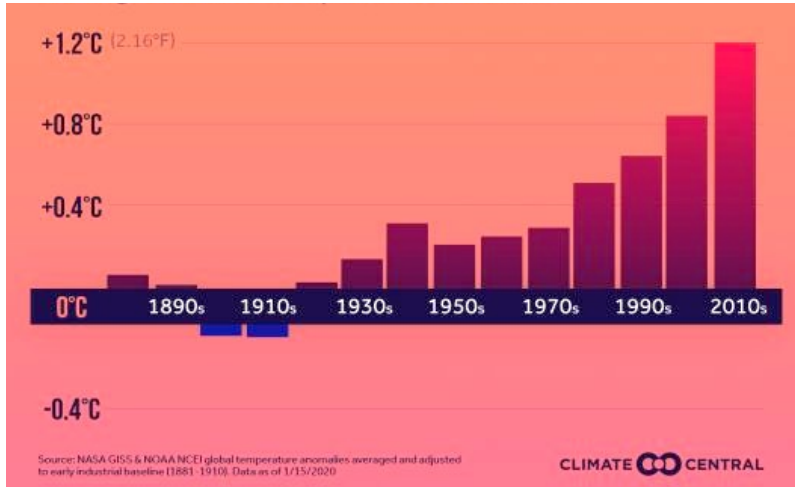


CLIMATE RISKS FOR OIL AND GAS COMPANIES' OPERATION IN THE ARCTIC REGION

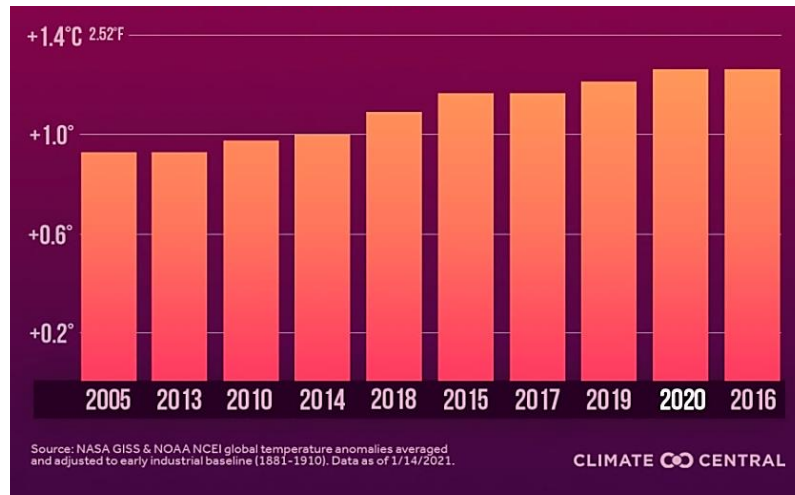
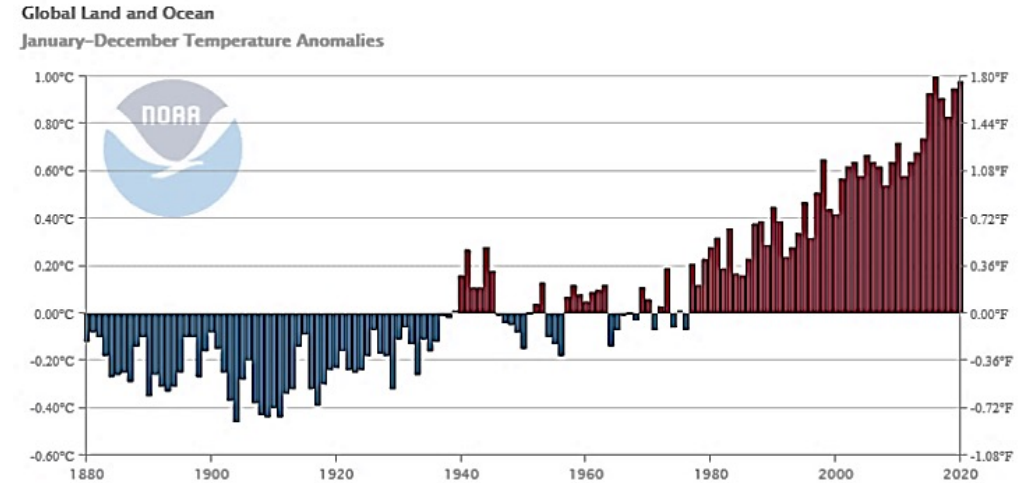
Michael Yulkin

Moscow, 25 May 2021

WHAT'S WRONG WITH THE CLIMATE?

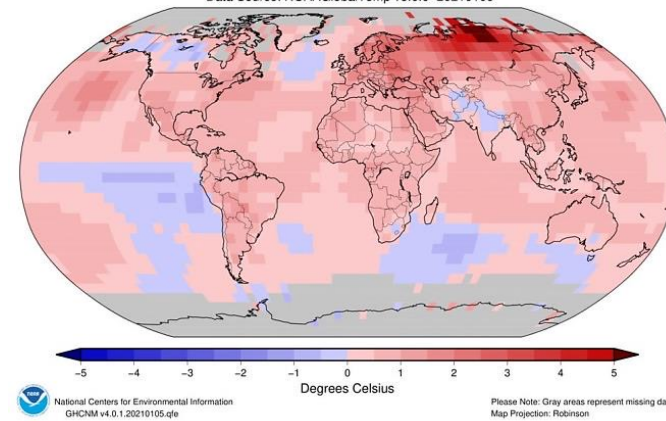


Starting from 1950-s, each new decade is warmer than the previous one



The most warm 10 years since monitoring started back in 1880 happened between 2005 and 2020, and the last 7 years, i.e. 2014-2020, happened to be the warmest of all.

Land & Ocean Temperature Departure from Average Jan–Dec 2020 (with respect to a 1981–2010 base period)
Data Source: NOAA GlobalTemp v5.0.0–20210106



In Russia the mean temperature is rising 2.5 times faster than globally, in the Arctic – 4-6 times faster

CLIMATE EMERGENCY

As of 20 March 2021, **climate emergency** has been declared by 1,910 jurisdictions and local governments in 34 countries.

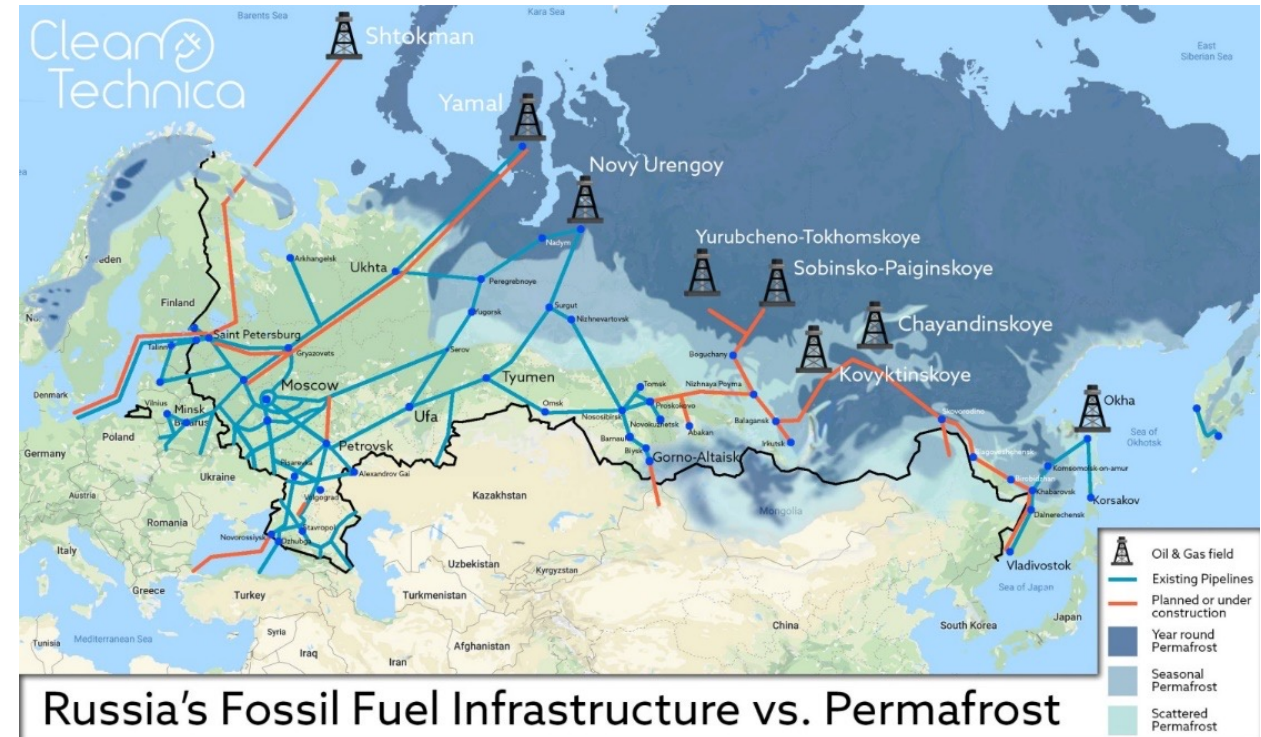
About 826 million people live altogether in the locations where climate emergency has been declared.

