Zero Carbon Analytics

Latin American successes in the energy transition

REPORT OCTOBER 2023

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- Investment in renewables in Latin America has increased exponentially by an average of 10% every year in the past decade, providing almost 100 GW of wind and solar capacity in 2022
- Brazil is adding 1 GW of solar capacity every month and is in the top 10 solar and wind power generators in the world
- Uruguay has achieved the quickest renewable deployment in the world. Today, 98% of electricity comes from renewables
- By 2027, the Latin American wind and solar market is expected to double from current levels
- There are around 320 wind and solar projects in Latin America's pipeline, of which around 200 are in the pre-construction or construction phase. Together, the projects amount to 319 GW of new capacity.

We are at a pivotal moment in our response to climate change. We are off track, but meaningful action is happening – often faster than we think – and momentum is building towards an exponential shift in our energy systems. Some countries are getting ahead of the curve by taking significant steps towards decarbonisation, while at the same time building new industries, creating jobs, reducing dependence on energy imports and insulating consumers from volatile fossil fuel prices. This briefing presents evidence of where and how this is happening.

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Latin America's leap forward

Latin America and the Caribbean together represent less than 10% of global emissions, partly because many countries in the region have traditionally relied on hydropower. Additionally, several Latin American countries have taken measures to further reduce their impact on the climate:

- **Chile** has committed to renewables for 70% of its total energy consumption by 2030.
- **Costa Rica** has committed to net-zero GHG emissions by 2050 without using carbon offsets and was one of the first countries in Latin America to implement a mechanism to credit solar PV owners for the electricity they add to the grid.
- **Colombia's** target of net-zero emissions by 2050 has been enshrined in law since December 2021, with over 2 GW of wind energy set to be installed by 2026.
- **Guatemala** is aiming for 80% renewables for its electricity generation by 2027. Its rural electrification plan aims to focus on solar PV, wind, small hydroelectric plants and hybrid power plants. The country recently obtained bids for 329 MW of solar generation.
- **Panamá** commissioned a record 190 MW of solar power in 2022.
- **Mexico** established a mandate to generate 35% of its electricity from clean sources by 2024. Its energy efficiency regulations have also led to a reduction in annual electricity consumption of 7% and a drop of 17% in average household consumption.

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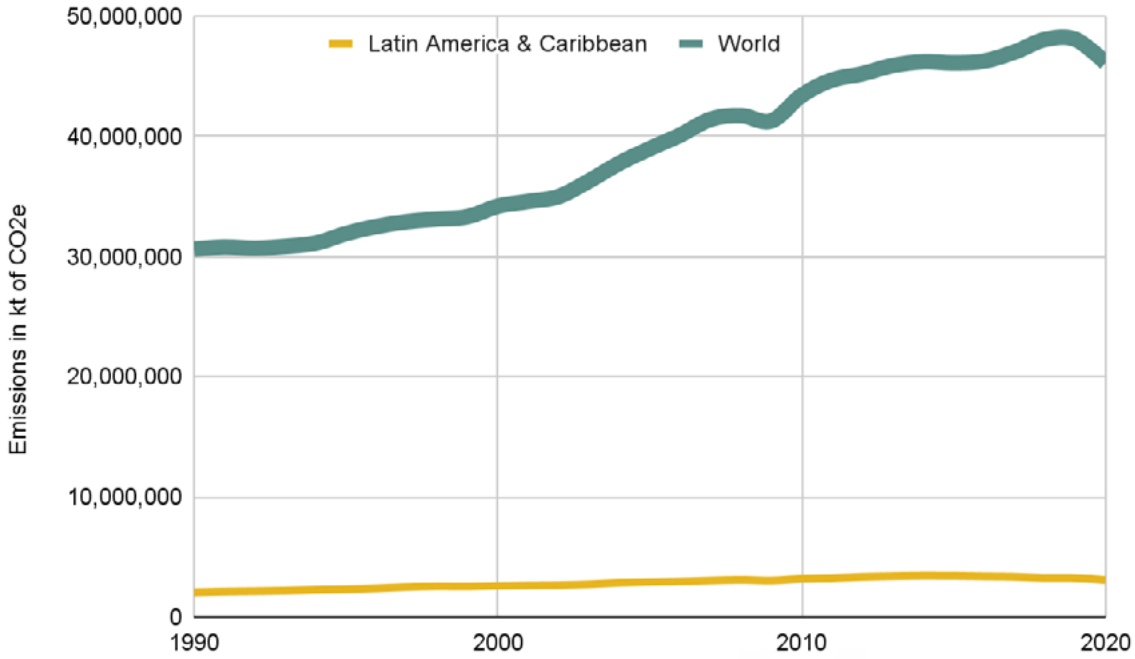
Fig. 1: Total greenhouse gas emissions



