Carbon Transition Initiative - Utilities Sector Investor Brief

by Pavel Laberko, CFA and Sharon Lui

The Carbon Transition Initiative aims to study the impact of climate change in emerging markets and identify best practices available to the investment community to help assess and manage climate- and transition-related risks and opportunities. To achieve this objective, the initiative is conducting a series of 12 webinars complemented by investor research briefs on macro issues and sectors that are material to carbon transition.

Table of Contents

Executive summary

Electricity generation is a significant contributor to GHG emissions. It is also a key enabler and driver of carbon transition. As the economy is moving toward greater electrification, it is becoming imperative to ensure the power utilities sector is rapidly switching to renewables, and away from coal, gas, and oil. The importance of this transition is reinforced by growing demand for energy in developing countries.

Right now, electricity is generated from various energy sources, with coal still holding the highest share. GHG emission from electricity generation is a function of the carbon intensity of the fuel mix as well as the level of demand in key electricity producing countries. Carbon intensity of the fuel mix varies across emerging markets, with China in the lead, producing 65% of its electricity from coal. Emerging markets are also among the largest electricity producers in the world, with China and India accounting for approximately 28% and 6% of the total, respectively.

In the meantime, the cost of electricity produced from renewable sources has been rapidly declining. As a result, it is becoming more and more competitive vs. the traditional fossil-fuel-based generation.

According to the Science Based Targets initiative, GHG emissions need to be halved by 2030 and to reach net zero by 2050 in order to achieve the goals of the Paris Agreement. The IEA believes that the electricity sector needs to achieve net zero globally by 2040 to meet the 1.5 degrees target. The Science Based Targets initiative has issued a set of guidelines for the power sector companies' GHG emissions reduction targets. These guidelines allow for some variation among acceptable pathways depending on the expected growth in electricity generation, emissions intensity, sources of energy and other variables.

Power utility companies are facing a number of challenges that are slowing down their progress in achieving the Paris Agreement targets. Partially as a result of these problems, companies are slow in setting science-based net zero targets.

The power utilities sector also offers tremendous opportunities (from the projected growth in demand for more electricity) for investors who want to benefit from carbon transition. Further investment opportunities are related to new technologies and new primary sources of energy and the corresponding need to revamp the sector and shift it to a fossil-fuel-free future.

Introduction

Electricity generation is currently a significant contributor to GHG emissions. It is also a key enabler and driver of carbon transition. As the economy is moving toward electrification (increasing use of electric vehicles, heat pumps, and other forms of substitution of fossil fuels by electricity as the source of energy), it is becoming imperative to make sure the power utilities sector is rapidly switching to renewables, and away from coal, gas, and oil.

The importance of this transition is reinforced by growing demand for energy in developing countries. Populations in many countries, especially in Africa, still lack basic access to electricity. As these countries develop their infrastructure, and as people in emerging markets enjoy growing disposable incomes and begin to use more electricity-powered goods and services, demand for this source of energy is bound to keep growing for decades to come.

There are numerous obstacles for utilities to transition to carbon-free operation in developing countries. They include lack of not only generation, but also transmission and distribution infrastructure, legacy of existing coal-based assets, distorted power markets, inadequate policies, inefficient and overbearing involvement of the state, and many other problems.

Investors have a key role to play in supporting the power utilities sector in its carbon transition. They can, and should, engage with issuers, including both governments and companies. A practice of negative screening of companies involved in thermal coal and other fossil fuels is widely used, but it is not enough to move things forward as quickly as needed. Businesses relying on coal need to be nudged toward replacing it with other sources of energy as much as feasible. New technologies are likely to be required, and investors can benefit from allocating capital to their development. Governments, driven in part by advocacy efforts, need to create conducive regulatory conditions to stimulate investments in renewable energy. We hope that this brief will help investors become better informed before starting and moving forward these advocacy campaigns and engaging with governments and the private sector to drive the decarbonization of power utilities.

Key Terms

Nationally determined contribution (NDC) - a target that each country is expected to formulate and achieve as a Party to the Paris Agreement. These targets, when combined, should lead to fulfillment of the aims of the Agreement. NDCs are voluntary and most of them are not, currently, in full compliance with the Paris Agreement's aims. Individual NDCs are submitted to the UNFCCC (United Nations Framework Convention on Climate Change) every five years (starting from 2020). The Paris Agreement requests the Parties to increase the ambition of the targets at each submission.[1]

UN Sustainable Development Goal (UN SDG) - in 2015, all member states of the United Nations adopted 17 Sustainable Development Goals that should lead the world into peace and prosperity. These goals encompass 169 specific targets to be achieved by 2030. Many positive impact and sustainability-focussed investment managers use the framework of SDGs as a foundation for their products. More information about the 2030 Agenda for Sustainable Development is available at this link.

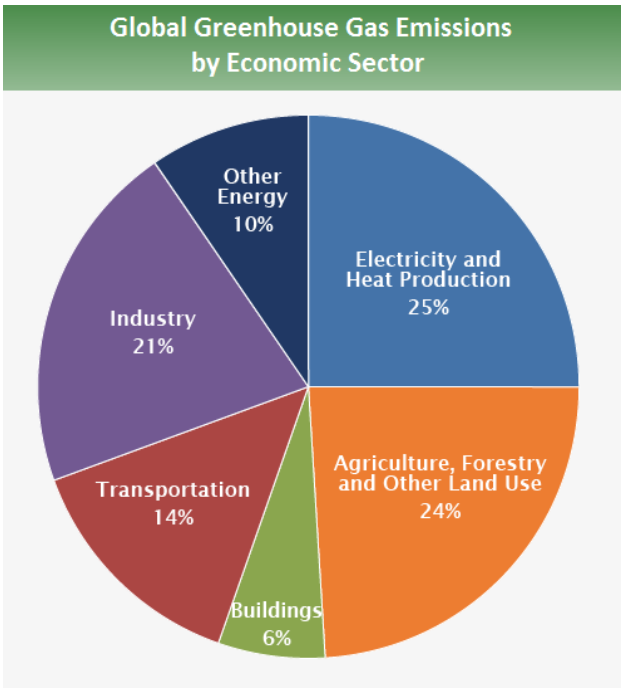
Bioenergy with carbon capture and storage (BECCS) – generation of electricity or heat using biomass and capturing the resulting GHG emissions to store them afterward. In theory, this should lead to negative emissions because the biomass draws carbon from the atmosphere before being burnt into energy. See this link for an overview of the technology's pros and cons.

[1] UNFCCC

The state of affairs

According to the U.S. Environment Protection Agency (EPA), the burning of coal, natural gas, and oil for electricity and heat is the largest single source of global greenhouse gas emissions [i.e. approximately 25% of the total global Greenhouse Gas (GHG) emissions]. Carbon dioxide (CO_2) accounts for the majority of GHG emissions produced in the generation, transmission, and distribution of electricity and heat. Methane (CH_4), nitrous oxide (N_2O), and fluorinated gases (F-gases - less than 1%) are also emitted.

Fig. 1. Global Greenhouse Gas Emissions by Economic Sector (2010)

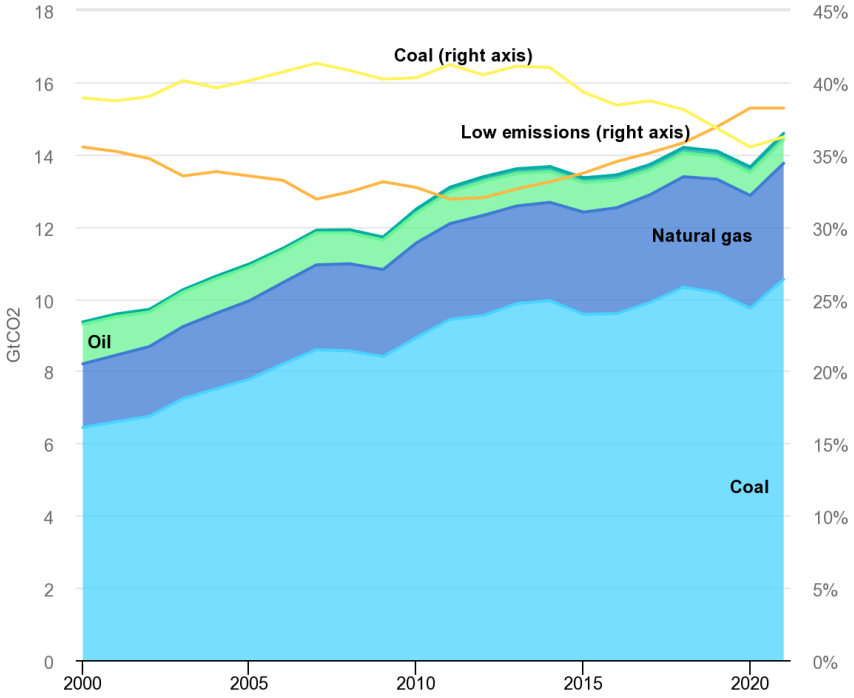


Source: https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data

Specifically, CO_2 emissions from electricity and heat production exceeded 14 gigatonnes (Gt) in 2021, up 492 Mt from 2019 levels, according to the IEA. Notably, emissions from coal were the largest contributor in 2021 (i.e., 10.5 $GtCO_2$), followed by natural gas (i.e., 3.2 $GtCO_2$) and then oil (i.e., 0.7 $GtCO_2$).[2]

[2] IEA

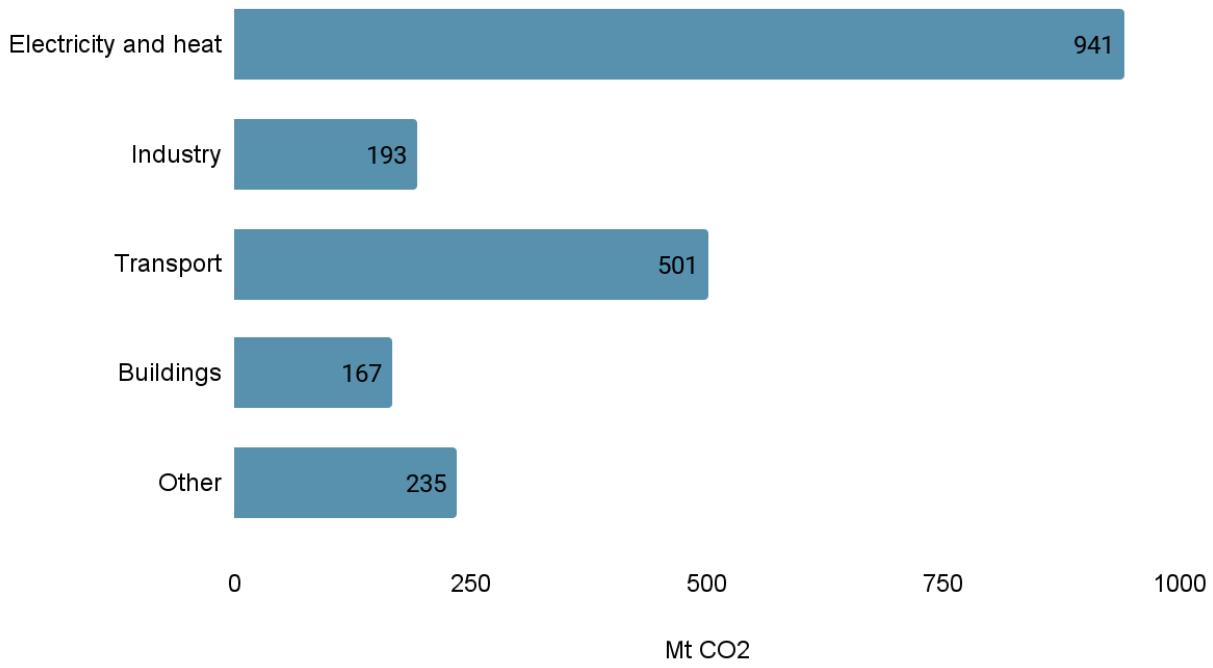
Fig 2. CO2 emissions from electricity and heat production by fuel, and share by fuel, 2000-2021



Source: IEA, CO2 emissions from electricity and heat production by fuel, and share by fuel, 2000-2021, IEA, Paris https://www.iea.org/data-and-statistics/charts/co2-emissions-from-electricity-and-heat-production-by-fuel-and-share-by-fuel-2000-2021

In 2021, global energy-related CO2 emissions increased to a record high, according to the IEA. The agency noted that the electricity and heat production sector was the key driver in the year-over-year increase, accounting for 46% of the global increase in emissions. Specifically, CO2 emissions from the electricity and heat sectors in 2021 increased by 900 Mt (i.e., +6.9% year-over-year) as a result of the biggest ever year-on-year increase in global electricity demand, driven in part by a recovery after the COVID-related restrictions. Yet, the IEA noted that the growth in electricity demand in 2021 (i.e., an increase close to 1 400 terawatt-hours (TWh), or 5.9%) was more than 15 times the size of the drop in demand in 2020. Given the need for increasing electrification, electricity demand can be expected to climb steadily in the years and decades to come.

