



REUTERS EVENTS™

Global energy transition: the top 100 innovators





Contents

Introduction.....	3
Digital solutions	4
Decarbonization	5
Wind power	6
Just transition.....	7
Collaboration and partnerships.....	8
Hydrogen.....	9
Carbon capture.....	10
Novel technology.....	11
Green finance	12
Energy storage.....	13
Outlook and conclusions.....	14



Introduction

Innovation is key to the energy transition as global greenhouse gas emissions continue to mount and the window for meaningful climate action closes. For the second year running, Reuters Events has wanted to recognize some of the many organizations innovating to save the planet from catastrophic climate change.

This list of 2022's top 100 energy transition innovators draws on Reuters Events' expertise as the world's leading provider of cleantech events. As with last year, we have divided the list into 10 categories with 10 organizations in each, three of which have been given a detailed profile. Rather than a comprehensive ranking, what follows is a celebration of organizations that have made notable contributions to the energy transition.



Digital solutions

Digital technology is increasingly recognized as being key to the success of the energy transition, to the extent that some experts believe net zero will be practically unachievable without significant digitalization.

Special mentions

GE Digital

GE Digital's strapline is 'putting industrial data to work' and the business operates across the energy space in fields as diverse as oil and gas, to mining and power generation, to petrochemicals. In the energy space, the GE subsidiary's software helps monitor gas turbines and provide carbon insights and reduction services. GE Digital has been named asset performance management software leader two years in a row by the analyst firm Verdantix.

IBM

Computing titan IBM's Environmental Intelligence Suite tackles a growing problem in green grids: how do you forecast renewable energy output from intermittent generation assets such as wind farms and solar plants? The Environmental Intelligence Suite generates high-accuracy forecasts of wind and solar farm assets through the use of artificial intelligence and advanced analytics, sophisticated instrumentation and best-in-class weather data.

Energy Systems Catapult

Working with innovators, utilities, industrial and commercial companies and central and local government, Energy Systems Catapult is the UK's leading energy transition technology and innovation center.

Other top innovators

- **Artial**, for intelligent drones.
- **Bamboo Energy**, for distributed flexibility aggregation.
- **Beyond Limits**, for grid analytics.
- **FlexiDAO**, for certificates of origin tracking.
- **Octopus Energy**, for the KrakenFlex platform.
- **RINA**, for energy performance reporting.
- **Urbio**, for urban energy planning.



Decarbonization

The race to reduce emissions is no longer about who is pledging the most but who is really moving the needle through concrete actions.

Special mentions

Decarbonization Vattenfall

The iron and steel industry is responsible for around a tenth of global carbon emissions and for a long time has been seen as one of the hardest sectors to decarbonize. However, Vattenfall is changing that perception with HYBRIT (Hydrogen Breakthrough Ironmaking Technology), in collaboration with steel producer SSAB and mining company LKAB. HYBRIT could reduce Sweden's CO₂ emissions by 10% if implemented at scale.

8 Rivers

The Allam-Fetvedt Cycle is a new way to generate low-cost power from fossil fuels without producing air emissions. The technology, commercialized by NET Power, of which 8 Rivers is a shareholder, will support the delivering of climate targets without having to pay more for electricity. 8 Rivers is pioneering the invention and commercialization of sustainable, infrastructure scale technologies, for the global energy transition – with several game-changing, proven decarbonization technology being deployed globally.

Schneider Electric and Walmart

The unlikely duo of Schneider Electric and Walmart has produced one of the year's most eye-catching decarbonization schemes in Project Gigaton, which aims to cut a billion metric tons from global supply chains by 2030. In October 2022 the project administrators announced a first cohort of suppliers taking part in the scheme.

Other top innovators

- **Cory**, for sustainable waste management.
- **Engie**, for early retirement of coal-fired generation.
- **Hitachi**, for renewably powered manufacturing.
- **Linde**, for industrial decarbonization.
- **National Grid**, for low-carbon electricity generation.
- **Neste**, for low-carbon fuels.
- **TC Energy**, for solar powered renewable natural gas

Wind power

Wind is one of the core generation technologies of tomorrow—and an area of intense innovation as project developers move into deep offshore waters.

Special mentions

Massachusetts Institute of Technology (MIT)

Working with experts from turbine maker Siemens Gamesa and developer ReNew Power, MIT researchers have found a way to improve wind farm output by 1.2%—at no cost. The benefit can be achieved by modeling the wind flow of an entire collection of turbines and optimizing the control of individual units accordingly, the researchers found.

Ørsted

Danish developer Ørsted is taking offshore wind to new heights with its Hornsea plants off the east coast of England. When complete, the four Hornsea offshore wind farms will total 6 gigawatts (GW) of capacity, making this one of the largest renewable energy projects in the world.

Acciona Energía

Acciona of Spain is the majority owner of Australia's biggest wind project. When complete in 2024, the MacIntyre complex in Queensland will have around 1 GW of capacity, enough to power 700,000 homes.