Source: World Bank Development Indicators , 2020.

Current and projected renewable capacity

In seven Latin American countries, non-hydro renewable power already represents over 30% of installed capacity.[1] There were 22 GW of capacity additions of wind and solar in 2022, bringing the total to almost 100 GW for the region.

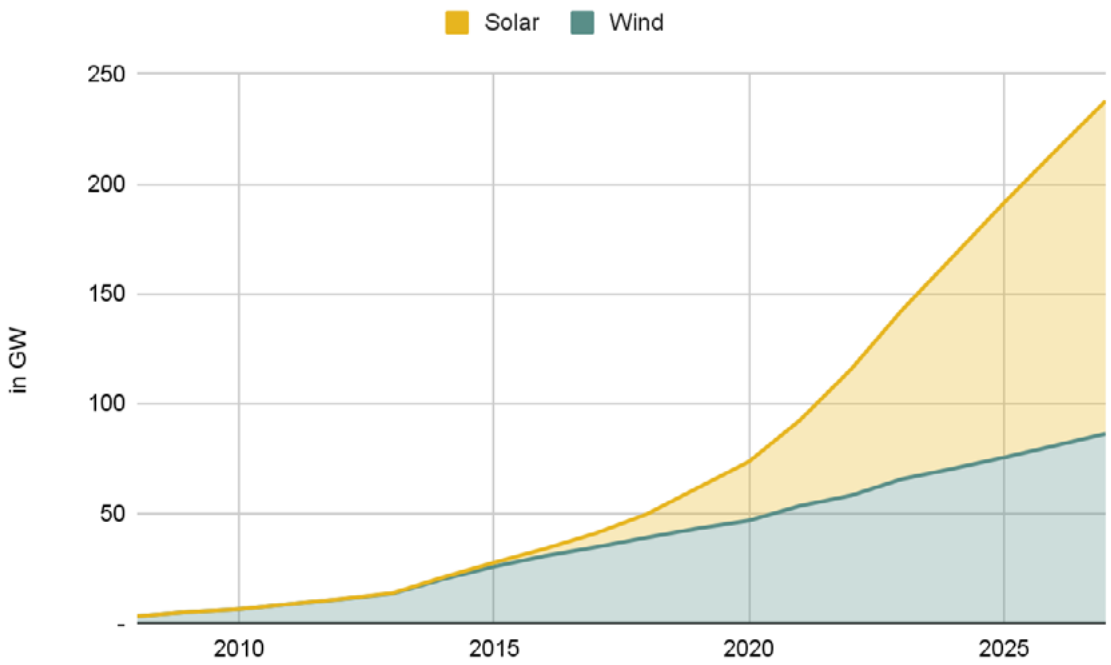
For 2023, BloombergNEF projects another record year for Latin America of around 25 GW of new wind and solar, with Brazil and Chile leading the way. This is equivalent to five times the total installed capacity of Uruguay's electricity sector.