Fig 3. Annual change in CO2 emissions by sector, 2021

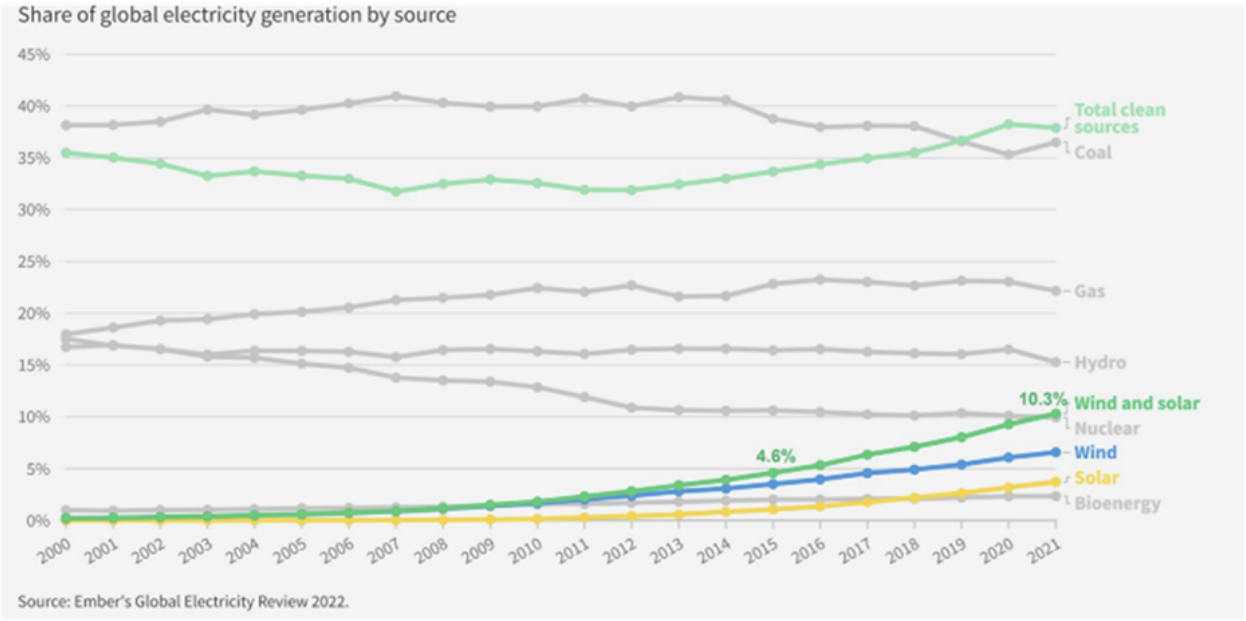


Source: https://www.iea.org/reports/global-energy-review-co2-emissions-in-2021-2

Global Electricity Generation By Fuel

Electricity is generated globally from various energy sources, with coal still holding the highest market share. Energy sources include fossil fuel based ones (i.e. coal 36%, natural gas 22%, other fossil 3% in 2021) as well as clean energy resources (i.e., hydro 15%, nuclear 10%, wind 7%, solar 4%, bioenergy 2%), according to Ember, a climate and energy-focused, independent not-for-profit organization. This data shows that approximately 38% of global electricity was sourced from clean energy in 2021. This is a moderate increase from 32% ten years ago based on 2011 data.

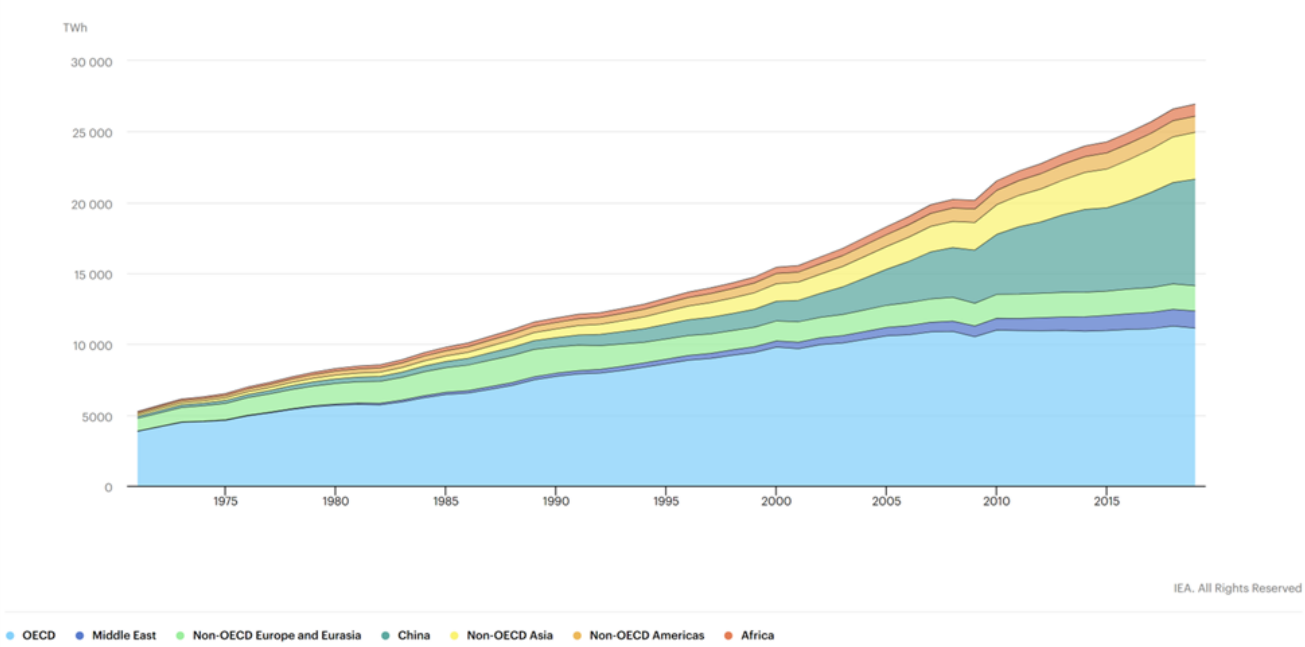
Fig 4. Share of Global Electricity Generation by Source (2021)



Source: https://ember-climate.org/insights/research/global-electricity-review-2022/#supporting-material-downloads

The fuel mix used in electricity generation is different regionally. Certain countries rely more heavily on fossil thermal versus renewables. Hence, GHG emissions from electricity generation is a function of the carbon intensity of the fuel mix as well as the level of demand of key electricity producing countries. For example, China produced 7509 Twh of electricity in 2019 (or approximately 28% of the global total of 26936 Twh), according to the IEA. Renewables accounted for only about 27% of China's fuel source vs. approximately 65% from coal that year. As a result of China's growing economy and electricity demand, the country's share of world CO2 emissions from fuel combustion has increased to 29.5% in 2019 from 5.7% in 1973, according to the IEA.

Fig 5. World electricity generation by region, 1971-2019



Source: World electricity generation by region, 1971-2019, IEA, Paris
https://www.iea.org/data-and-statistics/charts/world-electricity-generation-by-region-1971-2019

Notably, the following emerging markets accounted for five out of the top 10 global producers of electricity, according to the IEA.

- People's Republic of China, 7472 Twh, 27.7% of 2019 total
- India, 1624 Twh, 6.0%
- Russian Federation, 1120 Twh, 4.2%
- Brazil, 626 Twh, 2.3%
- Korea, 578 Twh, 2.1%

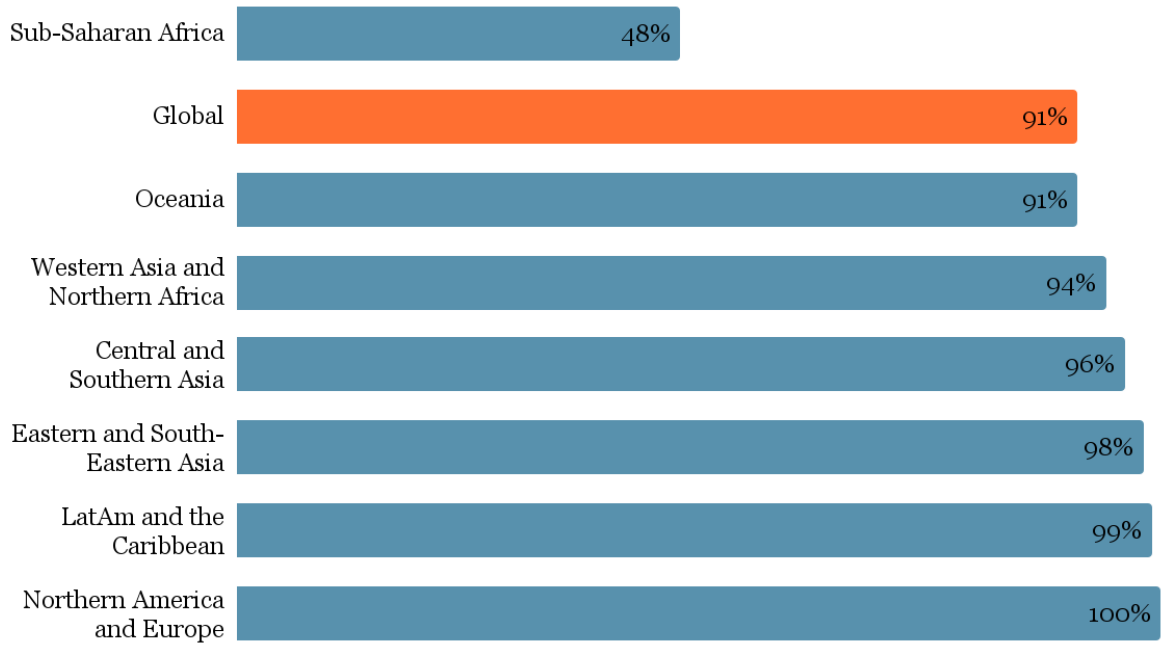
Access to electricity

According to IRENA, 758 million people had no access to electricity in 2019. The organization's estimates show that since then the situation has been deteriorating, with the number of people with no electricity growing by 2% in 2021.[3] Access to electricity is uneven across countries and

[3] IRENA World Energy Transitions Outlook 2022, Chapter 4

continents. The situation is particularly dire in less developed parts of Africa, which is also where the population is growing at high rates.