Other top innovators

- **Equinor**, for low-emissions crew transfer vessels in offshore wind.
- **GE Renewable Energy**, for the Digital Wind Farm.
- **MingYang**, for the world's largest offshore wind turbine.
- **Siemens Gamesa**, for recyclable turbine blades.
- **SSE Renewables**, for the Dogger Bank project.
- **Vattenfall**, for wind-to-hydrogen innovation.
- **Vestas**, for wooden turbine towers.

Just transition

Getting to net zero emissions is a challenge that affects everyone—and just transition innovation leaders aim to make sure no-one gets left behind.

Special mentions

Boston Consulting Group (BCG)

BCG's Center for Energy Impact aims to engage a changing industry in new and different ways by providing challenging ideas to drive performance. The Center's international team has tackled issues ranging from scaling up renewables to the transition facing the oil and gas sector.

Government of Canada

As part of the Powering Past Coal Alliance, the Canadian government has committed to banning new thermal coal mining and ending coal-fired power generation. Campaigners have called on the administration to build on this ambition by banning coal exports as well by 2023.

Climate Investment Funds (CIF)

CIF is leading \$1 billion in investments for a just transition from coal to clean power in South Africa and Indonesia. The multilateral fund intends to equip each country with access to \$500 million in concessional, risk-bearing capital from CIF's Accelerating Coal Transition investment program.

Other top innovators

- **Business for Social Responsibility**, for enterprise collaboration.
- **CEE Bankwatch Network**, for tracking Europe's coal phaseout.
- **Engie**, for coal divestment.
- **Eni**, for transition in oil and gas.
- **European Commission**, for its Just Transition Mechanism.
- **European Bank for Reconstruction and Development**, for sustainable market economies.
- **SSE**, for corporate commitment to a just transition.



Collaboration and partnerships

The energy transition will require a scale and speed of infrastructure deployment that will be hard to achieve by organizations acting alone. Hence, a key part of innovation will be work carried out in partnerships and collaborations.

Special mentions

Hydrogen Import Coalition

This collaboration between DEME, Engie, Exmar, Fluxys, the Port of Antwerp, the Port of Zeebrugge and WaterstofNet has carried out important research into the feasibility of large-scale imports of low-carbon hydrogen into Europe.

Net Zero Technology Centre

Based in Aberdeen, Scotland, the Net Zero Technology Centre is at the forefront of developing and deploying technologies for an affordable net-zero energy industry. It has screened more than 1,640 technologies and commercialized 33, as well as accelerating 45 startups.

Asian Renewable Energy Hub

Backed by BP, Intercontinental Energy, CWP Global, Vestas and Pathway Investments, the Asian Renewable Energy Hub will be one of the largest renewable energy hubs in the world. At full scale, its 26 GW of wind and solar power will deliver 1.6 million tonnes of green hydrogen and 9 million tonnes of low-carbon ammonia a year.

Other top innovators

- **Antwerp@C**, for cross-border carbon transport.
- **Equinor Ventures**, for startup investments.
- **International Energy Agency**, for its Technology Collaboration Programmes.
- **ScotWind**, for offshore wind development.
- **Siemens Gamesa**, for collaboration in wind power research.
- **Thyssengas**, for decarbonizing gas.
- **Wood and Luxcara**, for energy transition investments.

Hydrogen

Low-carbon hydrogen is rapidly emerging as the key to decarbonizing sectors such as industry and marine transport, but innovation is required to bring down the cost of the gas.

Special mentions

AquaVentus

The AquaVentus initiative aims to use electricity from offshore wind farms to operate electrolyzers also installed at sea—on an industrial scale. Plans envisage setting up electrolysis units in the North Sea with a total capacity of 10 GW by 2035, enough to produce a million tonnes of green hydrogen.

Hy2gen

Hy2gen's goal is to become a market leader in the production of green hydrogen and clean fuels for mobility, agriculture and industry. Founded in 2016, the company is building 880 megawatts (MW) of production capacity and has a project pipeline of over 12 GW in development.

Linde

Industrial gas leader Linde is building one of the world's largest proton exchange membrane electrolyzer plants at its Leuna Chemical Complex in Germany. The 24 MW electrolyzer will supply Linde's industrial customers through the company's existing pipeline network.

Other top innovators

- **CBloom Energy**, for fuel cells in distributed energy.
- **Constellation Energy**, for nuclear-powered hydrogen production.
- **CWP Global**, for hydrogen hub investments.
- **Dow**, for hydrogen and carbon capture.
- **Equinor**, for H2H Saltend.
- **Toyota**, for fuel-cell vehicle development.
- **U.S. Department of Energy**, for the HydroGEN consortium.



Carbon capture

With global anthropogenic carbon emissions at their highest level ever in 2022, the need to scale up carbon capture and storage (CCS) technologies is growing.

Special mentions

Remora

U.S. startup Remora has not only developed a neat device to capture 80% of carbon emissions from semi-trailer trucks, but also has a novel business model. It sells the captured CO₂ to companies that store the carbon and splits the profits with truck owners.

Baker Hughes

In April 2022, energy technology company Baker Hughes acquired Mosaic Materials and with it a next-generation capture technology for carbon removal from the atmosphere. Mosaic's metal-organic framework technology is a proprietary adsorbent material that acts like a high-capacity molecular sponge to selectively capture CO₂, Baker Hughes said.

