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Climate-Tech Companies to Watch in 2025: BNEF Pioneers

BloombergNEF announced the 2025 winners of its Pioneers program on April 21, the culmination of an annual competition that identifies game-changing climate technologies. The 12 winners this year are helping to decarbonize both heavy and light industries, develop innovations in energy storage, and make the world's food and energy systems more resilient to climate change.

- This year's competition is the 16th edition of BNEF Pioneers. Including this year's laureates, the contest has now named 164 winners, which together have raised a cumulative $22.1 billion in equity funding. For this year's program, BNEF received more than 700 applications. Each year the competition focuses on three challenges, plus a 'wildcard' category.
- **Challenge 1: Making light industry more sustainable.** The winners of this challenge are decarbonizing low- and medium-temperature industrial heat through the use of heat pumps (**AtmosZero**) and thermal storage (**Rondo**), as well as developing innovations to reduce the environmental impact of textile waste (**Circ**) and textile dyeing (**Everdye**).
- **Challenge 2: Innovations in energy storage.** The winners of this challenge are developing a solid-state battery chemistry (**Hytzer**), and mobile, modular battery packs with applications in powering construction sites and events (**Instagrid**).
- **Challenge 3: Boosting climate adaptation capabilities.** The winners of this challenge are developing technology to make grids safer and more reliable (**AiDASH**), increase the resiliency of bee pollination services (**Beewise**), and allowing farmers to react faster to fungal infections in crops (**InnerPlant**).
- **Wildcards.** This year's wildcards are all focused on the decarbonization of heavy industry. This includes improvements to iron making (**Binding Solutions**), high-temperature heat electrification (**Coolbrook**), and cement recycling (**Reclinker**).
- *References to Beewise's cumulative funding totals on pages 3 and 16 have been corrected.*

Figure 1: BNEF Pioneers 2025 winners

Source: BloombergNEF

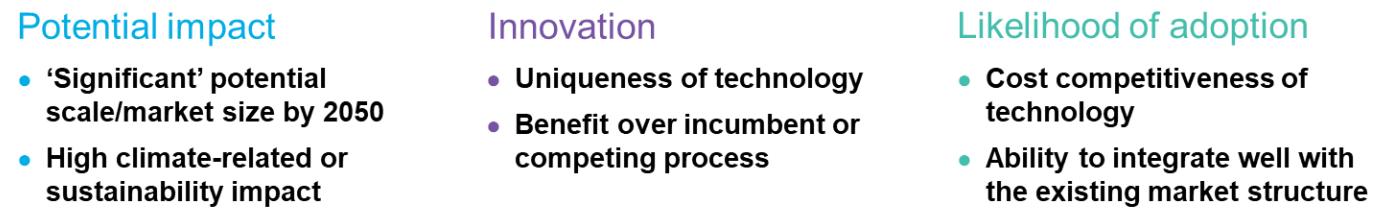
1. How does BNEF choose its Pioneers?

Each year, BNEF awards the Pioneers prize to innovators addressing three pre-selected challenges. It also recognizes a few 'wildcard' winners outside of these categories.

The Pioneers are selected via a four-step process:

1. **Choosing the challenges:** BNEF chooses its challenge areas in collaboration with each of our sector teams, with a particular eye toward identifying topics where an urgent climate challenge still lacks a clear technological solution. BNEF's long-term outlooks on energy, industry and transport, including the *New Energy Outlook* (web | terminal) and the *Electric Vehicle Outlook* (web | terminal), help identify these areas.
2. **Finding the applicants:** BNEF searches for potential applicants using its own startup databases and published research, as well as analyst knowledge. We solicit applications from our analysts, network of clients and research contacts. About a third of the 250-300 applications that BNEF receives each year are solicited, while the other two-thirds come from our open application portal. Winners are often chosen from the pool of unsolicited applications.
3. **Choosing the finalists:** Each application is read and scored by a relevant sector analyst based on potential impact, innovation and likelihood of adoption (Figure 2). BNEF balances both quantitative and qualitive scoring data to select finalists that represent a diversity of technological solutions.
4. **Choosing the winners:** BNEF conducts a full day of finalist judging, where BNEF analysts present each finalist to a panel of judges. The judges are the BNEF management committee, which uses a voting and discussion process to determine the winners of the competition.

Figure 2: Scoring dimensions for BNEF Pioneers applicants



Source: BloombergNEF

1.1. Who are this year's Pioneers?

This year's Pioneers have raised a cumulative $650 million across 59 deals according to CB Insights (Table 1). Half of the Pioneers are based in the US, with five in Europe and one in China. The companies based in the US are all later stage, with AtmosZero being the only American winner yet to raise a Series B. The bulk of deals and funding activity by the winners is therefore happening in the US, highlighting the maturity of the market's innovation ecosystem (Figure 3).

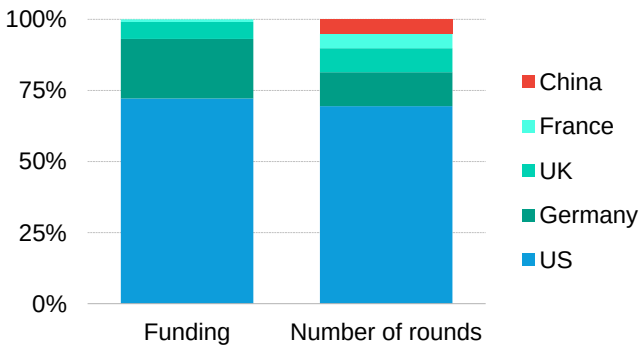
Table 1: BNEF Pioneers 2025

Challenge	Company name	Region	Latest funding round	Latest funding date	Cumulative funding ($ million)
Light industry	AtmosZero	US	Series A	February 2024	25
	Circ	US	Series C - II	March 2025	99
	Everdye	France	Incubator/Accelerator	November 2023	5.7
	Rondo	US	Series B - II	June 2024	82
Energy storage	Hytzer	China	Seed VC - II	October 2024	*No funding disclosed*
	Instagrid	Germany	Series C	January 2024	145
Climate adaptation	AiDASH	US	Series C	January 2024	92
	Beewise	US	Series C	March 2022	115
	InnerPlant	US	Series B	July 2024	54
Wildcards	Binding Solutions Ltd.	UK	Corporate Minority	August 2023	35
	Reclinker	UK	Seed VC	July 2024	5
	Coolbrook	Finland	*No funding disclosed*		

Source: BloombergNEF, CB Insights. Note: Colors indicate region and stage of deal maturity.

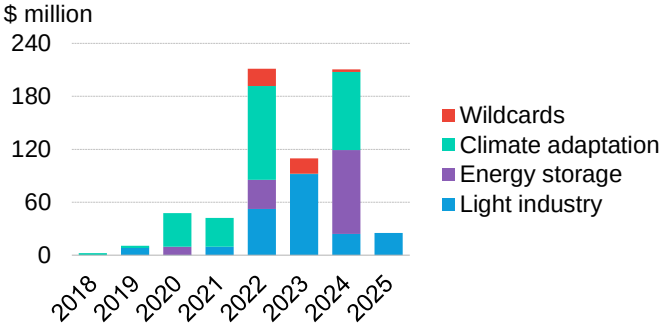
Despite the fact it might be considered the least mature investment theme, this year's Pioneers addressing climate adaptation have raised the most equity funding of any challenge group at $261 million (Figure 4). Each of the winners in this category has raised at least a Series B. This outlines that companies in the space have developed clear business cases and attracted growth capital despite the emerging nature of the theme.

Figure 3: VC/PE activity for 2025 BNEF Pioneers by market



Source: BloombergNEF, CB Insights.

Figure 4: VC/PE activity for 2025 BNEF Pioneers by challenge



Source: BloombergNEF, CB Insights.

2. Challenge 1: Making light industry more sustainable

Industry is responsible for one-quarter of the world's greenhouse gas emissions. While significant focus has been on the largest emitting industrial sectors, namely heavy industries such as steel, cement and chemicals, light industries are still responsible for one-third of industrial emissions.