Wind and solar help to shield households against price fluctuations, but they also generate jobs. According to a report by the OECD, an effective green transition in Latin America and the Caribbean could add 10.5% more new jobs by 2030.

Last year, 15 countries signed the Renewables in Latin America and the Caribbean (RELAC) initiative, aiming to achieve 70% renewable energy in their overall electricity consumption by 2030.

1: The installed power capacity of a country is the amount of energy that its power stations are able to produce. The countries are Uruguay, Guatemala, Panama, Costa Rica, Honduras, El Salvador and Nicaragua.

Fig. 2: Latin America cumulative wind and solar capacity additions



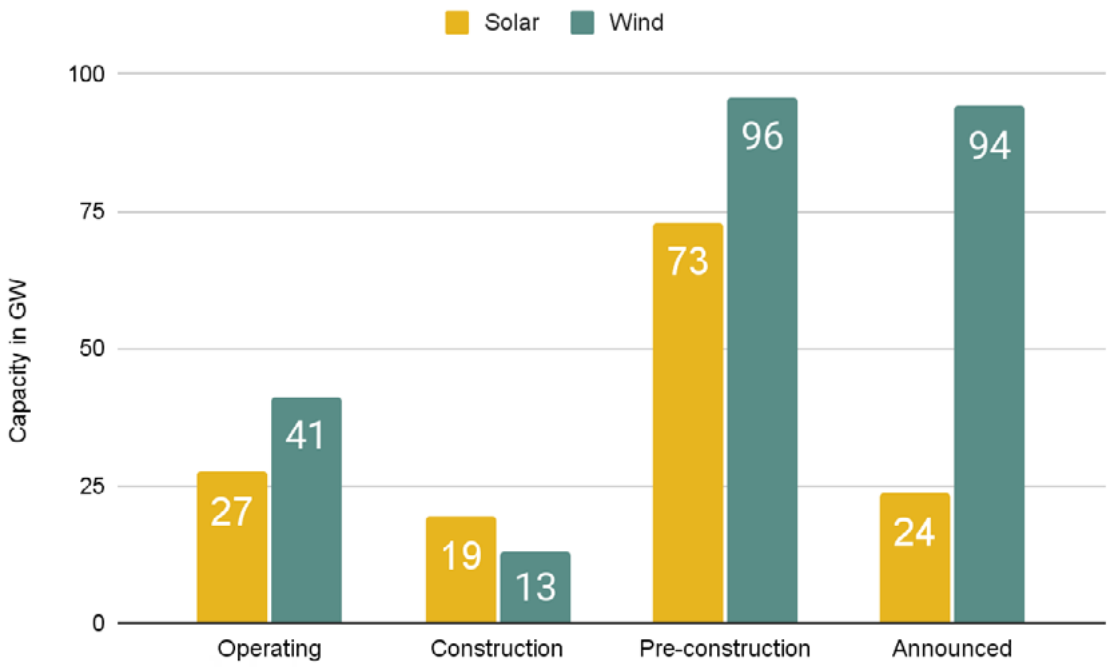
Source: BloombergNEF, 1H 2023 Latin America Market Outlook.

Note: Numbers after 2022 are estimates.

The Global Energy Monitor, a nonprofit organisation monitoring renewable energy projects, also highlights the progress being made – if all 319 GW of prospective new projects in the region are realised, Latin America would meet and even surpass the International Energy Agency's 2030 regional net-zero renewable energy goals.

This would represent a 460% increase in the region's utility-scale solar and wind power capacity by 2030. It would also signify a 70% growth over Latin America's current total electrical capacity from all sources. Fig. 3 shows that around 200 wind and solar projects are in a preconstruction or construction phase – between 2022 and 2027, BloombergNEF expects the wind and solar market to double.