Fig. 6. Share of the population with access to electricity (2020)[4]



This lack of access to electricity in some parts of the world is going to serve as a driver of growth in demand, especially as the UN's Sustainable Development Goal (SDG) 7 calls for access to affordable, reliable, sustainable and modern energy for all by 2030.[5]

Cost competitiveness of renewable sources of energy

During the last decade, the cost of electricity from renewable sources has been rapidly declining. Thus, since 2010, the cost of new large-scale photovoltaic solar power went down 85%, that of onshore wind by 56%, and offshore wind – by 48%. As a result, they are becoming more and more competitive vs. the traditional fossil-fuel-based generation. According to IRENA's most

[4] The Energy Progress Report: Tracking SDG 7
[5] UN Sustainable Development Goals

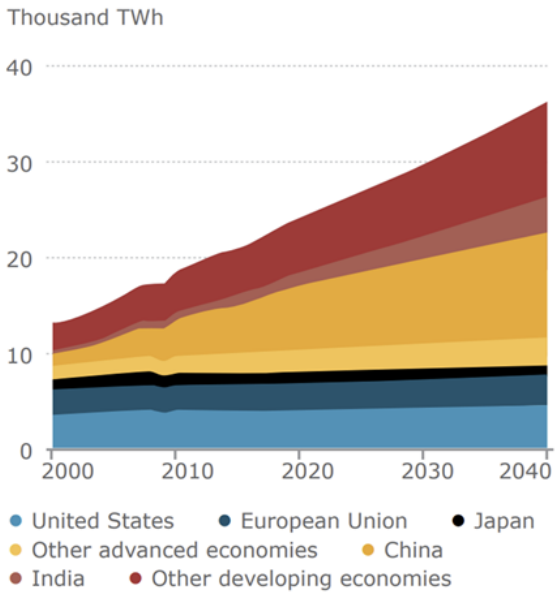
recent overview, already in 2020, 62% of all new renewable generation had lower costs than the cheapest new fossil-fuel capacity.[6] Or, as Bloomberg New Economics Foundation put it, solar and wind are the cheapest sources of energy in countries that together make up three quarters of the global GDP.

The cost of energy storage is also declining, with a battery price index calculated by Bloomberg down 89% between 2010 and 2021.

Emerging Markets' contribution to power-related emissions

As noted before, emerging markets are key global producers of electricity, with China and India accounting for approximately 28% and 6%, respectively of the 2019 total. Notably, these countries are also the largest emitters, with China ranking no. 1 at 26.4% of GHG emissions in 2019, followed by the United States at 12.5%, India at 7.06%, and the European Union at 7.03%.[7] The share of developing countries in total demand for electricity is expected to rise going forward.

Fig 7. Projected increase of global electricity use in the IEA's Stated Policies Scenario



[6] World Energy Transitions Outlook 2022
[7] World Resources Institute Climate Watch Platform

Source: IEA
https://sciencebasedtargets.org/resources/legacy/2020/06/SBTi-Power-Sector-15C-guide-FINAL.pdf

The IEA noted in its "Greenhouse Gas Emissions from Energy: Overview" report the following drivers that determine emissions from electricity generation[8] :

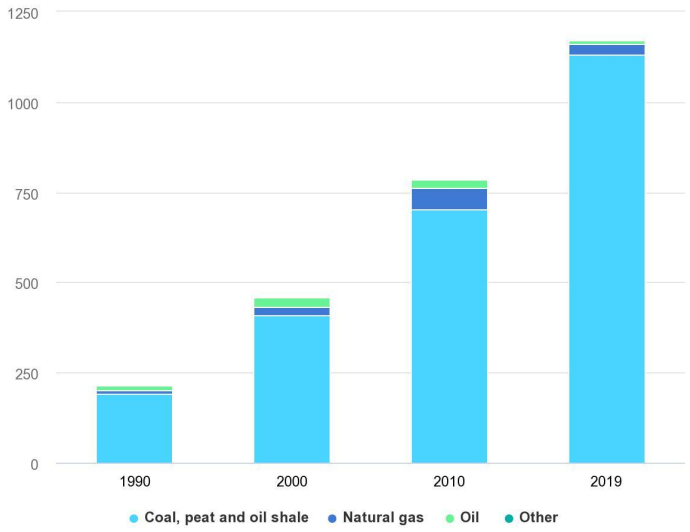
- electricity output
- generation efficiency
- share of fossil in total generation and
- carbon intensity of fossil generation

The following section will focus on these factors specifically for China and India.

India

India's CO2 emissions from electricity and heat generation increased to 1,172,993 ktCO2 in 2019, up from 785,470 KtCO2 in 2010, according to the IEA.[9]

Fig. 8. CO2 emissions from electricity and heat generation by energy source, India (MtCO2)

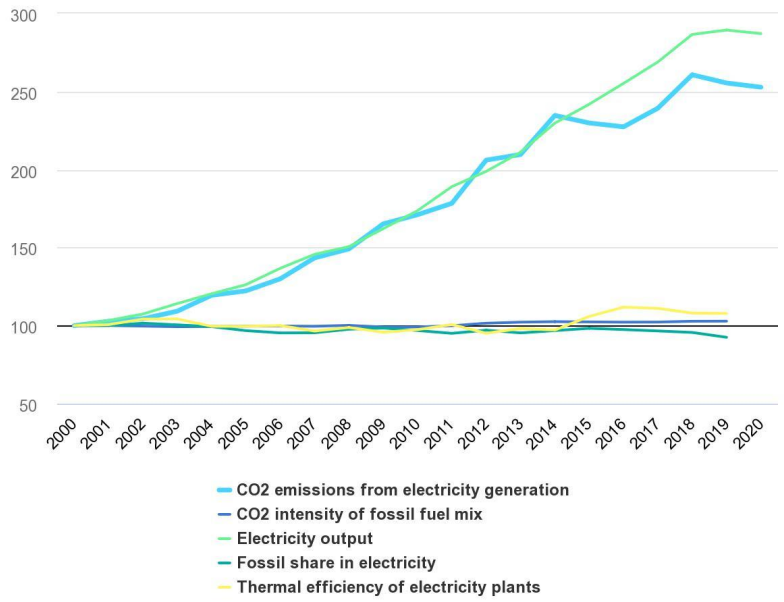


Source: https://www.iea.org/reports/greenhouse-gas-emissions-from-energy-overview/data-explorer

[8] IEA (2021), Greenhouse Gas Emissions from Energy: Overview, IEA, Paris
[9] IEA (2021), Greenhouse Gas Emissions from Energy: Overview, IEA, Paris

The key contributor to the increase in India's emissions has been the growth in electricity output by the country (based on the IEA's analysis). In 2020-21, total generation was 1,491.9 TWh, a ~75% increase from 850.4 in 2010-11, according to India's Ministry of Power.[10] Electricity generation is expected to continue growing at an accelerated rate. The IEA forecasts India to experience the largest increase in energy demand of any country (across all of its scenarios to 2040) based on the country's expanding economy, population, urbanization, and industrialization.[11]

Fig. 9. Electricity generation and CO2 emissions drivers, index, India (2000=100)

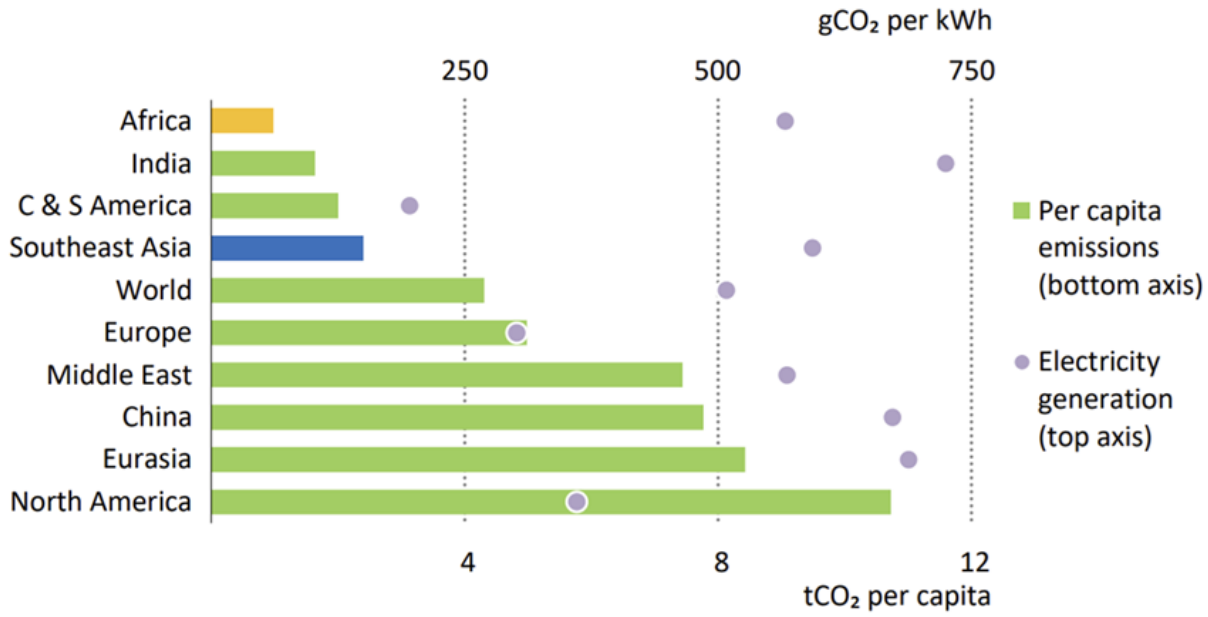


Source: https://www.iea.org/reports/greenhouse-gas-emissions-from-energy-overview/data-explorer

According to the IEA, India's per capita CO2 emissions are 60% lower than the global average, but the emissions intensity of its electricity generation is among the highest of any country.[12] The high carbon intensity is primarily attributed to the use of coal as the primary fuel source (i.e., close to 70%).

