World Energy Investment 2023

Supplementary charts: energy venture capital trends

15 June 2023
Early-stage equity funding for energy start-ups is booming

VC investment in energy start-ups, by technology area, for early-stage and growth-stage deals, 2005-2023e

Investment is led by clean mobility and renewables, but prevailing macroeconomic conditions have dented the amount of capital available and 2023 could be leaner for later-stage deals.
Most VC funding for energy has flowed to US-based start-ups

Europe has a strong presence in hydrogen and China active in mobility and batteries, but other emerging market and developing economies account for just 5%
European start-ups attract a higher share of early- than growth-stage

The big rise in investment in 2021 to 2023 was spread across the main regions, led by the United States, then Europe and China. Other regions represent much lower shares, a result that has not changed significantly since 2015.
Corporate VC investment in clean energy start-ups remains high

The contribution in 2022 from electricity, oil and gas, and heavy industry companies rose
Most of the boom in energy is for start-ups working on hardware

More than 25% went to less risky digital technology and project developers in 2022, more than in 2020-2021 2023, likely reflecting lower willingness among VC funds to make large, long-term bets
Energy has outperformed other VC segments since 2021

Early-stage equity funding for energy start-ups in particular has experienced impressive growth while VC investment has fallen in general.
Trends by category
Mobility
Early-stage deals for mobility have shifted from vehicles to charging.

VC investment in energy start-ups in the Mobility category, for early-stage and growth-stage deals, 2010-2023.

Early-stage funding for charging, fleets and aviation is starting to translate into finance for scale-up.
Chinese EV start-ups are well-funded, while US leads mobility VC

Early- and growth-stage equity investment in energy start-ups in the Mobility category by region, 2018-2022

Europe has strong shares of funding for non-road and hydrogen-based mobility
Energy efficiency
VC funding for energy spiked in 2022 across nearly all categories

Energy efficiency has been a strong performer in the past, with most activity in digital-related products and processes. In 2022, there was more funding for heating, and heat start-ups entered the market.
North American and European start-ups dominate energy efficiency

Digital and connected solutions for building energy management show the most regional diversity. Recent investment in heat pumps has been largely in Europe.
Energy storage and batteries
Li-ion leads growth-stage VC, but other storage options are emerging

VC investment in energy start-ups in the Energy storage category, for early-stage and growth-stage deals, 2010-2023

In 2022, both early-stage and growth-stage funding for the dominant battery technology, lithium ion, dipped. Energy storage funding nonetheless reached a new high, as other battery types and battery recycling surged ahead.
Energy storage VC is regionally diverse

Early- and growth-stage equity investment in energy start-ups in the Energy storage category by region, 2018-2022

Funding for lithium ion start-ups has been evenly split between China, Europe and the United States. While US start-ups have attracted most funding for other battery types, data indicate a European focus on non-battery storage.

Funding distribution by region and technology category:

- Li-ion batteries and components
- Other batteries
- Other components
- Battery management systems
- Battery recycling and reuse
- Thermal storage
- Mechanical storage
- Supercapacitors
- Stationary project developers

- United States
- Canada
- China
- Israel
- Rest of world
- United Kingdom
- Other Europe
Renewables
In 2022, VC funding for renewables returned to 2011 levels

VC investment in energy start-ups in the Renewables category, for early-stage and growth-stage deals, 2010-2023

Project developers continue to raise a large share of the VC investment for renewables, though early-stage funding has shifted in part from solar start-ups to wind, bioenergy and geothermal.
Europe and India have produced innovators in bioenergy and wind

While manufacturing of solar PV has become concentrated outside North America, US entrepreneurs developing new designs continue to attract VC financing. The region is also home to the recent uptick in funding for geothermal.
Hydrogen and fuel cells
Investors have responded to the rise of policy support for hydrogen

VC investment in energy start-ups in the Hydrogen and fuel cells category, for early-stage and growth-stage deals, 2010-2023

Investors see growing opportunities in early-stage businesses across hydrogen supply segments, but this is yet to translate into growth-stage funding, which has been led by fuel cells over the past decade.
No region shows dominance in VC funding across H₂ and fuel cells

Early- and growth-stage equity investment in energy start-ups in the Hydrogen and fuel cells category by region, 2018-2022

VC investors keen to profit from the scale up of hydrogen-related technologies are looking for excellence around the world, with only hydrogen-based fuels showing significant regional concentration.
Industry
VC activity in heavy industry has been boosted by cement and steel

The spike in energy-related VC activity in 2021 and 2022 extends beyond traditional energy areas and indicates that net zero pledges are creating value for start-ups aiming to shift industrial activity away from CO₂-intensive processes.
Industrial decarbonisation funding is mostly going to the US and EU.