Fig. 3: Solar PV and wind projects in Latin America



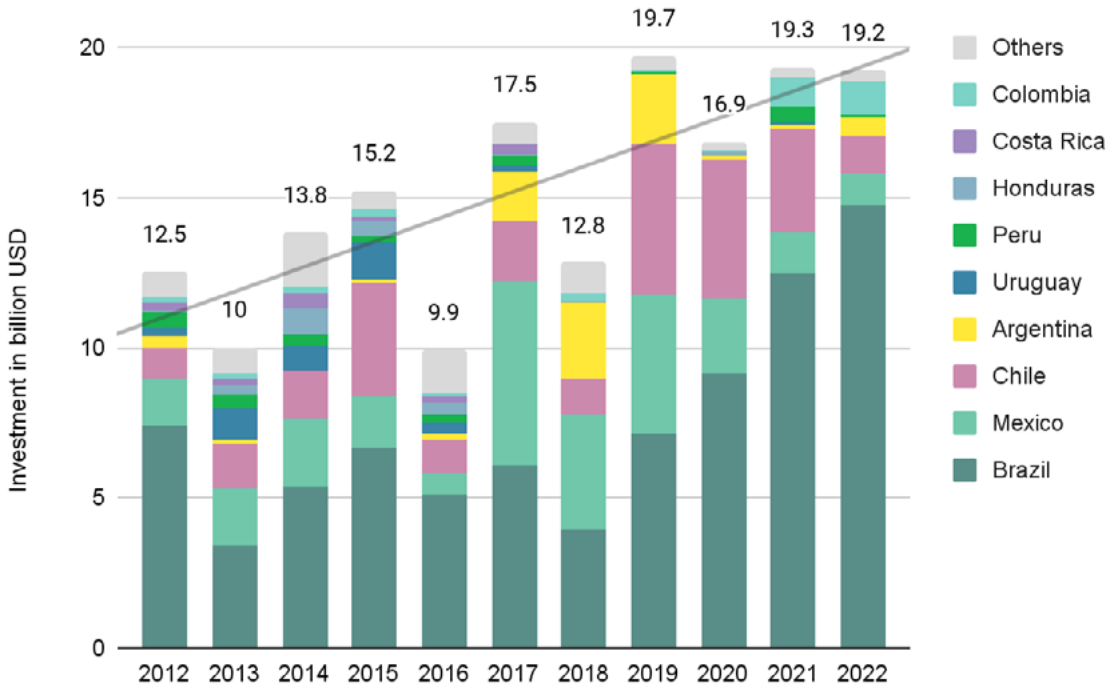
Source: Based on data of Portal Energético para América Latina, Global Energy Monitor, 2023.

Investment in wind and solar

Despite annual variations, renewable energy in Latin America is attracting strong investment, with an average annual increase of around 10% in the past decade (see Fig. 4).[2] Over USD 15bn has been invested every year, amounting to almost USD 167bn over the whole period. This number is mainly driven by wind and solar investment, which has increased by 84% on average each year. In 2022, Latin America made USD 19.2bn in renewable energy investments. BloombergNEF estimates that as record wind and solar expansion continues, this amount will increase to USD 20bn in 2023, "defying macroeconomic headwinds including inflation, rising interest rates and slowing GDP growth as pandemic-era stimulus terminates". Brazil leads the way thanks to small-scale solar PV, which accounts for almost two thirds of total Latin American renewable investment in 2022.

2: Renewable energy includes: Wind, Solar, Small Hydro, Biomass & Waste, Biofuels, Geothermal

Fig. 4: Renewable energy investment in Latin America



Source: Based on BloombergNEF, 1H 2023 Latin America Market Outlook.

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Case studies: Brazil, Uruguay and Chile

Renewable energy in Latin America has grown exponentially over the past two decades, stimulated by government policies and rapidly falling prices that have accelerated the uptake of solar and wind. Brazil, Uruguay and Chile provide impressive case studies.

