

Energy Transition Investment Trends

Tracking global investment in the low-carbon energy transition

2021

BloombergNEF



Executive summary

This is an abridged version of BloombergNEF's annual accounting of global investment in the low-carbon energy transition. BNEF clients can find the full version on Bloomberg Terminal or bnef.com

Previously focused on renewables, the report now includes investment figures for a wider scope of transition areas, including energy storage, electrified vehicles and heating, hydrogen, and carbon capture and storage. We also cover thematic highlights such as the rise of green finance, performance of clean energy stocks and investment by oil majors.

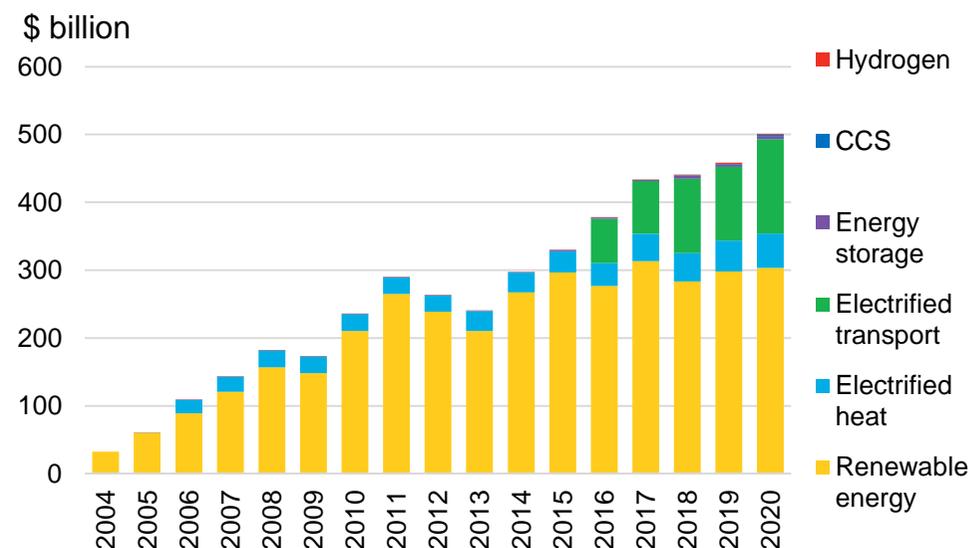
- In 2020, global investment in the low-carbon energy transition totalled \$501.3 billion, up from \$458.6 billion in 2019 and just \$235.4 billion in 2010. This figure includes investment in projects, such as renewable power, energy storage, EV charging infrastructure, hydrogen production and CCS projects – as well as end-user purchases of low-carbon energy devices, such as small-scale solar systems, heat pumps and zero-emission vehicles.
- The largest sector in 2020 was renewable energy, which attracted \$303.5 billion for new projects and small-scale systems. This was up 2% on 2019, despite Covid-related delays to some deals.
- The second-biggest was electric transport, which saw \$139 billion of outlays on new vehicles and charging infrastructure, up 28%. Electric heat got \$50.8 billion of investment, up 12%.
- Hydrogen and CCS are small sectors for now, but are expected to grow. In 2020, they received investment of \$1.5 billion and \$3 billion, respectively down 20% and up 212%.
- Europe and China are currently vying for top position among markets active in energy transition investment.

\$501.3bn Global energy transition investment in 2020

9% Year-on-year increase in 2020, happening despite Covid-19

2% Year-on-year growth in renewables investment, specifically

Global investment in energy transition by sector



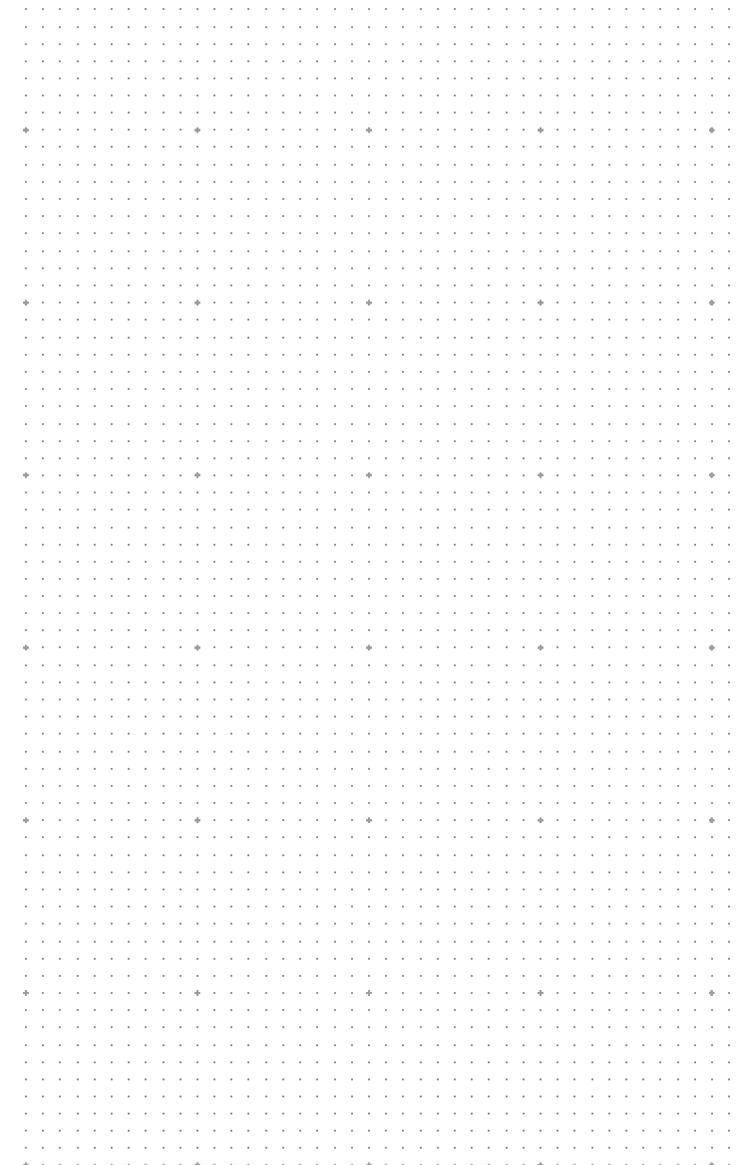
Source: BloombergNEF

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Energy transition investment

Top-level findings (abridged)



Energy transition investment: preface

This section of the report presents our top-level findings on global investment in the low-carbon energy transition.

Brief definition and methodology

The figures in this section represent capital spent on deployment of low-carbon technology. This largely excludes capital invested in companies, and money spent on research, development and manufacturing (with limited exceptions, such as in CCS where we include some of these sums).

For large infrastructure projects such as renewables, stationary energy storage, hydrogen production, EV charging and CCS, our figures are built based on bottom-up intelligence on individual projects and financial commitments. In general, we account for money that has been committed to a specific project, whether through a final investment decision, a government grant allocation, or a project proceeding to construction and commissioning. We don't include money that hasn't been explicitly committed to a known project (such as unallocated government grant funding), or projects that have not yet reached final investment decision. We apply cost estimates where project values are not disclosed.