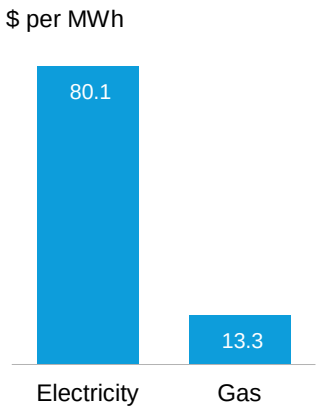
These industries include food & beverage, textiles, and pulp & paper sectors and are technically simpler to decarbonize than heavy industries because they tend to need lower temperature heat and steam, meaning they can electrify more easily. These industries – particularly the textiles sector – also have a notable impact on plastic and water pollution, a great environmental challenge in its own right. The Pioneer winners in this challenge focus on electrifying heat for industry, recycling, and eliminating energy and chemical requirements.

2.1. AtmosZero

Why is innovation needed?

An estimated 12,600 terawatt-hours (TWh) of global industrial heat consumption in 2016 were delivered at temperatures below 200 Celsius (C) in the form of steam and hot air. Most of this heat is delivered by boilers and ovens that are powered by fossil fuels. While electrical resistance heaters could theoretically service all this demand, it would be dramatically more expensive to do so. The average electricity price paid by industrials in the US at the end of 2024 was over six times higher than the price paid for natural gas (Figure 3).

Figure 5: Average industrial energy price in the US



Source: BloombergNEF, EIA. Note: Average electricity price is for December 2024, gas price is for all of 2024.

What is AtmosZero's technology?

AtmosZero has developed a 650 kilowatt (kW) industrial heat pump, which it refers to as a Boiler 2.0, that aims to displace fossil-fuel boilers currently used in industry. AtmosZero's Boiler 2.0 uses two refrigerant loops to produce steam. The first loop utilizes glycol as a heat transfer medium to move heat from ambient air to the refrigerant. The refrigerant is compressed to a higher temperature and pressure and then enters a heat exchanger to transfer the heat to a second, higher-temperature refrigerant. In the second refrigerant loop, the refrigerant is once again compressed to reach even higher temperatures. This hot refrigerant then enters the condenser, where heat is transferred to water, causing it to evaporate into steam.

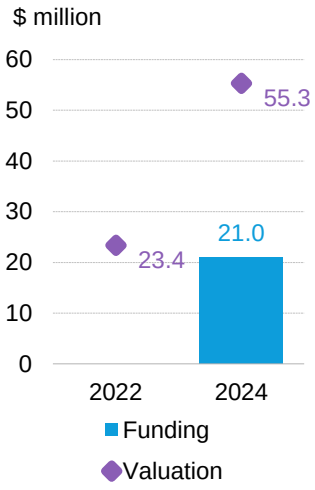
AtmosZero's core innovation is in the compressor that transmits the heat into the second refrigerant loop, and in the controls system and cycle design that enable the system to operate in a broad range of industrial applications. The vapor compression cycles on which the system relies are well understood.

Why is AtmosZero a Pioneer?

Industrial heat pumps are not a new technology but to date they have seen limited adoption. A big limiting factor on growth of the sector has been products' focus on utilizing waste heat. While this boosts the coefficient of performance, reducing operating costs, it has meant that most projects are custom-built for a specific site. This means that each unit takes a long time to install, disrupting production, and the heat pump industry benefits less from economies of scale.

AtmosZero's product uses ambient air as its heat source, which allows it to overcome this issue around customization. The company says it reduces installation costs three- to six-fold compared with incumbent heat pumps, and installation should only take days rather than weeks. Reducing installation time is hugely beneficial to industrial customers, for whom downtime is a costly nuisance.

Figure 6: AtmosZero reported funding and valuation



Source: BloombergNEF, CB Insights.

AtmosZero's Boiler 2.0 targets a coefficient of performance of around 2. It can operate effectively in climatic conditions as low as -20C and can deliver temperatures up to 200C, which is a higher temperature delivery range than has typically been offered by incumbent heat pump products.

What's next for AtmosZero?

AtmosZero raised its seed round in 2022 and secured a $21 million Series A in 2024 at a reported valuation of $55.3 million (Figure 4). The company announced a pilot project with Colorado-based brewer New Belgium Brewing when it emerged from stealth in 2023, which is going into operation in spring 2025.

From its inception, AtmosZero has been developing a product that can work in commercial applications rather than constantly attempting to scale up larger and larger prototypes. With this in mind, it commissioned its first manufacturing facility in February 2025, only 20 months after emerging from stealth. The facility, which will be able to produce 100 Boiler 2.0s per year once fully operational, received a $24.3 million tax credit from the US Department of Energy from the Qualifying Advanced Energy Project Credit (48C)[1].

2.2. Circ

Why is innovation needed?

Many industries have environmental impacts well beyond their emissions footprint, with the waste generated by the textiles industry being one notable example. Polyester accounts for almost 60% of global fiber production and less than 12% of it ends up getting recycled according to Textile Exchange. Cotton recycling rates are even lower at 1%. With global fiber production set to rise to 160 million tons by 2030, from 124 million tons in 2023, solutions to improve recycling rates will be vital in reducing the environmental impact of the industry.

One particular challenge in textiles recycling is that it is difficult to recycle blends, which are textiles made from combinations of different fibers. These are difficult to recycle because each type of fiber in the blend cannot be separated mechanically once it is woven.

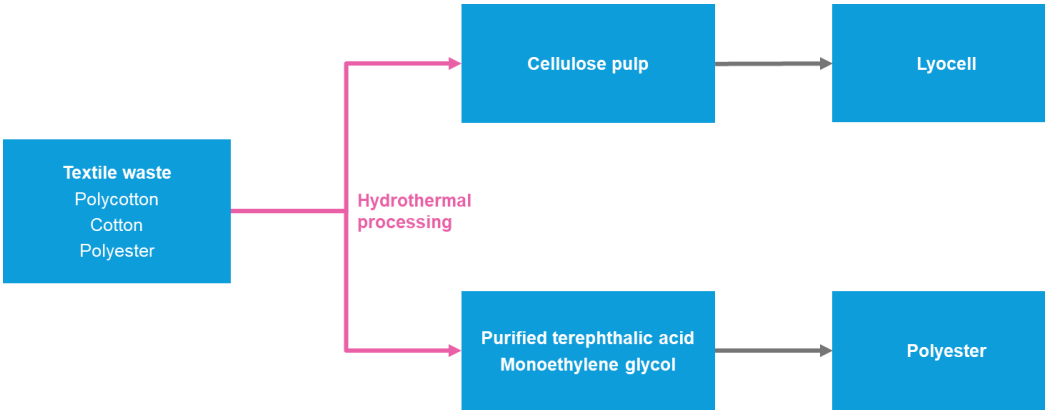
What is Circ's technology?

Circ has developed a process for recycling polyester and cotton blends into virgin-grade materials (Figure 5). Its process follows three steps:

1. Polycotton blends, cotton and polyester textiles are collected, sorted and mechanically resized to prepare them for recycling.
2. These sorted fibers are subjected to a hydrolysis process. This involves applying water, heat, pressure, and some chemicals to the fibers. The plant fibers are converted into cellulose pulp. The petrochemical fibers are separated into purified terephthalic acid (PTA) and monoethylene glycol (MEG).
3. The cellulose pulp is converted into lyocell, a man-made cellulosic fiber. The PTA and MEG are converted back into polyester.

[1] The 48C tax credit provides an investment tax credit up to 30% of costs.

Figure 7: Circ's textile recycling process



Source: Circ, BloombergNEF.

Why is Circ a Pioneer?

Circ aims to open a factory with an annual textile processing capacity of 60,000 tons in the next three years.