The renewable energy boom in Brazil

Brazil has invested heavily in developing a booming renewable energy sector, positioning itself as a world leader in renewable energy job creation, second only to China.[3] Since 2018, Brazil has consistently held the highest number of renewable energy jobs in Latin America. In the latest rankings of the Renewable Energy Country Attractiveness Index (RECAI), Brazil was ranked 14th globally, ahead of any other Latin American country.

Brazil is the largest energy market in Latin America. Its commitment to renewables is evident in the country's Energy Expansion Plan (PDE) for 2021-2031, which aims for 50% renewable sources in the total energy mix. In 2020, renewables accounted for 85% of the electricity sector's demand, and this number is expected to rise to 88% by 2030.

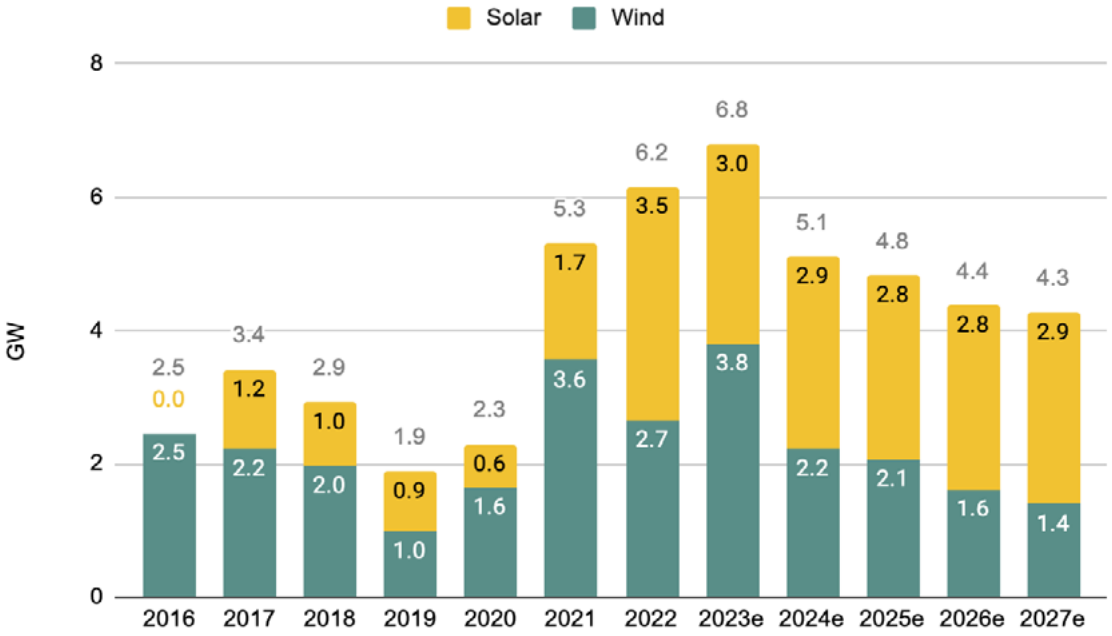
Hydropower makes up 57% of Brazil's electricity mix, but its susceptibility to climate change makes it highly vulnerable. Research suggests that building new hydropower plants will not be cost effective, as rainfall is predicted to decrease in several parts of the country in the near future - climate models indicate not only a decrease in average rainfall, but also a change in precipitation patterns, characterised by shorter and more intense wet periods and prolonged dry periods. Furthermore, the construction of new hydro plants raises additional concerns as it inflicts immense pressure on ecosystems, like the Amazon rainforest, occupying extensive areas of vital vegetation and wildlife habitats. Recognising these vulnerabilities, Brazil has been actively shifting its focus towards wind and solar power, which are expected to benefit from an increase in wind and solar radiation across the country.

Brazil's commitment to renewables is reflected in the number of renewable energy plants built this year. In this period alone, 160 power plants began operating, including 67 wind farms with a capacity of 2.3 GW and 59 solar PV plants generating 2.2 GW.[4] In total, 5.1 GW was installed, constituting half of the growth target set by the National Electric Energy Agency (ANEEL) for 2023, of 10.3 GW.

