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Intelligence Series | **Electric Power**

August 2021

Aiming For Zero: How Latin America is Decarbonizing its Power Sector

The region has emerged as a global decarbonization leader. As the clean energy transition accelerates, opportunities for investment abound, as do regulatory, political and economic challenges.

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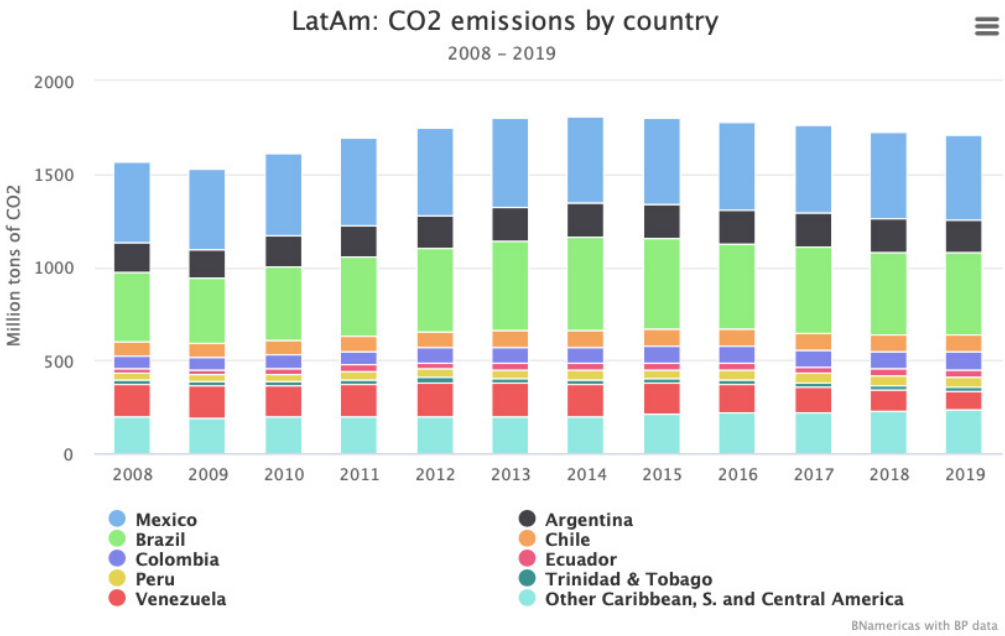
The race to zero emissions

Latin America's clean energy transition has made great strides, with Brazil and Chile leading the charge, while Mexico's move in that direction has lost momentum following a change in policy by the current government. Argentina, Colombia and Peru are also making headway, while Uruguay stands out as a regional leader, albeit a much smaller market. Central America and the Caribbean are also embarking on an energy shift, although the pace of transition varies widely as countries face diverse obstacles.

Latin American and Caribbean countries were among the 190 signatories of the Paris Agreement, the 2016 global climate change pact under which signatories pledged to mitigate the causes of climate change by, among other measures, reducing their emissions to net zero by 2050. Five years on however, the sixth report by the Intergovernmental Panel on Climate Change (IPCC) warned that temperatures are likely to rise by more than 1.5C above pre-industrial levels by mid-century, possibly making the Paris agreement's goals unachievable.

Even so, the region has emerged as a leader in energy sector decarbonization, with the largest global share of renewable energy use, according to Tracking SDG 7: The Energy Progress Report. The region is also seeing a decentralization of its electricity grids. Brazil has now reached 6.5GW of solar and wind distributed generation (DG) capacity, and the segment is expected to grow by over 50% during 2021, closing the year with over 7GW of installed DG capacity, according to national association ABGD. Chile has implemented a special regime for DG, known as PMGD, which is expected to spur growth of the segment.

But challenges remain in order to sustain the region's lead, such as deregulation to allow greater private participation, the increase of public financing for renewables projects, a transition toward improved energy efficiency, and a greater penetration of renewables in the transport, industrial and mining sectors.



