Advancing Latin America's Power System Transformation

COMMUNITY REPORT

OCTOBER 2025

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Contents

Executive summary

Forward-looking regulation, innovative finance mechanisms, advanced technologies and regional cooperation are key to driving power system transformation in Latin America.

Latin America and the Caribbean (LAC) is rich in renewable energy resources and generates nearly 70% of its electricity from clean sources – significantly above the global average. However, to keep pace with rapidly growing electricity demand and meet regional climate goals, the region must modernize its grid infrastructure and attract greater investment.

Over the past decade, LAC has seen significant growth in wind, solar and hydro power capacity, driven by supportive policies and declining technology costs. Despite this progress, barriers such as regulatory uncertainty, limited access to finance and insufficient grid integration hinder further expansion. Addressing these challenges is critical to attain the region's full clean energy potential.

Throughout 2025, the World Economic Forum has convened a public-private working group of energy and finance experts to identify challenges and propose solutions for unlocking investments and fostering regional partnerships to drive power system transformation in LAC (see Table 1).

This collaborative process has focused on two complementary levels of analysis:

- **National power systems** – Assessing country-level barriers and best practices for making electricity systems cleaner, more flexible and reliable, with a focus on regulation, investment, planning, permitting and distributed energy integration.
- **Regional integration** – Building on analytical work led by the Inter-American Development Bank (IDB), exploring how enhanced cross-border cooperation can lower costs, boost resilience and improve renewable energy integration, through better regulatory alignment, interconnection infrastructure and regional platforms.

TABLE 1 **Summary of solutions to accelerate power system transformation in LAC**

Policy opportunities to accelerate grid deployment and transformation	Policy message 1 **Improve coordination and holistic, long-term planning** Align grid infrastructure planning with national energy, climate and environmental policy objectives. This can be done through improved coordination, transparency and integrated strategies that account for projected trends in electricity demand, generation mix and decarbonization targets.
	Policy message 2 **Foster greater predictability and cost recovery** Establish a stable and transparent regulatory framework that builds investor confidence and enables cost recovery for grid investments.
	Policy message 3 **Supportive policy-making and incentive mechanisms** Develop targeted incentive mechanisms, policy support and regulatory frameworks to promote investment in advanced technologies and grid modernization.
	Policy message 4 **Streamline permitting and administrative processes** Accelerate grid project deployment by promoting predictable, sound and agile permitting and approval processes.
Innovative finance mechanisms to unlock grid investments	Solution 1 **A grid-dedicated fund** Create specialized investment vehicles targeting transmission and distribution infrastructure.

TABLE 1 | **Summary of solutions to accelerate power system transformation in LAC** (continued)

Innovative finance mechanisms to unlock grid investments	Solution 2 **Green transmission line standard** Develop a standardized framework to designate transmission projects as “green” based on their alignment with national decarbonization goals.
	Solution 3 **Pipeline platforms for bankable projects** Establish dedicated platforms to identify, structure and prepare grid infrastructure projects for investment.
Technology solutions to overcome challenges for power grids	Solution 1 **Digitalization to drive grid intelligence** Deploy advanced digital technologies that virtualize and monitor grid operations in real time.
	Solution 2 **Advanced transmission technologies** Adopt high-voltage direct current (HVDC) technology to enable efficient, long-distance power transmission between remote renewable energy generation zones and major demand centres.
	Solution 3 **Advanced energy storage solutions** Integrate storage solutions with transmission and distribution planning to improve asset utilization and enhance resilience.
	Solution 4 **Inverter-based resources for grid stability** Scale inverter-based resources to reduce inertia and fault current in power system.

1 Overview

Surging electricity demand will require grid expansion, modernization and system integration.

1.1 Context

The LAC power sector stands at a critical juncture, poised for significant transformation amid rapidly growing electricity demand. Projections indicate that electricity consumption could increase by 90% by 2050 under existing policies – and potentially surge by 180% under current scenarios.[1] This increase reflects ongoing urbanization, economic growth and electrification efforts throughout the region, including the expansion of electricity access and the increasing electrification of transport, industrial processes and energy use in homes and businesses, particularly data centres required for artificial intelligence (AI) potentially adding further load.

BOX 1 **Definition of power systems**

Power systems comprise generation, transmission, distribution and demand-side resources, working together to deliver reliable electricity. In the future, power systems must adapt to rising demand while continuing to ensure sustainability, security of supply and inclusive growth.