Aker Solutions

Aker Solutions is working with Siemens Energy and Doosan Babcock on Keadby 3, which could become the UK's first power station with carbon capture and storage. The proposed plant, with a generating capacity of up to 910 MW, will be equipped with CCS to capture up to 1.5 million tonnes of carbon a year, which represents around 5% of the UK's 2030 target.

Other top innovators

- **Air Liquide**, for cryogenic carbon capture.
- **C-Capture**, for solvent-based capture technology.
- **Chevron**, for its backing of Carbon Clean.
- **Honeywell UOP**, for CCS in oil and gas.
- **IHI Corporation**, for methanation technology.
- **Saipem**, for CCS in power generation.
- **Shell**, for carbon capture investment.

Novel technology

While many of the tools needed to reach net zero are already available, innovation could play a major role in helping uncover the breakthroughs needed to accelerate decarbonization to levels needed to achieve climate targets.

Special mentions

Twelve

Californian chemical technology developer Twelve shows what downstream players might look like a few decades from now. The company uses metal catalysts to convert atmospheric CO₂ into zero-emissions industrial chemicals, materials and fuels.

Shell

Energy giant Shell is no stranger to digital innovation in oilfields, but now it is using digitization to support clean energies too. The company uses blockchain to track the source of renewable energy and allocate sustainable aviation fuel purchases for air travel.

Virta

As the motor industry embraces electrification there is growing interest in using the spare capacity of electric vehicle batteries to help the grid. This requires vehicle-to-grid technology that is in its infancy—but in Finland Virta has already introduced the world's first nationwide automated demand response scheme for electric car charging power.

Other top innovators

- **Arrecife Energy Systems**, for wave energy.
- **BigD**, for Dubai's smart palm concept.
- **Bjarke Ingels Group**, for the Copenhill waste-to-energy plant.
- **Gradient**, for direct lithium extraction.
- **Heineken**, for biomass-powered brewing.
- **Norwegian Crystals**, for solar bricks and wafers.
- **Studio Mom**, for hydrogen bikes.

Green finance

Financing the energy transition is a massive undertaking, requiring financial innovation to achieve scale and streamline funding.

Special mentions

Triodos Bank

The Triodos Pioneer Impact Fund is making money for investors with investments in a range of small and medium-sized stock-market listed companies that are working on pioneering approaches to sustainability challenges.

Union Bancaire Privée (UBP)

UBP's UBAM Positive Impact Equity sub-fund addresses the fastest-growing part of the sustainable investment universe, focusing on companies that aim to deliver social and environmental benefits and excluding those that contribute to problems.

Wylie Heyworth Environment Business (WHEB)

Certified B corporation WHEB has been focusing on sustainable investing since 2005 and today its impact investment funds are highly regarded by UK and Irish investors. The company has identified more than 500 companies offering products and services which provide solutions to sustainability challenges.

Other top innovators

- **Alexa Capital**, for corporate finance advisory services.
- **Bluefield Solar Income Fund**, for low-carbon investing.
- **Greencoat UK Wind**, for wind energy investment.
- **Impax Asset Management**, for energy transition investing.
- **Pictet**, for sustainable wealth management.
- **Schroders**, for the impactIQ impact analysis toolkit.
- **S&P Global**, for the Global Clean Energy Index.

Energy storage

Switching to renewables will not work without massive amounts of energy storage to capture intermittent generation and deliver it on demand.

Special mentions

Polar Night Energy

Eschewing the materials challenges that haunt widely used lithium-ion batteries, Polar Night Energy of Finland is looking to store up to 20 gigawatt-hours of energy per plant using one of the most common substrates in the world: sand.

Avanti

MIT spinoff Avanti is also looking to store energy with commonly occurring materials, specifically aluminum, sulfur and rock salt crystals. The company expects its batteries to be cheaper and less flammable than lithium-ion chemistries, and with faster charging times.

Hydrostor

Compressed air energy storage has been around as a concept for decades, but companies that have managed to commercialize the technology are few and far between. Hydrostor of Canada is arguably the sub-sector frontrunner, with projects in development around the world.

Other top innovators

- **EnergyNest**, for thermal energy storage.
- **Energy Vault**, for gravity storage.
- **ESS**, for flow batteries.
- **Fluence**, for grid-scale battery storage.
- **Siemens**, for its product portfolio.
- **Sonnen**, for residential storage aggregation.
- **Tesla**, for Megapack large-scale batteries.





Outlook and conclusions

Selecting a mere 100 organizations out of the thousands that are contributing to the energy transition is no easy task. While progress is being made, there remains lots of work to be done in order to truly deliver a net-zero energy system.

What is most important about this list is perhaps not the inclusion or otherwise of particular names but rather the diversity of the organizations concerned, from research institutions and technology platform providers to financiers and project developers. Many of the organizations listed in this report will be

at the Reuters Events Global Energy Transition 2023 event in New York, United States, on June 07 – 08 2023. Do not miss this opportunity to catch up with the innovators driving the energy transition.

For more information, see reutersevents.com/events/energy-transition-global.