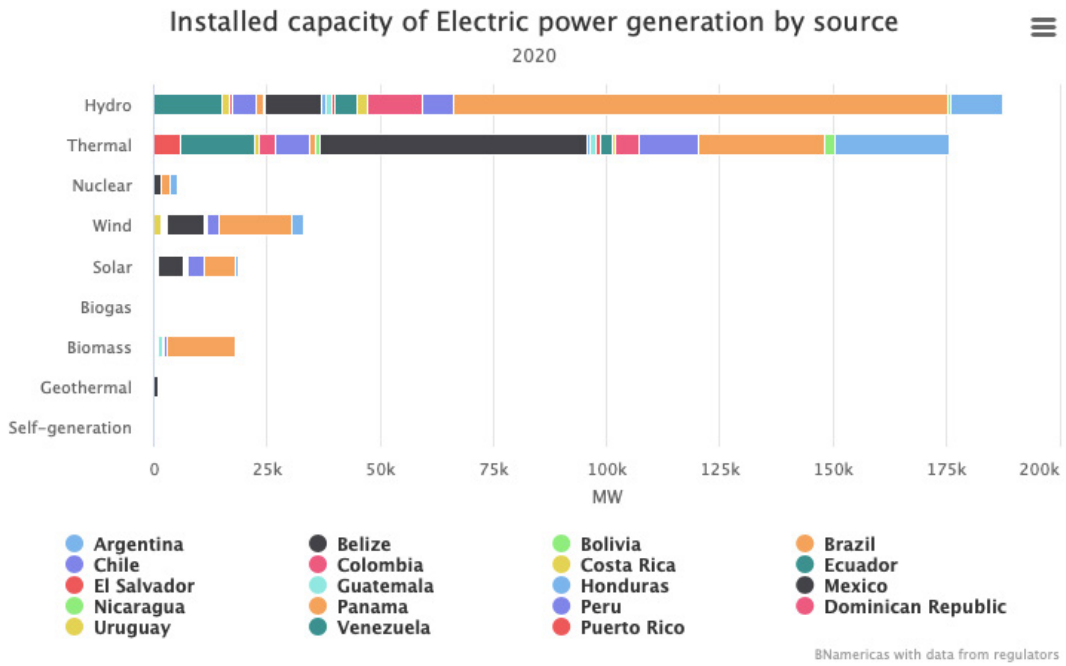
What are the opportunities?

According to the International Energy Agency (IEA), weather phenomena resulting from global warming, such as heat waves and low rainfall, "highlight the urgent need for strong and well-planned policies and investments to improve the security of our electricity systems". Heatwaves put pressure on electricity systems, as demand surges to power air conditioning, while low rainfall causes fluctuations in hydropower output.

As governments and utilities pursue electric power sector decarbonization, mainly through increasing solar and wind capacity, they need to ensure they have sufficiently robust and diverse sources of flexibility to ensure secure supplies, including in the event of extreme weather events, the IEA says.

And according to the International Renewable Energy Agency's (IRENA) June 2021 World Energy Transitions Outlook, while electrification and energy efficiency will be the main drivers of decarbonization, enabled by renewables, green hydrogen and bioenergy, countries also "need to transcend the limits of the existing infrastructure created for the fuels of the past".

Chile, Argentina, Brazil, Colombia, Mexico and Peru have all successfully used long-term auctions to increase renewable energy generation capacity, and while government-coordinated auctions will remain an important incubator for new projects, migration to a deregulated market has emerged as an equally important mechanism in some countries.



In addition to wind and solar, which have accounted for the biggest buildout of capacity as a result of auctions in the aforementioned countries, hydropower and green hydrogen also offer routes to decarbonization, the former as a means of countering the intermittency of wind and solar generation, and the latter contributing to the decarbonization of industrial processes and heavy transportation, by using renewable energy to power the electrolysis of water to produce the fuel.

"Hydropower is the backbone of low-carbon electricity generation, providing almost half of it worldwide today," says the IEA's Hydropower Special Market Report, published in June. The Paris-based entity makes a strong case for hydroelectricity as a way for countries to decarbonize their electricity sectors, but highlights the huge investment needed to harness the power source's potential.

Latin America's installed hydroelectric capacity totaled 197.5GW in 2020, according to the International Hydropower Association (IHA). "South America has seen significant demand for hydropower development in recent years, making it one of the fastest growing regions," the IHA's latest report states. However, the report points out that many hydropower facilities require modernization, with the IEA calculating that $17bn in investment is required to modernize Latin America's hydropower capacity by 2030.

Hydropower has drawbacks, however, evidenced by the myriad problems that have afflicted initiatives such as Brazil's Belo Monte mega-dam, completed in 2019, and Colombia's long-delayed Hidroituango project. The high social, environmental and economic cost of these developments has prompted many observers to argue that large-scale hydropower is no longer sustainable.