European and US start-ups are seeking different technology paths to transition the steel sector away from fossil fuels.
Other power and grids
Early-stage grid-related investments have mostly been for digital

Both early- and growth-stage funding for grids has risen sharply. The newer entrants are led by digital businesses, such as optimisation services, while scale-up deals are for more traditional areas of district heating and metering.
African and Asian start-ups are the leaders in offgrid energy access.

District heat remains a Europe-dominated area, while Israeli start-ups have attracted attention for power generation technologies.
Fossil fuels
Fossil fuel-related VC deals shift to methane and pollution control

VC investment in energy start-ups in the Fossil fuels category, for early-stage and growth-stage deals, 2010-2023

VC funding for start-ups aiming to improve the economics of fossil fuel production is back at 2010-2012 levels, but with more emphasis on dealing with scope 1 and 2 emissions.
Fossil fuel VC activity has largely been North American

Outside North America, Chinese start-ups have attracted funding for better combustion technologies and European start-ups have been most active in infrastructure, such as natural gas distribution.
There was a big jump in investment in nuclear start-ups in 2021-2022

VC investors see value in both nuclear fission (especially small modular reactors) and fusion start-ups, with more money going to fusion. There have also been a major increases in CCUS and critical minerals funding.
The United Kingdom is a potential hub for nuclear fission innovation

UK start-ups are also present in several CCUS areas, though US companies have attracted most of the investment into CO₂ capture, transport and storage.
Trends for cross-cutting categories
Hydrogen
Most VC funding for hydrogen is for supply-side technologies

VC investment in energy start-ups in Hydrogen-related areas, for early-stage and growth-stage deals, 2010-2023

Hydrogen start-ups were absent from the boom in clean energy VC in 2010-2012, but have now become a major area of expected returns. Early-stage bets are split between novel approaches to making and converting hydrogen.
Chinese start-ups have raised most money for fuel cell development

Early- and growth-stage equity investment in energy start-ups in hydrogen-related areas by region, 2018-2022

So far, hydrogen-related project developers have mostly been founded in Europe, but this may change as the outlook for project finance has improved under recent US policies.
Carbon capture, utilisation and storage (CCUS)
A surge of investment in CCUS project developers is a sign of trust

VC investment in energy start-ups in CCUS-related areas, for early-stage and growth-stage deals, 2010-2023

More early-stage funding has been directed to technologies for CO₂ utilisation – in fuels, cement or chemicals – which can target niche consumer products, compared with policy-dependent CO₂ capture and storage.
VC investment for CCUS is going mainly to North American start-ups

Direct air capture and CO₂ infrastructure are exceptions, with European start-ups attracting most money
Critical minerals
Concerns about minerals supplies are spurring new energy VC areas

VC investment in energy start-ups in critical mineral-related areas, for early-stage and growth-stage deals, 2010-2023

Early-stage funding has translated very rapidly into scale-up funds for promising start-ups, especially in lithium supply and battery recycling.
Most VC for critical minerals is in regions that have also funded R&D.

The United States and Canada are home to the start-ups attracting most funds for battery minerals and recycling, but various countries are active, especially in regions looking to de-risk international supply chains.
Energy access
A concerning dip in early-stage funds for energy access

Funding for start-ups working on products and services for energy access in emerging market and developing economies has not followed the rapidly rising trend in other energy technology areas.
African start-ups are successful in digital and hardware for access

Early- and growth-stage equity investment in energy start-ups in Critical mineral-related areas by region, 2015-2022

VC fundraising by African and Asian start-ups indicates the importance of exposure to local challenges as a spur to innovation.
All charts are from IEA analysis based on Cleantech Group i3 database and supplemented by insights from Crunchbase. Analysis is based on the 8 617 deals that have a disclosed deal value among the 10 771 relevant deals since 2010 in the dataset.

In all categories, “Other” includes unclassified start-ups.

BEMS = building energy management systems

CCUS = carbon capture, utilisation and storage

CTL = coal-to-liquids

EV = electric vehicle

GTL = gas-to-liquids

ICT = information and communication technology

PV = photovoltaic

UCG = underground coal gasification