3: Totaling around 1.27 million jobs, the biofuels sector accounts for the largest portion employing 874,200 individuals, followed by hydropower (176,900), solar PV (115,200), wind (63,800), and solar heating/cooling (42,000).

4: Additionally, there were 23 thermoelectric plants, eight small hydroelectric plants and three hydroelectric generating stations.

Fig. 5: Brazil utility-scale wind and solar annual additions



Source: Based on BloombergNEF, 1H 2023 Latin America Market Outlook.

Brazil's solar power expansion

Solar energy has experienced significant exponential growth in Brazil, with new long-term developments rivalling investments in wind power. In early 2023, the country reached a milestone by surpassing 25 GW of solar energy capacity, securing 8th position worldwide for solar PV generation. Currently, the total installed capacity of solar energy in Brazil exceeds 32 GW, making it the second-largest energy source in the country's energy mix (14.8%). The growth rate has been notable, with an average increase of 1 GW per month since July 2022. This has not only contributed to energy diversification, but has also created 960,000 new jobs and helped avoid 40 million tons of CO2 emissions.

Currently, electricity production is concentrated among small users. In July 2023, Brazil surpassed two million installed solar photovoltaic systems on rooftops, facades and small plots, which includes solar PV projects below 5 MW in size. This corresponds to 23 GW of installed power, benefiting homes, businesses, industries, rural properties and public buildings.

According to regulator ANEEL, Brazil currently boasts 18,164 operational solar power plants, which collectively generate 10.3 GW. Additionally, there are 162 plants under construction and 2,730 projects in the planning phase. Investments in utility-scale solar energy projects that have been approved in Brazil have surpassed USD 20bn, with an additional USD 1bn invested in distributed solar generation since 2012.

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Brazil's wind power dominance

Wind energy is currently the third biggest energy source in Brazil, boasting an installed capacity of just over 26 GW and making up 13.7% of the country's electricity mix. With 935 wind farms (over 9,000 wind turbines) already built and an additional 4.6 GW of capacity expected to be operational by 2023, Brazil has made significant strides in the wind energy sector, securing its position as the 6th largest global player in wind energy. By 2028, the country is expected to have almost 44.8 GW of installed capacity.

While offshore wind energy is still an emerging market, according to Brazil's environmental regulator Ibama there are 74 projects in the licensing phase, which, if approved, have the potential to generate 183 GW of power and become operational within the next six years.

Brazil's commitment to wind power is evident in its investments. In 2022, wind sector investments reached USD 6.2bn, accounting for 42% of all investments made in renewable energy sources.

In 2022, wind energy generation had the capacity to supply an average of 41.5 million homes per month, benefiting approximately 124 million citizens. This avoided more than 26 million tonnes of CO2 emissions, equivalent to the annual emissions of around 22 million cars. From 2016 to 2024, the Brazilian wind sector is projected to avoid GHG valued at between USD 12bn and 14bn.

Decline in fossil fuel consumption

As renewable power generation continues to rise, Brazil's reliance on fossil-fuel generation is expected to decrease significantly in the coming years. According to BloombergNEF and the Climate Investments Fund (CIF), on its current trajectory Brazil is projected to achieve 81 GW of renewable energy capacity by 2030 and 190 GW by 2050. As a result, estimations indicate a decline in the contribution of gas, oil and coal to Brazil's power generation, which will fall from 13% to 4% by 2050. Consequently, Brazil's power generation is estimated to reach 95% zero-carbon by 2050, further solidifying its position as one of the world's cleanest major markets and helping destroy fossil fuel demand.

Uruguay: The quickest deployment of renewables worldwide

Uruguay started its move away from fossil fuel-based electricity generation in 2005 with a National Energy Plan that set a target of 15% renewables by 2015, including 300 MW of wind. Not only did Uruguay reach its goal a year early, but in 2015 the country had almost three times more installed wind energy than targeted (857 MW). Uruguay achieved the quickest renewable deployment in the world - between 2013 and 2018, generation increased from 1% to 35%.

