SIRONA TECHNOLOGIES

# Sirona Technologies

The case for Direct Air Capture is clear:
the world needs permanent, verifiable, and scalable carbon dioxide removal,
and this is our master plan to deliver it.

# About Sirona Technologies

Sirona Technologies builds, deploys, and operates **Direct Air Capture (DAC)** machines that remove $CO_2$ directly from the atmosphere.

Sirona Technologies' edge to DAC is to manufacture modular, plug and play machines. These unique DAC machines are then rapidly deployed globally in project sites where the $CO_2$ can be permanently stored in geological formations.

Through this process, Sirona delivers **high-quality, durable carbon removal credits** to the market.

| Founded in | Pilot operational after | Design-to-deployment cycle | Enables durable $CO_2$ removal for |
|---|---|---|---|
| 2023 | 19 months | 6 months | 10 000+ years |

**Key facts about Sirona Technologies**

- Fastest DAC company to deploy globally
- Developing projects in Kenya, UAE and Norway
- Certified by Isometric

## What is Direct Air Capture ?

**Direct Air Carbon (DAC)** is a technology that **removes CO2 directly from the atmosphere and permanently stores it underground** in geological formations.

The permanent removal of $CO_2$ is **verified and certified by a third party**. They validate that the $CO_2$ has effectively been removed, and that **more CO2 has been removed than emitted** during the process (using lifecycle analysis).

It's the most robust contribution to science-based net zero climate strategies.

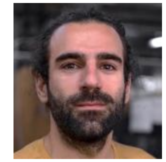
**Co-founder & CEO**

### Thoralf Gutierrez

TESLA

Worked for 5y at Tesla HQ. Built Safety Score, reporting progress directly to the CEO. Lead the team with hardcore engineering culture.

**Co-founder & CTO**



### Gauthier Limpens

EPFL

PhD in Thermodynamics with hands on experience, in the field. Leads the machine team to think from first principles and deliver effective solutions in record time.

**Lean team**

16 engineers out of 24 total

MIT · University of Oxford · aerospacelab · CERN · École Polytechnique · KTH

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# Our projects

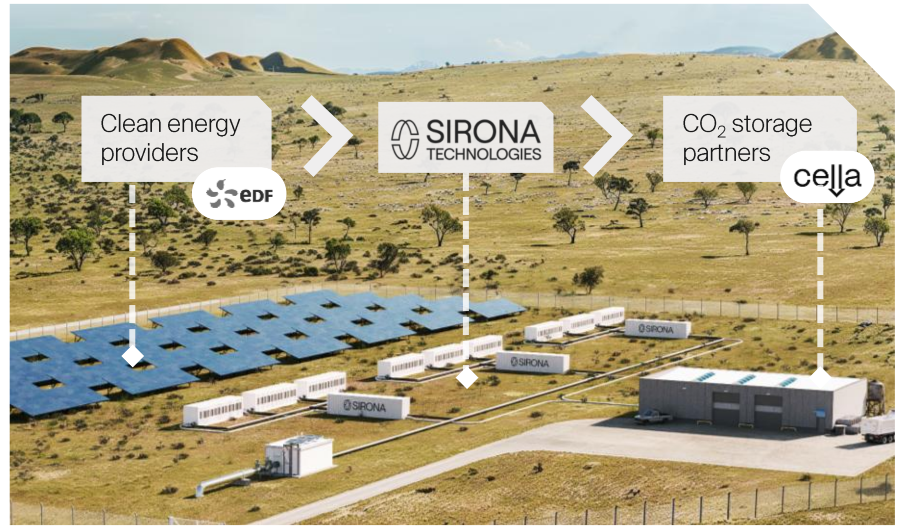
## Project Moringa: Leading the race to scalable carbon removal


| | | | |
|---|---|---|---|
| Certified by | ISOMETRIC Protocol v1.1 | Capture location | Oman |
| Co-benefits | | Storage location | Fujairah, UAE |

### Speed of execution

| February | April | October | June |
|---|---|---|---|
| First discussions | Test plant | Commercial tests | Commercial operations |

## Project Jacaranda: Sirona's route to DACCS at scale




| | | | |
|---|---|---|---|
| Certified by | ISOMETRIC Protocol v1.1 | Location | Great Rift Valley, Kenya |
| Co-benefits | | 100% powered by renewable energy | |

### Speed of scaling

| 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|
| 600 | 5,000 | 15,000 | 50,000 | 100,000 |

*Project capacity will incrementally scale over time thanks to modular approach (kt of CO2 captured/year).*

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• The Master Plan

# Introduction

To reach net-zero, we'll need to remove billions of tons of $CO_2$ from the atmosphere every year. Even if we reduce emissions as fast as possible, that level of removal is unavoidable to compensate residual and historical emissions. **We believe Direct Air Capture will play a crucial role in getting us there.**

Delivering that climate impact will require systems that are durable, verifiable, and scalable. Systems that can operate anywhere. Systems that can move rapidly down the cost curve. Systems that can go where clean energy is abundant.