The region already boasts an exceptionally clean power system. With abundant renewable energy resources and the particularly strong expansion of hydropower, the region achieved a historic 69% of electricity generation from renewable sources in 2024 with hydropower contributing nearly half – well above the global average of ~30%.[2] At the same time, solar photovoltaic (PV) and wind are rapidly scaling. In 2024, the generation of non-conventional renewables (mainly solar PV and wind) increased by more than 30% year-on-year, underscoring the accelerating momentum of these technologies in the region.[3]

TABLE 2 **Power generation and consumption in LAC in 2024[4]**

Indicator	Value/percentage
Total electricity generation	1,829 terawatt-hour (TWh) (5.5% year-on-year growth)
Generation mix by source	Hydropower 45%, natural gas 25%, wind 12%, solar 7%, bioenergy 4%, coal 2%, nuclear 2%, oil 2%, geothermal 1%
Share of renewables in generation	69%
Share of renewables in new installed capacity	79%
Energy surplus	12% surplus in 2023; projected 27% surplus in 2024
Supply vs demand growth between 2023-24	Supply up 2.2%, final consumption up 3.8%
Electricity access coverage	97.37%, but with 17 million people still without access
Target share of renewables in generation by 2050	85% clean electricity generation, requiring 1,500 gigawatts (GW) of additional capacity

However, this abundance of renewables also brings structural vulnerabilities. The region's strong reliance on hydropower – while providing low-cost, clean electricity – makes power systems increasingly susceptible to climate-related disruptions such as droughts and shifting rainfall patterns.

Addressing these risks requires not only the physical expansion and modernization of grid infrastructure, but also the development of enabling regulations and market designs to integrate a more diverse energy mix. Regional cooperation – through cross-border interconnections and coordinated planning – will be critical to integrate variable renewable energy while also enhancing system flexibility and resilience.

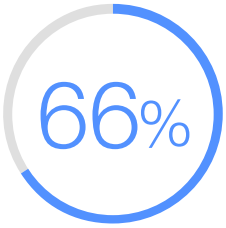
Yet, this transformation is hindered by persistent structural and institutional challenges.

Despite its structural advantages, LAC is still experiencing high system losses, limited transmission capacity, outdated grid assets and institutional fragmentation. In 2024 alone, the region lost an estimated 53,000 gigawatt-hour (GWh) of renewables generation due to curtailment. This is equivalent to the annual electricity consumption of over 10 million households based on average usage. This was primarily due to grid congestion, lack of system flexibility and weak demand-side integration.[5] Beyond curtailment, total electricity losses across the region average 16-17% – nearly triple the Organisation for Economic Co-operation and Development (OECD) benchmark of 6% – reflecting persistent inefficiencies and underinvestment, as well as a variable share of non-technical losses such as electricity theft, which remains significant in several countries.[6]

These challenges are reflected in the region's overall energy transition performance as measured in the World Economic Forum's Energy Transition Index benchmarking 118 countries' energy transition progress. While Latin America ranks third globally, its average score of 54.3 out of 100 remains below the global average, revealing persistent barriers including underinvestment in clean energy technologies, lagging innovation and limited political alignment.[7]

To fully unlock its renewables potential and achieve a clean, reliable and inclusive power system, the region must now increase its focus on grid expansion, modernization and system integration. This means scaling up investment in transmission and distribution (T&D) networks, enhancing operational flexibility, strengthening resilience by deploying digital grid technologies and accelerating regional interconnection efforts. These are not secondary enablers, but essentials for sustained renewables growth and long-term decarbonization.

1.2 Financing a grid-centric transition



of investment into grid infrastructure will come from private capital

Unlocking the clean energy potential of the region will require a significant and sustained increase in investment – particularly in grids, which represent the backbone for enabling greater renewables integration, system reliability and long-term growth. As renewable energy generation grows and demand for electricity accelerates, the grid must be modernized and expanded to manage variability, reduce losses and connect new sources of supply and demand (e.g. data centres). It is also important to note that strengthening the grid can be combined with solutions such as increased utility-scale energy storage capacity and demand, with flexibility to further enhance efficiency, sustainability and resilience.