For consumer- or end-user-led technologies, such as small-scale solar, heat pumps, and electric and fuel cell vehicles, we estimate the total amount invested (spent) based on our own benchmarks of the total costs of these products, including any relevant installation costs.

Coverage and gaps

The main sectors covered are as follows:

- **Renewable energy:** wind (on- and offshore), solar (large- and small-scale), biofuels, biomass & waste, marine, geothermal and small hydro
- **Energy storage:** stationary storage projects (large- and small-scale), excluding pumped hydro, compressed air and hydrogen. The majority are battery projects.
- **Electrified transport:** sales of electric cars, commercial vehicles and buses, as well as home and public charging investments
- **Electrified heat:** residential heat pump investments
- **Hydrogen:** hydrogen electrolyzer projects, fuel cell vehicles and hydrogen refuelling infrastructure
- **Carbon capture and storage:** large- and small-scale commercial CCS projects, dedicated transport infrastructure

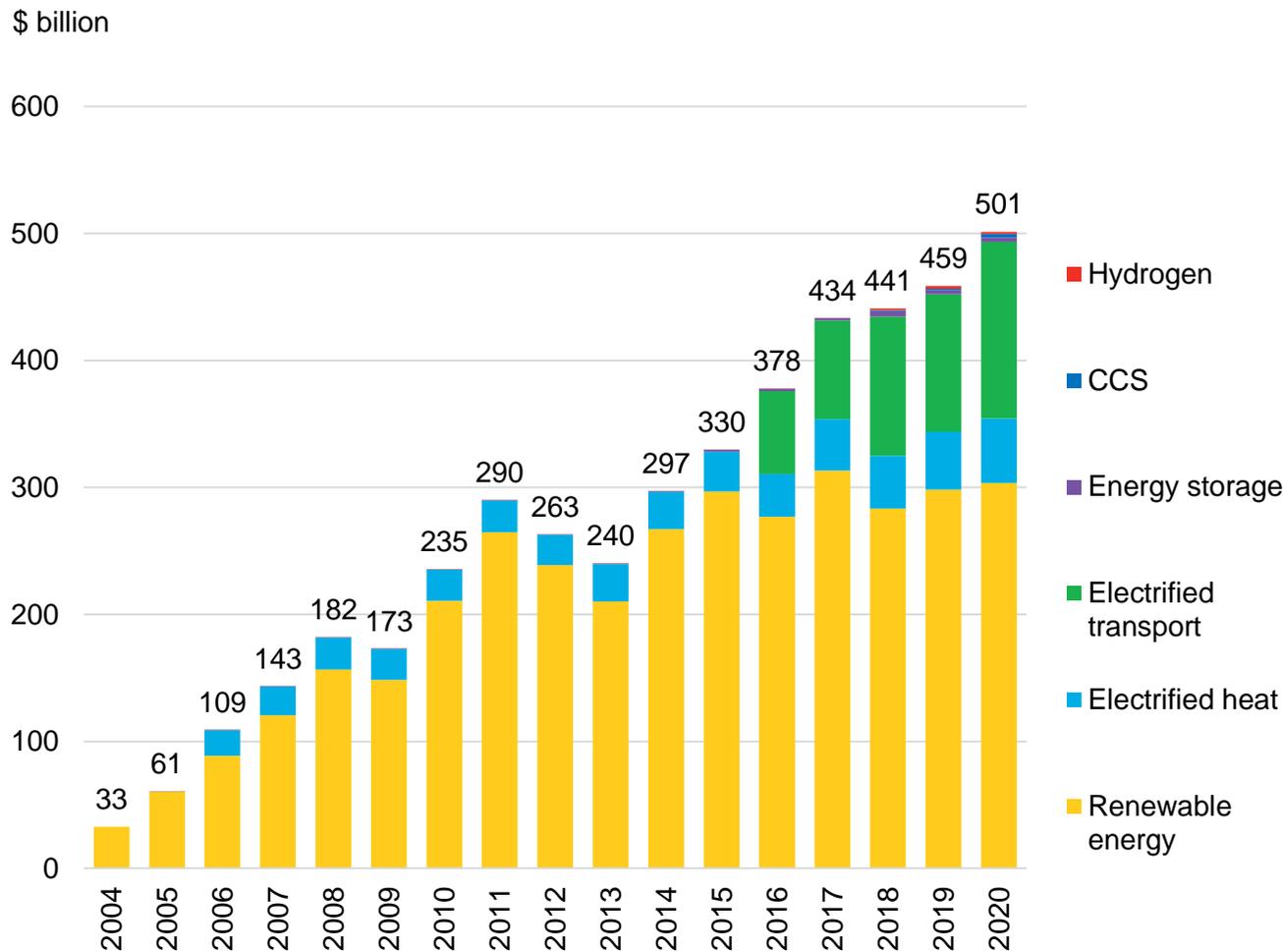
These sectors cover a broad swathe of low-carbon energy investment, and are a good representation of global energy transition investment. There are, however, areas that we have not yet included – most notably energy efficiency, due to a lack of good data sources. There are also subsectors that we have yet to tackle. For example, our electrified heat sector currently only covers the residential subsector. And within hydrogen, we are not yet including industrial hydrogen-use projects or production of 'blue' hydrogen with CCS.

The totals here can therefore be thought of as a conservative estimate of global energy transition investment.

For further detail on methodologies, please contact Michael Daly at mdaly71@bloomberg.net