The challenge of textiles waste has clearly attracted a huge amount of interest from investors, with many new textiles recycling solutions coming to the market in recent years. Circ has set itself apart by its focus on the recycling of blends. The company has also gained more traction than many of its peers, raising almost $100 million in funding since its founding in 2011.

While Circ's technology does have demonstrable benefits, it is not a silver bullet for all textiles waste. It can recycle polyblends, but it is not a solution for other blends containing fibers such as elastane, for example.

What's next for Circ?

Circ is over 10 years old, but it aims to ramp up its business in the coming few years. Within the next three years, it aims to have opened a factory with an annual textile processing capacity of 60,000 tons before scaling further. In 2025, Circ will announce the site of Circ One. The company has also signed partnerships with Zara, Far Eastern Group, and Birla Cellulose among others . It aims to continue to launch a steady stream of new products with fashion brands in the coming years and secure long-term commercial purchase agreements for recycled materials.

2.3. Everdye

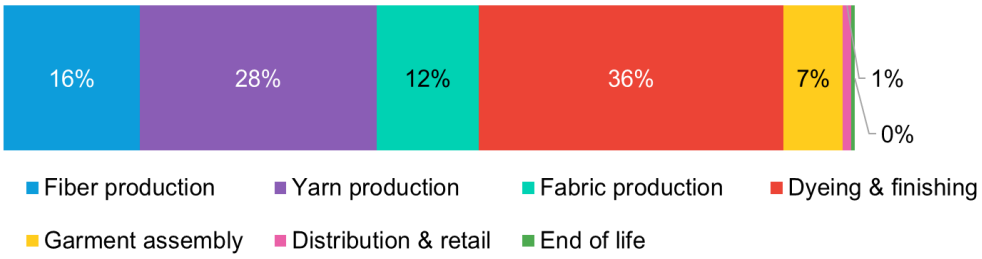
Why is innovation needed?

The fashion industry is responsible for anywhere from 2-8% of global emissions.

While it is difficult to put a fine point on the environmental impact of the fashion industry, it is certainly large. Estimates indicate that it is responsible for anywhere from 2-8% of global emissions and textiles dyeing and finishing is responsible for 20% of global clean water pollution. There is no single process that contributes a majority of the impact, but over one-third of the emissions comes from dyeing and finishing, as does almost all of the industry's water pollution (Figure 6).

Dyeing and finishing typically involves submerging textiles in hot baths, washing, and then drying them with hot air, all of which consumes energy. The chemicals used in the dyeing process end up polluting water streams, harming ecosystems and human health, as effluent is disposed of.

Figure 8: Textiles sector share of emissions



Source: BloombergNEF, Quantis 2018. Notes: This does not include customer travel to and from clothing stores.

What is Everdye's technology?

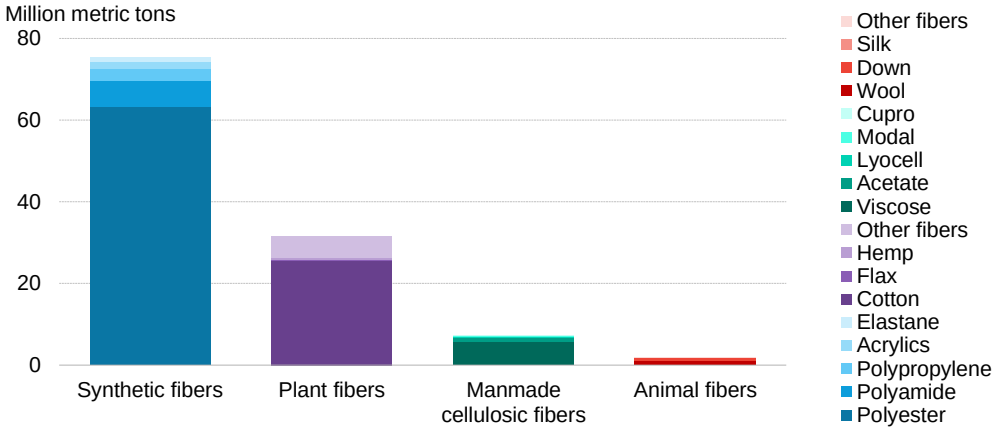
Everdye's biobased pigment can eliminate up to 90% of a dyeing mill's energy use.

Everdye makes a bio-based dye that can color textile fibers at room temperature, thereby eliminating up to 90% of a dyeing mill's energy use. Everdye has developed proprietary bio-based pigments (made from organic waste and natural minerals) and a bio-sourced organic polymer binding agent for its coloring process. Fabric is pretreated to create a negative charge on its surface and then the positively charged pigment is applied, creating a strong bond to the fabric. This electrostatic attachment is the reason why the process does not require any heat and is four times faster than traditional dyeing. The pigment can be easily filtered from the wastewater produced, which is not true for incumbent processes, and so Everdye can reduce water pollution of textile dyeing by 90%.

Everydye's product is currently limited to orange, yellow and brown dyes.

Everdye's technology does not work for every textile. It can only currently apply orange, yellow and brown dyes to cotton and other cellulosic fibers using garment, jigger and pad dyeing applications. Cotton and cellulosic fibers account for just under 30% of global fiber production (Figure 7).

Figure 9: Global fiber production by material category, 2022

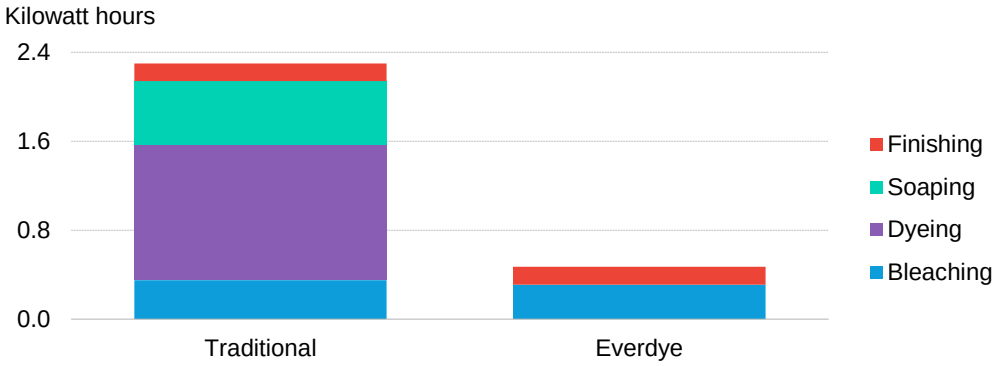


Source: BloombergNEF, Textiles Exchange.

Why is Everdye a Pioneer?

Everdye's process reduces the energy intensity of the largest source of emissions in the textiles value chain by over 90%, while also dramatically reducing water pollution from the industry. While its dyes are more expensive per kilogram than incumbents, the process also has the advantage of working four times more quickly than dyeing processes that rely on heated baths and drying cycles. This allows for greater throughput on equipment. Everdye told BNEF that its operations this year have demonstrated that its process only carries a 1% cost premium over incumbents.

Figure 10: Energy use during dyeing of 1 kilogram (kg) of cotton



Source: BloombergNEF, Everdye.

What's next for Everdye?

Everdye is an early-stage company. After its founding in 2021, it raised a $2 million seed round in February 2023 alongside non-dilutive financing. The company's dyeing process has to date been limited to test runs for brands such as AdoreMe and Le Petit Bateau. Since these tests, AdoreMe has reordered the dye for a capsule collection run this year, and in September 2024 Everdye announced the appointment of Philippe Berlan as CEO. Berlan was previously CEO of Le Petit Bateau and La Redoute, the French homeware and fashion retailer.

2.4. Rondo

Why is innovation needed?

An opportunity has emerged to store all a facility's heat requirements during a small number of hours, where low-cost power is accessible.

One strategy to make electricity more competitive with gas is to use heat pumps, getting more heat out of each kilowatt-hour you consume. Another is to make sure each of those kilowatt-hours is as cheap as possible. As low-cost intermittent solar energy has created large depressions in daily power prices, a large opportunity has emerged to store all of a facility's heat requirements during a small number of hours, and produce a consistent heat output for industrial processes (Figure 11 and Figure 12).