The region is already making notable strides, with clean energy investment projected to reach approximately $70 billion in 2025, a 25% increase since 2015. This amount, however, still only represents 5% of global private clean energy financing, revealing a major gap relative to the region's potential. To meet energy and climate targets, total annual clean energy investment must rise to $150 billion by 2030 and continue to increase steadily through 2050.[8] Within this, grid infrastructure alone will require around $30 billion per year until 2035. Of this amount, nearly two-thirds is expected to come from private capital.[9]

Mobilizing such volumes of private investment remains challenging in much of the region. High interest rates and short debt maturities contribute to a high risk-perception among investors and continues to constrain large-scale financing – particularly in grid infrastructure. Yet, countries like Brazil, Peru and Chile are demonstrating what is possible. Brazil's 2024 transmission auction successfully mobilized nearly $4 billion to build over 10,500 kilometres of new lines – offering a replicable model for other countries in the region.[10] The country's auction system speaks to an overall successful model in terms of attracting clean energy finance.

Alongside grid-focused investments, the region is seeing rapid growth in green and sustainable finance. Since 2014, more than $250 billion in green, social and sustainability bonds have been issued in LAC, including $20 billion in 2024 alone.[11]

While this momentum is encouraging, the scale of transformation ahead demands more targeted tools. At the same time, technological modernization – including advanced grid management systems, smart meters and local manufacturing of key components – will be essential to reduce losses, improve system reliability and optimize operations.

2 Strengthening national power systems

Policy, finance and technology solutions could strengthen national power systems in LAC.

2.1 Policy and regulation

Barriers

The power sector in the LAC region faces a combination of regulatory and policy challenges that hinder the development and modernization of grid infrastructure. A key barrier is the misalignment between national energy policy goals and grid planning, often resulting in transmission bottlenecks, delays and underutilized renewable energy resources. Planning focuses largely on expanding generation, but pays limited attention to grid development. This is tied to unrealistic timelines and a lack of integration with projected demand and generation patterns.

Frequent policy shifts and limited transparency create uncertainty, making it difficult for developers and investors to assess risks and returns. This deters long-term investment and slows grid expansion. Although many countries have national energy plans, translating them into projects remains difficult. The absence of mechanisms – such as competitive auctions or bankable power purchase agreements (PPAs) – stalls investment and leaves deployment targets unmet.

Tariff structures often fail to recover utility costs, limiting funds for operations and maintenance, while utilities struggle to secure capital for large-scale upgrades. Sustainable tariffs and effective financial mechanisms are essential to ensure steady funding and attract investment.

Regulatory frameworks frequently lack provisions for innovation and integration of emerging technologies. Distributed energy resources, storage and advanced grid management systems are often not addressed in regulations, leaving licensees without incentives to adopt them. This slows the deployment of technologies essential for a flexible, reliable, modern grid.

Finally, administrative and permitting processes add complexity. Lengthy approvals and burdensome requirements raise costs and cause delays – particularly for cross-border infrastructure and projects involving newer technologies.

Policy message 1
Improve coordination and holistic, long-term planning

The following measures could help enhance policy planning and coordination:

- Establish integrated, long-term planning frameworks that foster coordination among government agencies, regulators, utilities and private stakeholders; align grid development with broader energy, climate, environmental and national development strategies and expected demand for cohesive decision-making.
- Establish transparent, long-term T&D plans aligned with renewables integration, decarbonization and resilience objectives – including clear project pipelines and investment timelines to guide stakeholders.
- Advance regional interconnection strategies to enhance grid flexibility and optimize resource sharing across countries – complementing national-level efforts to strengthen system resilience.

Policy message 2

Foster greater predictability and cost recovery

The following measures could help address frequent policy changes and unpredictability in regulations, while also providing sufficient cost recovery:

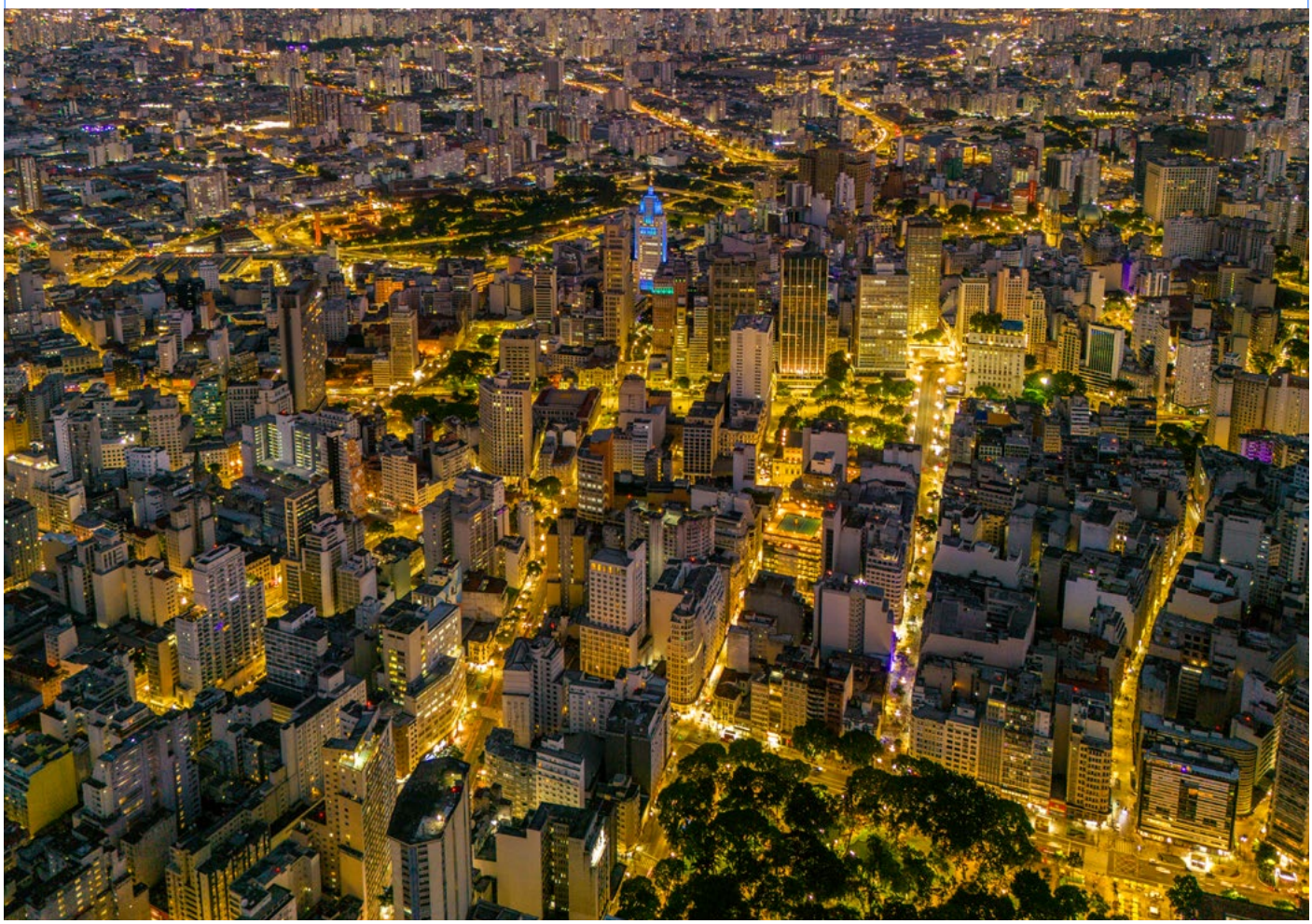
- Ensure stable and forward-looking regulation, providing long-term predictability to investors and confidence in terms of a fair return on investments made by operators – not only supporting anticipatory investments but also guaranteeing that capital expenditures are fully repaid within a reasonable timeframe and at a fair rate of return.
- Encourage demand response mechanisms and implement hourly and flexible tariffs providing sufficient cost recovery for grid expansion and upgrades and making investments more attractive for utilities.
- Invest in regulatory sandboxes (see case study 1).

CASE STUDY 1

Brazil's tariff sandboxes[12]

Building on Brazil's experience with tariff sandboxes, several countries in the region are exploring controlled environments to test innovative billing and pricing models that support grid modernization. These pilots aim to evaluate new approaches such as time-of-use, dynamic and prepaid tariffs; multipart pricing structures tailored to low-voltage users; and smart metering combined with demand response mechanisms.

By reducing regulatory and technical uncertainty, these sandbox pilots offer a flexible framework for managing emerging consumption patterns and enable a more responsive and efficient power system.



Policy message 3

Supportive policy-making and incentive mechanisms

The following measures could help create a conducive environment for innovation, incentivizing investments in new technologies:

- Maximize the use of existing grid infrastructure by promoting digital technologies and smart applications for demand-side management, as well as deploying grid-enhancing technologies to increase transmission capacity and efficiency.
- Support performance-based regulation models that reward outcomes such as efficiency, reliability and flexibility as opposed to traditional cost-of-service models, which may not incentivize innovation or operational optimization.
- Introduce resilience schemes – subject to results-based monitoring to avoid distortions and inefficiencies – to enhance specific objectives, such as resilience of grids or storage, which current regulations may not support (see case study 2).