(<https://climateemergencydeclaration.org/>)



PERMAFROST IS NO LONGER PERMANENT BUT MELTING

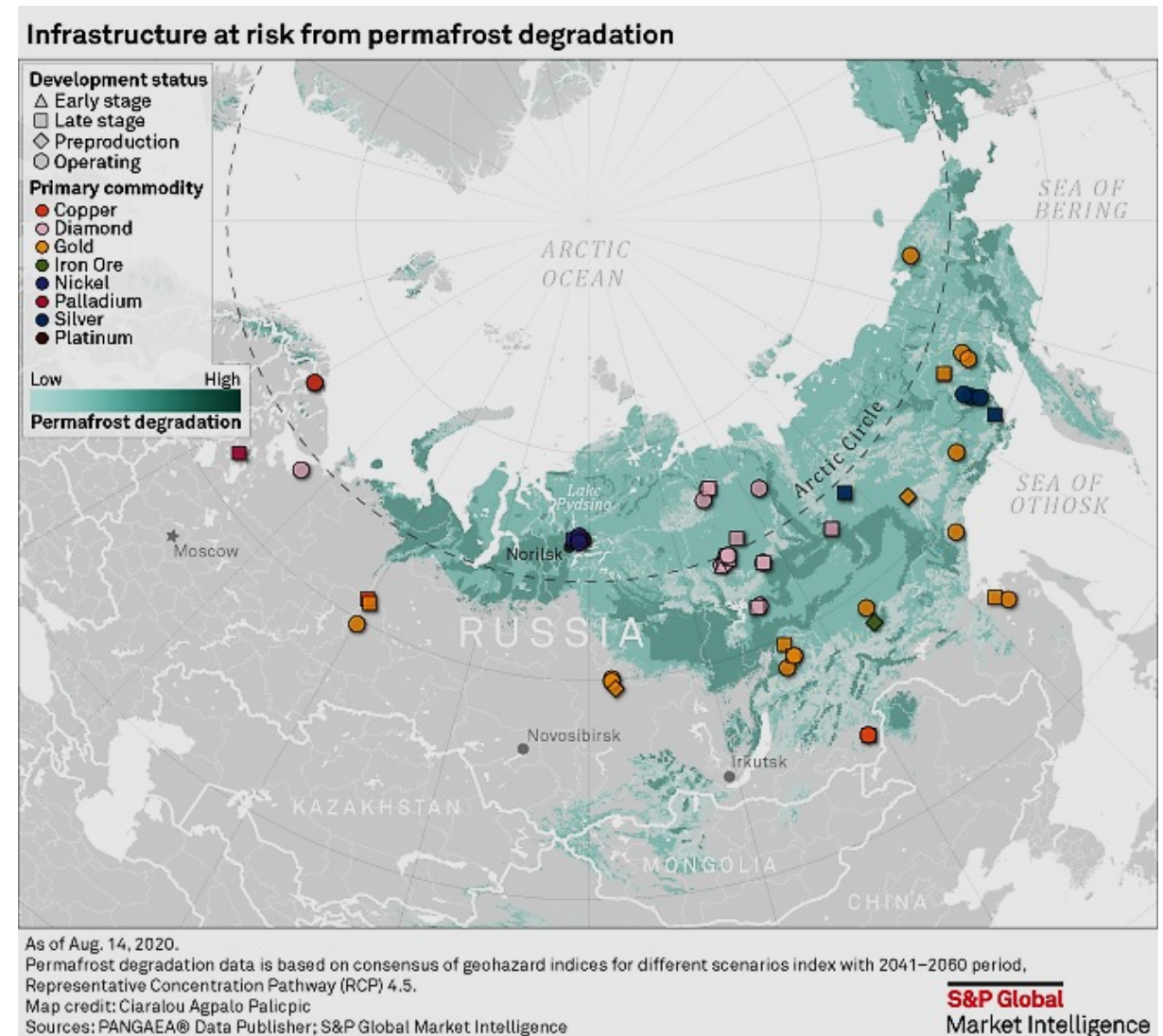
- More than half of Russia's territory is located in the permafrost zone.
- With only 4% of Russia's population living in here, this zone is the main source of oil and natural gas that Russia produces for local consumption and to export.
- Melting of permafrost in Siberia and the Far East is in full swing. Permafrost thaws especially quickly in the region of Vorkuta, Salekhard, Chita, Ulan-Ude, Petropavlovsk-Kamchatsky.
- By the end of the XXI century, glaciers and snow covers may thaw to a depth of 3 ... 4 m, the cities of Igarka, Yakutsk, Magadan will be in the melting zone.
- According to forecasts, by 2025 the bearing capacity of the soil in Yamal will decrease by 25-50%.
- Melting permafrost may lead to additional emissions of GHGs into the atmosphere. First of all, methane.
- Up to 1 million tons of mercury and anthrax spores were also found in the permafrost.



The growth of the average annual temperature in Russia since 1960 exceeds that of the world 2.5 times and 3-4 times in the last 20 years in permafrost areas. In the result, bearing capacity of foundations in key regions of hydrocarbon production in Russia decreased by 25-75% compared to 1965-1975. Significant risks also exist in the electricity, their implementation can lead including to stop production, analysts warn.