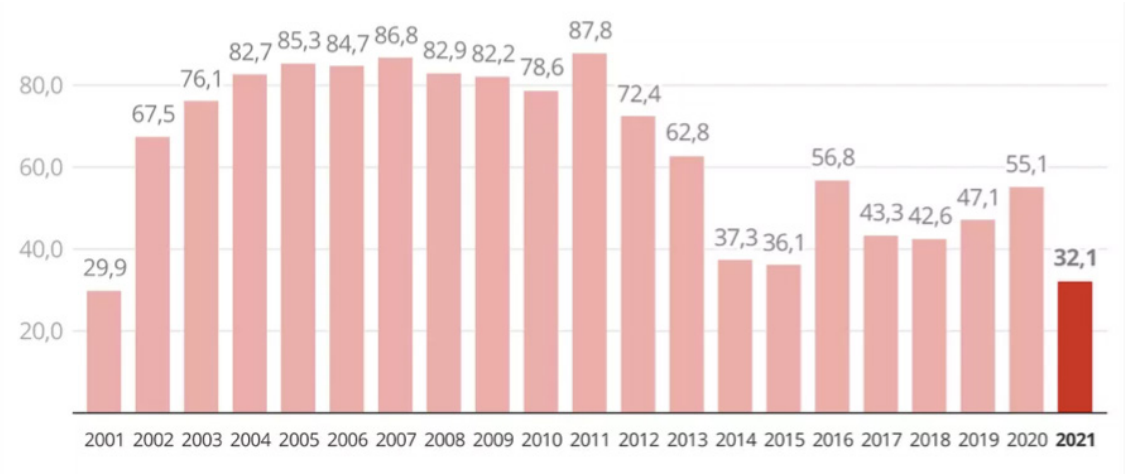
Changing weather patterns triggered by global warming are also causing increasing concern. In recent years there have been sharp fluctuations in hydropower output in Brazil and Colombia, with the former currently suffering its worst drought in 91 years, leading to a greater reliance on other power sources, such as liquefied natural gas (LNG). Colombia's demand for gas is expected to exceed domestic supply as soon as 2024 as the El Niño climate phenomenon parches hydroelectric reservoirs and leads to soaring generation of gas-fired thermopower.

"South America is running out of hydropower because of dry weather, and I wouldn't be surprised if buyers all across the region were buying more LNG," says Henning Gloystein, global director of energy and natural resources at consultants Eurasia Group.

A severe drought at the turn of the millennium forced Brazil to expand its thermoelectric capacity to counter dwindling hydropower output. And while hydroelectricity still accounts for around 70% of Brazil's power generation, that figure is likely to fall to around 49% by the end of the decade, according to Bloomberg. Meanwhile, Brazil's LNG imports are up 60% so far this year, according to consultancy Timera Energy.

Brazil's chamber for hydropower management (Creg) has implemented a number of initiatives to ameliorate the effects of drought, such as allowing for greater flexibilization of water reservoir levels, the increase of electricity imports from Argentina and Uruguay and gas imports from Bolivia, as well as flexibilization of regional energy exchange within the country. Drought also prompted Brazil's government to publish guidelines in July for contracting additional power from thermoelectric plants.

The IEA predicts that Argentina and Colombia will each add 3GW of hydropower capacity through 2030, the only Latin American nations to figure in its global top 15 for forecast growth in the segment.



Hydroelectric reservoir levels in Brazil's southeast and central-west regions fell to 32.1% of capacity at the end of May. Graphic: ONS

Elsewhere in the region, Ecuador's state power utility Celec EP is moving forward with bidding processes for contracts for three major hydroelectric plants with combined investments of around US$4.7bn, while Nicaragua's state power company Enel is seeking financing for two such projects totaling nearly 50MW, part of a potential 2GW of hydropower capacity.

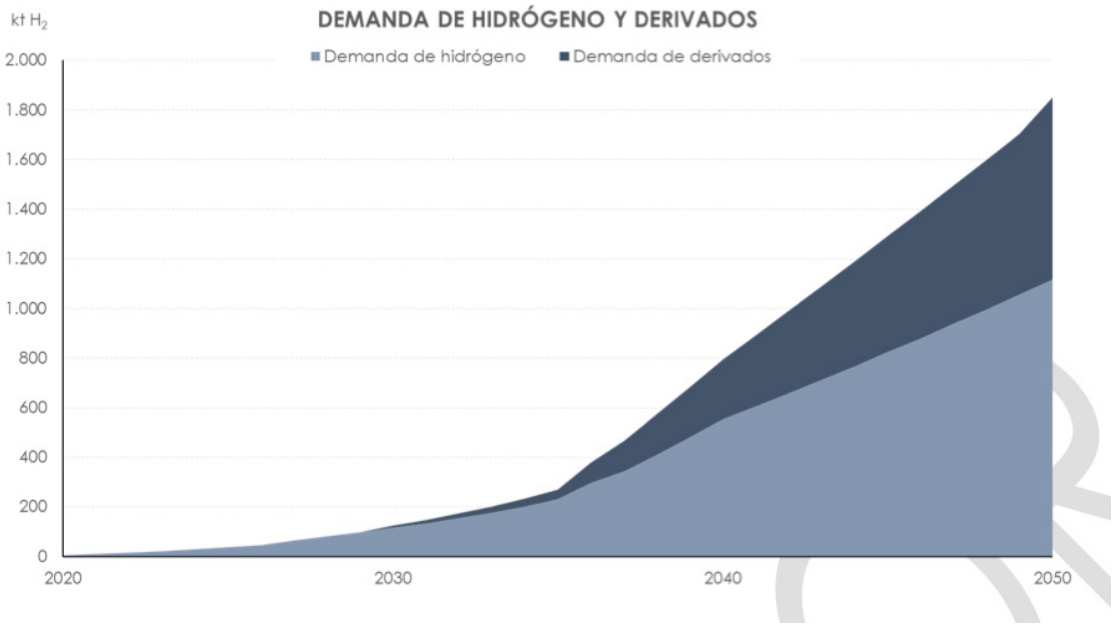
Meanwhile, green hydrogen is emerging as a cleaner alternative for powering industrial processes and transport, as well as an opportunity for investors, with several countries in the region having expressed interest in the fledgling segment.