A great drought in 2020 made hydropower unreliable, which pushed further investment in renewables, mainly into wind power. Investment in renewable energy was also incentivised through several tax breaks. In 2021, those investments had already paid off - Uruguay sold its surplus wind and solar electricity to Brazil and Argentina, making USD 529m.

In the last decade, Uruguay invested over USD 8bn in the renewable energy sector, with the result that, today, 98% of electricity comes from renewables. In 2021, wind and solar generated 47% of the country's electricity, the third highest percentage in the world, with the rest mainly provided by hydropower. The country has 48 wind farms, with 1,525 MW of installed capacity.

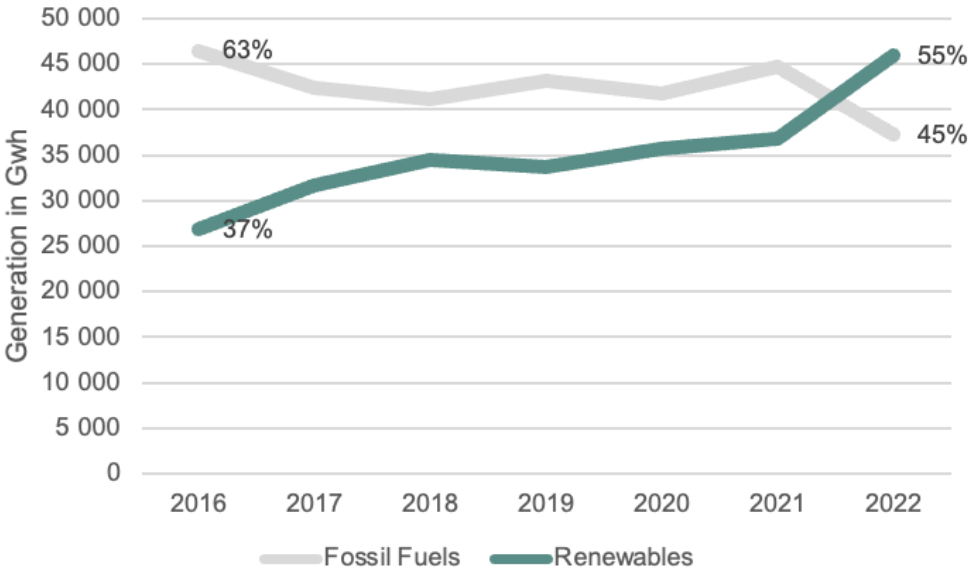
Chile: Hosting 20% of Latin America's new wind power

In the last seven years, the share of electricity generated with renewables in Chile increased from 37% to 55%, driven mainly by the addition of more solar power (see Figure 6). This happened partly by giving the state a greater role in energy planning, particularly regarding electricity transmission.

In 2022, Chile was responsible for 20% of Latin America's new wind power. The country recently added 2.6 GW of wind and solar, making solar PV the largest power generation technology by capacity. In 2022, 21% of Chile's installed capacity was solar power, accounting for 17% of electricity generation, and wind represented 12% of installed capacity and almost 12% of total generation. With USD 3.4bn in renewable energy investments in 2021, Chile is the second most popular destination for clean energy investment in Latin America.

Meanwhile, fossil fuels decreased from 63% to 45% of the energy mix between 2016 and 2022. Chile has announced an ambitious plan to phase-out coal by 2040 in order to reach its net zero by 2050 target. It has made significant progress since the plan was launched in 2019, closing eight coal plants and planning to close or convert nine further plants by 2025.

Fig. 6: Renewables and fossil fuels in Chile's electricity generation



Source: Based on BloombergNEF, Latin America Market Outlook.

Note: renewables include hydro, solar, wind, geothermal, biomass and waste.