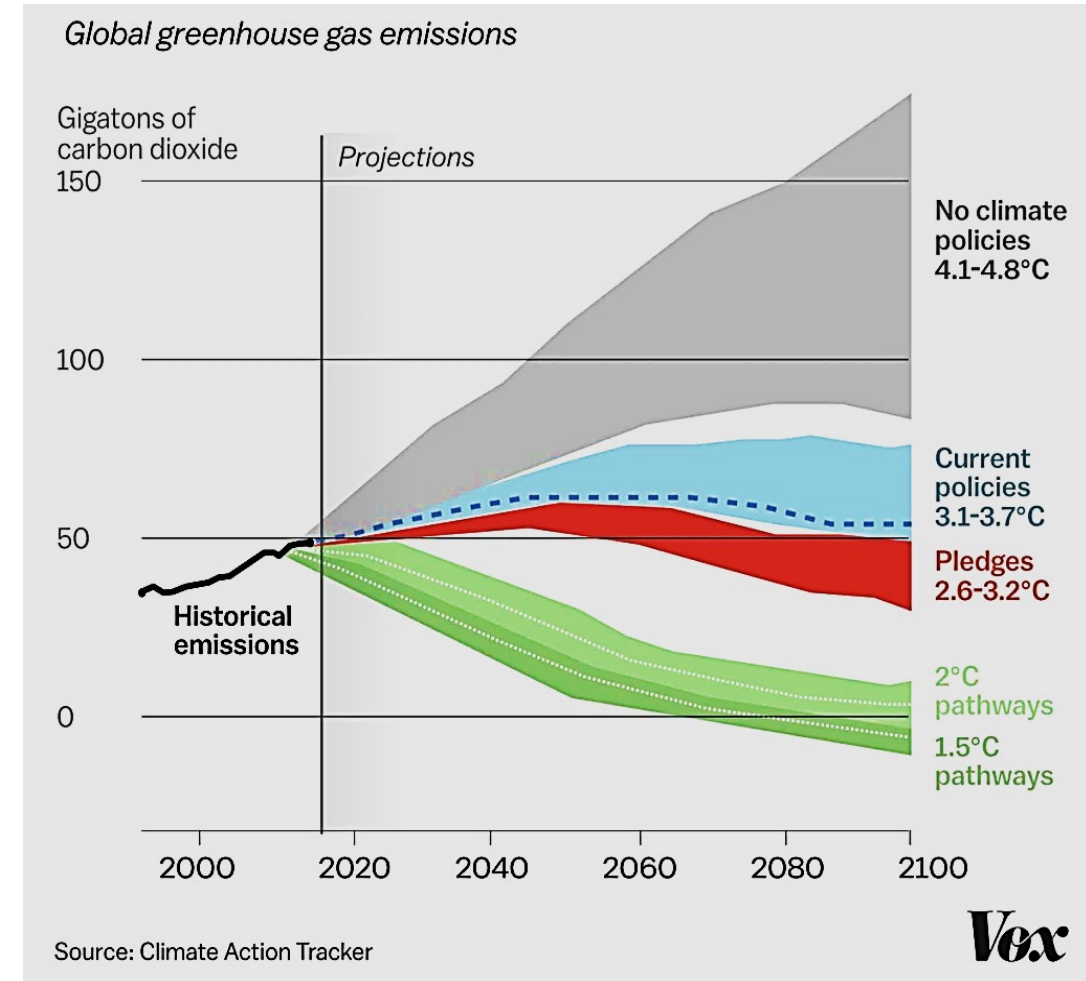
STRESS-TESTING RUSSIAN COMPANIES ON CLIMATE RISKS

- Warming in permafrost regions is one of the main threats to the infrastructure of the largest Russian corporations and in the future may significantly affect the financial performance of such companies as: Gazprom, NOVATEK, Norilsk Nickel and ALROSA, the risk for which in this respect is most prominent.
- These are the findings of the research analysts made by Morgan Stanley, which conducted a stress test for the largest Russian mining companies. The study highlighted that Gazprom produces more than 90% of the gas in regions of permafrost, at NOVATEK 100% of production in 2019 were conducted in the permafrost zone, the figure for LUKOIL was 46%. At Norilsk Nickel and ALROSA more than 90% of EBITDA are at permafrost melting risk.
- Russia's two largest gold mining groups, Polyus and Polymetal, also face rising exposure to environmental risks as they develop new projects such as Sukhoi Log and Nezhda in permafrost areas.
- The same is true for steelmaker Severstal operating coal and iron ore mines in Komi Republic and Murmansk Oblast.



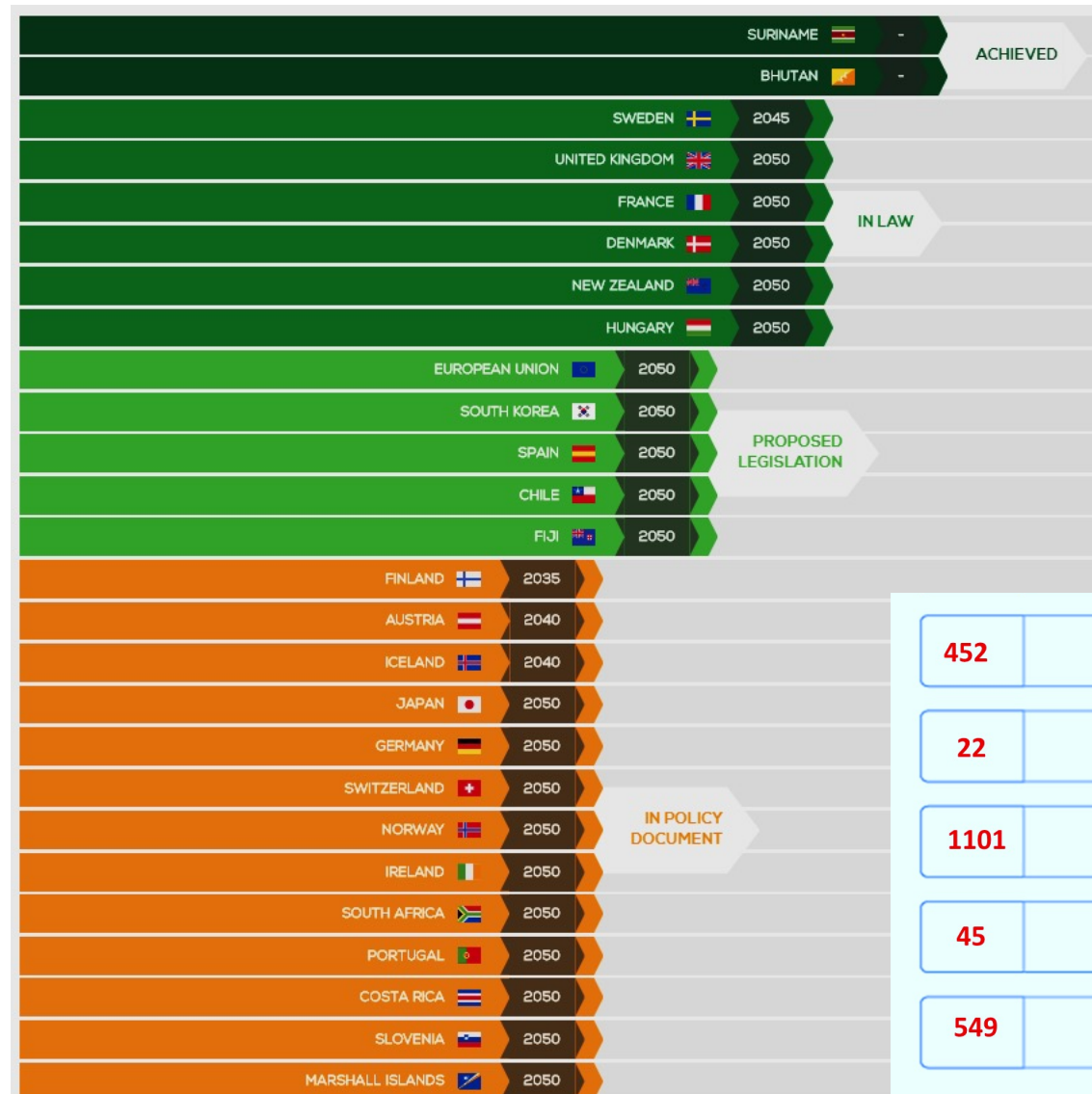
DECARBONITION TARGETS DECLARED

- According to the IPCC, an increase in the average global temperature by 2 °C by 2100 above the pre-industrial level corresponds to a CO₂ emission budget of 1,170 billion tons, while the increase by 1.5 °C – to a CO₂ emission budget of 420 billion tons.
- This estimate was made in 2017. In order to adjust to 2020, the above numbers should be reduced by the actual amount of CO₂ emitted in 2018-2020, which is about 120 billion tons
- In pathways with no or limited overshoot of 1.5°C, global net anthropogenic CO₂ emissions decline by about 45% from 2010 levels by 2030, reaching net zero around 2050. For limiting global warming to below 2°C, CO₂ emissions are projected to decline by about 25% by 2030 and reach net zero around 2070.



DECARBONITION TARGETS DECLARED

- More than 120 countries have adopted or are preparing to adopt a climate goal, providing for the reduction of net GHG emissions to zero by 2050, including the EU countries, Japan, South Korea.
- China and Kazakhstan announced recently that they will reach net-zero by 2060.
- The announcements made this year and expected early next year mean that countries representing around 65% of global CO₂ emissions, and around 70% of the world's economy, will have committed to reaching net zero emissions or carbon neutrality.