Energy transition investment hit \$500 billion for the first time in 2020

Global investment in energy transition by sector

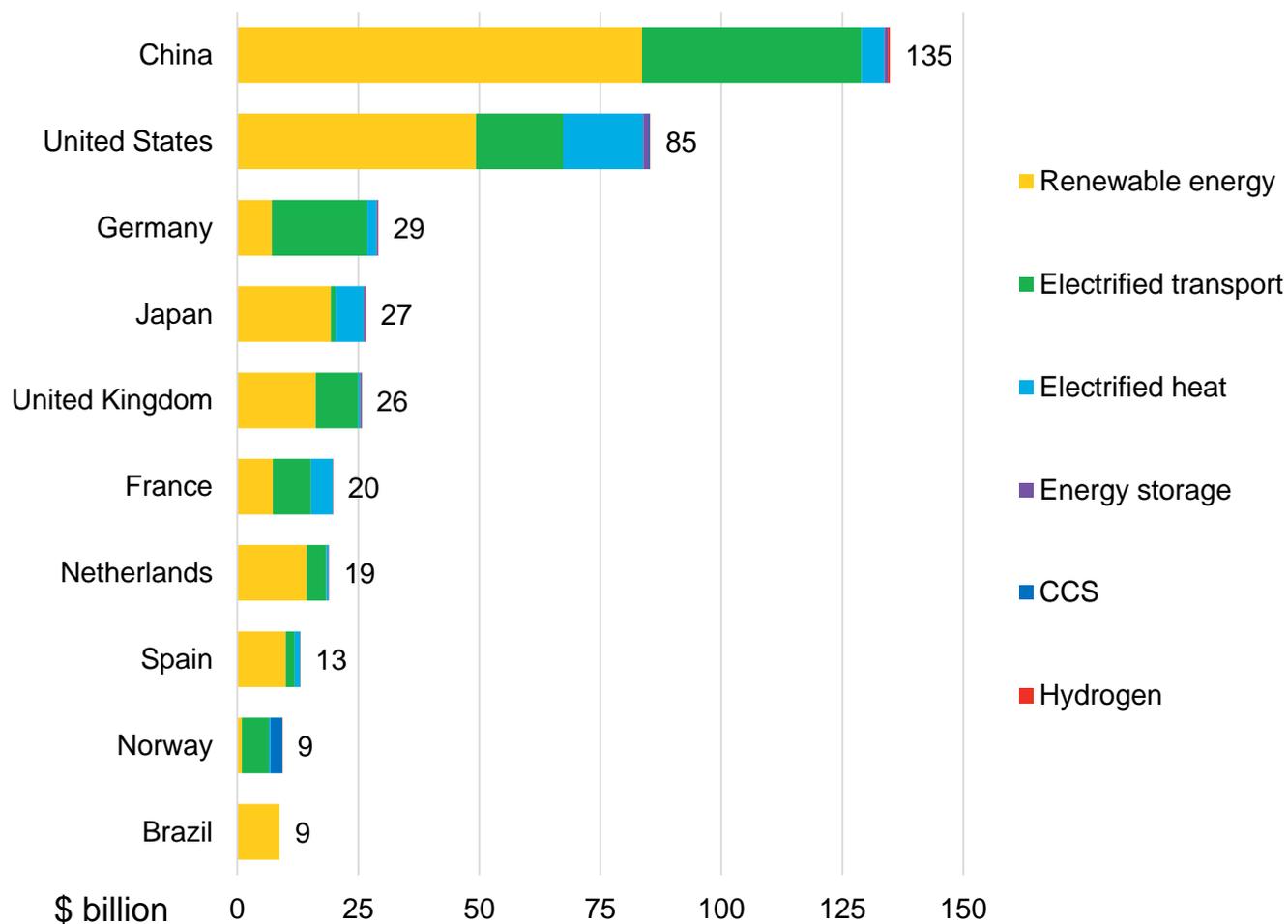


- Our top-level finding is that the world committed a record \$501.3 billion to decarbonization in 2020, beating the previous year by 9% despite the economic disruption caused by Covid-19.
- Our analysis shows that companies, governments and households invested \$303.5 billion in new renewable energy capacity in 2020, up 2% on the year. They also spent \$139 billion on electric vehicles and associated charging infrastructure, up 28% and a new record.
- Other categories also showed strength. Domestic installation of energy-efficient heat pumps came to \$50.8 billion, up 12% last year, while that of batteries and other energy storage technologies was \$3.6 billion, level with 2019 despite falling unit prices. Global investment in carbon capture and storage rose 212% to \$3 billion, and that in green hydrogen was \$1.5 billion, down 20% but the second-highest annual number to date.

Source: BloombergNEF

China invested more than any other country, with the U.S. in second place

Global investment in energy transition by country, 2020

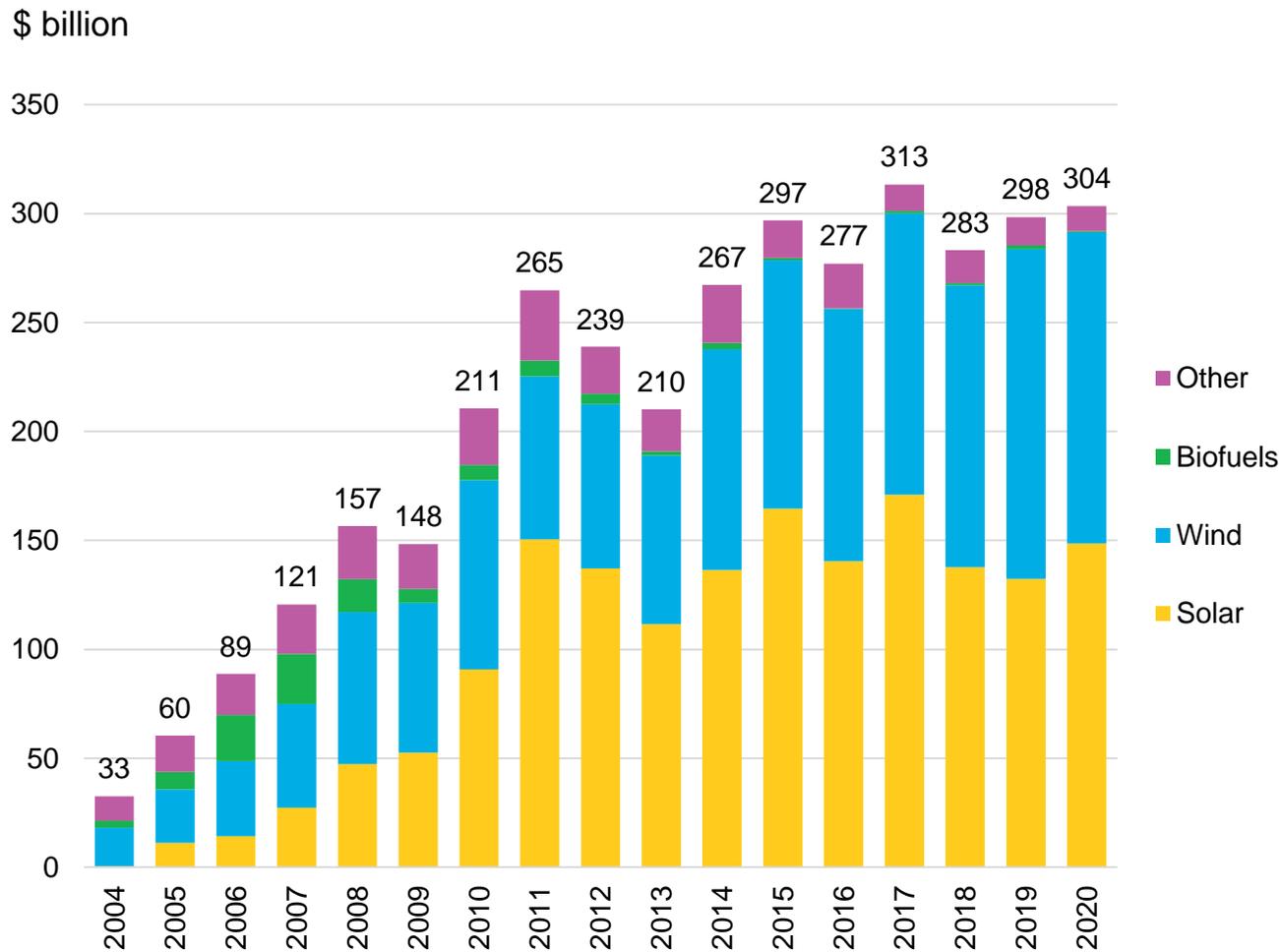


- China’s energy transition investment in 2020 slid 12% to \$134.8 billion, but was still by far the largest of any country in the world. Renewable energy capacity investment dropped 12% to \$83.6 billion, and outlays on electric transport 14% to \$45.3 billion.
- The U.S. was the second-biggest investing country, but its commitments also declined last year, by 11% to \$85.3 billion. Renewables capacity investment fell 20% to \$49.3 billion, while electric transport outlays edged up 3% to \$18 billion. Residential heat pump spending rose 7% to \$16.5 billion.
- European countries drove much of the uptick in energy transition investment last year. The total for Europe was 67% higher than 2019, at \$166.2 billion – greater than China and the U.S. – with big offshore wind financings in the U.K. and the Netherlands, and rising electric vehicle sales in many countries, among the main factors.