CASE STUDY 2

Italy's targeted incentive scheme

Italy's energy regulator, ARERA, has introduced a targeted incentive scheme to accelerate private investment in grid development. Distribution companies receive a premium – up to 13% of project costs – on top of standard remuneration based on the regulatory asset base (RAB), provided their projects pass a cost-benefit analysis.

This mechanism improves financial returns while ensuring regulatory stability, effectively aligning investor incentives with national grid expansion priorities, supporting the broader goal of modernizing infrastructure for a low-carbon energy transition.

Policy message 4

Streamline permitting and administrative processes

The following measures could help alleviate permitting and administrative delays:

- Promote a predictable, sound and agile permitting process for new grid infrastructure and upgrades by digitalizing the process and establishing coordination mechanisms among relevant authorities (see policy message 1) and harmonizing environmental study requirements based on project complexity.
- Adopt the World Economic Forum's Principles for Responsible Deployment of Renewables Infrastructure to involve communities and collectively speed timelines.[13]
- Create a one-stop-shop centralizing all permitting procedures.
- Clarify risk allocation and streamline processes for land acquisition in grid infrastructure projects to reduce delays and uncertainties.

2.2 Finance and investment

Barriers

Investment in the LAC grid infrastructure is constrained by persistent, interlinked financial barriers that limit the mobilization of capital and slow the pace of modernization. In many markets, grid projects continue to depend on government-backed loans, as attracting large-scale private capital remains challenging under prevailing market conditions. This reliance on public funding reflects persistent challenges to mobilize more private capital in the financing of infrastructure: structural weaknesses in the investment

> Establishing dedicated investment funds for grid infrastructure can play a catalytic role in unlocking capital for T&D projects

environment; lack of interest from private investors; insufficient readiness of projects; lack of more effective de-risking mechanisms; and the cost of capital that jeopardizes the provision of affordable services to the end user.

While the region presents a relatively high risk profile for infrastructure investments, tools such as guarantees, credit enhancements and currency hedging mechanisms are often insufficient or hard to access. Their absence erodes investor confidence and constrains the flow of long-term capital into the sector.

Uncertainty around macroeconomic conditions and inconsistent policy signals further exacerbate the investment challenge. Frequent shifts in regulation and limited predictability of returns make it difficult for investors to assess risk over the life cycle of grid assets, weakening the investment case.

As a result of these overlapping constraints, the cost of capital in LAC remains significantly higher than in other regions. This cost premium places considerable pressure on project economics and limits the financial viability of grid infrastructure investments – especially those requiring long-term, large-scale capital commitments.

Solutions

The working group has identified a number of financial strategies to help address the root causes of investment constraints in the LAC grid sector. These include mechanisms to lower the region's elevated cost of capital, expand access to competitive funding, enhance the availability of risk-mitigation instruments and build investor confidence in the face of economic and regulatory uncertainty.

Grid-dedicated investment funds

Establishing dedicated investment funds for grid infrastructure can play a catalytic role in unlocking capital for T&D projects – particularly in markets facing high financing costs and elevated risk profiles. Led by public or private financial institutions, such funds can provide targeted financing to priority segments of the supply chain, helping to de-risk investments, shorten procurement timelines and accelerate project execution.

The working group could support the development of actionable recommendations for fund design, governance structures and strategies for capital mobilization – ensuring alignment with regional investment needs and transition goals.

Green transmission line standards

Developing standards to classify electricity transmission projects as "green" can help unlock climate-aligned capital for grid infrastructure. By aligning project eligibility with national decarbonization strategies, these standards strengthen the investment case, reduce perceived policy risk and enable access to green and concessional financing. To ensure credibility and scalability, such mechanisms should be supported by shared taxonomies and verification criteria that clearly define what qualifies as sustainable grid infrastructure.

CASE STUDY 3

IDB Invest's green transmission line standard[15]

IDB Invest, part of the Inter-American Development Bank (IDB), has proposed a Green Transmission Line Standard to identify electricity transmission projects that can be deemed "green" based on their contribution to the decarbonization of countries' energy matrices. A practical example is Uruguay's Green Transmission Line project, which involves the construction and operation of high-voltage lines connecting renewable energy sources to demand centres.[14] This project's green certification has enabled access to specialized financing, lowering the cost of capital and attracting international investors focused on sustainable infrastructure.

Developing and preparing bankable grid projects

Improving investment flows into grid infrastructure requires first developing, and then preparing, a robust pipeline of bankable projects. A critical enabler is investing in the pre-investment phase, including technical design, environmental assessments, regulatory compliance and financial structuring. These early-stage efforts are essential to reduce uncertainty, de-risk proposals and lay the foundation for viable investment opportunities.