While lithium-ion batteries have become very competitive as a means of storing electricity, thermal energy storage (TES) batteries are arguably a better solution for storing heat in industrial applications:

- Capital costs for thermal batteries are lower than lithium-ion because they are made of such abundant materials. Without the need for additional turbine equipment to convert heat back to electricity, thermal batteries perform even better from a capital cost perspective.

- Thermal batteries are actually more efficient at storing electrical energy and delivering it as heat than lithium-ion batteries.

Figure 11: Charge and discharge cycle of sample thermal battery based on daily average power prices in Ercot

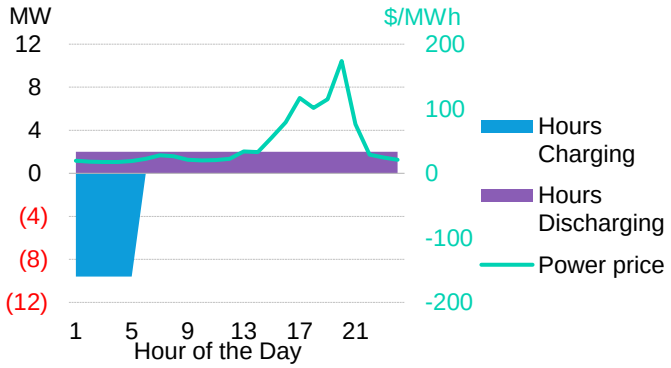
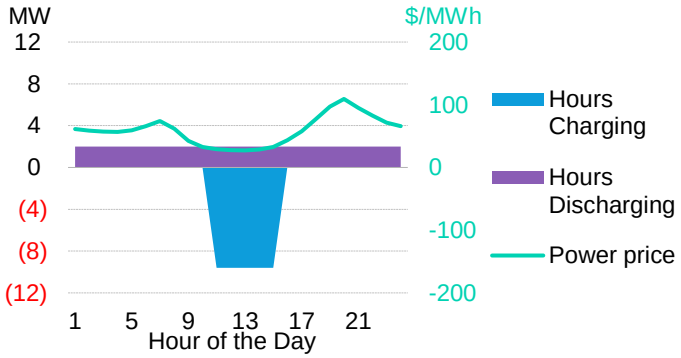


Figure 12: Charge and discharge cycle of sample thermal battery based on daily average power prices in Caiso



Source: BloombergNEF. Note: This example assumes that a thermal battery charges for five hours per day and discharges for 24 hours per day. It assumes that it charges in the five cheapest hours per day. The power price is calculated from 2023 hourly averages of each power market. Actual daily charging and discharging could vary as power prices vary across days and seasons. Ercot is the power market in Texas. Caiso is the power market in California.

What is Rondo's technology?

Rondo stores electrical energy as heat by using resistance heating to heat bricks up to a temp of 1,500C.

Rondo Energy has designed a thermal energy storage (TES) device that stores electricity as heat in stacked refractory bricks and delivers temperatures of 1,500C for industrial processes. Energy is discharged by running air over the bricks and steam is generated via a heat exchanger. Rondo sells two models: RHB100 and RHB300, which store 100MWh and 300MWh of energy, respectively.

Rondo's system is composed of very well understood, abundant industrial materials. Rondo's innovation is in the shape of the refractory brick and resistive wire. Refractory brick has many favourable properties, including that it is low-cost and inert. The low thermal conductivity of refractory brick, however – the rate at which heat is transferred in or out of a material – makes rapid heating via conduction or convection challenging. Rondo's solution is to use radiation to rapidly heat the brick to very high temperatures and convection to extract heat. This is accomplished by designing bricks with large surface areas onto which resistive heating wires radiate heat directly and air passages that enable air circulation to extract the stored heat.

A key feature of the Rondo thermal battery is its ability to charge and discharge simultaneously. Because steam will be required around the clock in an industrial facility, battery designs that do not have this ability would need additional equipment redundancy to supply heat during hours when the rest of the battery is charging.

Rondo's process can produce both electricity and heat.

Rondo produces superheated steam and pressures exceeding 100 bar, which means the steam can be used to generate power with a steam turbine. Because many industrial plants only need steam at temperatures of around 200C and pressures of 10 barg, Rondo can offer a product that first runs the steam output of the battery through a turbine to generate power. The discharge steam from the turbine is then still hot enough to provide thermal energy for the industrial process. The electricity generated by the turbine can serve the industrial plant's electricity load.

Why is Rondo a Pioneer?

Rondo aims to build enough manufacturing capacity to supply 90GWh worth of storage capacity devices per year.

The potential of thermal energy storage in decarbonizing industrial heat has become apparent. BNEF has tracked 27 startups developing a variety of technologies to address the challenge of storing energy for low- and medium-temperature industrial heat.

Rondo has emerged as one of the startups with the most commercial traction. It has raised more than $80 million and has the most announced thermal storage projects of any startup tracked by BNEF addressing industrial heat demand. The technology also has desirable qualities in many of the areas that BNEF believes will be helpful for thermal storage technologies including:

- It is made of abundant, low-cost, inert minerals.
- It operates in a wide temperature range compared to many competitors.
- It has a dual charge and discharge capability.

What's next for Rondo?

Rondo is arguably the most commercially advanced of any of this year's Pioneers addressing light industry emissions. It has announced seven projects where its product will be used (Table 2). In June 2023, the company announced it aimed to build enough manufacturing capacity to supply 90GWh worth of storage capacity devices per year, which would put it on par with some of the world's largest lithium-ion battery makers on a per-gigawatt-hour basis.

Table 2: Rondo's current and announced thermal storage projects

Project Name	Location	Date of completion	Status	Size	Description
Calgreen	California	2023	Online	2MWh	Rondo's first system in commercial operation replaces fossil-fuel powered equipment in a biofuel refining process. Thermal energy is provided on a 'heat-as-a-service' basis, supplying energy at a predictable cost without an upfront capital cost.
Diageo	Kentucky/ Illinois	2026/2028	Announced project	n/a	Diageo will use heat batteries in two separate facilities to replace natural-gas-fired boilers providing steam to distillation processes. The project will be funded by the US Department of Energy's Office of Clean Energy Demonstrations' (OECD) Industrial Demonstration Program (IDP), which selected Diageo to negotiate an award of up to $75 million to support the electrification of its factories.
Eastman	Texas	2027	Announced project	n/a	Eastman's molecular recycling facility will use a heat battery to recycle hard-to-recycle polyester waste and produce new recycled materials. The project will be funded by the OECD's IDP program, which selected Eastman to negotiate an award of up to $375 million to support decarbonization.
Covestro	Europe	n/a	Announced project	100MWh	Covestro is a polymer manufacturer that will use Rondo's system to deliver continuous steam powered by intermittent renewables for manufacturing polymer.
GreenLab	Europe	n/a	Announced project	100MWh	The GreenLab industrial park system will provide green base heat and power for a manufacturing facility at the industrial park. Some industries reached include biofuels and food and beverage.
Europe Food & Beverage Project	Europe	n/a	Announced Project	n/a	Rondo is building a third project in Europe that charges from onsite and offsite solar.

Project Name	Location	Date of completion	Status	Size	Description
SCG Cleanergy	Thailand	n/a	Announced Project	n/a	Siam Cement Group's Cleanergy subsidiary has begun construction of a heat battery that will convert solar power to provide continuous heat and power for a cement plant. Rondo says the project is the first commercial thermal heat battery for both the cement industry and Southeast Asia.

Source: BloombergNEF, company website, press releases

3. Challenge 2: Innovations in energy storage

Energy storage systems are likely to play a significant role in balancing power markets and enabling 24/7 clean power. BNEF estimates that demand for energy storage technologies could reach almost six terawatt-hours by 2035. The development of higher-performance, lower-cost batteries could enable battery-powered heavy-duty vehicles and potentially even aircraft. Rapidly falling battery pack costs could also allow for the deployment of batteries in previously unexplored applications.