Source: BloombergNEF

Global renewable energy investment running at around \$300 billion a year

Global new investment in renewable energy by sector

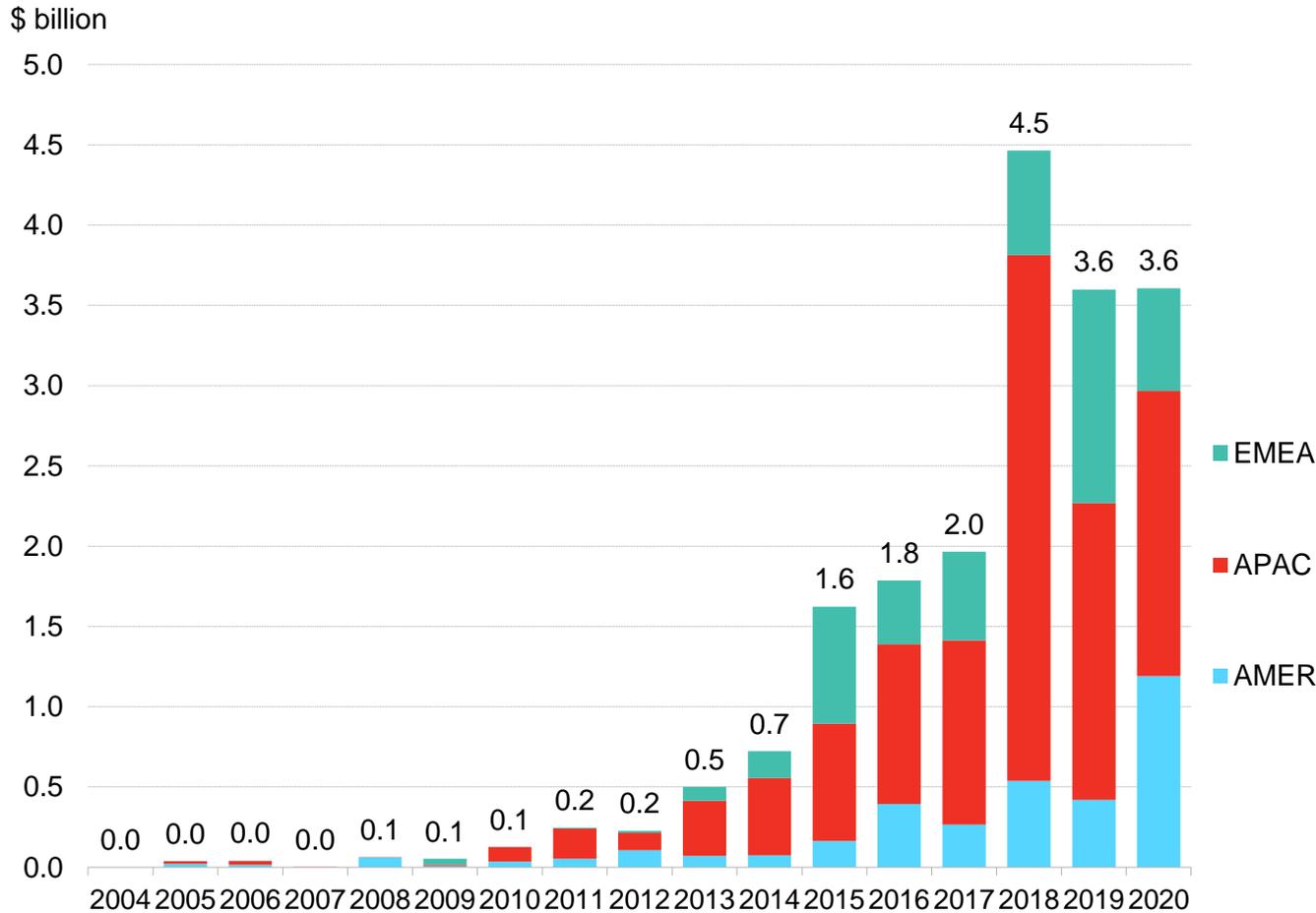


Source: BloombergNEF

- Looking specifically at the renewable energy component of energy transition investment, there is a clear message of stability in the flow of dollars.
- Global investment in renewables capacity (excluding large hydro) was \$303.5 billion in 2020, up 2% on 2019, and the seventh successive year of figures in excess of \$250 billion.
- Solar led the way, with investment of \$148.6 billion, up 12%, while wind saw a 6% decline to \$142.7 billion. The latter figure disguises a record year for offshore wind, and a sizeable fall in onshore wind commitments.
- Biomass and waste-to-energy capacity attracted \$10 billion in capacity investment, down 3% on 2019.