During the CEM12 Clean Energy Summit in Chile in early June, the country's energy and mining minister Juan Carlos Jobet said Chile, together with Australia, the UK and the EU, would lead a new mission to increase the fuel's competitiveness with an eye on building a global hydrogen economy. He also announced plans for large-scale green hydrogen valleys in Antofagasta and Magallanes as part of a national strategy for the technology launched late last year.

In Brazil, a number of states have signed agreements with companies to produce and export green hydrogen, while in Colombia, state-owned Ecopetrol is in talks with Siemens with a view to jointly develop such projects. The German company has said the Andean nation's access to Pacific and Caribbean ports makes it an ideal location to produce and export the fuel.

Colombian President Iván Duque earlier this year promulgated a law that recognizes green and blue hydrogen as unconventional energy sources. The move makes developers of these projects eligible for incentives such as income tax and VAT deductions, and tariff exemptions on imports. In early August, the mines and energy ministry published a roadmap for hydrogen development, forecasting investments of more than US$2.5bn in the nascent segment by the end of the decade.

Mexico is also embracing green hydrogen projects. The national hydrogen association (AMH) has tracked some 150 renewable power generation projects with the potential to contribute to the production of the fuel. "Mexico has huge potential to develop green hydrogen on a large scale, as an industry," says AMH president Israel Hurtado.



Forecast demand for hydrogen and its derivatives in Colombia. Source: UPME

The regional leaders

While Latin America as a whole has been lauded for its renewable energy rollout, there is a sharp disparity between countries in terms of capacity growth, the effectiveness of public policy and the regulatory capability to enable that buildout.

“Brazil and Chile are leading the push toward decarbonization, in terms of complying with their clean energy generation goals through auctions, subsidies or tax incentives that are spurring investment in renewables,” Valentina Izquierdo, a senior Latin America solar analyst at energy consultancy Wood Mackenzie, says.

Tariff subsidies for transmission and distribution in Brazil, and Chile’s small distributed generation scheme (PMGD), which establishes fixed prices for all technologies, have lowered the entry barriers for renewable project developers, according to Izquierdo.

Both those mechanisms are currently in a transition phase however, with subsidies in Brazil valid until March 2022, while the PMGD has shifted from fixed prices to a structure of stabilized prices according to time of day.