3.1. Hytzer

Why is innovation needed?

Solid-state lithium batteries are one of the most promising next-generation battery technologies.

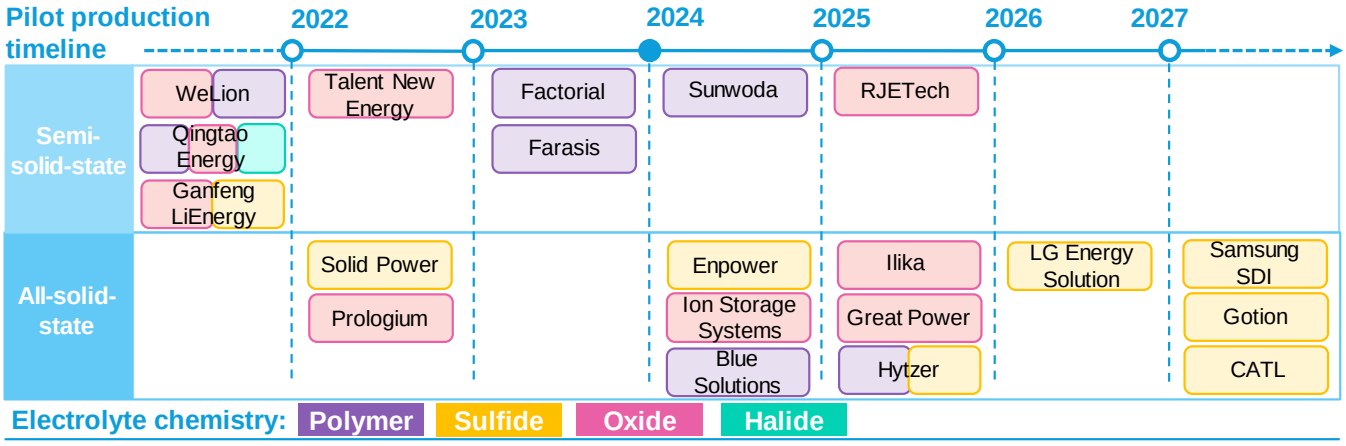
Solid-state lithium batteries are one of the most promising next-generation battery technologies. When fully developed, they will enhance safety, boost energy density and allow batteries to be physically structured in ways that can enable new vehicle architectures beyond what is possible with conventional lithium-ion batteries.

The mass production of solid-state lithium batteries remains limited to either semi-solid-state batteries, which still contain liquid electrolytes, or small cells (less than 2 ampere-hours (Ah)) for consumer electronics. Both semi-solid-state batteries and micro all-solid-state batteries were first mass produced years ago by Chinese and Japanese companies, but current manufacturing methods constrain the production of large-format all-solid-state batteries.

What is Hytzer's technology?

There are two main categories of solid-state batteries being developed: inorganic and organic. Inorganic electrolytes are made of oxides or sulfides (ceramic materials) while organics are made of polymers. These two types of electrolyte have tradeoffs. Ceramic electrolytes are susceptible to cracking while polymer ones can soften at battery operating temperatures and so lack mechanical stability. Hytzer is trying to solve this problem through 'rigid-flexible' coupling of a composite electrolyte as well as combining an organic polymer electrolyte with a sulfide electrolyte. It is the only solid-state company tracked by BNEF that is pursuing this strategy (Figure 13).

Figure 13: Roadmap for pilot production of solid-state batteries



Source: BloombergNEF. Note: Excludes solid-state batteries targeting consumer electronics applications.

Why is Hytzer a Pioneer?

Hytzer says its electrolyte would enable batteries with densities exceeding an impressive 600 watt-hours per kilogram.

Today, a battery with an energy density of more than 250 watt-hours per kilogram would be impressive. Hytzer says its electrolyte would enable batteries with densities exceeding 600 watt-hours. Its 65Ah battery, which it delivered as a sample to automotive customers this year, achieved an energy density of 320 watt-hour per kilogram and very effective rates of charge and discharge.

One of the biggest challenges in solid-state lithium battery development will be the scale-up of manufacturing. A primary advantage for Hytzer, over its competitors, is its focus on the use of materials that are easy to mass manufacture.

Many solid-state battery startups have been around for a while and are well-recognized because of the extent to which the industry has been anticipating the development of the technology. While Hytzer is relatively new (founded in 2022), it has an impressive pedigree. The company is a spin-off of Qingdao Institute of Bio-energy and Bio-process Technology (QIBEBT), an institute of the Chinese Academy of Sciences (CAS). The CAS can be thought of as similar to the US National Labs, and QIBEBT is one of the main research hubs on lithium-ion battery technology. Cui Guanglei, a leading researcher on solid-state batteries at the institute, is a founder of the company.

Over the last eight years, Hytzer's technology has been deployed in various real-world niche applications resulting in a cumulative 8,000 hours of operational data. This data has demonstrated that its solid-state chemistry solves intrinsic safety issues, with self-shutdown features at 320 watt-hours per kilogram energy density.

What's next for Hytzer?

Hytzer's technology has been in development for almost one and a half decades, but the company was only founded as a spinout of the QIBEBT in 2022. In 2024, it raised funding from investors including Temasek, Huizhi Capital, Aramco Ventures and Sinopec Capital. It is aiming to commence pilot-scale production of its battery in 2025 (Figure 13). Hytzer has been working with

global automotive OEMs in applying its solid-state battery in commercial applications. The company delivered A-samples to partners in 2024.

Hytzer is targeting high-end electric vehicles, electric vertical takeoff and landing (eVTOL) aircraft, electric yachts, data centers and robots.

Hytzer is targeting high-end electric vehicles, electric vertical takeoff and landing (eVTOL) aircraft, electric yachts, data centers and robots as its initial target markets. These are applications where energy density has a particular value add. It also sees stationary energy storage as a potential target market for solid-state lithium batteries.

3.2. Instagrid

Why is innovation needed?

Lithium-ion batteries are a crucial technology in decarbonizing the transport sector but also provide other social and performance benefits, such as reductions in tailpipe emissions, noise and operating fuel costs. The prize of disrupting the global auto market means there has been no shortage of efforts to develop electric vehicles and batteries for transport applications.

As lithium-ion battery costs continue to fall, their potential in new, more niche market segments have emerged. Onsite diesel generators, which are often used on construction sites or for large events, represent one such example.

What is Instagrid's technology?

Instagrid sells portable battery-based mobile power supplies for applications such as construction sites, film and media, and events. These are otherwise usually powered by long cables attached to outlets or portable, fossil fuel-powered generators, which are polluting and noisy. Instagrid's products have a rated output of 3.6kW, an energy capacity of 2.1kWh, and weigh 20 kilograms. It also sells a product to link packs together to form a larger unit. The battery charges from the grid and is then moved to the site where it is needed.

Instagrid's product includes a microinverter for each battery module in a pack, allowing for passive cooling.

Instagrid's core product innovation relates to the inverter design it uses in its packs. Many portable battery products will use a central inverter to convert the current in the battery to alternating current for electrical equipment. These central inverters are bulky, produce heat and make proofing against dust and water more difficult. Instagrid's product includes a microinverter for each battery module in a pack, allowing for passive cooling. It also allows for a high peak power output, making the product suitable for specific applications, such as welding, that have high power requirements.

Why is Instagrid a Pioneer?

Instagrid is not the only company manufacturing portable battery systems for construction sites but the company has clearly defined itself as a brand in the space and demonstrated significant market traction. It has raised more than $145 million to scale its operations and in 2023 doubled revenues. Instagrid has shipped 40,000 units to date. If each system had the same capacity as its flagship ONE product, this would equate to 84MWh of batteries deployed, more than all the commercial and industrial energy storage additions in the UK in 2024, based on BNEF estimates.

What's next for Instagrid?

