale.

Airthium is an energy solution that can scale

Airthium's solution: a novel heat engine. Developed by a Y-Combinator-backed team counting 6 PhDs, Airthium's first-of-its-kind Stirling engine delivers cost-efficient clean heat and electricity that can power industrial facilities and, ultimately, the electrical grid.

Airthium's breakthrough makes clean heat a reality

Our engine converts electricity to heat, and heat to electricity. It does so with record efficiency, low cost, very low maintenance and zero carbon emissions. This is a total game changer.



We currently have a room temperature prototype, and are building the first 550°C (1022 °F) prototype for 2023

Our beachhead market: clean industrial heat at scale

Our first application is industrial heat. Industrial users need an engine that can produce high temperatures — hot enough to produce steam or to dry materials. However, today's technology requires them to burn natural gas or coal, or to run large amounts of electricity through a resistor — electricity which, in today's grid, is typically also made from natural gas. None of these processes are environmentally friendly or sustainable.

Enter Airthium's revolutionary heat pump, a reverse heat engine that can produce temperatures far higher than any comparable technology on the market today—without relying on fossil fuels. **Our heat pump can generate 3 times as much heat as a resistor, using the same amount of electricity.** This is how we make 100% green heat, derived from green electricity, that cheaper than fossil heat. Our engine has the potential to slash CO2 emissions in the industrial sector, a necessary step to be able to save our planet.

We're currently conducting feasibility studies with several industrial prospects and partners so that we can adapt our technology to their needs. This will allow us to establish a cost-effective and scalable value chain.

Once our heat engine gains market traction, our unit costs will fall. In turn, this will allow us to deploy a new kind of industrial-scale, ultra-long-duration battery based on heat, and powered by the same engine.

We believe this battery can end our reliance on fossil fuels for backup power altogether.

Our endgame market: seasonal electricity storage to replace fossil fuels as backup power — worldwide

What is seasonal electricity storage, and why is it important?

Today, the U.S. can power most of its electrical grid for about four months with strategic natural gas reserves. Until batteries can achieve this kind of storage duration, clean energy sources will never replace power plants that are fueled by natural gas.

Even if we increase our reliance on solar and wind energy, power plants that use fossil fuels will remain operational to provide backup power. The costs of keeping these power plants open will be passed on to customers, making electricity expensive. This will further hinder the adoption of green electricity.

Airthium's electricity storage, designed to work with any combination of solar and wind, provides 100% renewable energy, guaranteed available all year long and in every part of the world. With this system, backup power derived from coal, gas, or even nuclear power will become obsolete, allowing humanity to decommission fossil plants without the risk of blackouts.



The core of our battery: a large scale liquid ammonia tank. Credit: TIW Steel Platework Inc.

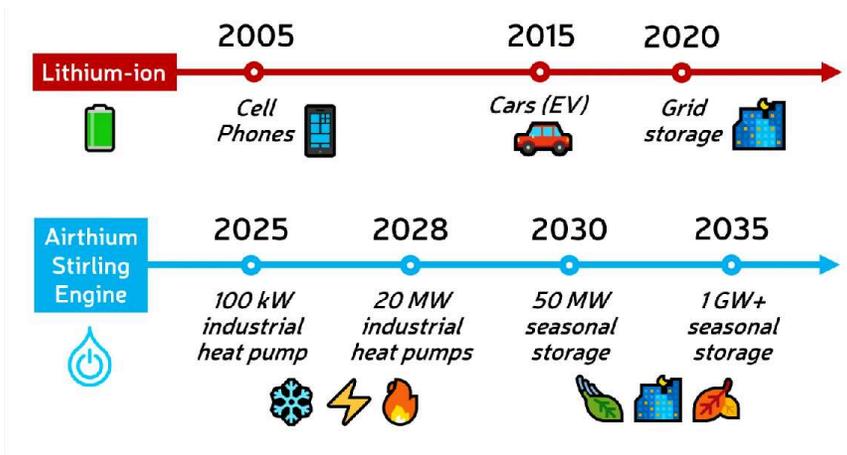
Airthium has a clear path to commercialization

It turns out that both our seasonal battery, and our industrial heat pumps, both rely on the same breakthrough, proprietary heat engine at their core.

This is why, first, we plan to sell our heat engine to OEMs who will use it as a heat pump, to build cost-effective electric boilers, dryers and ovens to replace their gas-fired equivalents. Then, once our unit costs are lower and our reliability is proven, we will sell the same engines to project developers who will use them to power seasonal energy storage systems based on heat and synthetic ammonia combustion.

Lithium-ion batteries followed a similar path to profitability and scale: they first powered cell phones, then cars, and only then, the electrical grid. Many emerging energy storage solutions failed because they did not have such a step-by-step path to large scale commercialization. But we do.

Beachhead market = High-temp. Heat Pumps



We plan to first sell our Stirling as a high temperature heat pump for the industry, then industrialize and reduce costs, then sell it as seasonal storage. Lithium-ion did the same in its time to industrialize profitably. The above dates and milestones for Airthium are forward looking projections and cannot be guaranteed.

This is the solution to the climate crisis we've been waiting for

With these ubiquitous applications of heat pumps and energy storage, we can make industrial heat and electricity 100% clean—all with a single proprietary heat engine. Combined, these opportunities can eliminate 30% of worldwide CO2 emissions—enough to change the fate of the planet.

We're a winning team of scientists and entrepreneurs

Making this vision a reality will require a great deal of brain power and support from established industry players and institutions. And that's exactly what we have. Our all-star team includes 6 PhDs in physics, applied mathematics, and thermodynamics. Alongside our world-class advisors, we have what it takes to create breakthrough innovations and bring them to market.



The Airthium Team in our French facility, except Franck (US) and Charles (Belgium)

We're already seeing success

Our engine has been 5 years in the making, has already won several awards, and

is ready to be patented.

Since we went through Y Combinator in 2017, it took us several attempts to find a theoretical path beyond the 62% Carnot efficiency (state of the art) toward 86%, all the while reducing costs by up to 3x. No one has done it in 200 years, and we're well on our way to make 86% a reality!

We currently have a room temperature prototype. Now, we're building the first 550°C (1022 °F) prototype, set to be completed in 2023.

Our work has won several national awards, including the Prix G rondeau by Zodiac Aerospace, Prix des innovateurs by ArcelorMittal, and the Concours Mondial de l'Innovation. We're now raising capital to bring our heat engine to market and to close deals with leading industrial companies.

A tremendous global market awaits

By capitalizing on the \$56B global heat pump market in the near term, we can deploy our engine in the field and accumulate millions of operating hours. This will lower our unit costs, thereby allowing us to build the capabilities and scale needed to deliver seasonal energy storage batteries for the grid—a \$125B market on its own.

As an Airthium investor, you're backing technology that actually has what it takes to curb climate change. Our engine makes renewable energy better than fossil fuels in every way. Renewable energy was already cleaner—and now it will also be cheaper, more dependable, and just as flexible and universal.



What if solar and wind farms provided all of our electricity?

Don't let future generations suffer when we can act today

We can tackle climate change now by making fully renewable power cheaper at scale through engineering innovation and business strategy. The planet simply can't afford to wait.

Invest now, and join us in outsmarting fossil fuels and accelerating the mass

adoption of clean energy!