

AUGUST 2023

SPRING
WISE **FUTURE
NOW**

**THE TOP 10
IDEAS SHAPING
THE WORLD
AND YOUR
INDUSTRY THIS
MONTH**



THIS MONTH, 10 IDEAS THAT FOCUS ON ENERGY

If we do not speed up the deployment of alternative energy, we will not reach the global goal to be net zero by 2050. This means doubling down on the progress already made: in most places, power from renewables is now cheaper than fossil fuels, but we need more of it if we are to fully transition to a green economy.

Heavy industry remains a tough nut to crack in terms of reducing emissions, as does transport. Transport emissions grew at an annual average rate of 1.7 per cent from 1990 to 2022, as did those from industry, faster than any other end-use sectors. Post-Covid, passenger and cargo transport activity led to a 3 per cent increase in transport-related CO2 emissions in 2022, compared to the previous year. This month, we share 10 ideas that are offering potential solutions to these challenges.

The startups in this report will inspire you, but, on their own, they are not going to make the kind of impact required. Corporations and government need to align to turbocharge the adoption of novel approaches, as in the case of the Chilean innovation featured this month, which is supported by both the private and public sector in Germany, building on historic ties between those two nations to look firmly to the future of alternative eFuels.

Change is possible!

Angela Everitt, Content Director, Springwise

The Springwise logo features the word "SPRING" in a large, bold, white sans-serif font, with a small "TM" trademark symbol to its right. Below "SPRING" is a horizontal line, and to the right of this line is the word "WISE" in a similar bold, white sans-serif font. The background of the logo is a dark, textured image of a wind turbine and solar panels.

SPRING WISE

ABOUT FUTURE NOW AND SPRINGWISE

In 2020, The United Nations dubbed this the 'decade of action' in order to foster greater urgency around meeting the Sustainable Development Goals by 2030. Decisions that drive change can no longer be kicked down the road. The future is now.

Solutions require innovation, and the hunt for those that make a real impact is the lifeblood of Springwise. We publish three new innovations every day across our ecosystem. And each month we curate 10 of the most pertinent for your industry to create this report, Future Now, which is designed to inspire and catalyse action.

THE NEED FOR SPEED

Photo credit: Terabase Energy



SOLAR CONSTRUCTION 40-TIMES FASTER

A new system combines IoT-connected sites with robotic assisted construction

The [International Energy Agency](#) (IEA) forecasts that the world is set to add as much renewable power capacity in the next five years as it did in the past 20. And the large expected increases in renewable capacity are 30 per cent higher than was predicted even one year ago. Innovators like California-based Terabase Energy are powering this unprecedented growth through digitisation and automation.

Terabase works as the lead construction partner for utility-scale solar plant projects, providing everything from performance modelling and terrain mapping, to in-the-field manufacturing and grid-friendly plant management technologies. The new factories, called Terafab, use robotics-assisted construction and IoT-connected (Internet of Things) sites, with round-the-clock capability. By using a digital twin of the solar plant location, Terabase's systems help developers make the most of limited resources. The Terabase platform can reduce the time engineers need to spend on site by up to 40 times, and its simulation ability helps plant managers track and predict voltage outputs for multiple years.

Terabase opened its Terafab manufacturing facility – a “[factory to make factories](#)” – in Woodland, California earlier this year. The company also recently raised [\\$25 million](#) (around €22.3 million) to support its expansion, and has several commercial projects lined up later in the year that will use Terafab for their construction needs.



CHEAPER, MORE EFFICIENT OFFSHORE WIND

Offshore wind power is accelerating globally, and one Swedish company has made a breakthrough that takes full advantage of marine conditions

Many offshore wind turbines are designed to replicate onshore equivalents. But this approach is not cost-effective and does not take full advantage of the unique environment the ocean provides. Swedish company SeaTwirl is changing all that with floating vertical axis wind turbines (VAWTs) that have been proven to withstand hurricane-force wind and wave conditions. Unlike conventional horizontal axis wind turbines (HAWTs), which look like a windmill, VAWTs are more like a spinning cylinder. SeaTwirl's design uses three blades mounted on a pole. This structure sits inside a static generator ring, which is anchored to the sea floor. The entire pole spins, and the generator harvests energy to send back to shore by cable.