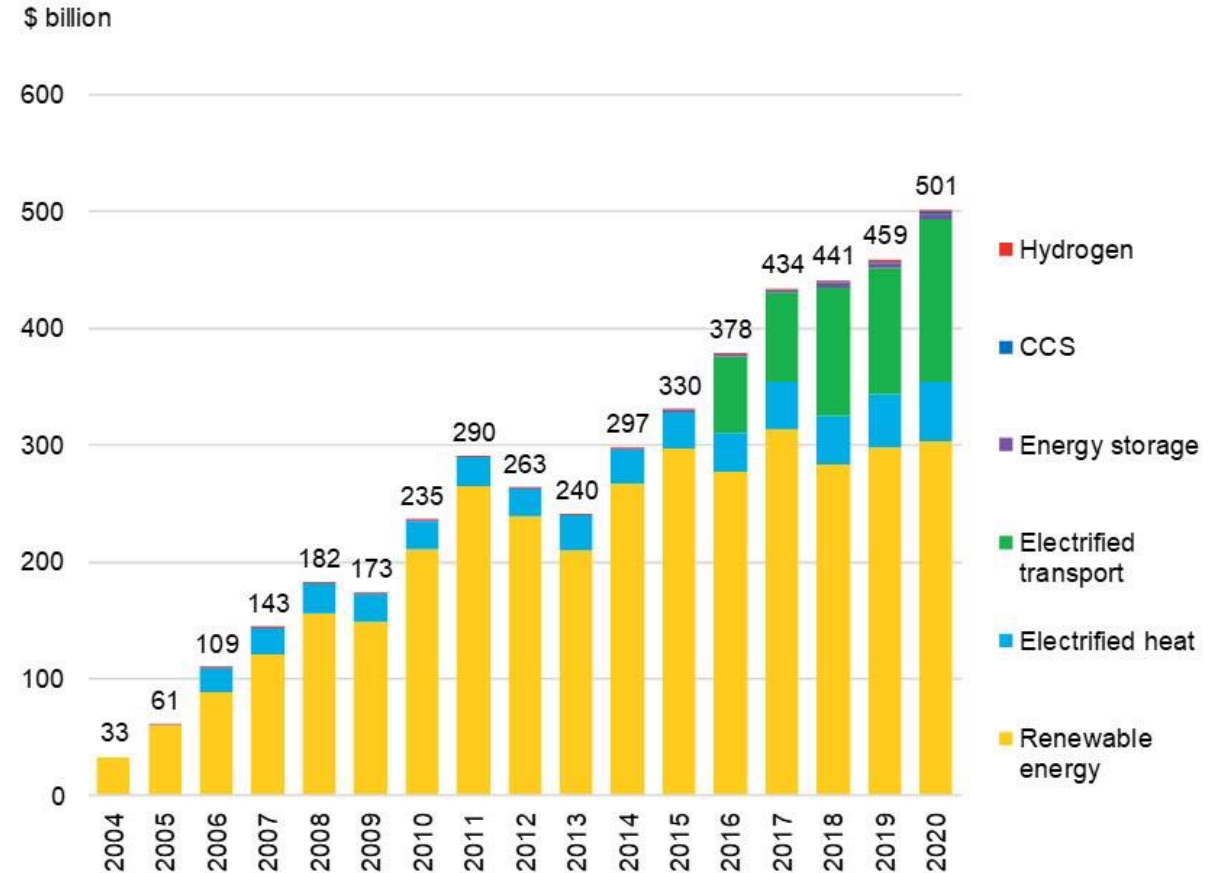


452	Cities
22	Regions
1101	Companies
45	Investors
549	Organizations

DECARBONITION IN PROGRESS



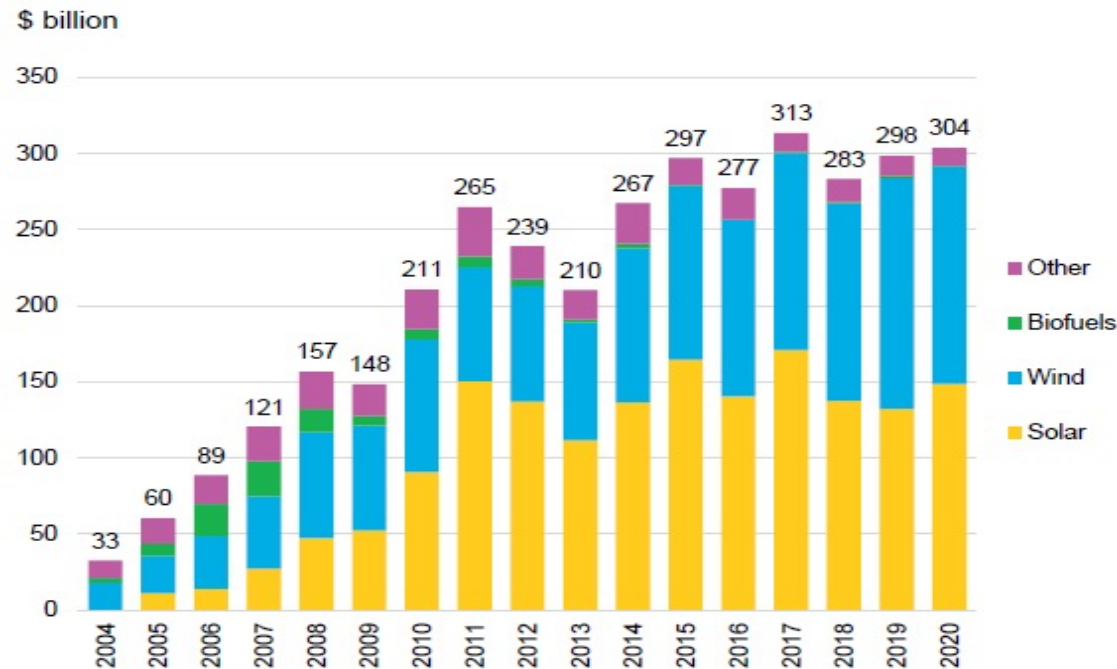
Figure 1: Global energy transition investment, 2004-2020



Source: BloombergNEF. Note: electrified heat figures begin in 2006; electrified transport in 2016; hydrogen and CCS in 2018.

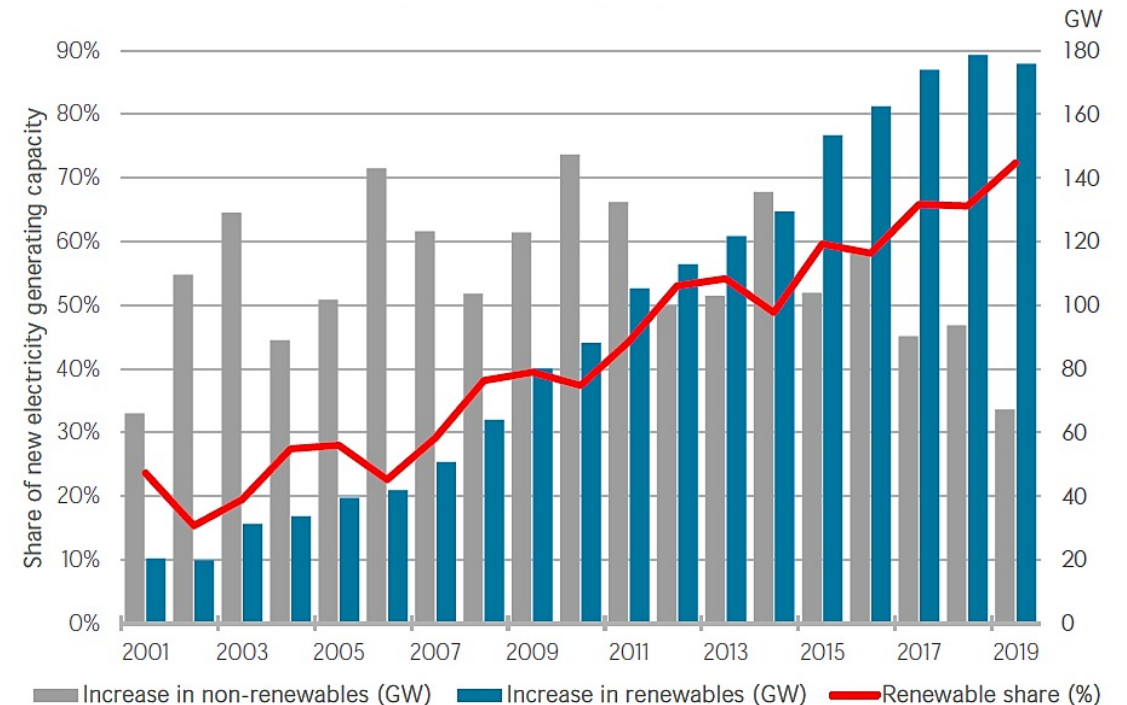
ENERGY TRANSITION

- In 2011-2020, \$2.75 trillion was invested in green energy worldwide, of which around \$ 1 trillion - in the last three years.
- Investments mainly go to the development of renewable energy (including bioenergy) and smart energy efficient technologies.



Source: BloombergNEF

- Since 2012, renewable energy has been contributing more than a half of the generating capacity growth worldwide.
- In 2019, the share of renewable energy sources in the growth of power generation capacity in the world exceeded 70%, in 2020 accounted for 90%



ENERGY TRANSITION

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)