Energy storage investment accelerated in the Americas, but receded in Europe

Global investment in energy storage by region

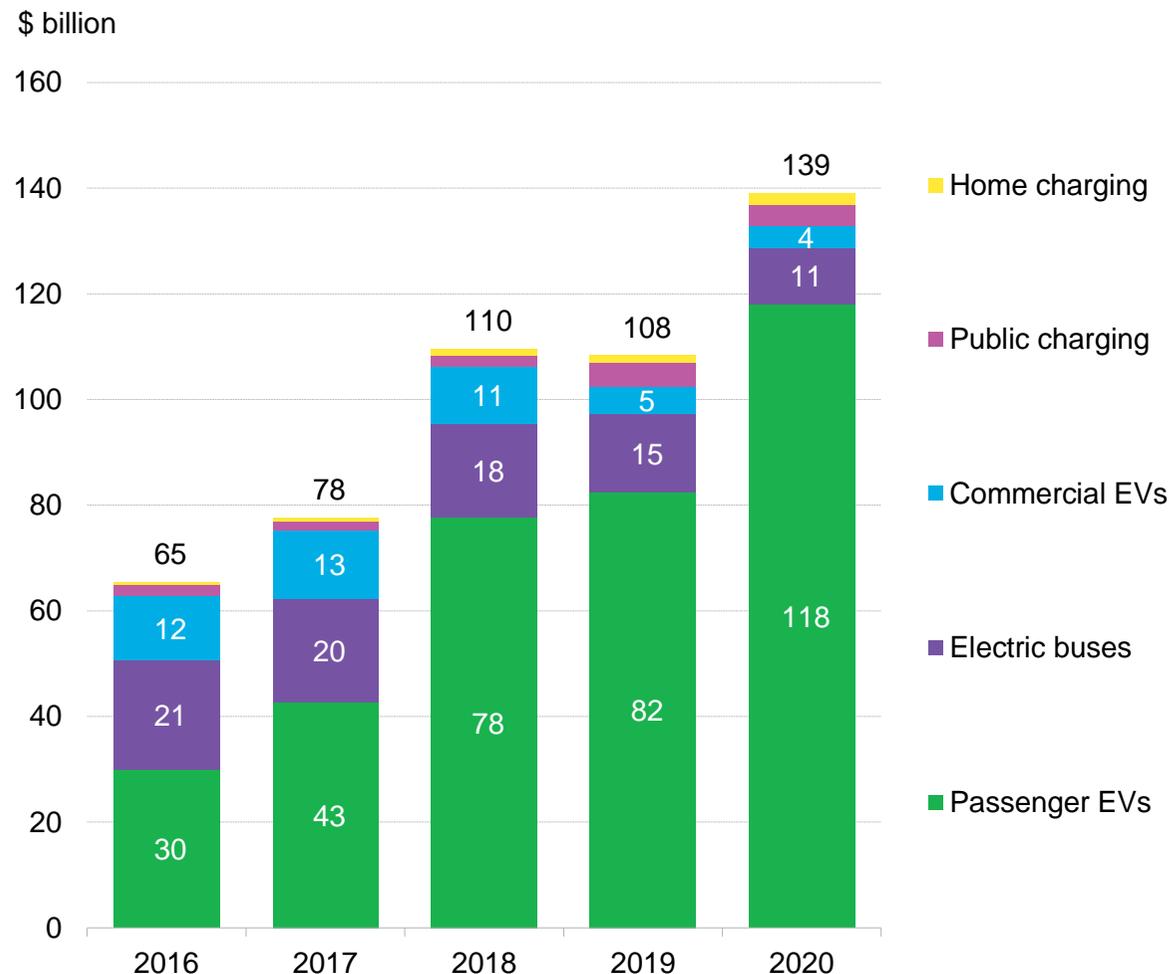


- In 2020, \$3.6 billion was committed to energy storage projects, including utility-scale, commercial and residential deployments. This figure was stable from 2019 to 2020, but lower than the record of \$4.5 billion in 2018.
- APAC retained its lead as China, South Korea and Japan invested the most, totaling \$1.8 billion in 2020.
- The Americas saw record investment in energy storage in 2020, achieving \$1.2 billion committed to projects.
- In comparison, EMEA had a slower year with \$0.6 billion invested in 2020, after a record year in 2019.
- The world saw its biggest batteries being commissioned in 2020, including the 300MW/1,200MWh Vistra Moss Landing and 250MW LS Power Gateway projects (both in California), and the 200MW/200MWh SPIC Huanghe New Energy Base project in Qinghai Province, China. These helped offset some of the slowdown in project progress due to Covid-19.

Source: BloombergNEF. Note: Stationary energy storage projects only; excludes pumped hydro, compressed air energy storage and hydrogen projects. Hydrogen projects are accounted for elsewhere in the report.

Passenger EVs are the main driver of transport electrification outlays

Electrified transport investment by category

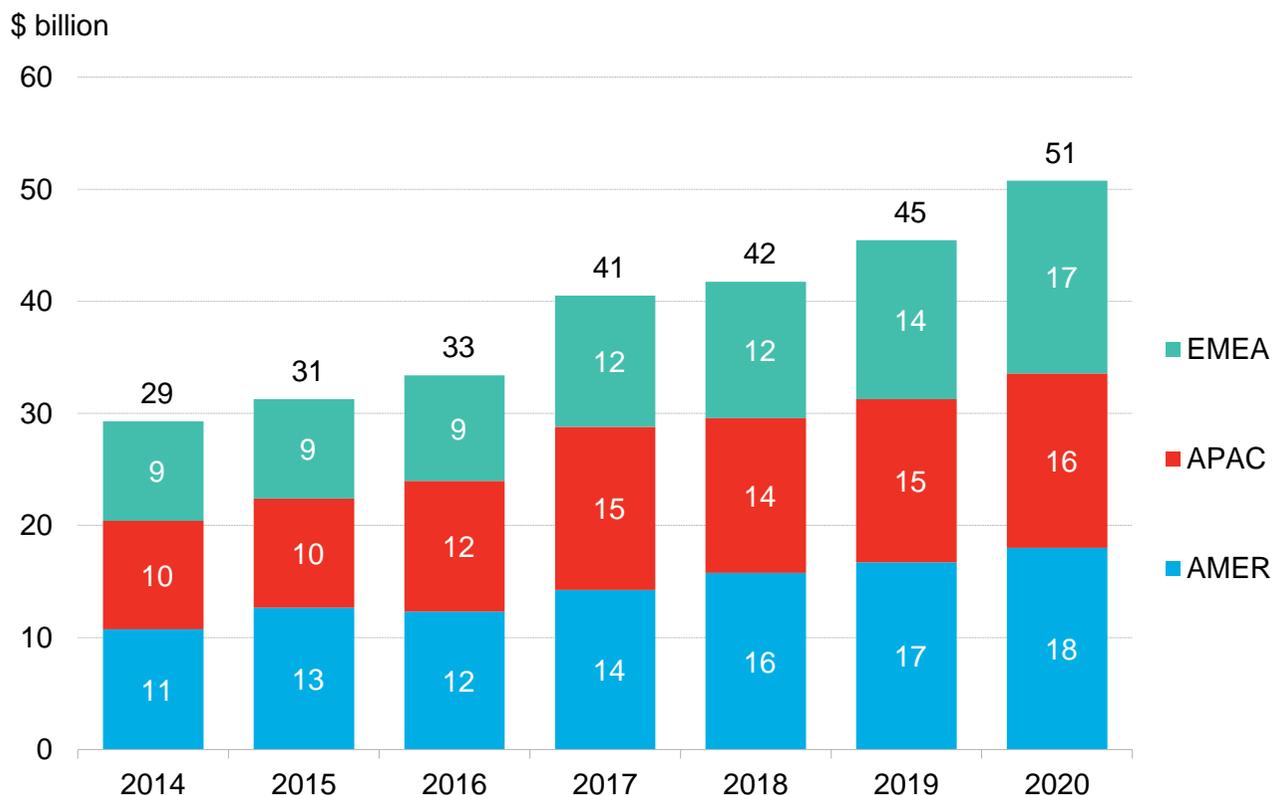


- Passenger EVs were responsible for the bulk of outlays on electrified transport globally. In 2020, the size of the market increased four times compared to 2016, reaching an estimated \$118 billion.
- Electric bus (e-bus) sales are the second largest category, although annual investment in the segment has decreased from \$21 billion in 2016 to \$11 billion in 2020. The decline has been driven by changing market dynamics in China, which accounted for 99% of global e-bus sales from 2016 to 2020. China's e-bus prices have declined, while annual sales have slowed due to the decrease in purchase subsidies as well as market saturation in large cities.
- Commercial EV investment declined from \$12 billion in 2016 to \$4 billion in 2020. This has been due to two factors: the decline in upfront costs of the vehicles – driven by falling battery prices – and changes in predominant duty cycles of vehicles sold in developed economies (Europe, U.S.). The market is shifting from long-haul heavy-duty commercial vehicles towards cheaper medium- and light-duty commercial vehicles for regional and local deliveries of consumer goods.
- Investment in public charging hit \$4.1 billion in 2020, while home charging brought in \$2.1 billion. Annual Investments vary as government spending increases and drops when networks are completed. Charging infrastructure investment is equivalent to a small fraction of what is spent on new vehicles.