SeaTwirl claims this design is not only cheaper, but also more efficient, as it can use wind coming from any direction. Additionally, the VAWTs can run their generators at or below the waterline, eliminating the need for strong towers and huge counterweights below the surface – significantly reducing materials and costs. The VAWTs can also be placed much closer together than HAWTs, increasing yield per area.

COMMERCIAL VIABILITY

SeaTwirl originally appeared on Springwise in September last year. In May this year, the company signed a memorandum of understanding with Scottish firm Kontiki Winds to identify opportunities to deploy SeaTwirl's floating wind turbines to electrify new and existing oil and gas assets and for micro grid applications such as the powering of fish farms, desalination plants, or other small-scale applications that would otherwise require fossil fuel electricity generation.

INDUSTRIAL-SCALE HEAT PUMPS OFFER A WAY TO CUT ENERGY USAGE

Heat pumps are increasingly seen as an important component in the drive to reach net zero. However, much of the focus has been on the development and installation of domestic heat pumps. Startup Futraheat is focusing instead on industry.

Futraheat's Greensteam pump uses an innovative turbo compressor, called the TurboClaw. This offers a cost-effective way to recover waste heat – a by-product of many industrial procedures – and boost it to the higher temperatures needed for many manufacturing processes. The compressor operates without oil at a relatively low 20,000 revolutions per minute (RPM), compared with the 60,000 RPM typically found in a comparable centrifugal compressor, meaning that it uses less energy to run.

Photo credit: Futraheat



SCALABLE MEMBRANE TECH COULD REDUCE HEAVY INDUSTRY ENERGY USE BY 90 PER CENT

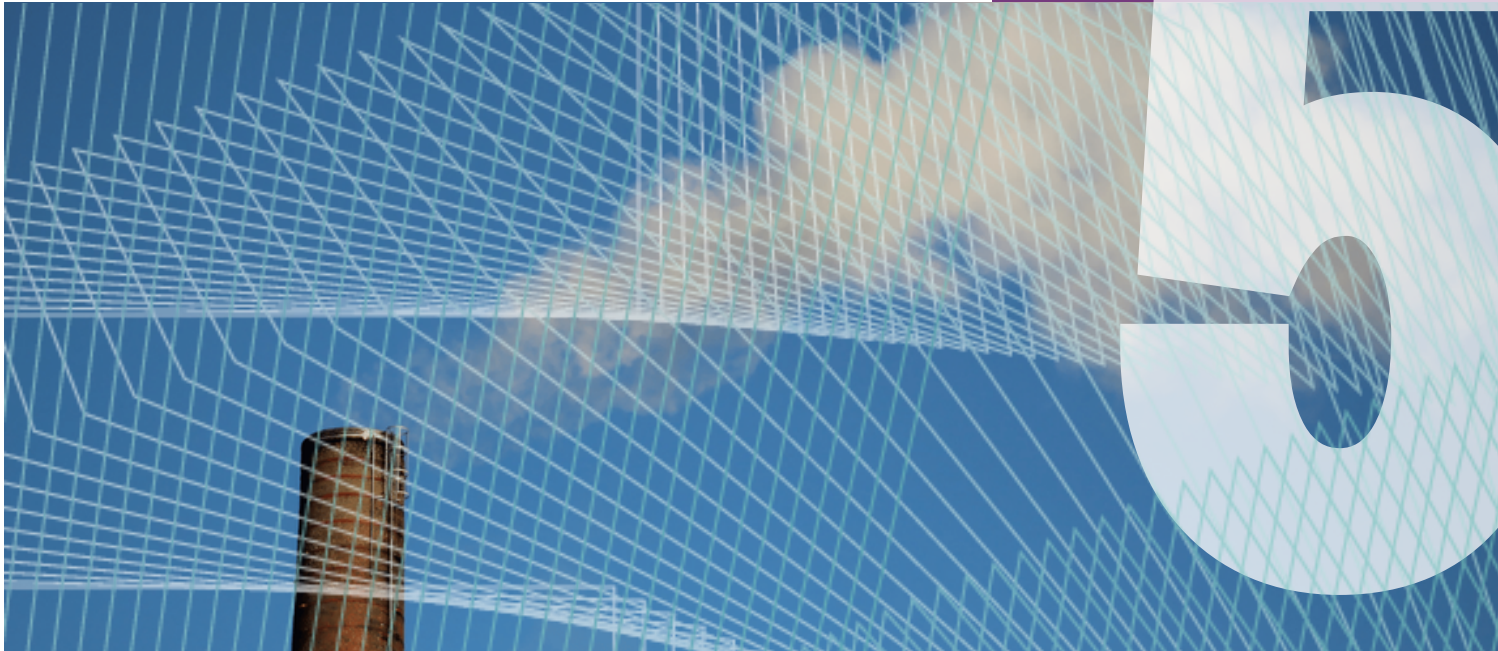
Industry accounts for about nine gigatonnes of direct CO2 emissions globally, or about one quarter of all energy and process CO2 emissions. And separation and purification in industrial processes uses a tremendous amount of this energy. Now, Swiss cleantech startup UniSieve has developed a technology that removes the need for heating and cooling in these processes, with sieving membranes that can drastically reduce energy use.