Instagrid announced on April 7 the launch of a new product, the Instagrid LINK MAX. The product connects three separate Instagrid packs together to form a system with a 400-volt, three-phase power output. While this is similar to its previously launched product that linked battery packs together to extend duration, it allows users to link battery packs to triple power output. The LINK

MAX will enable systems to supply energy to high-power equipment such as arc welders, diamond core drills and concrete chainsaws.

4. Challenge 3: Boosting climate adaptation capabilities

Climate change is already impacting, and will continue to impact, the world.

Whether the world is brought onto an emissions pathway that limits temperature increases to two degrees or not, climate change is already impacting, and will continue to impact, the world. Technologies that improve societies' ability to manage the effects of climate change will be vital in maintaining human quality of life in the coming decades. The United Nations Environment Programme estimates that up to $387 billion per year needs to be spent on climate adaptation in developing countries this decade.

4.1. AiDASH

Why is innovation needed?

Utilities are among the companies most clearly seeing the impact of climate change on their operations. Increases in the frequency of hot weather and drought are damaging to the grid and raise the likelihood of wildfires. While the catastrophic effects of this risk were made clear by the bankruptcy in 2019 of US power company PG&E, utilities can still suffer a hit even without an actual wildfire. More stringent regulations around developing wildfire mitigation strategies and the need to shut off power to at-risk areas during certain hours adds costs and reduces revenues.

What is AiDASH's technology?

AiDASH is primarily a software platform focused on grid inspection and monitoring which automates analysis, meaning a greater level of resilience can be achieved at a lower cost. It offers several products to help grid utilities and others build their resilience to climate change, including:

- **Climate Risk Intelligence System** for forecasting near-term outages caused by storms and near real-time vegetation monitoring with recommendations to reduce ignition causes, risks, and spread.
- **Intelligent Vegetation Management System** for managing vegetation risks along rights of way.
- **BNGAI** for helping developers, ecologists, planning authorities and others understand their biodiversity impact.
- **Asset Inspection and Monitoring Systems** for helping utilities inspect and monitor their assets remotely.

AiDASH's AI algorithms identify risks, such as potential outages and vegetation growth, provide biodiversity assessments, and alert operators to maintenance needs.

AiDASH's technology is based on satellite imagery from providers such as UP42 and Maxar, which it analyzes using its AiDASH AI engine. That allows AiDASH to frequently inspect a large set of assets. Utilities can optionally supplement the imagery with Lidar, visual inspections, aerial surveys and drone scans, which AiDASH can acquire on their behalf. AiDASH's AI algorithms then identify risks, such as potential outages and vegetation growth, provide biodiversity assessments, and alert operators to maintenance needs. Field staff and contractors access this information via web and mobile interfaces.

Why is AiDASH a Pioneer?

AiDASH was one of the most exciting adaptation startups that BNEF saw in the Pioneers competition this year because it was successfully reducing a climate risk, and able to do so cost effectively. The accuracy of AiDASH's analytics was independently assessed by Tulane University Law School's Utility Vegetation Management Initiative. It found that the satellite technology had a 95% accuracy rate.

AiDASH says that customers can make a return on investment in the first year of deployment.

In the two years since National Grid, an AiDASH client and investor through its corporate venture capital arm, became a customer, the grid operator has seen a 30% reduction in tree-related events, a 38% fall in tree-related customer interruptions, and a 55% drop in tree-related customer minute interruptions. AiDASH says that customers can make a return on investment in the first year of deployment.

What's next for AiDASH?

AiDASH is another of this year's Pioneers that is in scaling mode. The company has reportedly raised $91.5 million. Its investors include a collection of utilities such as Edison International, National Grid and Duke Energy, as well as other corporate venture investors such as SE Ventures and Shell Ventures.

4.2. Beewise

Why is innovation needed?

Pollination is an essential process for the reproduction of plants and is therefore an important component of global food supply chains. It is estimated that pollination accounts for around 10% of global crop production value, and in fact it is even more essential for nutrient rich foods. While most pollination can be attributed to wild animals, managed pollination services – where a beekeeper is paid to manage a hive of bees on a farm – are an important contributor. The process is particularly important in North America for crops including almonds, non-citrus fruits, and berries among others.

Pollination services are in decline globally due to many stressors, including climate change.

Natural pollination services are in decline globally due to many stressors. Climate change is one influencing factor, with pesticide use and land management practices being the other major contributors. As the climate continues to warm, innovations that allow pollinators to adapt will contribute toward a more resilient food supply chain.

What is Beewise's technology?

Beewise has developed a robotic hive that allows for remote, automated bee keeping. Its 'BeeHome' protects colonies from the impacts of climate change and improves crop yields via pollination services. Beewise's device thermally regulates hives, which insulates colonies from extreme weather, fires and flooding, and it provides nutrition when the bees' natural forage is compromised.

Beewise uses Arm Robotics-based CPUs with NVIDIA Jetsons and Raspberry Pis to operate most of its BeeHomes. This architecture enables robotic brood box management and computer vision-based monitoring, keeping track of honey harvesting, pest control and thermoregulation. Automatic interventions occur with a robotic arm and moving hive entrances, while keepers can also remotely monitor and treat bees inside using the robotic arm and computer vision.

Beewise says the device reduces bee mortality by 70% and manual labor by 90%, while also boosting honey yield by 70%. Healthier bees ensure stronger pollination activity. Better insulation and adjustable hive volume minimize the time colonies remain inside heating hives, further increasing time spent visiting flowers. Growers can also close hive entrances when spraying pesticides, an option unavailable in traditional hives.

Beewise says it can reduce bee mortality by 70% and manual labor by 90%, while also boosting honey yield by 70%.

Why is Beewise a Pioneer?

Pollination is a key area in which climate change may disrupt global food supplies and not only was Beewise one of the few startups BNEF found addressing this application, but it is also already scaling up its operations with impressive commercial relationships.

What's next for Beewise?

Beewise most recently raised an $80 million Series C in March 2022 to continue the scaling of its operations. This brings the company's cumulative funding to $115 million.

4.3. InnerPlant

Why is innovation needed?

Climate change poses a serious threat to crop yields globally, and thus food security. A warmer climate will create more heat stress on crops and rainfall variability will extend the duration of droughts and damage soils during heavy precipitation. A warmer climate is also expected to cause a shift in the development of plant pathogens, adding additional stress. Innovations that help growers cope with new stressors will be an important tool in helping the global food system adapt to a warmer climate.

Innovation that helps growers adapt to new stressors will be important in helping the global food system adapt to a warmer climate.

What is InnerPlant's technology?

InnerPlant's innovation is a genetically engineered soybean that emits optical fluorescent signals, which can be detected by satellites, when it has a fungal infection. InnerPlant has developed a software platform called CropVoice that detects this plant stress and sends text message alerts warning farmers which plants are infected in as little as 48 hours post-infection. Fungal infection in soy is not normally detected until at least six weeks after infection. InnerPlant's business model relies on selling access to its software platform that interprets satellite data to send text alerts to farmers about plant stress.

Why is InnerPlant a Pioneer?

InnerPlant's genetically engineered soybean and software solve a clear climate threat – the increased risk of fungal infections – for soybeans in the US, one of the world's largest crop markets. Given farmers can spend up to $40 per acre on fungicide application, and digital agriculture platforms typically cost in the single digit dollar range per acre, it is likely that its product will appeal to farmers.

InnerPlant achieved USDA approval for its soybean product in 2023 and successfully completed the FDA's voluntary New Protein Consultation Process in January 2025. Both were key steps in bringing its product to the market.

What's next for InnerPlant?

InnerPlant was founded in 2018 and to date has raised $54 million, with $30 million of that coming in a Series B in July 2024. InnerPlant highlights that its Series B was led by an alliance of farmers, indicating the confidence those growers have in the product.

Growers are using InnerPlant's CropVoice platform across three US states in the 2025 season.