You can read more about our reasoning on:

## Below is our master plan

How we're becoming the fastest company in the world to reach low-cost, large-scale Direct Air Capture.

We started executing on this plan in 2023: since then, we've deployed a pilot plant, we are now building commercial plants in multiple countries, and will deliver our first carbon removal credits in the coming months.

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# Mission-driven and hardcore engineering team

Scaling Direct Air Capture to gigaton scale won't happen by accident. It requires deliberate engineering, rapid iteration, and a team built for speed.

That's what we've been focused on from day one.

First, we are building a team that is **mission-driven**. We want people who are here to fight for the mission. When that's true, it removes ego from the equation and enables better decisions, always guided by what's best for the mission.

Second, we are building a **lean team** of **exceptional engineers**. You can do far more, far faster, with a small team of outstanding people. That's critical, given the urgency baked into climate change. We think of the team like a professional sports team, where everyone pushes themselves and each other to perform at the highest level. Engineers think from first principles, challenge each other, and take extreme ownership. We trust their judgment over rigid processes that slow them down.

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# Solid sorbents have the clearest path to rapid cost decrease

The key to unlocking Direct Air Capture is cost. Most systems today cost between $500 and $1,000 per ton. To scale globally, we need to bring that down to $100–200. So how do we choose the right technology to get there?

First, we look at the theoretical cost floor: what does physics and chemistry tell us is possible? This helps rule out paths that will always be too expensive.

Second, we ask which technologies get cheaper the fastest. According to Wright's Law, for every cumulative doubling of units produced, costs fall by a predictable percentage, known as the learning rate. Some technologies have high learning rates because we figure out how to improve them quickly. Others improve more slowly, even if they scale. Picking the right path means betting on the technology that will move fastest down the cost curve.

Ramez Naam highlights two key factors behind fast learning rates:

- How many moving parts does the technology have?
- How much of it can be built in a factory rather than on-site?

Simpler systems and controlled environments allow for faster iteration, and speed of iteration is paramount.

In fact, the **learning rate** can matter more than the starting cost. A technology that begins more expensive, or even has a slightly higher cost floor, can still win if it improves faster. We've seen this before: crystalline silicon solar panels aren't the most efficient or theoretically best photovoltaic technology, but they dominated the market because they improved quickly and scaled early.

That's why we chose to focus on **solid sorbents with a temperature–vacuum swing adsorption process**. We already know that solid sorbents work, which means we can skip the lab-scale uncertainty and get straight to building, testing, and improving. It may start higher on the cost curve than other approaches, but it offers the steepest learning curve.

The process handles only gases and liquids, which are far easier to move and control than solids. This allows us to design systems that are **simple** with very few moving parts.

Solid sorbents also lend themselves well to modular systems, which we can make plug-and-play. That means they can be **built on a manufacturing line** and deployed with minimal work on site. More on this later.

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# Sorbent-agnostic to ride massive cost reductions

At the heart of our machines is the solid sorbent, a chemical filter that captures $CO_2$ while the rest of the air passes through. There are many types, including amine-functionalized materials, zeolites, and metal-organic frameworks. Each comes with tradeoffs in capture capacity, kinetics, stability, reusability, and cost. These properties have a major impact on the overall economics of DAC.

The field is still in its early days, and it's too soon to pick a single winner. **Materials discovery is accelerating**, driven by growing financial incentives, rising interest from major OEMs, and AI-driven materials modeling that accelerates discovery and screening. As a result, more teams than ever are racing to develop better sorbents.

That's why we designed our machines to be sorbent-agnostic. They can run with a wide range of materials, which means we can always use the best sorbent available without redesigning our system. This flexibility lets us ride the wave of material innovation instead of betting on a single chemistry.

And that approach is **already paying off**. New players are bringing forward sorbents that outperform early standards across the board:

- Higher Capacity ↘
- Better Stability ↘
- Faster Kinetics ↘
- Lower Thermal Mass ↘
- Lower Cost ↘

Major automotive suppliers and some of the largest chemical companies in the world are stepping into the space. These breakthroughs are just getting started, and we're here for it.

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# Modular technology deployed to scalable plants

When deploying industrial technology at scale, the default approach is to build large plants on-site. This is how industries traditionally capture economies of scale: bigger compressors, bigger reactors, lower cost per unit. But this model has major drawbacks. Projects are often delayed, frequently go over budget, and leave little room for iteration. In many cases, you only get a chance to improve the technology when you build the next plant, which might not happen for another three to five years.