Separation often requires a long chain of steps that all depend on highly energy-intensive heating. In contrast, UniSieve's molecular membranes are made of highly ordered networks of porous crystals in a repeating pattern. These separate materials based on size, without the use of heat or cold. Smaller molecules can permeate the membrane, while larger ones are retained. By offering an extremely precise molecular cut off, UniSieve's membrane technology allows much more energy-efficient separation.

HOPE IS AT HAND FOR ENERGY-INTENSIVE INDUSTRIES

As the 2050 net zero deadline looms closer, the pressure is on for all companies working with energy- and carbon-intensive industrial processes. One of the key challenges for heavy industry is the need for high temperatures to facilitate certain processes.

Innovations such as Futraheat and UniSieve offer solutions. Futraheat closed a £1.5 million (around €1.7 million) investment round led by green investors Clean Growth Fund, while UniSieve has raised \$5.5 million (around €5 million) in an oversubscribed seed round.



PUTTING CAPTURED CARBON TO USE IN EVERYDAY PRODUCTS

One US company is turning sequestered CO2 into carbon fibre and wastewater treatment chemicals

Mars Materials is a California-based startup working to commercialise technology developed by the National Renewable Energy Laboratory (NREL). Using captured carbon dioxide, the process creates acrylonitrile (ACN), which is a building block for carbon fibre. Carbon fibre is used in plastics, rubbers, and chemicals, as well as in steel and aluminium production.

By reducing the need to create new chemicals, businesses using the material reduce their production emissions while putting captured carbon to extended use. Financially, the material could be a significant cost saver for companies as the Mars Materials team says that using the new method results in lower production costs than current systems.

Overall, the company plans to put at least a gigatonne (one billion tonnes) of captured carbon into everyday use. When used in carbon fibre applications and as a base material for chemical manufacturing, the sequestered emissions could soon be in products at every corner shop. Having recently closed a pre-seed round of funding that raised \$660,000 (around €600,000) the company plans to begin producing product samples to test with manufacturers. The organisation's two founders were also announced as Breakthrough Energy Fellows, recognition that comes with support for accelerating their innovation.

NEXT GEN CLEANTECH

Currently, less than one per cent of global carbon emissions are captured and stored. Yet experts say that the carbon capture and storage (CCS) market could pull significant amounts of carbon emissions out of the atmosphere. What is needed to bridge that gap is the rapid scaling of available technologies and swift development of the next set of innovations.

The NREL is the only US federal lab dedicated to renewable energy and energy efficient research. The NREL Growth Forum is an annual event where 40 startups from around the world at various stages are vetted and selected to present to cleantech investors, with the goal of pushing new, viable technologies to market.

A full list of the 40 can be found at nrelforum.com

ALTERNATIVES...



A NEW PLATFORM ALLOWS COMPANIES TO TAKE CONTROL OF THEIR EV BATTERY SUPPLY CHAIN

This startup creates clean strategies to help battery supply chain players meet the ever-growing customer demand for EVs

With the EU banning internal combustion-engine car sales from 2035, thoughts are now turning towards electric vehicles (EVs). But while EVs are the future, they currently face supply chain issues, from the mounting prices of critical minerals to disruptions caused by Russia's attack on Ukraine. The drive for EVs has created a surge in mining for metals like nickel, lithium, and cobalt, which has led to children as young as seven being forced to dig in dangerous conditions. Hoping to solve this problem is the London-based platform Infyos, which works to help battery companies mitigate risk and see through opaque supply chains.