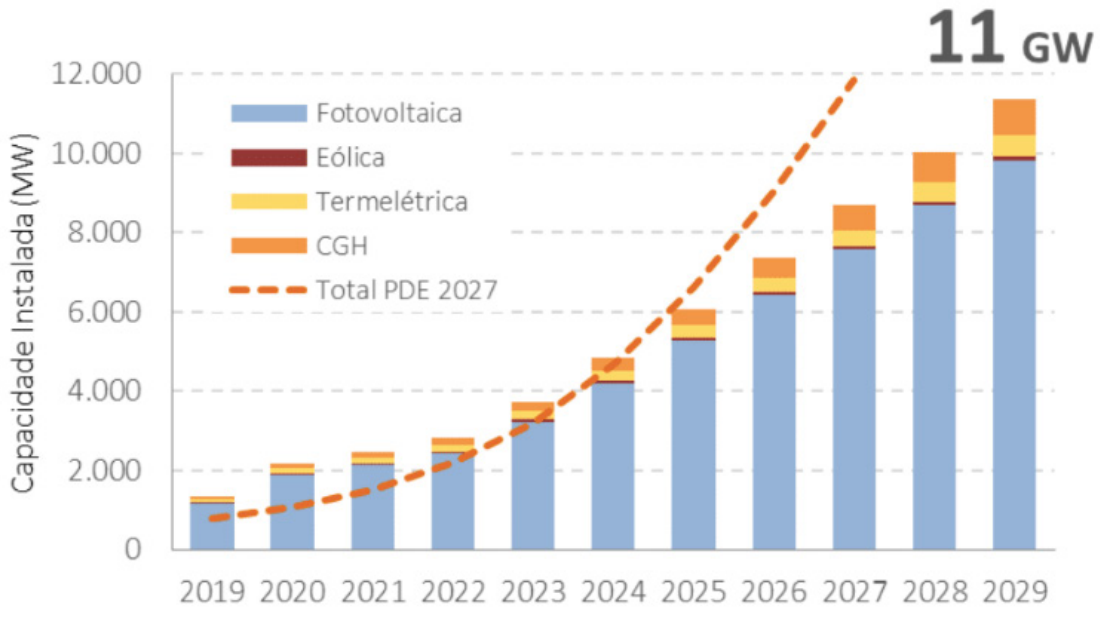


Figura 1 – Projeção da Capacidade Instalada da Micro e Minigeração Distribuída. Fonte (EPE, 2020).

Graphic: EPE

Despite a strong start, Brazil's renewables expansion has slowed, with only two tenders held in 2020, while this year's offering, the first launched by power regulator Aneel in more than a year, was seen as disappointing, with a total of 35TWh negotiated through 20-30 year contracts starting in 2024 and 2025. Most of the power contracted was based on wind projects totaling 419.5MW of installed capacity, with 112MW of hydropower and 269MW of solar.

"Very little energy was bought in total, and if we're expecting a market recovery, the volume sold would have to be much larger," Walfrido Ávila, CEO of electricity trader Tradener, told BNamericas following the July auction, adding that the federal government should allow the participation of power traders in regulated auctions.

Chile added almost the same amount of renewable energy capacity in the first quarter of 2021 as it did during the whole of 2020, bringing online 1.41GW from January to March, 436.6% higher than in 1Q20, while the 2020 total was 1.45GW. The acceleration of the renewables buildout obeys the country's aim to become carbon-neutral by 2050.

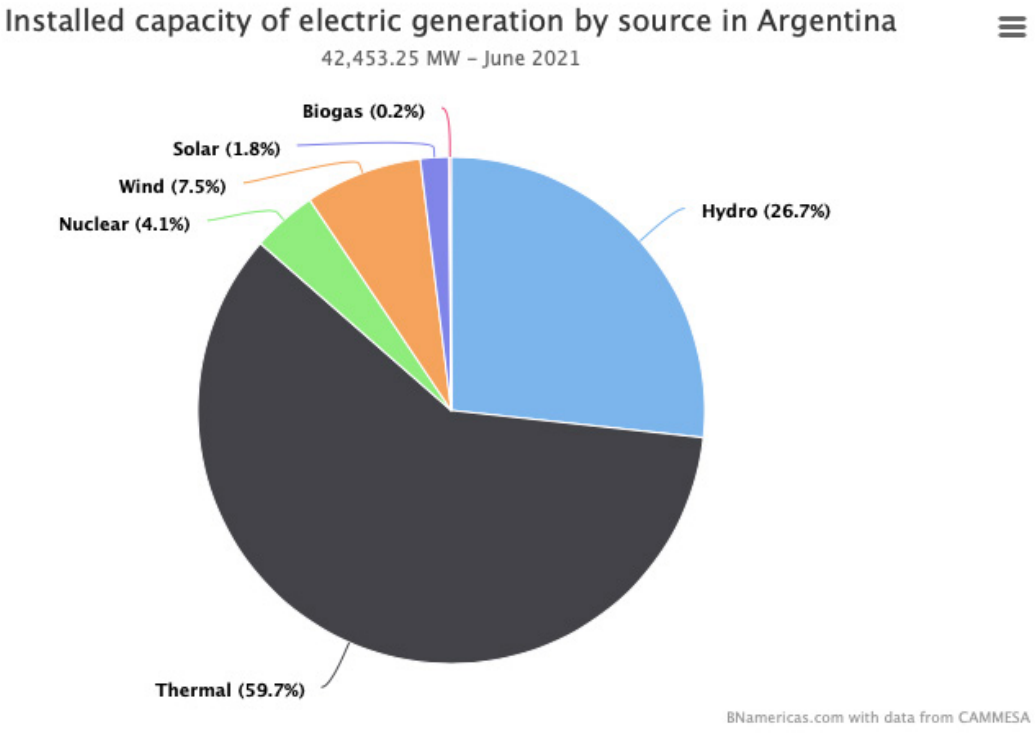
Chile's government is also preparing a bill to double the required contribution of non-conventional renewable energy in the national grid to 40% by 2030. Legislators have proposed retiring the country's coal-fired power plants before 2026, although critics say that would financially hurt several generators, such as AES Andes, as most of its 3.2GW generation park is coal-based. If approved, the legislation would likely have little impact on plant owners Enel and Engie, which are expected to fully retire or reconvert their coal-fired capacity before the 2026 deadline.