[10] Government of India Ministry of Power
[11] IEA India Energy Outlook 2021
[12] IEA India Energy Outlook 2021

Fig. 10. CO2 emissions per capita and emissions intensity of electricity generation by region, 2020

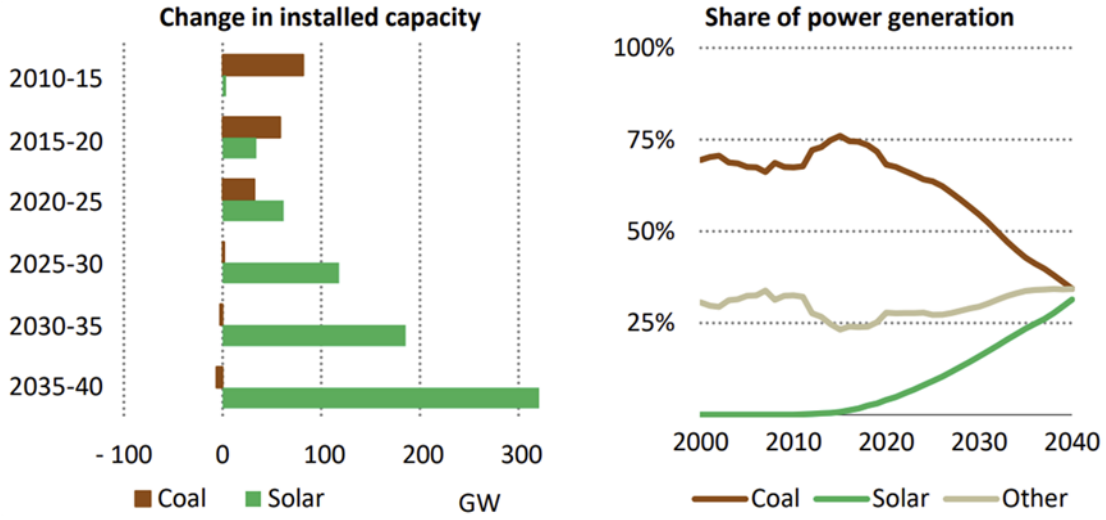


Notes: tCO2 = tonnes of carbon dioxide; C&S America = Central and South America.
Source: https://iea.blob.core.windows.net/assets/1de6d91e-e23f-4e02-b1fb-51fdd6283b22/India_Energy_Outlook_2021.pdf

In 2019, India announced a new target of 450 GW of renewable electricity capacity by 2030. The IEA expects an acceleration in solar power growth over the next two decades primarily driven by this goal and the cost competitiveness of solar. The agency notes that solar accounts for less than 4% of India's electricity generation, and coal close to 70%. By 2040, they converge in the low 30% area in the IEA's Stated Policies Scenario (STEPS),[13] and this transition occurs even earlier in the IEA's other scenarios.

[13] This scenario is based on existing policies and those under development, with the IEA assessing the probability of their implementation based on each country's relevant regulatory, market, infrastructure and financial circumstances.

Fig. 11. Changes in coal and solar capacity and share of power generation in India in the IEA's STEPS, 2000-2040

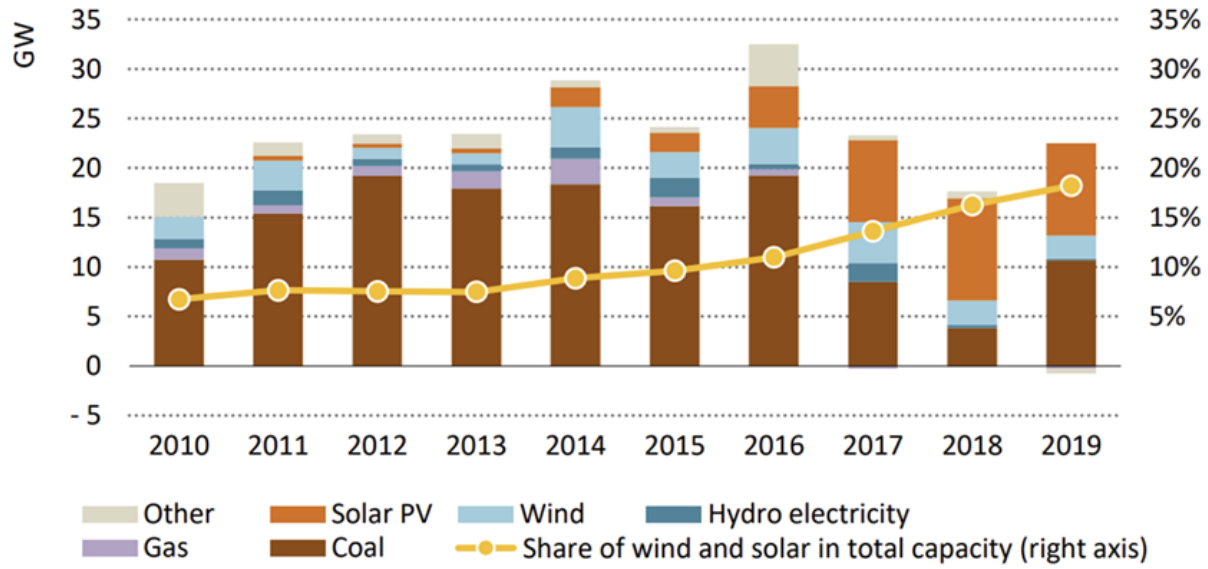


Source: https://iea.blob.core.windows.net/assets/1de6d91e-e23f-4e02-b1fb-51fdd6283b22/India_Energy_Outlook_2021.pdf

The share of renewables (wind and solar) in India's total power sector installed capacity has doubled to 7% (2019 vs. 2014). The IEA noted the following policy actions taken by India that have facilitated the growth of grid-connected renewables: (1) "reverse auctions resulting in progressively falling prices, (2) lower corporate tax rates for developers, (3) renewable purchase obligations mandating utilities to procure a certain minimum purchase of renewable power (in 2019-20, the guideline set by the central government was 17.5%, although state regulators have their own targets), (4) investment in transmission infrastructure, and (5) support for solar parks that help reduce project development and land acquisition risks.

The agency also highlighted important structural, regulatory, and institutional challenges India faces that could hamper further growth in renewables. "The challenges include: (1) the poor financial position of many state distribution companies, (2) difficulties in obtaining access to finance and in acquiring land, (3) grid congestion, and (4) uncertainties over grid infrastructure development."

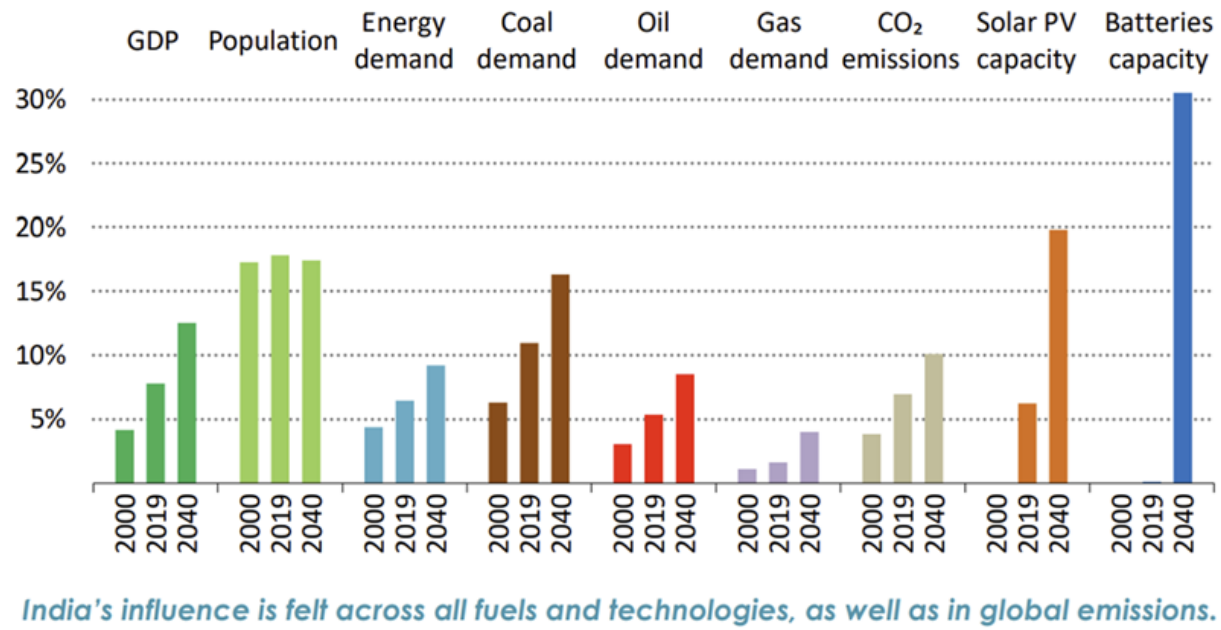
Fig. 12. India's annual power sector capacity additions



Source: *https://iea.blob.core.windows.net/assets/1de6d91e-e23f-4e02-b1fb-51fdd6283b22/India_Energy_Outlook_2021.pdf*

India accounts for nearly 25% of global energy demand growth from 2019 to 2040 in the IEA's STEPS. The agency noted that India's energy choices have direct and far-reaching effects on the lives of a growing population, and major indirect effects on the rest of the world through their impact on energy markets, emissions, and flows of technology and capital.

Fig. 13. India's share of selected global indicators in the IEA's STEPS

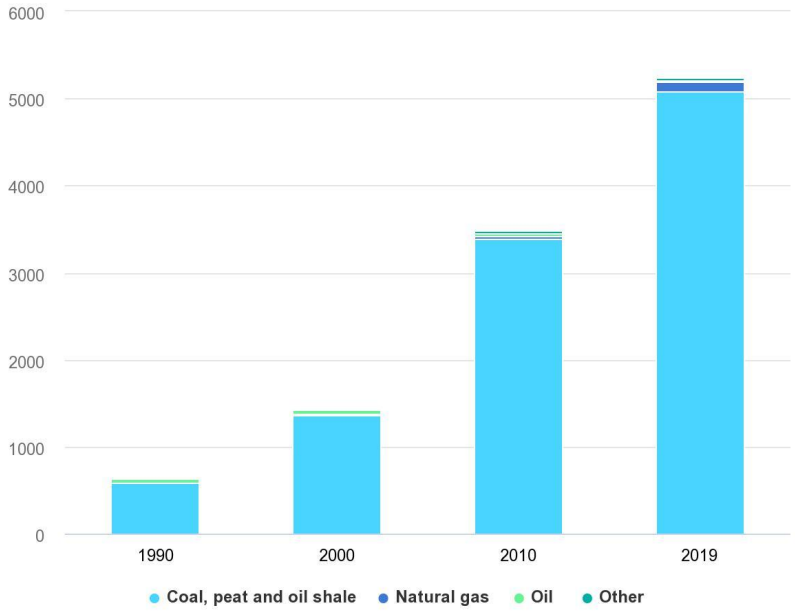


Source: https://iea.blob.core.windows.net/assets/1de6d91e-e23f-4e02-b1fb-51fdd6283b22/India_Energy_Outlook_2021.pdf

China

China is the world's largest energy consumer and carbon emitter, accounting for one-third of global CO2 emissions, according to the IEA. Specifically, China's CO2 emissions from electricity and heat generation increased to 5238.1 MtCO2 in 2019, up from 3477.6 MtCO2 in 2010, according to the IEA.