Source: BloombergNEF. Note: * ET investment includes investment in vehicles and charging infrastructure. 2020 investment numbers are based on preliminary EV sales data. Totals include estimated vehicle prices. Excludes two- and three-wheelers. We do not capture private charging investment for commercial vehicles.

Europe drives latest growth in global heat pump investment

Global investment in residential heat pumps by region

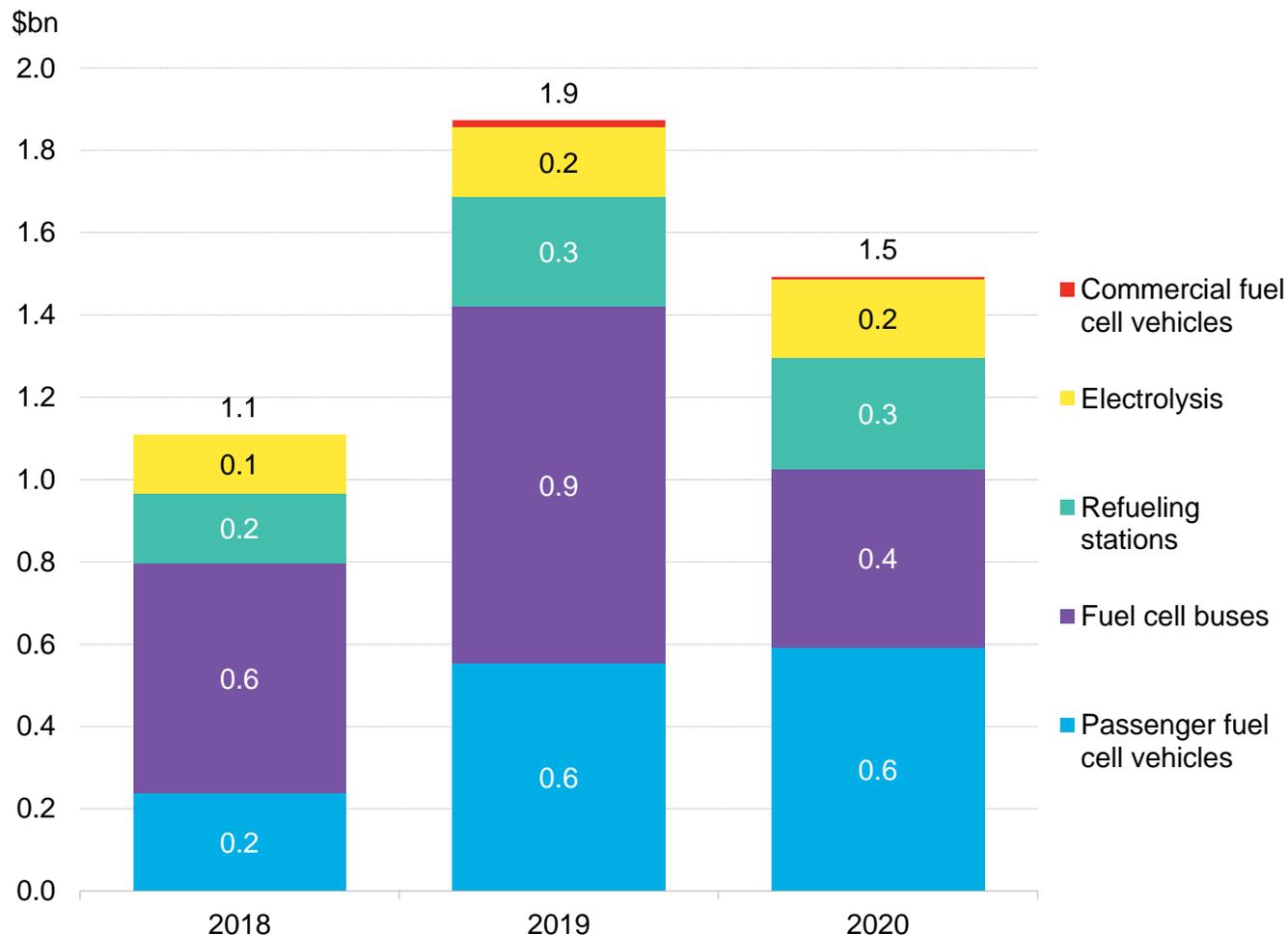


Source: BloombergNEF, European Heat Pump Association, U.S. Air-Conditioning, Heating and Refrigeration Institute (AHRI), Heating, Refrigeration and air conditioning Institute of Canada (HRAI), Zhao (2017), Qianzhan Industry Research Institute, Heat Pump Committee of China Energy Conservation Association (CHPA), Japan Refrigeration and Air Conditioning Association (JRAIA), consumer websites. Note: Investment calculated as sales multiplied by the average cost for equipment and installation for a typical single-family home. Currency conversion based on exchange rate as of December 31 of a given year.

- Heat pumps serve a dual role in decarbonization. First, they are electric systems that can displace gas, coal and oil heating units. Second, they use a refrigerant to transfer energy from the ambient environment; this means they are particularly efficient and produce more useful heat per kilowatt-hour of electricity than boilers or furnaces.
- The European market has been particularly strong in recent years, averaging a 14% CAGR since 2017. Increased subsidy support and strong energy standards for new buildings in particular have spurred new investment.
- The Americas has also seen steady growth. The U.S. remains the region’s biggest market, with new buildings and oil/propane furnace replacement accounting for the majority of demand. The fact that heat pumps can provide both heating and cooling is another key factor behind adoption in the U.S. and Canada.
- While Asia-Pacific heat pump investments rose 8% in 2020, this rate of growth was slower than for the other regions. Local subsidies have boosted heat pump demand, particularly in Japan and the north of China. However, reduced spending in Chinese infrastructure and poor economics relative to gas boilers – which are also favored by China’s coal phase-out policies – has slowed adoption.

Investment in hydrogen fell in 2020 on a lower level of fuel-cell bus deployments