To do this, the platform uses its in-house expertise and software to allow battery players to map their supply chain, pinpoint sustainability impacts, establish sustainability goals, and actively control their social and environmental influence.

As Infyos recognises, batteries are a crucial part of the clean energy transition for climate stability, but paradoxically, green technology supply chains can also be environmentally harmful. Infyos's work therefore aims to rectify this contradiction and make lithium-ion batteries a truly sustainable technology.

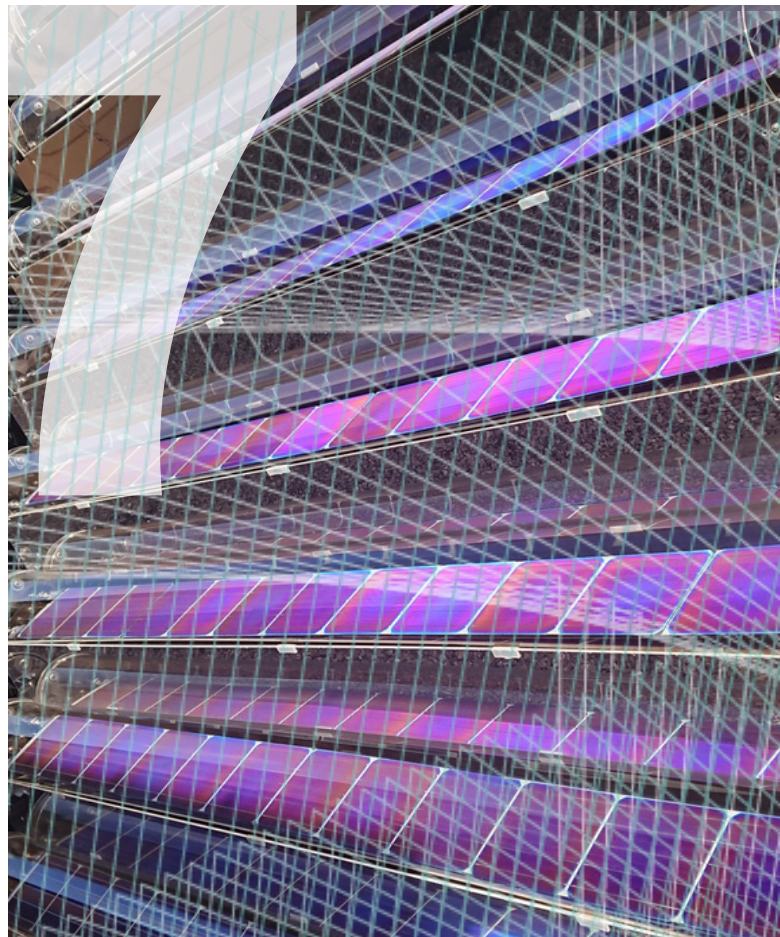
DECENTRALISED SOLAR PANELS FOR SMALLER ROOFS

This system promises to lower the carbon footprint of buildings with limited roof space

The International Energy Agency (IEA) reports that almost half of energy demand in buildings was used for space and water heating in 2022. Now, a new hybrid solar technology, called Virtu, from startup Naked Energy, is poised to clean-up heating in commercial buildings.

The startup's VirtuPVT collector generates both electricity and heat up to a temperature of 75 degrees Celsius. According to the company it is the world's highest energy density collector, delivering a peak efficiency of 80 per cent. The company has also developed the VirtuHOT, which generates only solar heat up to 120 degrees Celsius. Both products are three to four times more efficient than commonly used solar panels, modular, low cost, and designed to be integrated into existing buildings.

Photo credit: Naked Energy



At the end of 2022, Naked Energy launched a Series B round, receiving £10 million (around €11.6 million) of funding. It has also secured a £1 million (around €1.16 million) investment from Nesta to help scale up.

AMMONIA FUEL FOR SHIPPING

In 2021, The International Energy Agency (IEA) predicted that ammonia and hydrogen will need to be the main source of marine fuel if the world is to reach its net-zero goal by 2050, with ammonia accounting for 45 per cent of energy demand from shipping.