Fig. 14. CO2 emissions from electricity and heat generation by energy source, China (MtCO2)

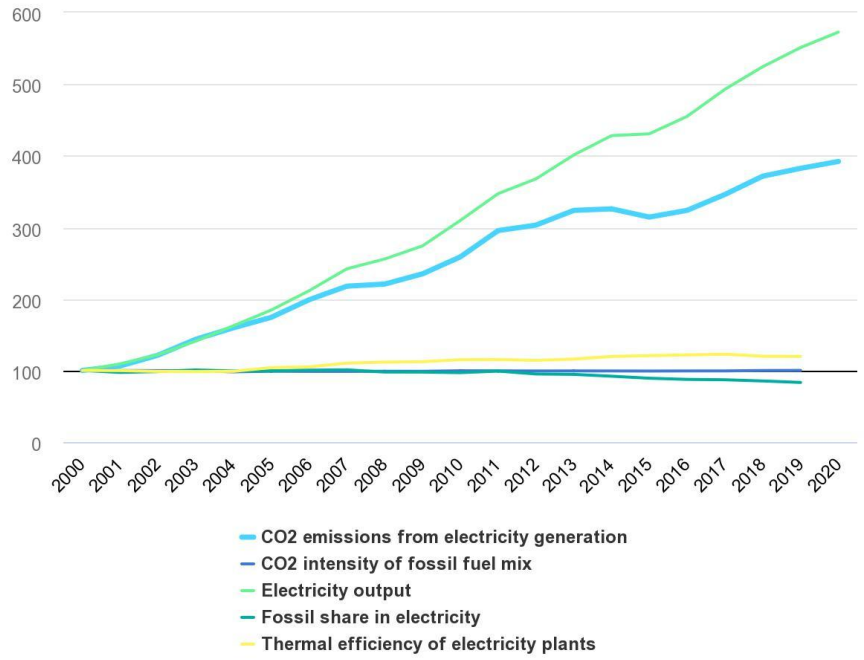


Source: https://www.iea.org/reports/greenhouse-gas-emissions-from-energy-overview/data-explorer

The key contributor to the increase in China's emissions has been the growth in electricity output by the country based on the IEA's analysis. The agency estimates that China accounted for nearly 30% of global electricity generation (7800 TWh) in 2020, with its electricity production rising over 80%, or 6% annually, between 2010 and 2020.[14]

[14] IEA Enhancing China's ETS for Carbon Neutrality

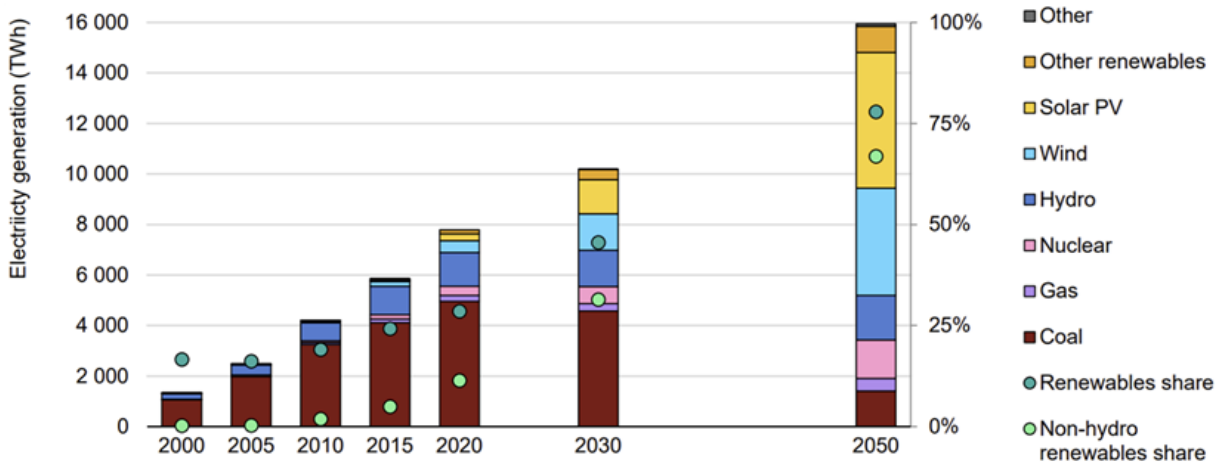
Fig. 15. Electricity generation and CO2 emissions drivers, index, China (2000=100)



Source: https://www.iea.org/reports/greenhouse-gas-emissions-from-energy-overview/data-explorer

Electricity generation is expected to continue growing at an accelerated rate. The IEA forecasts China electricity generation to increase from 7,800 TWh in 2020 to more than 10,000 TWh in 2030 and to approximately 16,000TWh by 2050.

Fig. 16. China electricity generation and projections in the IEA's Announced Pledges Scenario, 2000-2050



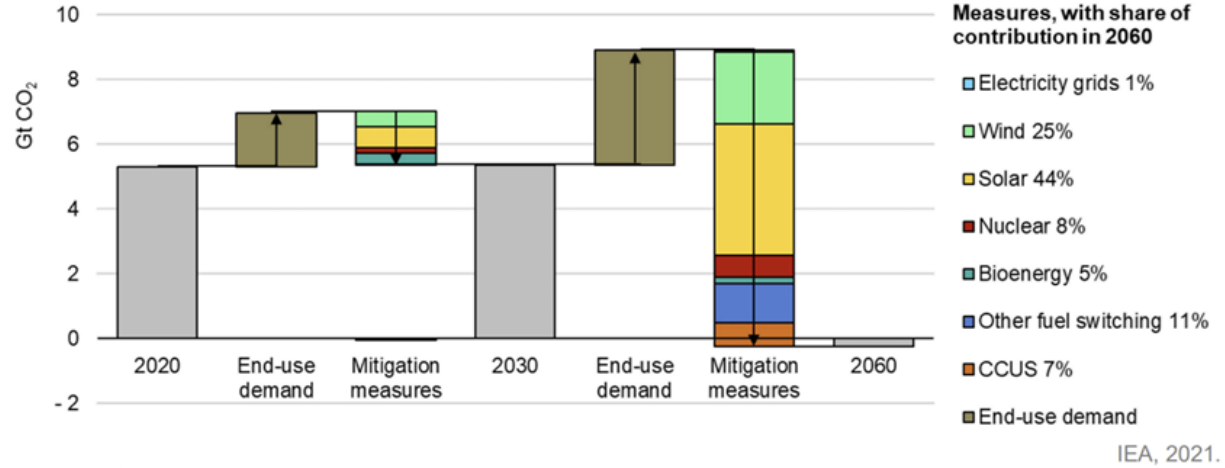
Note: The Announced Pledges Scenario (APS) is presented in IEA's World Energy Outlook 2021. It takes account of all of the climate commitments made by governments around the world, including Nationally Determined Contributions as well as longer term net zero/carbon neutrality targets, and assumes that they will be met in full and on time.
Source:
https://iea.blob.core.windows.net/assets/17fc0c1d-7fff-4ca6-af39-7f6e6f1c33fc/EnhancingChinasETSforCarbonNeutrality_FocusonPowerSector.pdf

In September 2020, China announced a target to have CO2 emissions peak before 2030 and achieve carbon neutrality before 2060. As noted by the IEA, the power sector accounts for almost half of China's energy sector CO2 emissions and, consequently, is central to achieving China's climate ambitions.[15] Similar to India, the IEA expects an acceleration in renewables (solar and wind) over the next two decades primarily driven by China's climate goals. The agency notes that renewables accounted for more than 30% of China's electricity generation in 2020. As well as India, the country is also heavily dependent on coal with the fuel accounting for more than 60% of electricity generation. China owns more than 50% of installed coal-fired power capacity in the world (i.e., 1080 GW).

China has announced a target to increase the total capacity of wind and solar power to over 1,200 GW by 2030 (almost doubling capacity of ~630 GW in 2021). In the IEA's APS, the share of renewables in electricity generation reaches over 45% in 2030 and nearly 80% in 2050. In the scenario, power sector emissions in China continue to increase from 5.4 Gt of CO2 in 2020 to reach a peak of 5.6 Gt by around 2025 and then fall to zero before 2055[16] and are marginally negative in 2060.

[15] Enhancing China's ETS for Carbon Neutrality
[16] IEA's An Energy Sector Roadmap to Carbon Neutrality in China

Fig. 17. CO2 emissions reductions in power generation in China by driver in the IEA's APS



Note: CCUS = carbon capture, utilisation and storage, utilisation and storage.

The power sector reaches net zero emissions before 2055 despite generation growing 130%, mainly due to switching to renewables and the phase-out of unabated coal

Source:
https://iea.blob.core.windows.net/assets/9448bd6e-670e-4cfd-953c-32e822a80f77/AnenergysectorroadmaptocarbonneutralityinChina.pdf

Industry targets – The Paris Agreement

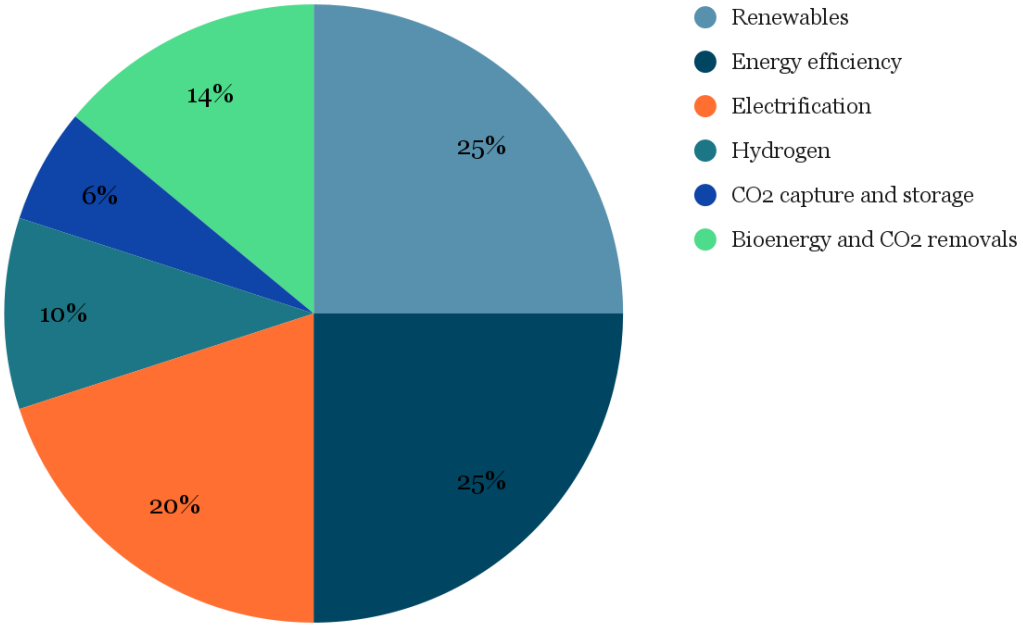
According to the Science Based Targets initiative, GHG emissions need to be halved by 2030 and reach net zero by 2050 to achieve the goals of the Paris Agreement. The power sector's emissions are to move in line with these aims, although specific dates and rates differ across a number of scenarios. These scenarios assume some variations in the rates of growth of electricity generation, the sector's mix of energy sources, and the deployment of bioenergy carbon capture and storage (BECCS).[17]

For example, a scenario from IRENA expects 79% of the final energy consumption to come from renewables in 2050.[18] By their estimates, 90% of electricity generation will be based on renewable sources (up from 26% in 2019). Half of the final energy consumption is expected to be

[17] Science Based Targets initiative's guidelines for the power sector
[18] IRENA World Energy Transitions Outlook 2022

fueled directly by electricity (compared to 21% now). The following chart shows the relative contributions of the main ways to reduce GHG emissions.