However, the bill has faced opposition from Chilean authorities, including the energy ministry, grid coordinator CEN and regulatory commission CNE, amid concerns about the effects on prices. According to Fitch Ratings, generation costs could rise 25-30% during peak hours owing to a higher participation of more expensive and pollutant diesel-fired units needed to meet demand. That could be offset however by the commissioning of new transmission capacity to transport the clean energy toward Chile's biggest consumption hubs.

In June, permit requests for Chilean energy projects represented US$1bn in proposed investments, 6% higher than in May, according to environmental evaluation agency SEA. And in another sign the transition is set to accelerate, Chile's energy and national assets ministries announced in August that more than 20,000 hectares of land would be made available in 2021 for the development of around 2GW of renewable projects in Antofagasta totalling investments of US$1.8bn.

Argentina has made headway in giving renewables a larger share of its generation base as a result of the RenovAr program. Wholesale power market operator Cammesa reported in July that renewables contributed 24.1% of total generation, with a breakdown of 92.5% wind, 4.7% biomass, and 2.6% hydropower, totaling 4.7GW. Only 861MW of that figure corresponds to solar power, a segment experts believe could grow exponentially if investors are given the necessary incentives.

Argentina is falling short of its goal to raise the share of renewables to 20% of the energy mix by 2025 however. Capacity from such sources is now around 10% of the total and the current economic panorama, marked by soaring debt and high inflation, acts as a deterrent to investment. There are currently no new renewable energy auctions planned in the country.



Despite the enactment of a distributed generation (DG) law in 2017, and an almost four-fold growth of the DG market over the past year, that market remains repressed due to high electricity subsidies. The DG market has potential however, with 13 of the country's 23 provinces having adhered to the law so far, and Santa Fe province having launched its own DG regime.

Argentina has also launched studies to explore its potential to produce green hydrogen, its first foray into the sector since the National Hydrogen Development Fund was launched in 2006. A private association, H2AR, has also been launched, in which a group of companies, including a subsidiary of state oil company YPF, has begun studying the potential production, transportation and export of the fuel.

Colombia earlier this year enacted an energy transition law that recognizes green and blue hydrogen as unconventional sources of renewable energy, allowing developers of such projects to access incentives such as VAT exclusion, zero tariffs and accelerated depreciation. The law also promotes efforts to improve and expand electricity coverage in remote areas, while the FONENERGÍA fund will allocate financing to projects aimed at improving service quality, expanding energy coverage and standardizing networks.

Colombia is also preparing its third renewable power auction for 15-year PPAs, slated for October. The mines and energy ministry said in August the country would double its renewables capacity by year-end as projects auctioned in 2019 come online. There are obstacles to the country's renewables buildout, however, such as transmission bottlenecks that could hinder connection for new wind and solar plants. The country currently has 11.4GW of approved grid connections, with a waiting list of projects exceeding 11GW. Developers of non-conventional renewable projects have also struggled to meet their construction deadlines because of insufficient port and road infrastructure.

Mexico took big strides toward the decarbonization of its electric power sector with the 2013 energy reform that ushered in private players, paved the way for three successful renewable power auctions, and led to the energy transition law, establishing a goals for renewables to contribute 30% to total generation capacity by 2021 and 35% by 2024.

Those goals seemed attainable in 2018 but are less so now. President Andrés Manuel López Obrador has dismantled several key aspects of the reform, canceling auctions and prioritizing state-owned utility CFE over private sector participation. In response, dozens of private companies that had signed contracts with the previous administration as a result of the auctions have filed legal proceedings, citing a 'moving of the goalposts'.

"The injunctions brought by various companies in the sector, above all generators and end users, reflect the uncertainty among market participants regarding the federal government's public policies," says Juan Carlos Serra, a partner at Mexican law firm Basham Ringe y Correa.

The government aims to modify the constitution to source 54% of power generation from CFE, and 46% from the private sector. However, it has remained adamant that the contribution of renewables to overall generation capacity will grow. The national grid development plan (Prodesen) estimates that 21.3GW of new capacity will be added by 2024, of which solar will comprise 24.8% and wind 13.4%, while DG is expected to contribute 12.5%.

That buildout will not be enough to allow Mexico to meet its short-term clean energy goals, however, with renewable capacity – which currently accounts for 27.3% of the total – expected to hit 31% by 2024 and 36% in 2026.

"We do not expect new long-term auctions that would incentivize investment in renewables to be held before 2024," Wood Mackenzie's Valentina Izquierdo says.

Peru's share of non-traditional renewables in the energy matrix stands at 5%, down from around 6.5% a year ago, while the country's combined power output from wind, solar and bioenergy decreased by 8.4% year-on-year, according to the energy ministry. But that percentage is likely to grow, with new projects in the pipeline, such as the 260MW Punta Lomitas wind farm. Non-conventional renewable energy developers have received clearance to access the electricity transmission system for projects totalling 1.07GW, according to grid coordinator COES.