Global investment in hydrogen by category

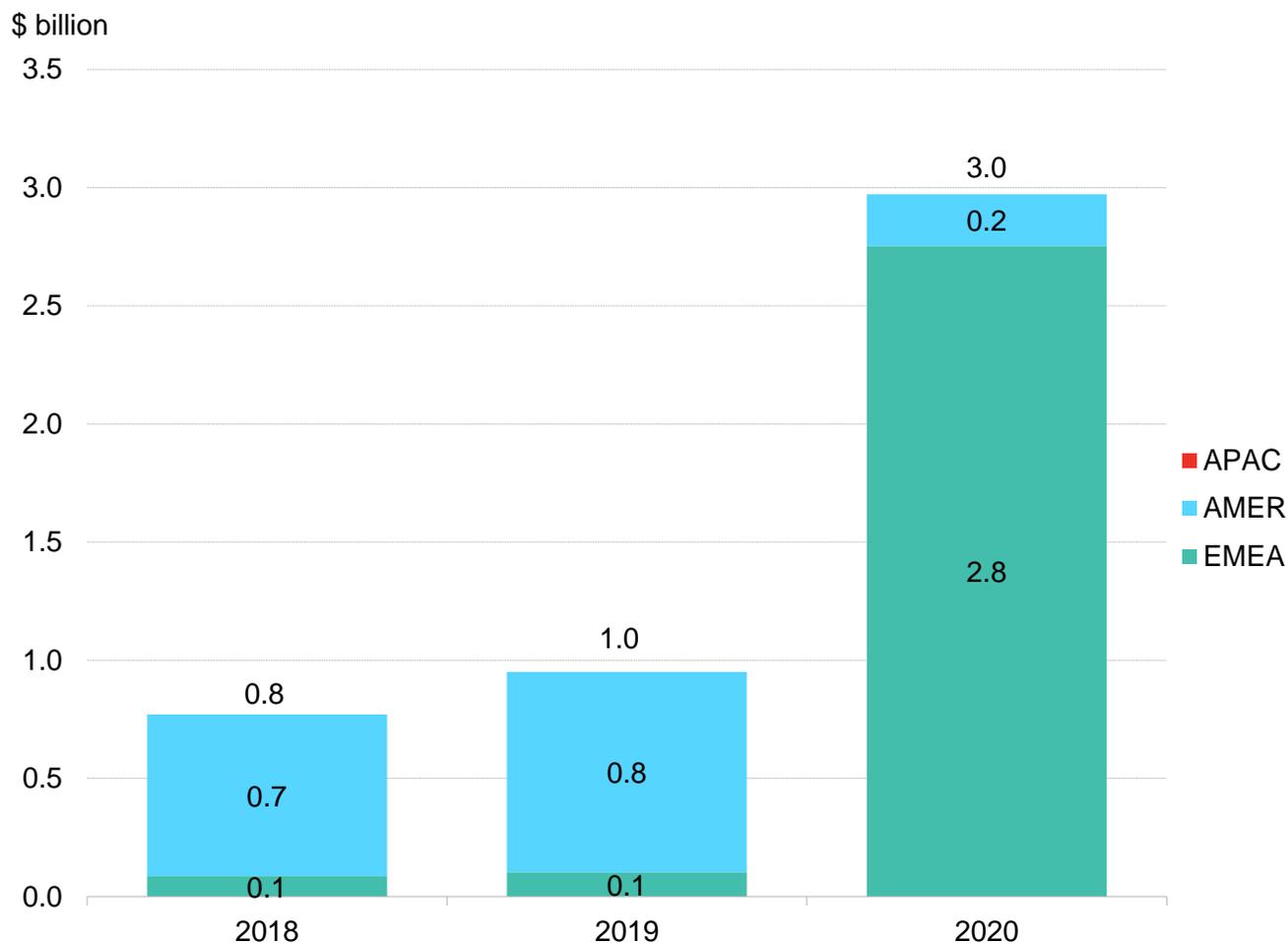


Source: BloombergNEF. Note: not all electrolysis systems included necessarily use clean electricity; refueling stations do not necessarily supply clean hydrogen, and vehicles do not necessarily use clean hydrogen.

- Hydrogen received nearly \$1.5 billion in investments in 2020, some 20% less than the year before.
- Fuel-cell bus sales drove the decline, falling from \$865 million in 2019 to approximately \$400 million in 2020. Passenger FCV sales grew slightly, from \$555 million in 2019 to \$592 million in 2020.
- Investment in hydrogen-fueled vehicles was only a 130th of that in electric vehicles in 2020, underscoring the gap between the two technologies.
- Hydrogen refueling stations saw a small rise in investment, with \$272 million in 2020 compared to \$268 million in 2019.
- Electrolysis investments registered a rise from \$168 million in 2019 to \$189 million in 2020, thanks to growing global interest in green hydrogen production.
- Hydrogen investment is expected to grow in the coming years, driven by increasing policy support.

Investment in carbon capture and storage advanced markedly in 2020

Global investment in carbon capture and storage by region

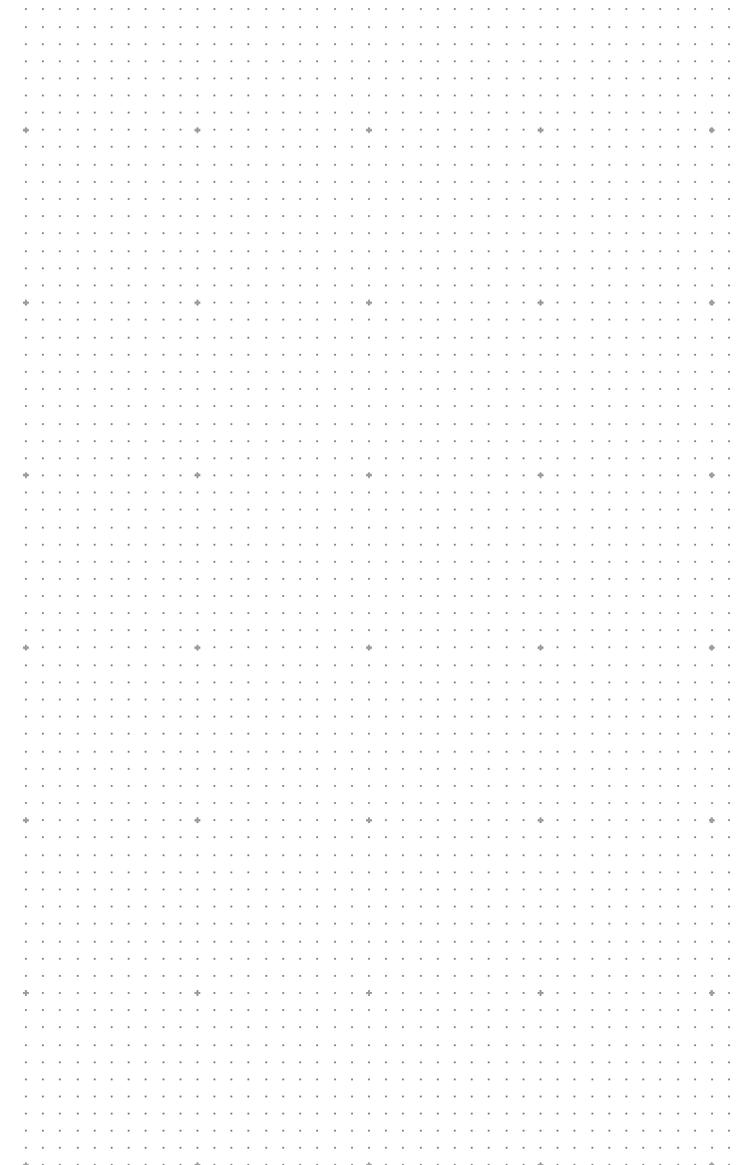


Source: BloombergNEF. Note: expenditure commitments considered only if recipient is announced.