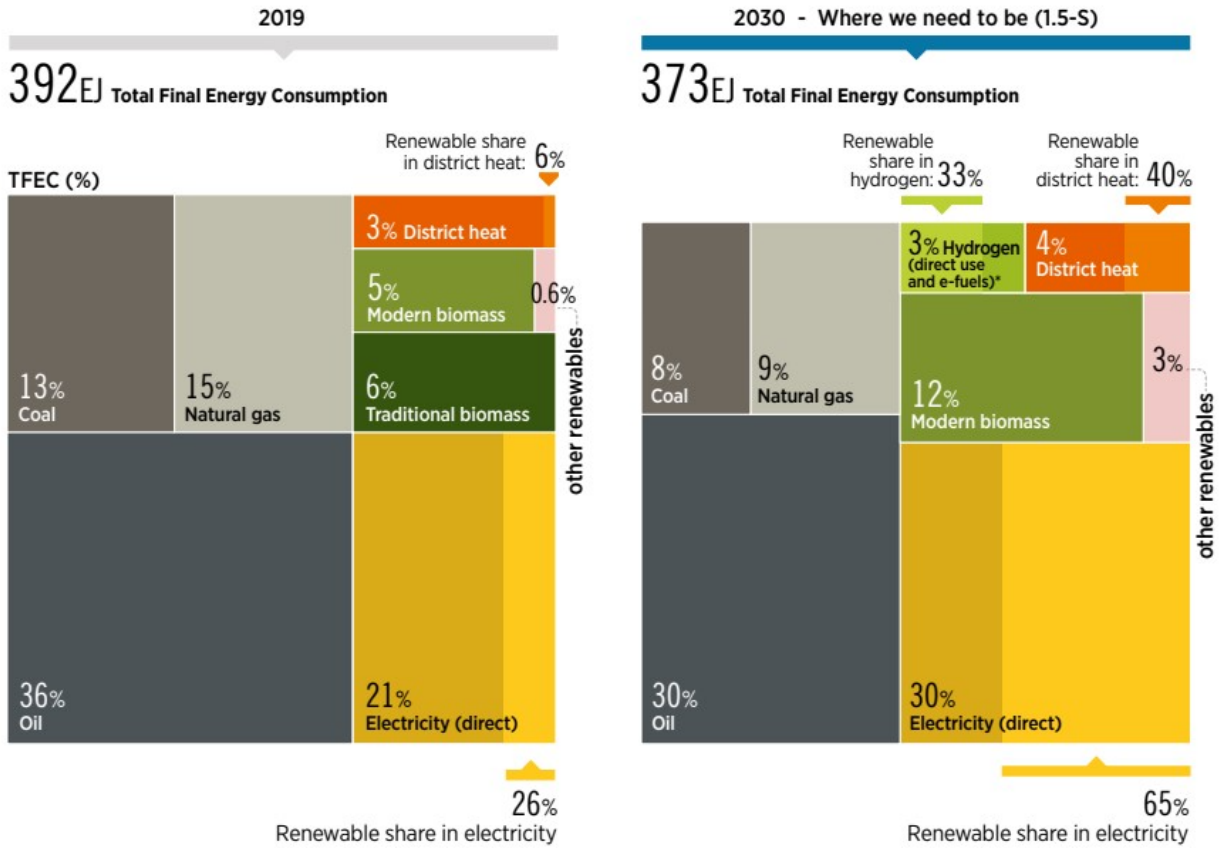
Fig. 18. Six technological avenues to reduce GHG emissions by 2050[19]



In order to reach the targets set by IRENA, renewable generation capacity will need to increase four-fold by 2030 and ten-fold by 2050 compared to 2020. Solar and wind are expected to lead the way. IRENA's scenario assumes fast and complete phaseout of coal, a slowly decreasing share of gas and a flat share of nuclear power. Thus, to reach the 1.5C target set by the Paris Agreement, the annual rates of solar, wind and other renewable generation sources need to accelerate sharply from the current levels. The following chart shows the distribution of fuel sources in energy consumption (excluding non-energy uses) by 2030 based on IRENA's 1.5C scenario.

[19] World Energy Transitions Outlook 2022

Fig. 19. Total final energy consumption by carrier



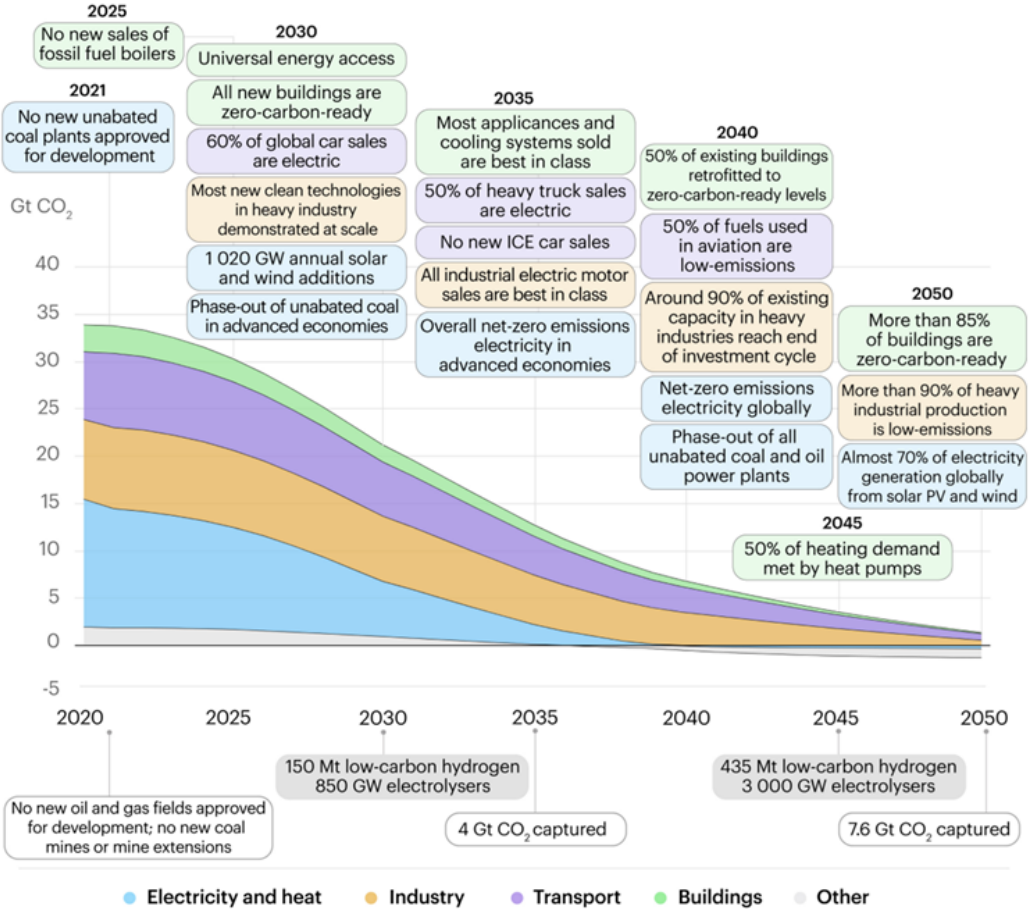
Source: IRENA World Energy Transitions Outlook 2022

The IEA has a similar view to IRENA on the pathway to keeping global warming to no more than 1.5 degrees. As published in the agency's Net Zero by 2050 report (May 2021), the IEA projects that two-thirds of total energy supply in 2050 would need to be from wind, solar, bioenergy, geothermal and hydro energy. Fossil fuels would account for slightly over one-fifth of total energy supply in 2050, down from almost four-fifths currently. Similar to IRENA's calculations, electricity would account for almost 50% of total energy consumption in 2050.

The IEA believes that the electricity sector needs to achieve net zero globally by 2040 in order to

meet the 1.5 degrees target. Under its net-zero scenario,[20] almost 90% of electricity generation would need to come from renewable sources by 2050 (e.g., wind and solar PV together accounting for almost 70% with most of the remainder coming from nuclear power). Yet, in accordance with the principle of differentiated responsibilities set by the Paris Agreement, developed countries should achieve full decarbonization of the power sector earlier than EM. The IEA's scenario assumes it will happen in 2035.[21]

Fig. 20. IEA's Key Milestones in the Pathway to Net Zero



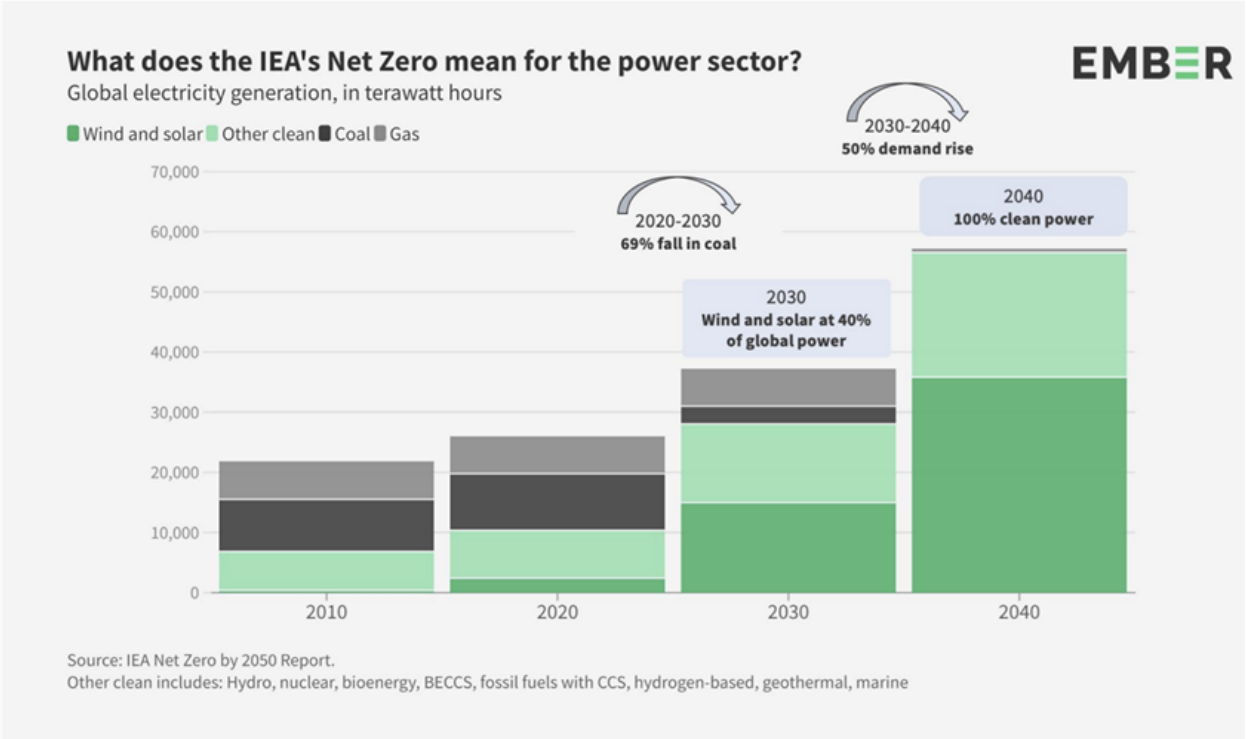
[20] IEA's Net Zero Emissions (NZE) scenario is a pathway for the global energy sector to achieve net zero emissions by 2050. This scenario is based on assumptions of achieving universal access to electricity by 2030 and keeping global warming at 1.5C without a temperature overshoot (with a 50% probability). See more details of the NZE here.

[21] Climate Action 100+, Global Sector Strategies for Electric Utilities

Source:
https://iea.blob.core.windows.net/assets/7ebafc81-74ed-412b-9c60-5cc32c8396e4/NetZeroby2050-ARoadmapfortheGlobalEnergySector-SummaryforPolicyMakers_CORR.pdf

The plan calls for an immediate shift away from coal to solar and wind as the main fuel sources. Specifically, "no additional new final investment decisions should be taken for new unabated coal plants, the least efficient coal plants are phased out by 2030, and the remaining coal plants still in use by 2040 are retrofitted." The IEA projects 1020 GW of annual solar and wind additions by 2030. Longer-term, "solar PV capacity increases 20-fold between now and 2050, and wind power 11-fold."