Uruguay is the region's leader in terms of installed renewable capacity as a percentage of the total, generating around 97%, or 4.9GW, in 2020. Electricity demand in the country was fully met by renewables in June, with wind power covering 50%, hydropower 45% and biomass 5%. Uruguay plans to add solar from 2028, according to state utility UTE, citing favorable costs as a key attraction for the buildout. The country has excess wind power capacity and aims to become a green hydrogen exporter, leveraging wind to power its production. The government also has plans to harness DG to reach 100% electrification by end-2024.

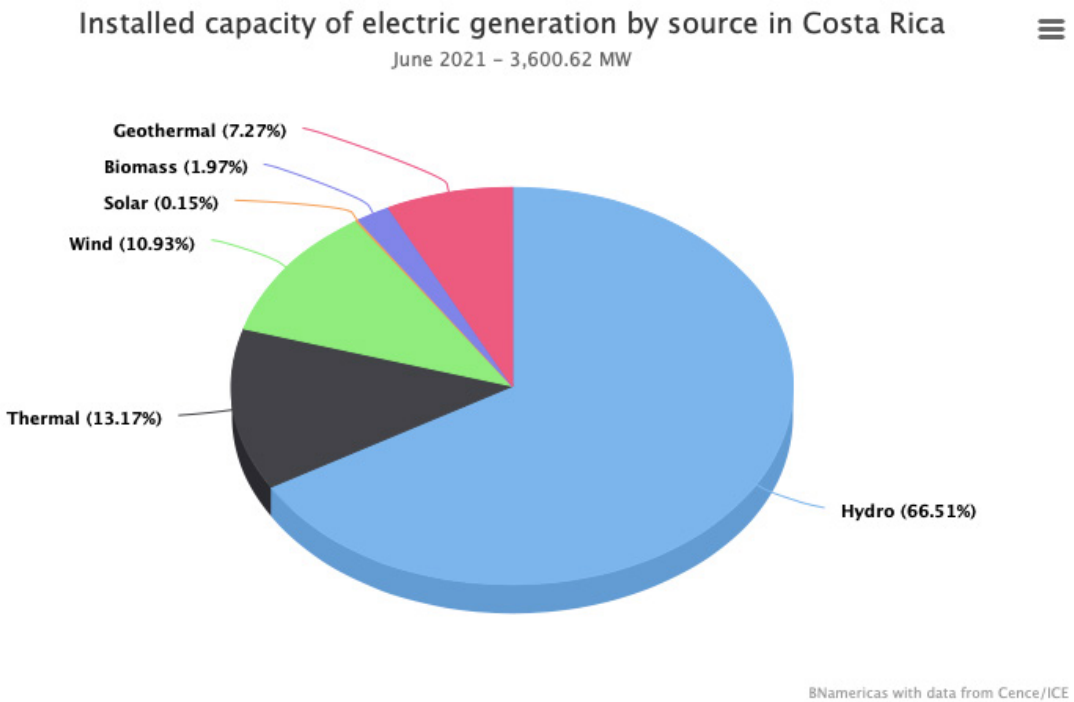
The Caribbean and Central America are eyeing a shift toward a renewables-based energy matrix, though the pace of the transition varies widely from country to country. Guatemala's announcement in July that it will withdraw from the regional Central American power market (MER) may lead to the development of more power plants in the countries dependent on Guatemalan power exports, while the Inter-American Development Bank (IDB) recently published a report recommending a regionally integrated approach to achieving energy sustainability in the Caribbean region.

Costa Rica's government launched a decarbonization plan in March, for which it is earmarking $21bn in investment. According to some observers, the announcement is somewhat overdue, with the Central American country having remained behind the curve in terms of non-conventional renewable energy deployment. Solar power, for example, accounts for only 1% of energy generation, compared with 20% in Honduras.

A bill presented to congress in February seeks to facilitate the development of green hydrogen projects by providing incentives and financial support, such as soft loans and green bonds. Costa Rica already has a small pilot plant in operation with the capacity to produce 2.5kg per day of green hydrogen, as well as storage and dispatch infrastructure and a small ecosystem of hydrogen vehicles.

Honduras plans to withdraw nearly 740MW of thermoelectric capacity through 2031, according to power grid operator ODS. Power regulator CREE has proposed modifications to the regulations governing the operation of the wholesale market, and aims to strengthen the regulatory framework by modifying the methodology for determining and calculating supply from power plants.

Panama has seen solar development gain traction, with seven PV plants for a combined 73.8MW scheduled to launch this year. The government has also announced that the Panama Canal will be carbon-neutral by 2030.