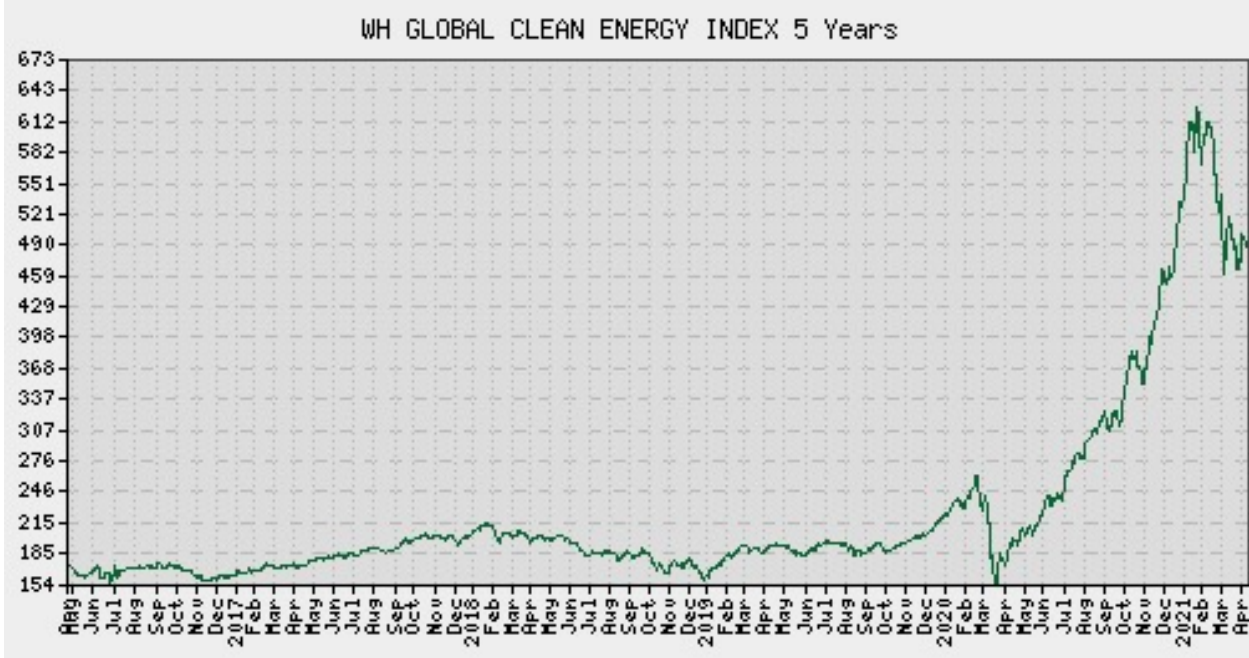
Source: BloombergNEF. NEX is WilderHill New Energy Global Innovation Index

- 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.

ENERGY TRANSITION



NYSE Arca Oil Index

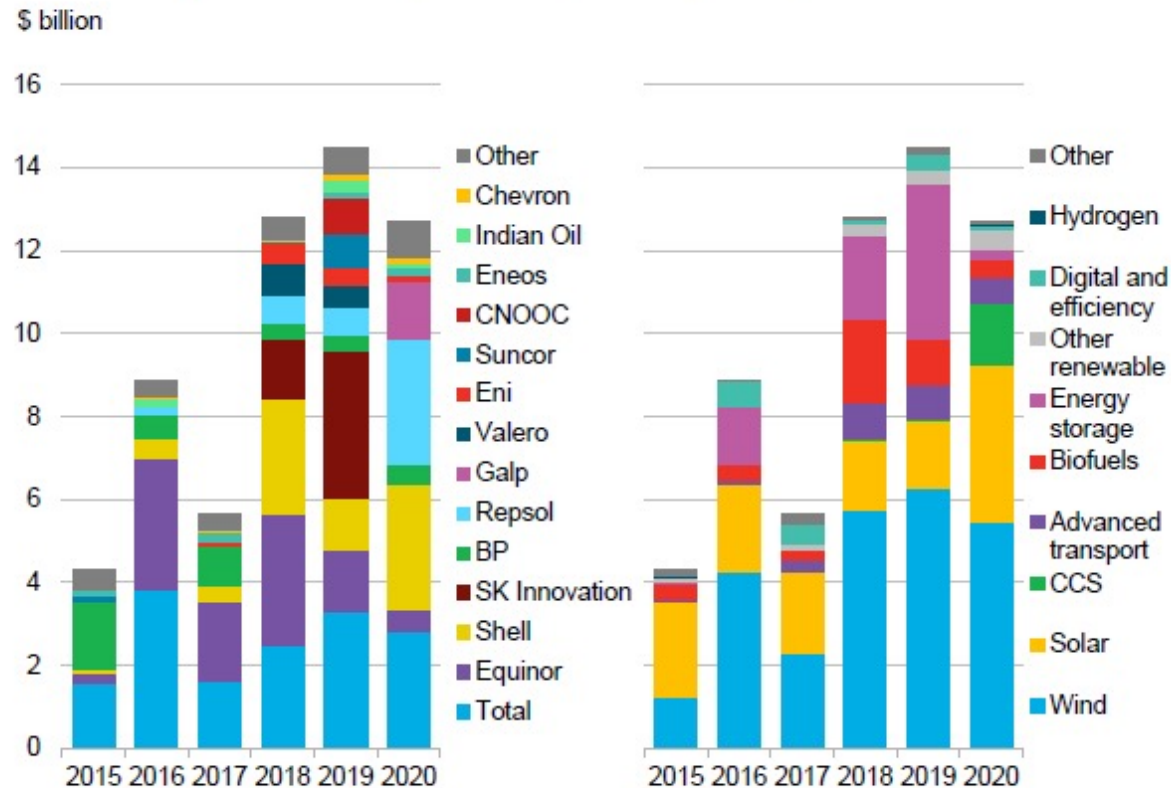


The WilderHill New Energy Global Innovation Index (NEX)

ENERGY TRANSITION

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

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



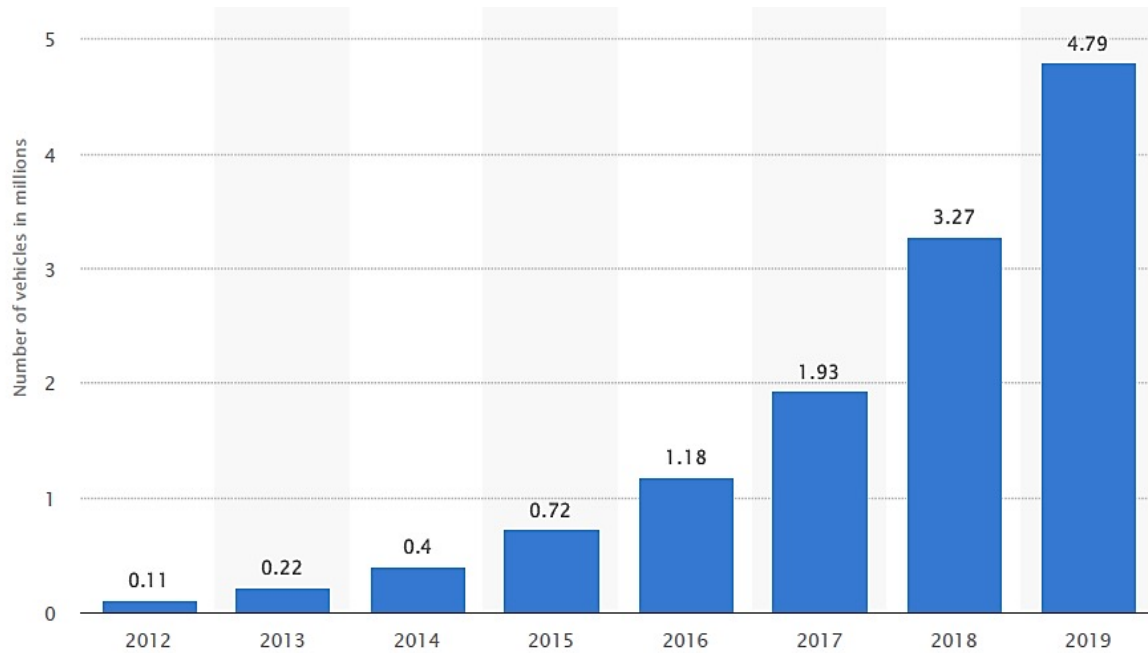
Source: BloombergNEF, company disclosures. Note: analysis includes all completed deals, and estimated values for undisclosed deals. CCS data excludes non-commercial projects that have not disclosed investment values. Asset finance data may overstate investment by each company where project equity shares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