Fig. 21. Fuel Sources for Power Sector Under IEA's Pathway to Net Zero (2010 vs. 2040)



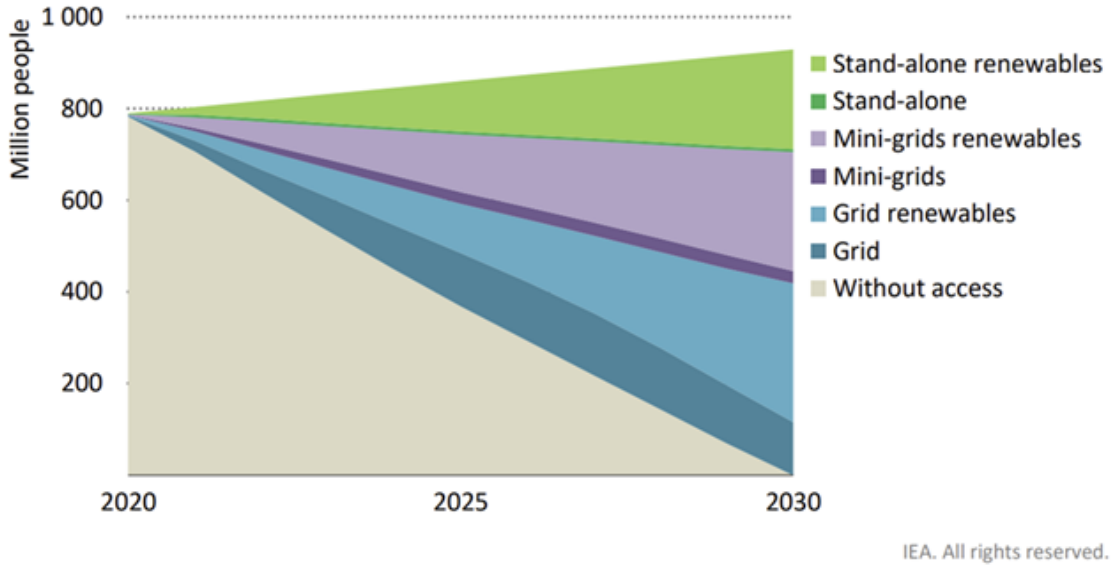
Source: https://ember-climate.org/app/uploads/2022/03/Report-GER22.pdf

The necessary shift to renewable sources of energy will require supportive policies. For now, the announced NDCs are not ambitious enough to reach the Paris Agreement targets globally. Furthermore, each NDC calls upon specific targets and policies aimed at industries in each country. According to IRENA, 145 countries have set up policies to support renewables in the

power sector by 2020. Yet, these policies, overall, are not ambitious enough, and their geographic coverage is still not complete.[22]

Under the IEA's roadmap, the goal is also to ensure energy access to all by 2030. This entails providing electricity to approximately 785 million people that have no access (currently primarily located in sub-Saharan Africa and developing Asia) and clean cooking solutions to 2.6 billion people (35% of them were in sub-Saharan Africa, 25% in India and 15% in China, per the IEA). The agency estimates the initiative would cost approximately $40 billion annually (i.e., around 1% of average annual energy sector investment).

Fig. 22. People gaining access to electricity by type of connection in emerging markets and developing economies under IEA's pathway to net zero



Source: https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c-10b13d840027/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf

Science-based targets

[22] World Energy Transitions Outlook 2022

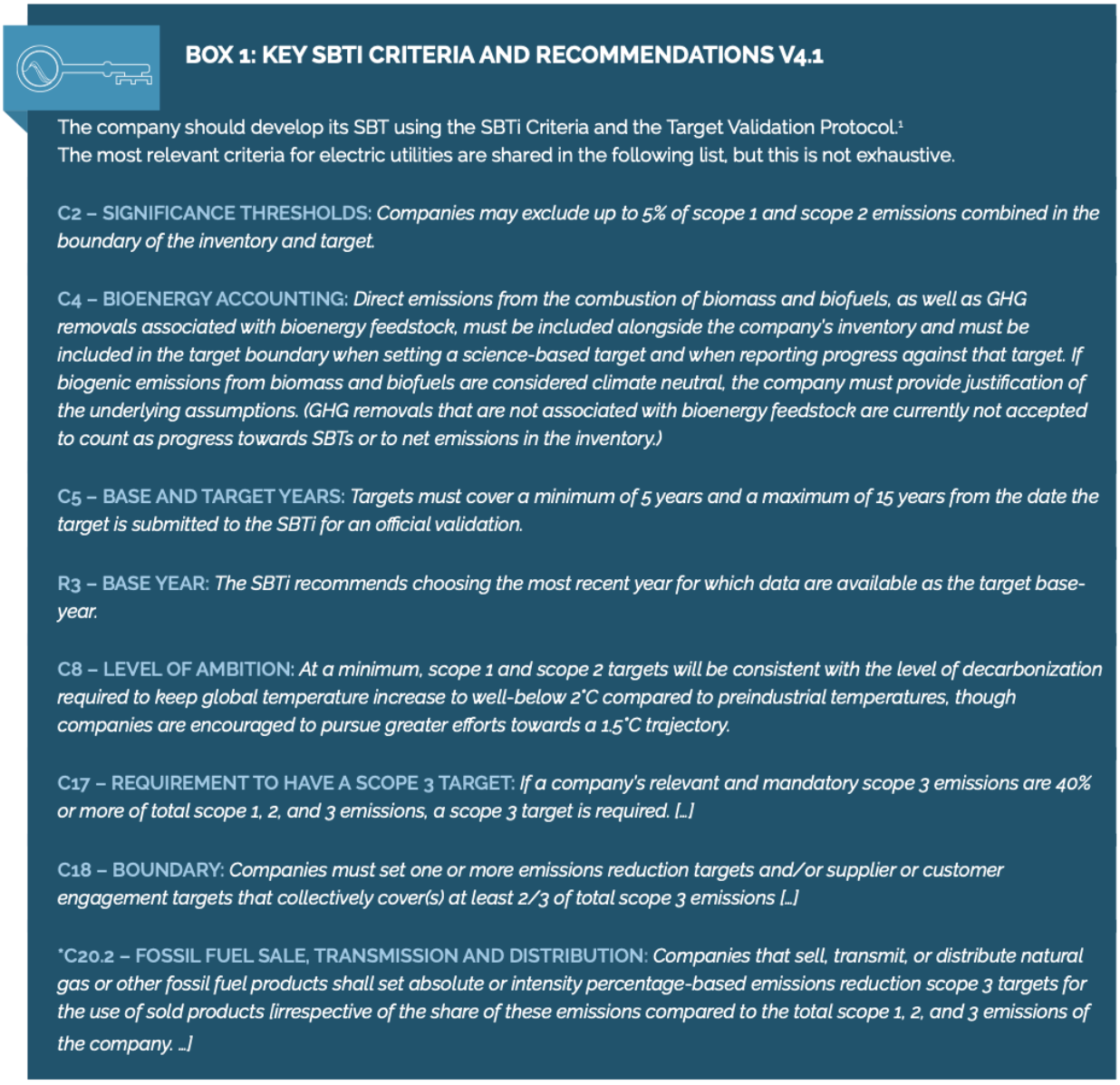
The Science Based Targets initiative has issued a guideline for the power sector companies' GHG emissions reduction targets. These guidelines allow for some variation among acceptable pathways depending on the expected growth in electricity generation, emissions intensity, sources of energy and other variables. In order to reach the 1.5C global warming threshold, any science based scenario requires some utilization of carbon removal technologies. However, for now these technologies remain prohibitively expensive, so their practical application remains a distant option. Consequently, Climate Action 100+ in its sector strategy proposes a scenario with no carbon dioxide removal as the minimum decarbonization pathway.[23]

One of the lowest energy demand scenarios, which is well-documented, assumes a 30% electricity generation growth between 2020 and 2035. Combined with the required reduction in GHG emissions, this scenario calls for an 85% reduction in emissions intensity for the same period.

The following excerpt from the SBTi guideline for the power sector lists the main criteria for GHG emissions reduction targets. A more detailed manual for companies is available on SBTi's website.

[23] CA100+, Global Sector Strategies, Electric Utilities

Fig. 23. Key SBTi criteria



BOX 1: KEY SBTI CRITERIA AND RECOMMENDATIONS V4.1

The company should develop its SBT using the SBTi Criteria and the Target Validation Protocol.[1]
The most relevant criteria for electric utilities are shared in the following list, but this is not exhaustive.

C2 – SIGNIFICANCE THRESHOLDS: *Companies may exclude up to 5% of scope 1 and scope 2 emissions combined in the boundary of the inventory and target.*

C4 – BIOENERGY ACCOUNTING: *Direct emissions from the combustion of biomass and biofuels, as well as GHG removals associated with bioenergy feedstock, must be included alongside the company's inventory and must be included in the target boundary when setting a science-based target and when reporting progress against that target. If biogenic emissions from biomass and biofuels are considered climate neutral, the company must provide justification of the underlying assumptions. (GHG removals that are not associated with bioenergy feedstock are currently not accepted to count as progress towards SBTs or to net emissions in the inventory.)*

C5 – BASE AND TARGET YEARS: *Targets must cover a minimum of 5 years and a maximum of 15 years from the date the target is submitted to the SBTi for an official validation.*

R3 – BASE YEAR: *The SBTi recommends choosing the most recent year for which data are available as the target base-year.*

C8 – LEVEL OF AMBITION: *At a minimum, scope 1 and scope 2 targets will be consistent with the level of decarbonization required to keep global temperature increase to well-below 2°C compared to preindustrial temperatures, though companies are encouraged to pursue greater efforts towards a 1.5°C trajectory.*

C17 – REQUIREMENT TO HAVE A SCOPE 3 TARGET: *If a company's relevant and mandatory scope 3 emissions are 40% or more of total scope 1, 2, and 3 emissions, a scope 3 target is required. […]*

C18 – BOUNDARY: *Companies must set one or more emissions reduction targets and/or supplier or customer engagement targets that collectively cover(s) at least 2/3 of total scope 3 emissions […]*

*C20.2 – FOSSIL FUEL SALE, TRANSMISSION AND DISTRIBUTION: *Companies that sell, transmit, or distribute natural gas or other fossil fuel products shall set absolute or intensity percentage-based emissions reduction scope 3 targets for the use of sold products [irrespective of the share of these emissions compared to the total scope 1, 2, and 3 emissions of the company. …]*

Climate Action 100+ has published sectoral decarbonization guidelines, and their report on electric utilities contains **specific recommendations for investors** on how to assess these companies' net-zero targets.

Investors: challenges and opportunities

Investment challenges and risks

Power utility companies are facing a number of challenges that are slowing down their progress in achieving the Paris Agreement targets. Some of them are common for different segments, such as inadequate regulatory environment, insufficient investments, lack of grid connections etc. In addition, rapid acceleration of wind generation capacities is facing public resistance to wind farms nearby, shortages of skilled labor, and unclear impact on marine life. Challenges facing the solar segment include lack of economically feasible storage capacities, underdeveloped regulatory and market infrastructure for distributed generation, and inadequate digitalization of demand management.