Growers are using InnerPlant's CropVoice platform across three US states in the 2025 season. It aims to make its soy product broadly available by 2030 after completing the global approval process. The company signed a joint development agreement in 2023 with Syngenta and John Deere, leaders in the seed and agricultural equipment sectors, suggesting it could scale quickly based on its existing relationships.

While InnerPlant's product currently detects fungal infections in soy, the same approach could theoretically be adapted in future to indicate other stressors or be developed for different crops. The company has a pipeline of other research and a corn product is currently in development.

5. Wildcards: decarbonizing heavy industry

Beyond the three challenges outlined above, BNEF has also selected wildcard Pioneers where there was no pre-determined theme. We encouraged submissions for all climate-tech solutions. This year, however, the wildcard winners were all coincidentally working on the theme of decarbonizing heavy industries, such as steel, cement and petrochemicals.

5.1. Binding Solutions

Why is innovation needed?

Iron and steel production accounted for 7.2% of global emissions in 2020.

Iron and steel production accounted for 7.2% of global emissions in 2020. Efforts to decarbonize processes have focused on eliminating the emissions of the most energy-intensive step: iron ore reduction. However, because the emissions of the sector are so large, reducing the emissions intensity of secondary processes in the value chain can have big environmental benefits.

Agglomeration is a key step in steelmaking and accounts for around 10% of the sector's emissions. It is the term for concentrating iron ore into pellets and enhancing the structure of those pellets, with the aim of making the material more suitable for reduction in a furnace. The process currently uses mechanical and thermal energy to achieve this.

What is Binding Solutions technology?

Binding Solutions Limited (BSL) has developed a patented process that cuts the energy consumption of agglomeration by 80%, CO_2 emissions by 70%, and reduces capital costs by up to 86% compared with incumbent processes. Its approach has the additional benefit of eliminating the SO_x and NO_x associated with induration and sintering. BSL's technology uses patented binders and a proprietary modular process to bind iron ore fines into Cold Agglomeration Pellets (CAPs), reducing the need for thermal energy. Iron ore fines are first ground down, treated to improve properties, then mixed with proprietary binders to form pellets, as opposed to being indurated at high temperature.

Why is Binding Solutions a Pioneer?

BSL's technology offers several benefits:

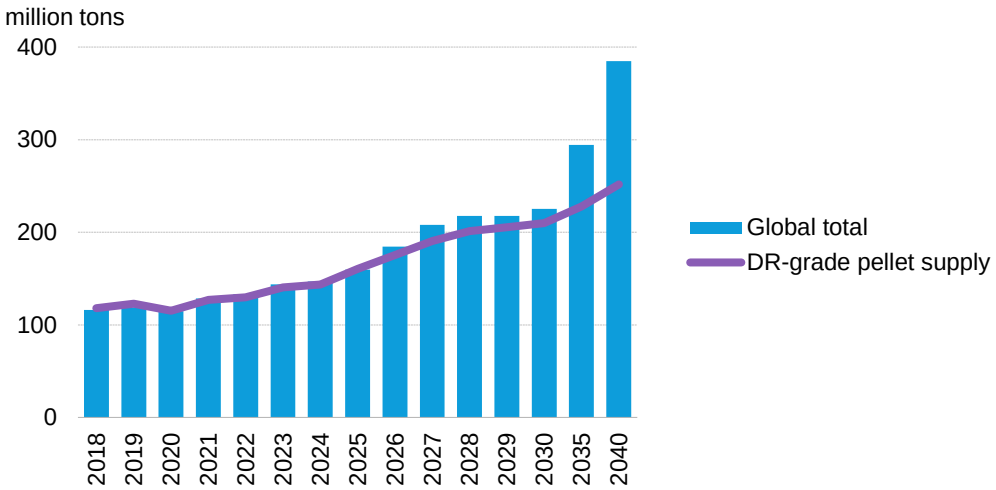
- It reduces existing blast furnace production emissions, which account for 70% of today's production capacity, by about 8-10%.

- It enables the upgrading of iron ore fines into high-quality pellets, suitable for green steel production from direct reduction (Figure 14).
- It valorizes waste fine materials from metals manufacturing by converting them into CAPs that can be added back to the furnace.

This shortage of high-grade iron ore could be a bottleneck that holds back future growth of green steel capacity.

BNEF projects that global demand for high-grade pellets will outpace supply around 2030 and could reach a deficit of 133 million metric tons by 2040. This shortage of high-grade iron ore could be a bottleneck that holds back future growth of green steel capacity from the hydrogen-fired direct reduction route. BSL's CAPs could ease this high-grade ore supply shortage.

Figure 14: Global direct-reduction-grade iron ore pellet demand vs. supply



Source: BloombergNEF

What's next for Binding Solution Limited?

BSL is still advancing its technology from a pilot stage, where it produces up to two tons of CAPs per hour for large-scale furnace trials. The company has amassed an impressive list of partners including several iron ore producers and iron makers such as Mitsui and Co., Mineral Resources Limited and Champion Iron. It is also partnering with Innovate UK and the Materials Processing Institute to test its output as a feedstock for the hydrogen-reduction-based steelmaking method.

BSL is working with European steel plants to demonstrate the CAP technology at industrial scale and evaluating potential commercial sites.

BSL has expanded its R&D capabilities in the last year. The addition of hot testing equipment at its technology center allows the company to simulate conditions found in direct-reduction plants and blast furnaces, ensuring its CAPs meet key standards and customer requirements. BSL is working with European steel plants to demonstrate the CAP technology at industrial scale and evaluating potential sites in the UK, Europe, and Canada for its first production plant in collaboration with iron ore and steelmaking partners.

5.2. Coolbrook

Why is innovation needed?

It is very difficult to electrify the supply of high-temperature industrial heat. A big part of the reason for this is that many processes rely on hydrocarbon fuels to act as a reduction agent (such as in steel production). Another reason, however, is that generating extremely high temperatures from

resistive heating elements is no simple task. Equipment to do so is not optimized and often quite unreliable.

Generating extremely high temperatures from resistive heating elements is no simple task.

High-temperature electrified heat, however, could play an important role in decarbonizing certain elements of industrial value chains. Petrochemicals is one sector where high-temperature electrified heat is necessary to decarbonize the cracking process. Around 40% of cement emissions come from fossil fuel combustion, which can also be abated with electrified heat. The remaining emissions from the process still require capture, but capture becomes cheaper and more effective when no fossil fuels are burned.

What is Coolbrook's technology?

Coolbrook is developing two products that produce very high-temperature heat from electricity that can be applied to multiple hard-to-abate industrial processes. It is developing solutions for several sectors, but its major focus is to supply this technology to the steel, cement and chemicals sectors.

At its core, the technology reverses the operation of a conventional turbine. It spins electrically powered, high-efficiency rotor blades to propel gas to supersonic speeds, which is then fed to a diffuser where it is decelerated rapidly. This creates turbulence and shockwaves in the gas that converts the kinetic energy in the gas to heat. This technology can accept a variety of gases, such as air, nitrogen, hydrogen, steam and more. This process is repeated in multiple stages and in quick succession to raise the temperature to as high as 1,700C in a few milliseconds. The company says that the technology can convert 90-95% of the electrical energy into heat, and that its compact design helps with easy installation at existing industrial sites.

The company offers two products based on this concept. Its RotoDynamic Heater generates hot air for steel, cement, glass, and other industrial production processes. The RotoDynamic Reactor product is a slightly modified piece of equipment that is specifically used in olefin production. Rather than using conventional indirect heating in furnaces, the gas is directly heated inside the reactor.

Why is Coolbrook a Pioneer?