## We chose a different path

Like solar and batteries, we build **modular, plug-and-play units** in a controlled manufacturing environment, then deploy many of them side by side to reach the scale we need.

Each of our units is container-sized and built entirely from **off-the-shelf components**. That means lower costs, shorter lead times, and access to a broader pool of suppliers. We don't use any custom hardware, which makes our supply chains more agile, more resilient, and easier to scale.

Because each container is an independent unit, we can iterate continuously. We don't have to wait years for the next plant to test a new idea. We can ship updated versions as fast as we can update the manufacturing line, and even run different versions side by side at the same site. This enables faster iteration cycles, which drive faster cost reductions.

Once built, our modules are shipped and installed with minimal on-site work. This enables **simple, scalable deployment**. We can start with a single container, which means we launch faster, learn from the real world sooner, and derisk the technology. That also unlocks project finance, because scaling is just a matter of adding more containers. Once the modular units are proven, we can scale plants **as large as needed**, without the risk of building a massive, untested system from the start.

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# The best places in the world to deploy DAC

One of the unique advantages of Direct Air Capture is that it can be deployed almost anywhere. $CO_2$ is evenly distributed in the atmosphere, so there's no need to "go where the emissions are." That opens up the possibility to site DAC systems where the economics work best.

We look for sites with **abundant, cheap clean energy.** Powering DAC only makes sense if the energy is both clean and cheap, that's what will make the unit economics attractive and ensures we remove far more $CO_2$ than we emit. That energy must either already be in surplus, or we must be helping to build more.

We also need **land**. Removing billions of tons of $CO_2$ will require deploying a lot of machines, which means a lot of space. We focus on areas where we can scale without displacing people or ecosystems.

Finally, we look for places where we can **store the $CO_2$ directly on-site**. Transporting $CO_2$ is expensive and adds complexity. By colocating with our storage partners, we eliminate that cost entirely and simplify operations.

The good news is that there are a lot of places that meet these criteria. Kenya is one of the best examples. The grid is already over 90 percent renewable, powered by geothermal, hydro, and wind. Its geothermal plants regularly curtail excess heat and electricity, which we can put to work. There's ample non-arable land in the Rift Valley, and the Rift itself is rich in basalt formations, ideal for permanent $CO_2$ storage through mineralization. Most importantly, local partners are eager to collaborate, and the energy infrastructure is ready to grow.

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# Driving down the cost of carbon removal

We already see a clear path to getting: ↘

Below $200 per ton by 2030

And the reason we're confident is because the cost-down has already started, and it's happening fast.

Our modular design accelerates everything. Because each container is an independent unit, we can iterate fast, improving energy efficiency, improving our designs, and driving down costs with every build.

In just the last 12 months: ↘

We've reduced the capex per container by 4x

Then there's scale. Several of our suppliers have already given us pricing tiers that drop significantly as volumes grow. The price of key components drop more than 50% as volumes increase, **just from known cost curves**. And as clean energy gets cheaper globally, the cost of running our machines keeps falling too.

Finally, because our system is sorbent-agnostic, we're ready to absorb improvements as they come.

Over the past year: ↘

Our sorbent cost has dropped by 3x

Thanks to new suppliers and better materials entering the market, and we already see their next-generation products bringing another 50% cost reduction. Because we can integrate those materials without redesigning the system, we capture those benefits immediately. And beyond that, there may be breakthroughs we haven't even accounted for. We'll be uniquely positioned to take advantage of them when they arrive.

We're confident in the tech and the cost curve, but some will argue that we should wait until the cost is lower before we scale. But that's not how progress works. The fastest way to reduce cost is to **deploy, learn, and iterate**. And in the meantime, early deployments generate revenue, build credibility, and prove the model. Did Tesla wait until they had the cheapest electric car before shipping something? Of course not. They started, improved, and scaled, and that's exactly what we're doing.

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# We are the gardeners now

In 1968, Stewart Brand wrote to the hippies who wanted to build a new world: “We are as gods, and might as well get good at it.” By 2009, he was reflecting on a new reality: nature is no longer in balance, and ecosystems won’t simply repair themselves if we leave them alone. Instead, we need to take responsibility.

That’s what we are about, and this is the master plan to get there:

**01.** Build our first modular DAC units in the form of a shipping container

**02.** Deploy those containers to build capture facilities

**03.** Iterate on the technology as fast as possible to drive down cost.

**04.** Scale our capture facilities in places with the best economics.


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Read the
Master Plan
on our website

Purchase
permanent carbon
removal credits

# Remove $CO_2$ with us

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