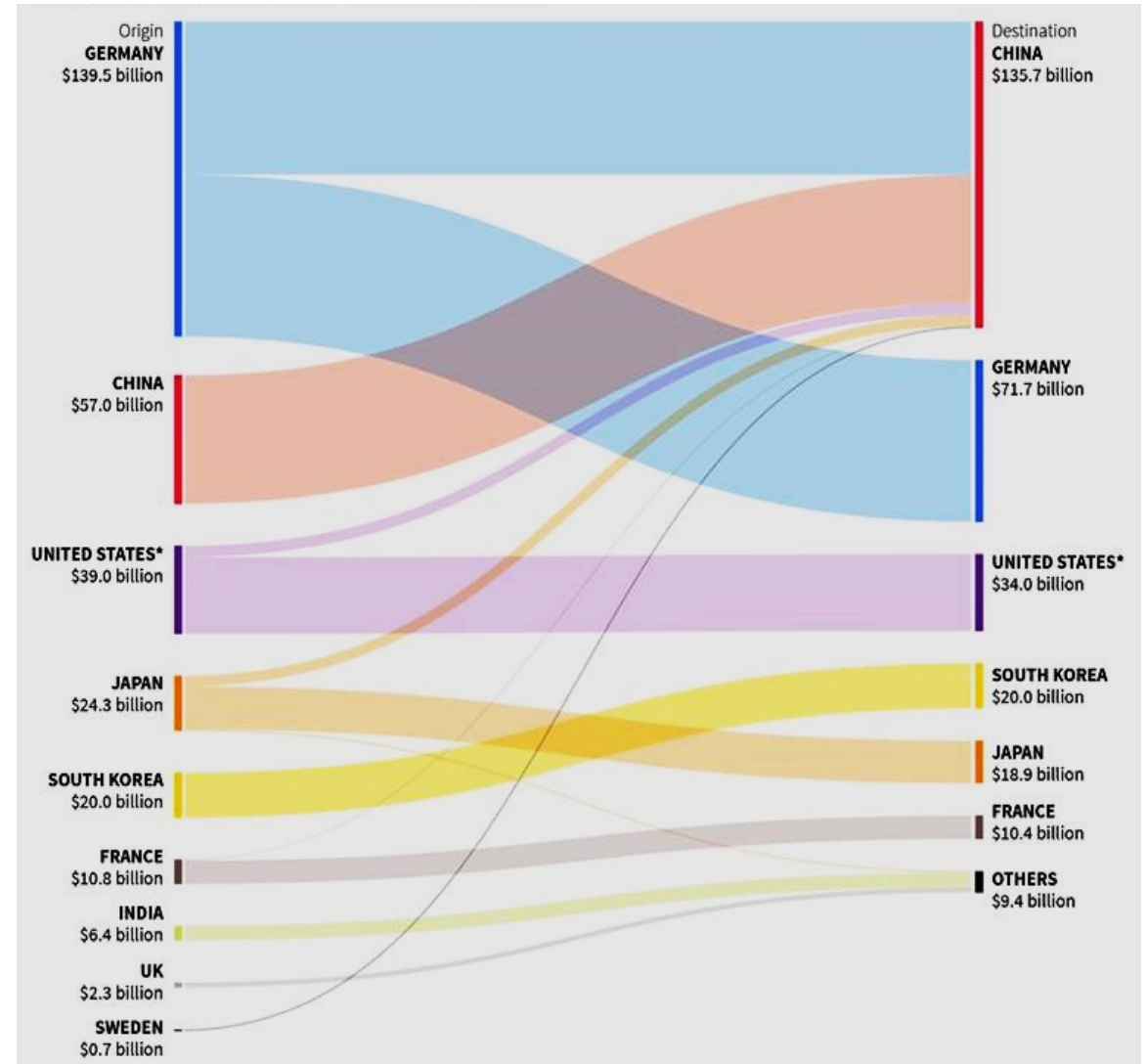
ENERGY TRANSITION

It the coming 10 years, the largest auto concerns will invest up to \$ 300 billion in the production of electric vehicles, including:

- Volkswagen - \$ 50 billion,
- Ford - \$ 11 billion



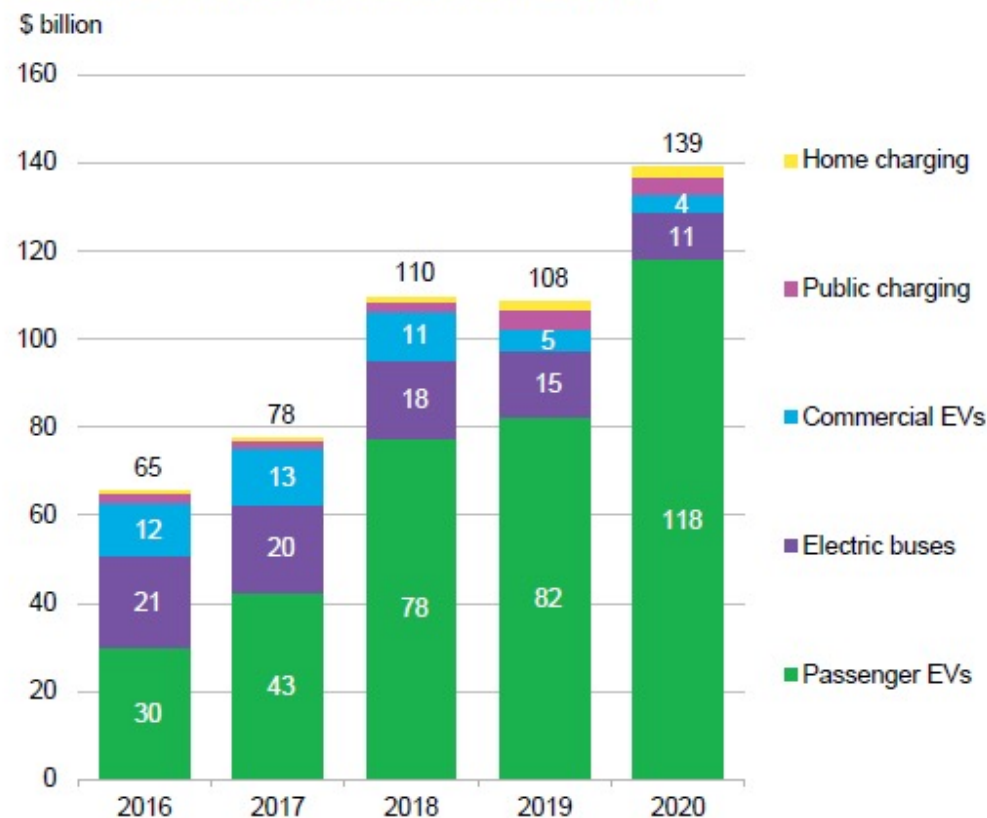
Worldwide number of battery electric vehicles in use from 2012 to 2019
(in millions)



WHY CBAM IS JUST A CHERRY ON THE CAKE?

Passenger EVs are the main driver of transport electrification outlays

Electrified transport investment by category



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.

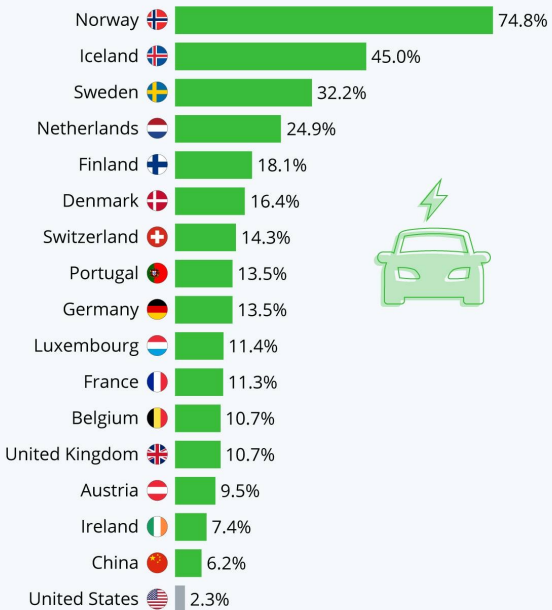
- Passenger EVs were responsible for the bulk of outlays on electrified transport globally. In 2020, the size of the market increased four times compared to 2016, reaching an estimated \$118 billion.
- Electric bus (e-bus) sales are the second largest category, although annual investment in the segment 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.

WHY CBAM IS JUST A CHERRY ON THE CAKE?

Продажи э/мобилей в 2020 г.

Electric Mobility: Europe Races Ahead

Countries with the highest share of plug-in electric vehicles in new passenger car sales in 2020*



* including plug-in hybrids and light vehicles, excluding commercial vehicles
Sources: ACEA, CAAM, EV-Volumes



statista

Who Leads the Charge Towards Electric Mobility?