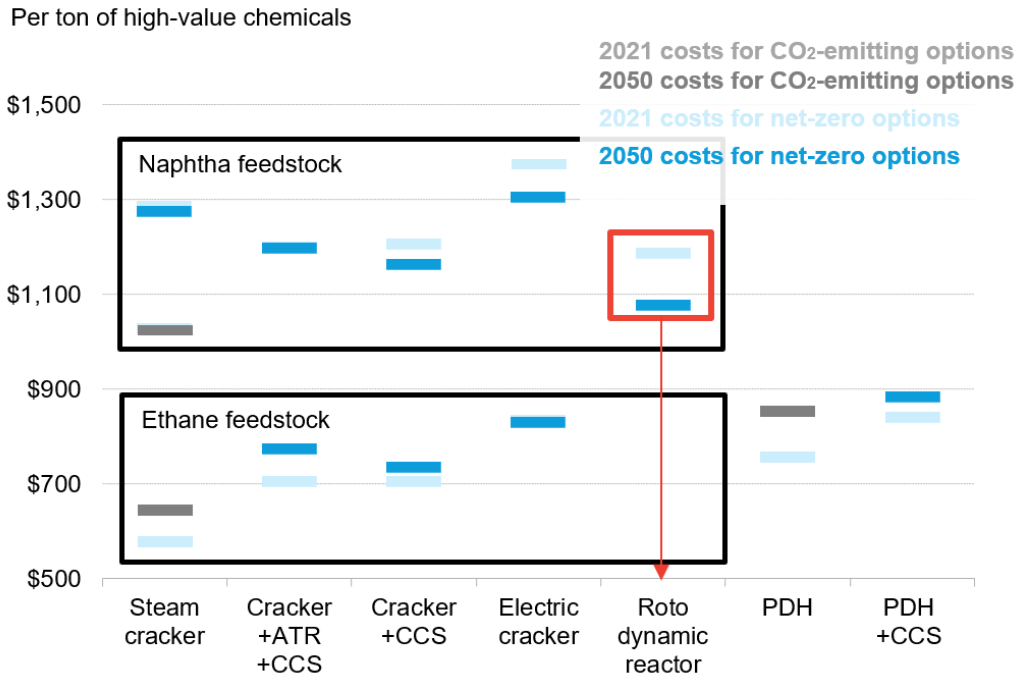
Coolbrook has signed an impressive list of partners across its target applications.

BNEF found that Coolbrook's RotoDynamic Reactor was a cost-competitive low-carbon production route for producing high-value chemicals from naphtha feedstock on a levelized cost basis in its long-term petrochemical cost outlook. This analysis assumed electricity costs of $29-42 per MWh (Figure 15). The company has also signed an impressive list of partners across its target applications. These include Sabic, Shell, Braskem, Cemex, Ultratech and ArcelorMittal among others.

What's next for Coolbrook?

Coolbrook was founded in 2011 and has been making steady progress in commercializing its technology. It has not publicly disclosed any funding rounds, but all of its aforementioned partnerships have been announced since 2021, suggesting its progress toward commercializing its product is accelerating. The company hopes to deliver its first commercial-scale project in 2026.

Figure 15: Change in average cost of net-zero chemicals production compared to business-as-usual (2021 to 2050)



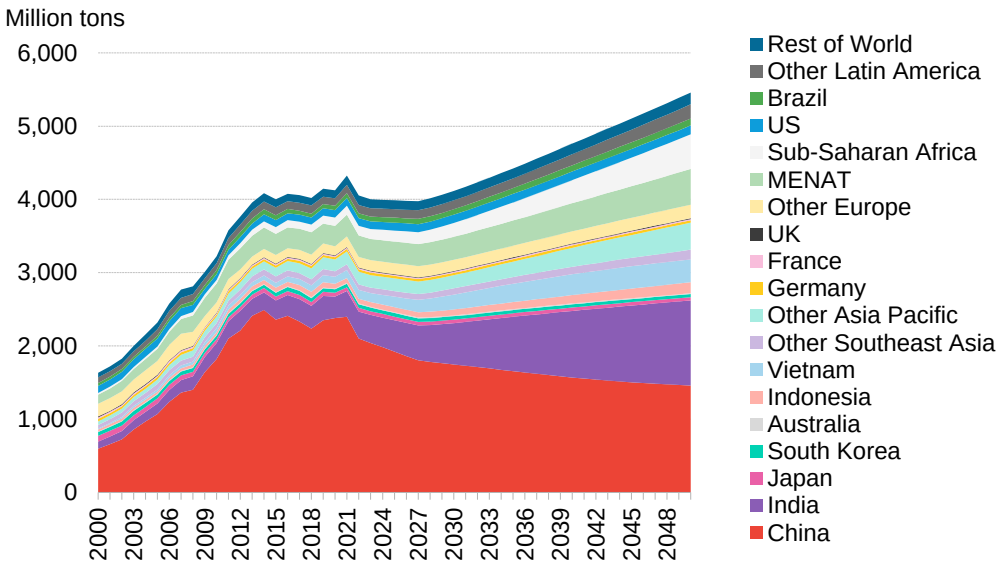
Source: BloombergNEF. For more see Decarbonizing Petrochemicals: Technologies and Costs (web | terminal).

5.3. Reclinker (formerly known as Cambridge Electric Cement)

Why is innovation needed?

Cement production is responsible for 8% of global emissions. Cement is today made by heating limestone above 1,400°C using coal, gas or solid waste as fuel. In addition to the emissions from the fuel needed to reach that high temperature, there are direct CO_2 emissions that the limestone produces when it decomposes into lime – a key step in cement production. In BNEF's New Energy Outlook, cement demand rises from four billion tons today to almost five and a half billion tons in 2050, so abatement technologies are needed to avoid rising emissions (Figure 16). Decarbonizing cement is difficult because large volumes of alternative green fuels for providing the high temperatures required are limited, and avoiding the direct emissions from limestone decomposition requires expensive carbon capture equipment or finding a new cement feedstock.

Figure 16: Cement production by region, BNEF New Energy Outlook Economic Transition Scenario



Source: BloombergNEF. Note: MENAT = Middle East, North Africa and Turkey.

What is Reclinker's technology?

Reclinker's process can produce a 'clinker' – the key component in cement – as a waste product from steel making.

Reclinker is developing technology that produces a low-carbon cement substitute, which leverages construction and demolition waste as a feedstock. Reclinker's process starts with waste concrete from the demolition of old buildings. This is ground up to separate the cement powder from the stones and sand that it is mixed with in concrete. This produces what Reclinker refers to as recycled cement paste (RCP).

Electric arc furnaces, which are an electrified way of producing steel, ordinarily use lime-dolomite flux as a material in the furnace that improves thermal efficiency, prevents oxidation and reduces impurities in the final steel. Reclinker's process partially replaces this lime flux with RCP. As the steel melts in the furnace, the RCP forms a slag which floats to the top of the molten steel, creating a seal to prevent oxidation of the steel – an important step in the process. The steel is then tapped off.

After the steel has been tapped off, the slag cools rapidly on contact with air. It can then be ground, producing a compound which in pilot-scale trials has met existing specifications for Portland clinker, a component in the ordinary Portland cement (OPC) process.

Why is Reclinker a Pioneer?

Reclinker estimates that its process could produce up to one third of global cement.

While there are many pathways for decarbonizing the cement industry, there are no silver bullets. Cement makers seeking to meet net-zero targets are increasingly seeking to source low-carbon substitutes for clinker, most of which are limited in their supply. Reclinker's technology offers a potentially large source of these substitute materials that can be sourced from recycled construction waste. The academic research on which the company is founded estimates that the process could produce around one third of global cement. This upper bound is constrained by the availability of electric arc furnaces globally.

On top of its potentially large impact, Reclinker's process could theoretically scale quickly compared with other electrified production routes given the process aims to leverage the world's existing capacity of electric arc furnaces.

What's next for Reclinker?

Reclinker is one of this year's earliest-stage Pioneers. It raised a $2.9 million seed round in July of 2024. The company is operating a pilot with CELSA, the UK's largest steel recycler. Reclinker is working on optimizing the chemistry of its process so that the output product meets specifications for Portland clinker at commercial scale. It has also recently demonstrated in commercial trials that its process results in a cleaner steel output than incumbent alternatives.

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