- Our CCS figures cover large- and small-scale commercial CCS projects, dedicated transport infrastructure, and direct air-capture venture capital, as well as investment from government funds specifically focused in CCS. We are not yet including carbon utilization projects.
- CCS investment totals are highly dependent on a few large commitments. For example, in 3Q 2018, the Alberta Carbon Trunk Line received the final block of financing required to finish the project. It came online in June 2020.
- In 2Q 2020, Equinor, Shell and Total announced their \$674 million investment in the Northern Lights project, the storage and transport infrastructure for Norway’s Longship CCS project. Later in 2020, the Norwegian government announced an investment of \$1.8 billion in the Longship project, to be used for the capture facilities at Norcem’s cement plant in Brevik and at Fortum waste incineration plant in Oslo, as well as for the Northern Lights implementation.
- The U.S. Department of Energy has been funding CCS research and project development since 1997, representing a significant share of the total investment tracked in the country.
- 2021 could be a pivotal year. If project owners can convert the government funding for early stages of projects, and the growing momentum for net zero, into successful long-term financing, CCS capacity could grow significantly over this decade.

Thematic highlights

Trends and themes in low-carbon investment (abridged)



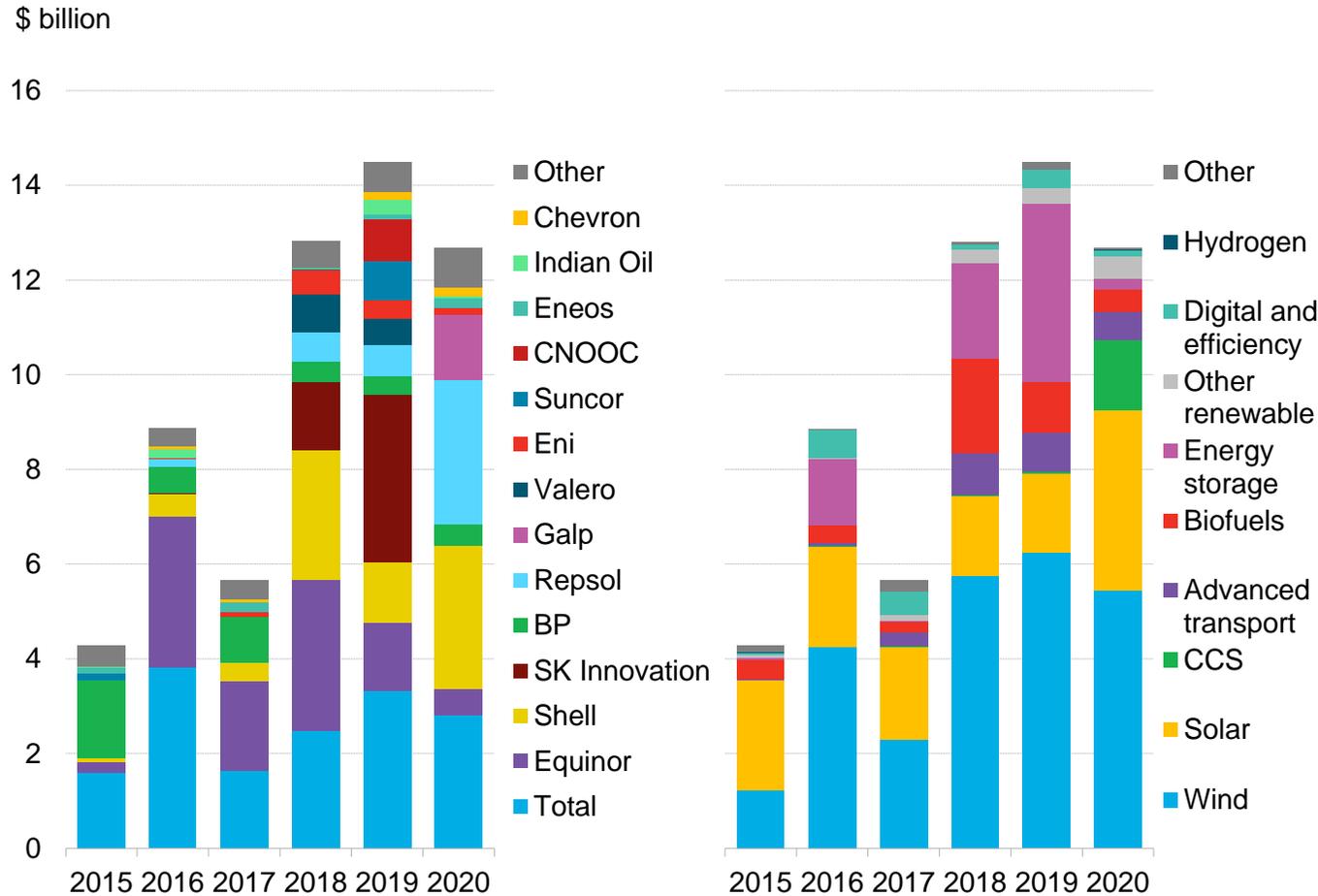
Thematic highlights: preface

This section provides an overview of various thematic areas in energy transition investment, such as oil & gas companies' investment into clean energy, green finance issuance, investments in battery manufacturing and the performance of clean energy stocks.

In most cases, these figures do not directly contribute to the totals in the previous section, but they help form a fuller picture of the key investment trends in the energy transition.

Investment by oil and gas companies has held up during the pandemic

Clean energy investment by oil and gas companies, 2015-2020



Source: BloombergNEF, company disclosures. Note: analysis includes all completed deals, and estimated values for undisclosed deals. CCS data excludes non-commercial projects that have not disclosed investment values. Asset finance data may overstate investment by each company where project equity shares have not been disclosed.

- A key trend underpinning clean energy investment is the push by oil and gas companies to build low-carbon portfolios. Most of the European majors have set goals to achieve net-zero emissions, not only from their own operations, but also from the consumption of the energy products sold to customers.
- BloombergNEF is tracking clean energy investment by 34 of the world’s largest oil and gas producers and refiners. We include investment in specialist companies, as well as low-carbon assets.
- These investments declined by 12% year-on-year to \$12.7 billion in 2020, with Shell, Total, Repsol and Galp accounting for the bulk of that.
- Over the past five years, total investment in renewables, storage, advanced transport, digital technologies, hydrogen and CCS has been almost \$60 billion, with wind, solar and battery storage making up the majority.
- Total oil sector capex in 2020 was likely to be over \$200 billion, so clean energy investment was equivalent to around 6% of that – higher than in previous years.

Clean energy shares jumped 142% in 2020, while oil shares fell

WilderHill New Energy Global Innovation Index (NEX) versus NYSE Arca Oil Index, full year 2020 (rebased)



- Clean energy shares have been serial under-performers for most of the last decade. However, in 2020, the trend reversed spectacularly, as investors warmed to the prospects for wind, solar, batteries and electric vehicles. Their increasing cost-effectiveness compared to fossil fuel alternatives was a key influence.
- Two other considerations in the minds of investors were hopes for a 'green recovery' from the Covid-19 recession; and excitement about the low-carbon policies that a Biden administration might adopt in the U.S.
- The chart shows that the WilderHill New Energy Global Innovation Index, or NEX, which tracks the performance of around 100 specialist stocks worldwide, gained 142% in the year. The NYSE Arca Oil Index, by contrast, fell 38%.
- The three best performers in the NEX were electric vehicle company NIO, fuel cell specialist Plug Power, and solar equipment maker Enphase Energy.

Source: BloombergNEF. NEX is WilderHill New Energy Global Innovation Index

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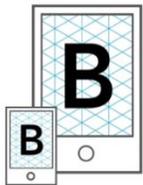
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