Largest markets in terms of plug-in electric passenger car sales in 2020*



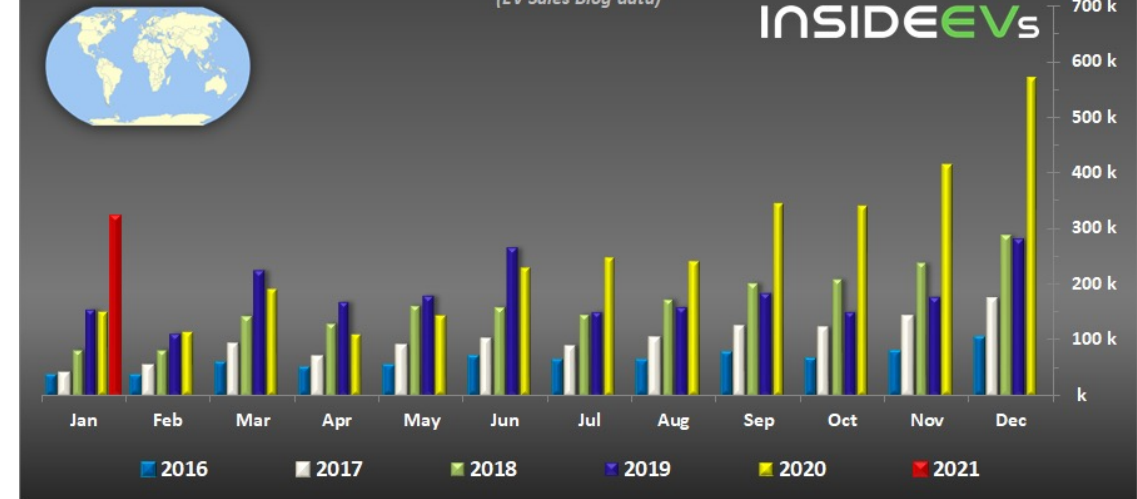
* including plug-in hybrids and light vehicles, excluding commercial vehicles
Sources: ACEA, CAAM, EV-Volumes



statista

Plug-In Electric Car Sales Worldwide

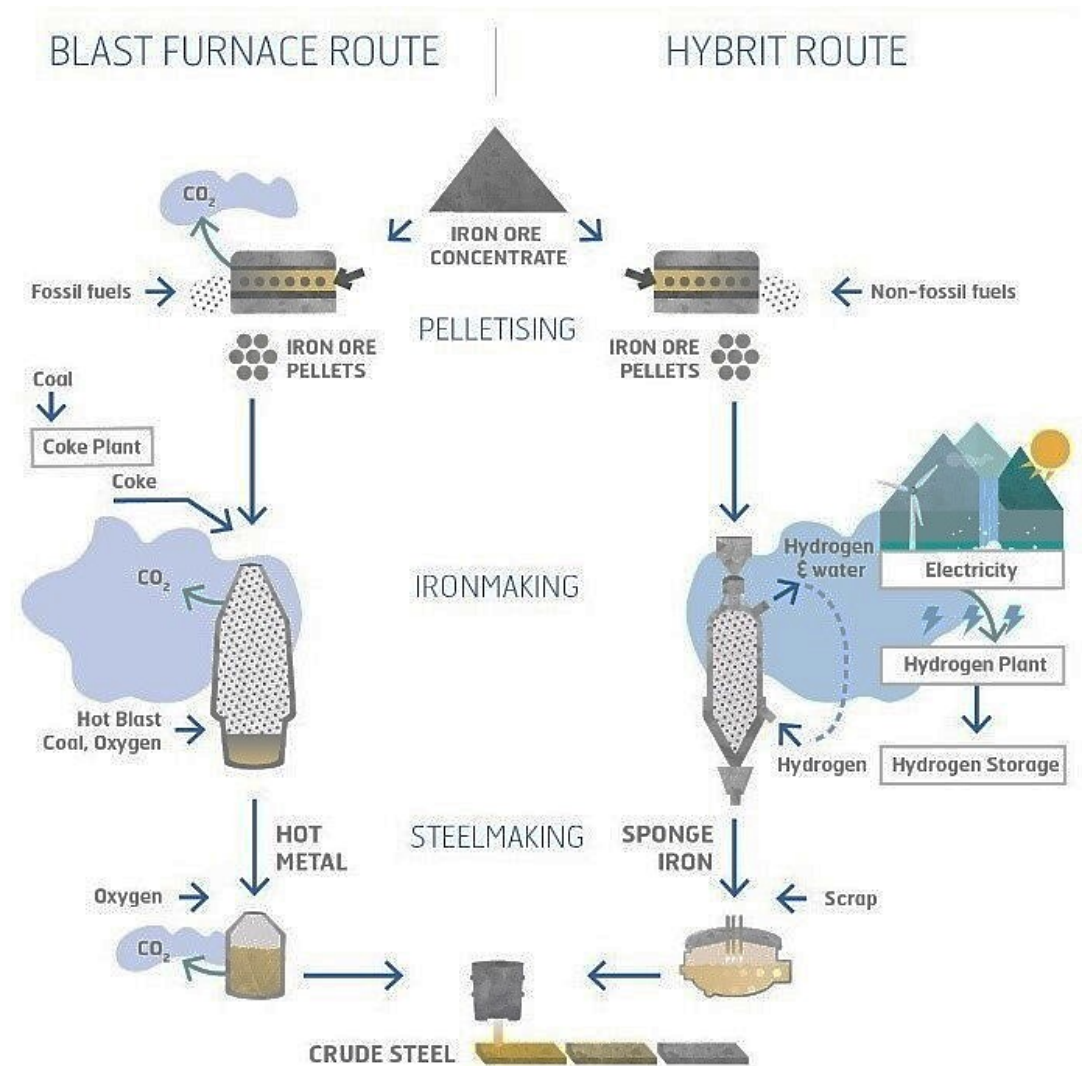
(EV Sales Blog data)



ENERGY TRANSITION

HYBRIT / Sweden

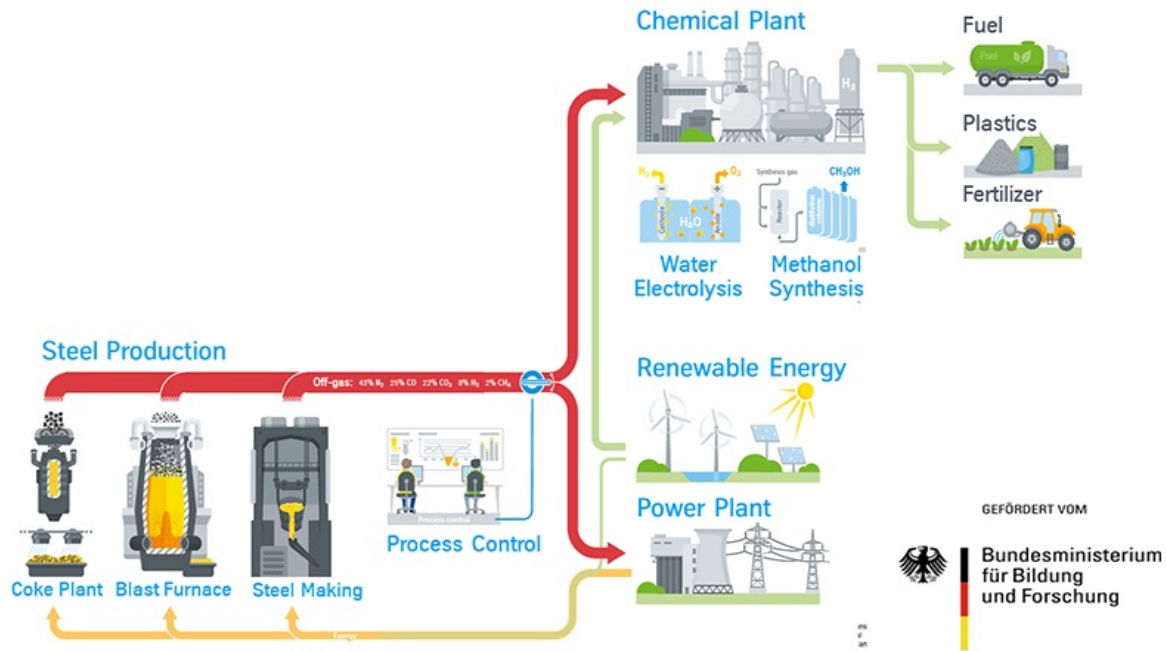
Three Swedish companies, steel manufacturer SSAB, mining company LKAB, and energy company Vattenfall are exploring the use of hydrogen in steel production processes. This joint endeavor is known as **HYBRIT**, short for [Hydrogen Breakthrough Ironmaking Technology](#). To make the process fully fossil-free, the hydrogen used will be generated from renewable electricity. HYBRIT estimates that using decarbonized hydrogen in place of coke could reduce Sweden's total carbon dioxide emissions by ten percent and Finland's by seven percent. A HYBRIT Development AB pilot plant began construction during summer 2018 at the SSAB site in Luleå, Sweden, with SEK 500 million (\$51.88 million) in funding assistance from the Swedish Energy Agency. The pilot phase is expected to last until 2024, followed by a demonstration phase from 2025 to 2035. HYBRIT was awarded the Environmental Goals Prize by the Swedish Environmental Protection Agency for "boldness and momentum".