It is essential for new renewable power generation projects to take into account social aspects and the impact on local communities. Large solar plants are often technically unable to share their output with local consumers, transmitting all the energy into high voltage transmission grids. Construction of new wind and solar plants creates new jobs, but many of them are short-term and finish when the equipment is up and running. Investors and companies, together with local governments, need to think beforehand about ensuring local communities benefit from these projects.

On a country level, renewable generation projects typically use imported equipment, and they are often financed in foreign currencies. On the other hand, the revenues they earn are usually nominated in the local currency. This mismatch creates additional FX risks for the country, and the operating company may find itself under pressure to raise tariffs to cover these unexpected losses.

Many developing countries are characterized by unstable or weak institutions. Given the very long-term horizon of renewable generation projects, operators and investors have to be prepared for a new government having a different view on their projects.

The aforementioned political risks need to be thought through and managed. Power Purchase Agreements (PPA) need to be well structured, with some government backstop inclusion to be considered. A political risk insurance policy could also be a useful instrument, if available.

Partially as a result of these problems, companies are slow in setting science-based net zero targets. According to TPI, only one of the 68 publicly listed power companies that it has analyzed has a decarbonization plan that is in line with a 1.5C global warming pathway.[24] Yet the organization notes a high level of intent among many of these companies to set net zero targets and proceed with carbon transition.

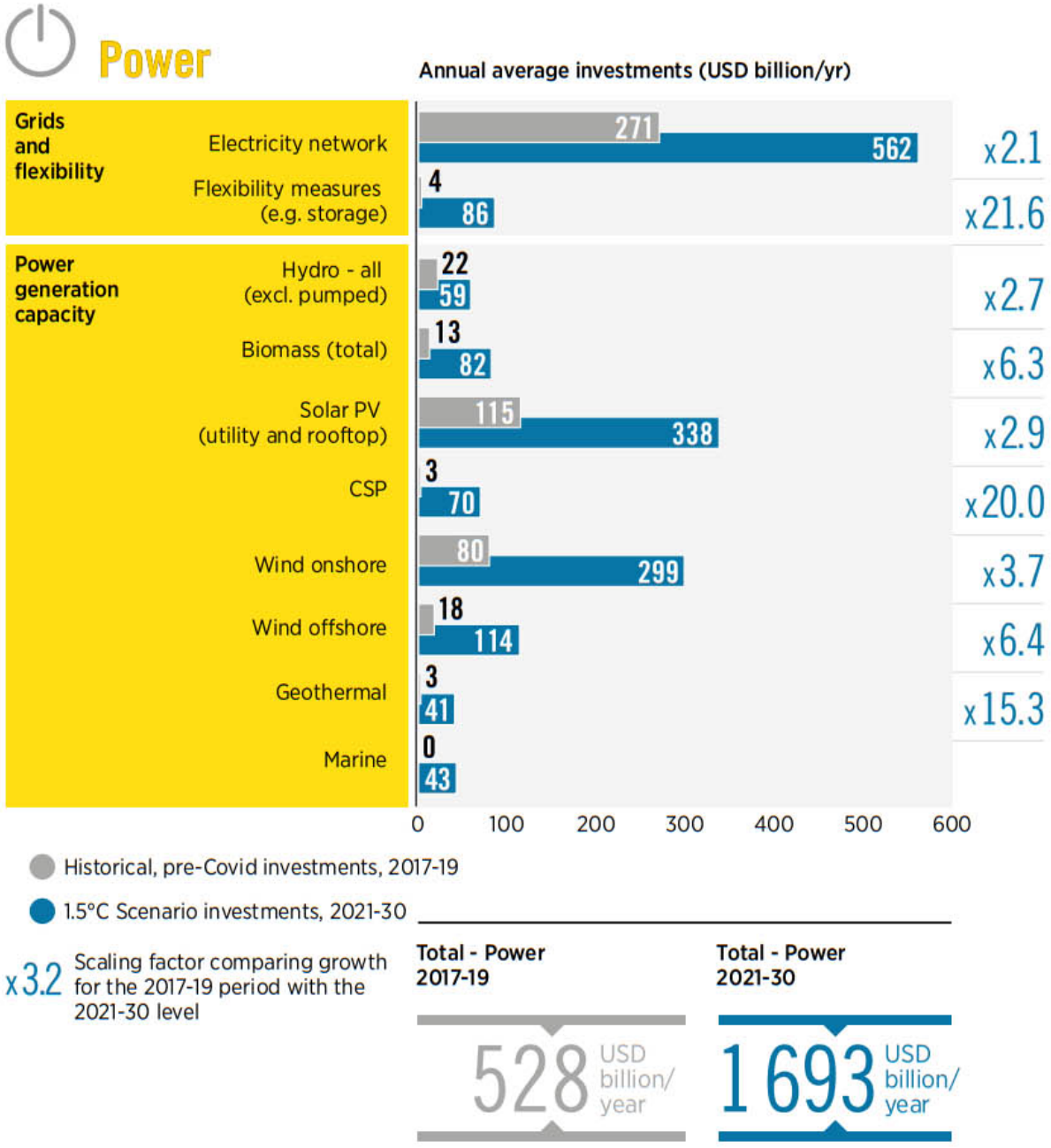
Investment opportunities

The power utilities sector offers tremendous opportunities for investors who want to benefit from carbon transition. These opportunities come from the projected growth in demand for more electricity. According to a forecast by the IEA, demand for electricity will grow by 166% by 2050.[25] The main drivers of this growth are increasing population, improving access to electricity, and massive electrification of transportation, manufacturing, and other industries. Further investment opportunities are related to new technologies and new primary sources of energy and the corresponding need to revamp the sector and shift it to a fossil-fuel-free future.

Investors considering the utilities sector will be wise to look beyond electricity generation plants. New generation capacity will require more transmission and distribution networks. New generation grids will be more flexible, digitalized and supported by artificial intelligence systems. They will include batteries and other storage capacity. The following chart depicts IRENA's forecast for investments in the power sector assuming the 1.5C scenario is materialized.

[24] CA100+, Global Sector Strategies, Electric Utilities
[25] CA100+, Global Sector Strategies, Electric Utilities

Fig. 24. Average annual investments in the power sector, USD billion



Source: [IRENA World Energy Transitions Outlook 2022]

It is also important to keep in mind the critical expected contribution to the climate mitigation from measures to improve energy efficiency. As shown earlier in Fig. 18, 25% of GHG emissions reduction by 2050 should come from this avenue, as estimated by IRENA.

New investment opportunities can also be found in a number of supporting industries. The list includes manufacturers of solar and wind generation equipment; miners of lithium, rare-earth minerals and other metals; construction companies specializing in generation plants and transmission gridlines; producers of electrical switches, transformers, cables and other supplies. Exciting opportunities can be found in innovation and production of more efficient heating and air conditioning appliances, equipment and services for flexible management of electricity generation, distribution and consumption, and many more.

Compared to the investment cycle of fossil fuel-based power generation, renewables call for more frontloaded capital allocation. As the entire energy system shifts from fossil fuels extraction and processing to solar, wind, hydro assets with longer lives and lower operating risks, it will be able to attract capital at lower cost. Therefore, we can expect the balance between debt and equity capital in the utilities sector financing to shift from the latter to the former.

Investors' action

Climate Action 100+ in its sector strategy for electric utilities suggests the following steps that investors can take to accelerate carbon transition in the sector.

- ➔ Advocate with regulators and policy makers, preferably in cooperation with peers, for removal of barriers that companies face.
- ➔ Engage with companies to improve the quality of their carbon transition plans and targets.
- ➔ Be persistent and use engagement escalation strategies with companies that are not responding.
- ➔ Allocate capital to infrastructure (such as transmission and distribution grids) that is needed for carbon transition.
- ➔ In allocating capital, pay particular attention to emerging markets where the need for such investments is especially acute.

Another useful resource focussed on just transition and avoidance of human rights violations in the renewable energy industry is provided by the Business and Human Rights Resource Centre.

The organization has recently issued an investor guide with specific practical recommendations for investors and key questions to ask companies which can be found at this link.

Conclusion

The power utilities sector plays a critical role in carbon transition. This role is underpinned by projected growing demand for energy in emerging markets, increasing electrification of energy sourcing, and the overarching need to decarbonize the generation of electricity. Fortunately, fossil-free renewable sources of energy are available, and their use is often economically attractive. Investors, both in the private and public sectors, have an important responsibility to keep pushing issuers toward carbon-free energy. They are facing a number of challenges, risks, and opportunities in this quest. Organizations such as SBTi, Climate Action 100+, TPI and others offer useful guidelines to help investors engage with issuers effectively.

Appendix of Initiatives, Frameworks, and Standards

Climate Action 100+

Climate Action 100+ (CA100+) is an investor-led engagement initiative aiming to advocate with 167 (at the time of writing) target companies to improve their climate governance practices and reach net zero GHG emissions. The initiative currently includes 615 investors with more than $60 trillion in AUM. CA100+ core organizers are AIGCC, Ceres, IGCC, IIGCC and PRI. The initiative has created a Net-Zero Company Benchmark, and it issues Global Sector Strategies focussing on decarbonization of individual sectors.

International Energy Agency (IEA)

The IEA was originally set up under the auspices of OECD to secure uninterrupted supply of oil in the 1970s. With time, the organization has expanded to cover many aspects of energy and its sustainability. It is now one of the leading providers of research and analysis related to energy transition, including scenarios and forecasts. The IEA's annual Global Energy Review report provides a wealth of statistics and analysis covering renewable and other sources of energy.

International Renewable Energy Agency (IRENA)

The IRENA is an intergovernmental organization promoting sustainable sources of energy. It was founded in 2011 in Abu Dhabi. Its website is a valuable source of information and statistics about power generation, its costs, scenarios, and projections globally and in individual countries. A large number of reports and datasets are available.

Science Based Targets initiative (SBTi)

The Science Based Targets initiative is developing guidance for companies to set targets aimed at achieving the Paris Agreement goals. It has already published a number of sectoral guidelines, including one for the power utilities sector. These guidelines include a list of 20 pathways for the sector that are in line with the Paris Agreement-compliant targets. Companies are encouraged to set targets based on these guidelines using the tool available on the website and then submit them to SBTi for approval.

Transition Pathways Initiative (TPI)

TPI was founded by the National Investing Bodies of the Church of England and the Environment Agency Pension Fund in 2017. The mission of this organization, led by asset owners and supported by asset managers is to assess the progress of companies on their path to a decarbonized future. TPI conducts research in partnership with the Grantham Research Institute of the London School of Economics. Its website has a tool that displays the results of TPI's evaluation of decarbonization pathways of sectors and individual companies.

TERMS AND CONDITIONS

Emerging Markets Investors Alliance, Inc. and its members, officers, directors, employees, agents, representatives, suppliers and service providers (collectively, the "Alliance") provide this material (the "Materials") for informational purposes only. Use of and access to the Materials is subject to these terms of use.

NO INVESTMENT ADVICE

The Materials are for informational purposes only, you should not construe any such information or other material as legal, tax, investment, financial, or other advice. All Materials consist of information of a general nature and do not address the circumstances of any particular individual or entity. Nothing in the Materials constitutes professional and/or financial advice, nor does any information in the Materials constitute a comprehensive or complete statement of the matters discussed or the law relating thereto. The Alliance is not a fiduciary by virtue of any person's use of or access to the Materials. You alone assume the sole responsibility of evaluating the merits and risks associated with the use of any information in the Materials before making any decisions based on such information.