US startup Amogy – founded by four MIT alumni – pioneers emissions-free ammonia to power systems for use in maritime operations. In June this year, it announced that it had signed its first pre-order for four 'Zero Emission Powerpacks' with a Norwegian shipping company.

The system uses liquid ammonia as an alternative fuel. Amogy's proprietary technology converts the ammonia into a clean energy source with zero carbon emissions at the point of use. A catalyst cracks the ammonia into hydrogen and nitrogen for direct integration into a fuel cell. The powerpacks are modular, which allows for 'scaling up' with supplementary modules to deliver more power where required. Safety has been baked into the design – Amogy worked with the US Coast Guard to confirm that the powerpacks complied with regulations and to identify any potential hazards and risks associated with using ammonia as fuel.



TURNING WIND, WATER AND AIR INTO GREEN FUEL USABLE IN EXISTING INFRASTRUCTURE

This synthetic fuel can be used to power everything from ships and planes to private cars

At the very bottom of Chile, not far from Antarctica, is the wild and rugged region of Magallanes. Known for the constancy and strength of its wind, the area has traditionally supported a variety of farms along with a sizeable tourism industry. But now, Chile's largest and southernmost region is the setting for an innovative, \$55 million (€50.6 million) plant called 'Haru Oni', the first operating eFuels facility in the world, run by the firm Highly Innovative Fuels (HIF).

Haru Oni combines the products of two separate processes: electrolysis and carbon capture. In the first, an on-site wind turbine produces an electric current that separates hydrogen from water. In the second, carbon dioxide is captured from atmospheric air and industrial sources. The CO₂ and hydrogen are then combined to create a fuel that can be used in a range of everyday applications.

The process is carbon neutral as the electricity used to produce the hydrogen comes from renewable wind, and the CO₂ is recycled from the atmosphere, so when the fuel is burned, no new CO₂ is released.

FUTURE BLUEPRINT?

HIF is paying local farmers to allow for the installation of wind turbines on their land and working closely with them on identifying the locations that are best for both parties. If such partnerships prove successful, they could inspire future sustainability measures focused on collaborations between landowners and sustainable technology companies.

Siemens Energy and Porsche are early adopters of HIF's eFuel, coming on as partners at the pilot stage. Synthetic fuels supplementing electromobility is a key component of Porsche's sustainability strategy, while Siemens Energy benefited from an €8 million grant from the German government as part of its national hydrogen strategy.

Siemens Energy CEO Christian Brunch predicts that new supply chains will arise all over the world to carry renewable energy from one region to another, as innovation in the sustainable energy economy continues. "It's going to require some rethinking," he says, "as renewable energy will no longer be produced where it's needed, but where natural resources like wind and sun are available on a massive scale."



THERE ARE BARRIERS, BUT THEY CAN BE OVERCOME

Net zero will only be possible if the network infrastructure is in place to manage the increased demand from heat pumps and electric or hydrogen-powered vehicles. UK firm SP Energy Networks is working to address this challenge by developing a first-of-its-kind digital twin of the UK's entire electricity network. The system, dubbed ENSIGN (ENergy System dIGital twiN), will be used to model and test digital solutions for managing electricity demand.

The digital twin was developed in collaboration with several leading Scottish universities, including Strathclyde, Glasgow, Heriot-Watt, and St Andrews. It is designed to identify the best ways to optimise capacity and manage increased electricity demand, as well as find the most cost-effective ways to incorporate green energy technologies.

The digital twin will use AI to create virtual links between homes and businesses and the grid. According to SP, this is an important step towards the smart grid of the future, which should give consumers a greater interactive relationship with the national grid. The project is being funded with a £10 million (around €11.6 million) award from the Engineering, Physics and Sciences Research Council's Prosperity Partnership Fund, part of the government-supported UK Research and Innovation (UKRI).

INNOVATORS FEATURED

1. Terabase

terabase.energy

2. SeaTwirl

seatwirl.com

3. Futraheat

futraheat.com

4. UniSieve

unisieve.com

5. Mars Materials

marsmaterials.tech

6. Infyos

infyos.com

7. Naked Energy

nakedenergy.com

8. Amogy

amogy.co

9. Highly Innovative Fuels

hifglobal.com

10. SP Energy Networks

spenergynetworks.co.uk

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