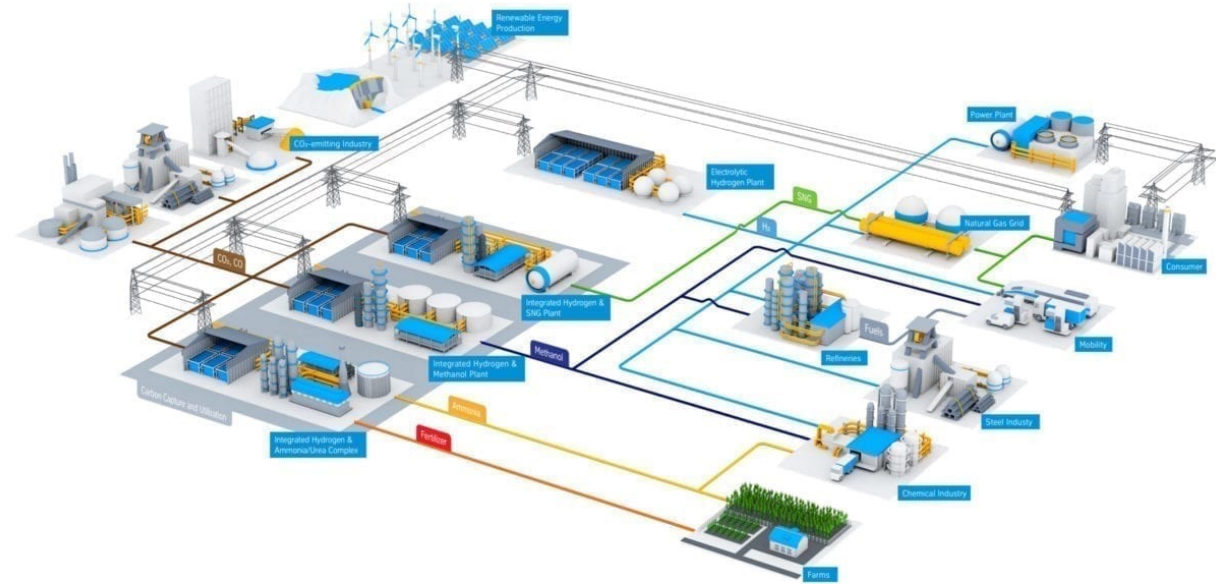
ENERGY TRANSITION

thyssenkrupp / Germany

is focusing on two parallel, equally important routes:



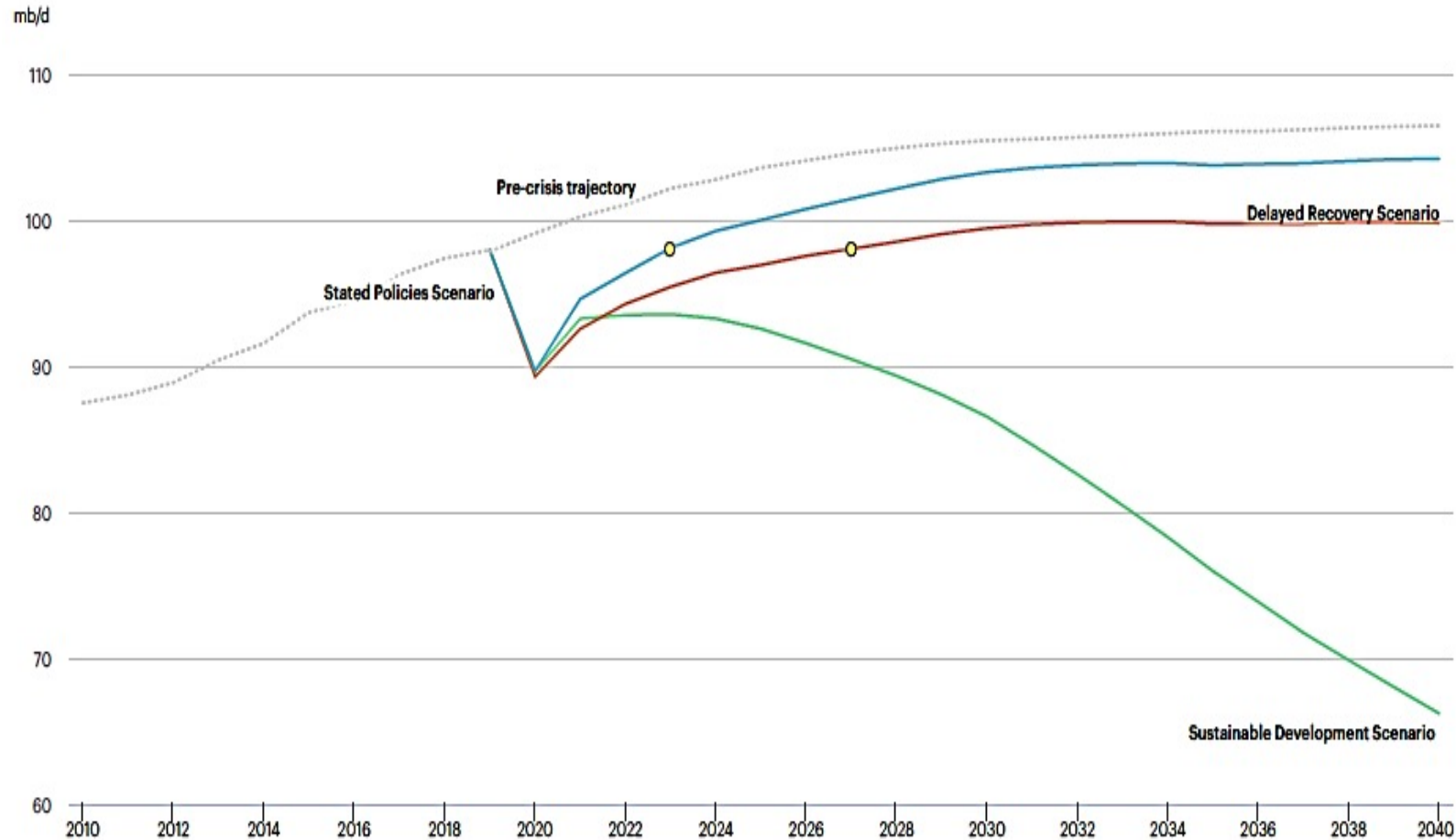
The use of CO₂ produced in steelmaking
("Carbon Capture and Usage", CCU)



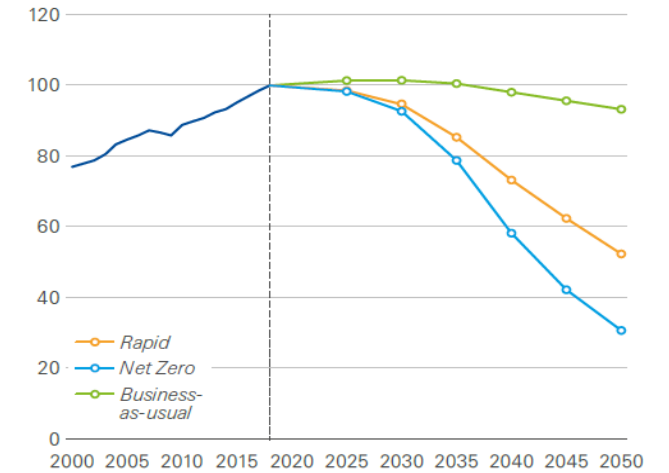
The avoidance of CO₂ through the use of hydrogen
("Carbon Direct Avoidance", CDA)

NEW ECONOMIC LANDSCAPE

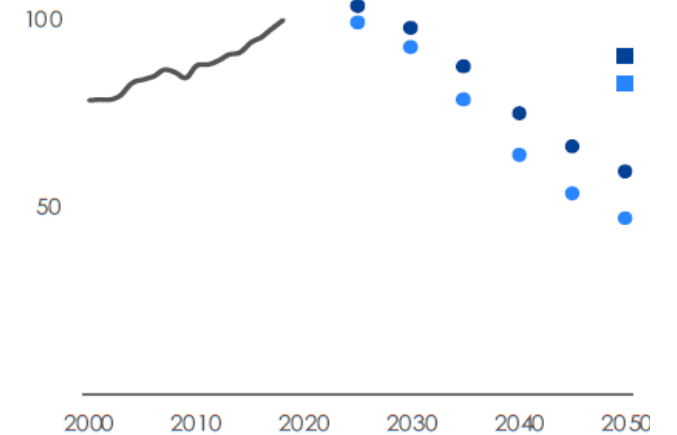
IEA's scenarios for the oil market



Scenarios by BP (2020)



Scenarios by TOTAL (2020)





Thank you for your attention!

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