Players and projects to watch

There are more than 5,000 early-stage electric power projects across Latin America, with more to be awarded as Brazil, Chile and Colombia plan further power auctions this year.

Unsurprisingly, Brazil has the largest portfolio of non-conventional renewable generation projects. BNamericas' database shows 821 such initiatives in the country with expected combined capital expenditure of US$53.4bn. The largest early stage developments, in investment terms, are BI Energia's Camocim and Eólica Brasil›s Asa Branca I offshore wind farms, both earmarked for waters off the coast of northeastern Ceará state. The 1,200MW Camocim project is slated to receive investments of US$2.57bn while the 720MW Asa Branca I farm is expected to require US$2.35bn. The projects are in the environmental and social evaluation phase.

Windpeshi is the largest renewables project in the pipeline in Colombia, managed by Enel Green Power Colombia and developed by Portuguese company CJR Renewables. The complex is expected to begin operating in the first half of 2022 following investments of US$313mn. Two other major wind farms are planned in Colombia, the US$250m Alpha complex, under development by EDP Renováveis (EDPR Colombia), and Beta, owned by Eolos Energía, a JV between EDP Renováveis and Austrian company RG Renovacio.

Several major wind projects are earmarked for Colombia's northern Guajira region

In Chile, the largest project in the pipeline is Cerro Dominador's Likana thermal solar plant, with a forecast capex of US$2.4bn. However, the project is currently in the bidding phase, with no construction date set. The country also boasts the US$590mn, 149MW Camán wind farm. Developer Mainstream Renewable Power, which secured US$182mn to finance the project›s construction phase, has said it expects to begin generating electricity there in 2022.

Mainstream is also developing three wind and three solar projects in Chile with a battery storage component, which would total 1GW of new capacity, in addition to the 1.35GW already in development by the firm.

Chile's environmental evaluation service SEA in August gave the green light for three large-scale solar parks, with investment totaling US$376mn. The projects are owned by Enel, France's EDF Renewables and the Czech Republic's Solek, the latter company's first foray into the country.

Mexico currently has three major solar parks in the pipeline, the largest being the US$656mn, 594MW Magdalena I facility in Hidalgo state, which remains in the planning stage and will be developed by Más Energía, a subsidiary of Enel Green Power Mexico. Other projects are the 500MW Guaymas solar park, to be developed by a local subsidiary of Iberdrola, and the US$419mn Palma Loca solar facility in Zacatecas, owned by a local subsidiary of Enel.

The US$611mn Los Huizaches wind farm, which is planned for Tamaulipas state, has been put on hold due to "uncertain conditions in the country," a spokesman for the developer of the same name told BNamericas in July. The northeastern border state is a hotbed of organized crime and considered one of the country's most dangerous.

Peru's largest early-stage project is the $130m Wayra I wind farm expansion, construction of which is slated to start this year, according to developer Enel Green Power.

Conclusion

While Latin America has moved toward the decarbonization of its electric power sector, there is still much progress to be made. Despite the renewables expansion, infrastructure limitations are apparent across the region. Delays to new transmission lines in Colombia's north – caused by protracted prior consultation requirements with local communities – have prompted fears that major solar and wind projects could be left without a connection to the national grid. Brazil also faces the challenge of increasing and reinforcing its transmission and distribution infrastructure, as well as modernizing its regulatory frameworks to include payment for energy storage.

"To overcome those challenges, [the region needs] energy planning that guarantees the system's security as renewables' penetration in the matrix increases, as well as a regulatory framework to incentivize and promote investment," says Wood Mackenzie's Izquierdo. In addition, certain administrative processes could be automated to improve approval times.

Obstacles to investment are also an issue in some countries, namely Argentina, Mexico and Peru. Argentina's high inflation, at around 50% this year, heavy tax burden, capital controls and a lack of dialogue between the government and investors were cited as barriers to investment in a recent report by the US State Department.

Peru's new left-wing president Pedro Castillo (pictured below) has rattled markets with his economic policy outlines, and the first months of his administration may see a more cautious approach by investors. Mexico's government, meanwhile, has dampened investor interest in the energy sector with a series of measures designed to ensure the dominance of state-owned companies.

Other obstacles to investment include social opposition to projects, particularly hydropower plants, wind farms and transmission lines, which can delay or halt development.

However, decarbonization should remain at the forefront of energy sector planning in Latin America and the Caribbean, and not just because of its environmental importance. The shift toward cleaner energy will also help to accelerate electrification plans, reduce costs to end-consumers and spur economic activity.

The region's ability to achieve its net zero targets will hinge largely on energy policies that focus on phasing out fossil fuels while prioritizing efforts to decentralize and digitalize grids. Equally crucial is the need for a stable political and regulatory environment to reassure potential investors.

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