Once projects are developed to a basic level of maturity, dedicated platforms and support mechanisms can help bring them to bankability by aligning proposals with national priorities, standardizing documentation and facilitating early-stage dialogue with financiers. These tools lower transaction costs, improve project visibility and build investor confidence – ultimately accelerating the mobilization of both public and private capital.

CASE STUDY 4

Brazil's climate and ecological transformation initiative[16]

The BIP initiative, aimed at boosting investment in climate and ecological transformation in Brazil, serves as a government-led mechanism to connect transition-aligned projects with financial institutions. By aligning project selection with national climate priorities, BIP helps build a pipeline of bankable initiatives and facilitates access to both public and private capital. The platform supports efficient matchmaking and reduces transaction barriers, offering a replicable model for mobilizing climate finance at scale.

2.3 Technology and operations

Barriers

Grid development in LAC continues to face a range of technological and operational barriers that delay implementation and deter investment. These challenges stem primarily from two structural pressures: capacity and complexity.

On the capacity side, LAC must significantly expand and modernize its T&D networks— requiring integrated planning, efficient execution and designs that account for long-term system resilience. At the same time, rising system complexity – driven by growing shares of variable renewables and increasingly dynamic demand patterns – calls for deeper digitalization, advanced power electronics and smarter operational practices to maintain grid stability and adaptability. Delivering on these fronts will require sustained and well-targeted investment across the entire power system.

While resilience must be embedded into both planning and operations, additional stressors such as climate-related disruptions and cybersecurity threats require dedicated investments in system hardening, real-time monitoring and institutional preparedness to ensure long-term reliability.

Solutions

Technology solutions will be critical to addressing the dual challenges of capacity and complexity in the LAC power systems. The working group has identified some of the most impactful technology solutions that can help accelerate the development of faster, smarter and more resilient electricity networks across the region.

Digitalization to drive grid intelligence

Emerging digital technologies offer powerful tools to enhance the intelligence, responsiveness and efficiency of power grids. Advanced sensing, real-time monitoring and data-driven control systems can significantly improve visibility across substations and distribution lines – often critical vulnerability points in Latin American networks.

These solutions enable automated fault detection, faster decision-making and more efficient maintenance and planning. By reducing reliance on manual operations and enabling virtualization of key functions, digitalization can optimize both capital and operational expenditures.

CASE STUDY 5

Colombia's QED application[17]

In Colombia, the application of quantum edge devices (QED) has demonstrated remarkable potential to enhance grid flexibility and resilience. A pilot deployment involved a network of decentralized QEDs, coordinated through a central control platform capable of monitoring real-time consumption and managing switchgear operations remotely. During peak stress events, the system enabled targeted demand reduction using advanced optimization algorithms. In one instance, participation from just 21 commercial and industrial customers – representing only 0.01% of the user base – contributed to a grid-wide demand reduction of over 12%, helping to prevent service disruptions for more than 300,000 customers.

Advanced transmission technologies

Strengthening regional transmission systems will require the adoption of a wide set of advanced technologies that enhance capacity, flexibility and efficiency. These grid-enhancing technologies (GETs) include dynamic line rating (DLR), flexible AC transmission systems (FACTs), power flow control devices and high-performance conductors – all of which can help optimize the use of existing infrastructure and defer costly new builds.

In parallel, HVDC systems offer a scalable solution for efficiently transmitting electricity over long distances, particularly between remote renewable energy generation zones and urban demand centres. HVDC is also relevant for enhancing regional interconnection and supporting the integration of variable renewables across geographies.

Scaling these technologies will require streamlined permitting, targeted investment incentives and stronger regulatory recognition of their value within national and regional planning frameworks.

CASE STUDY 6

Rio Madeira HVDC link in Brazil[18]

In Brazil, HVDC technology has been vital in strengthening grid reliability and enabling long-distance clean energy transmission. The Rio Madeira HVDC link connects hydroelectric plants in the Amazon to major demand centres in southeastern Brazil.

Spanning almost 2,400 km, the ±600 kilovolts (kV) system delivers 3,150 megawatt (MW) of renewable power from Porto Velho to Araraquara with minimal transmission losses, while simultaneously transmitting power to the surrounding AC network in northwest Brazil.

This project, one of the largest of its kind in Latin America, supplies electricity to over 10 million households and helps avoid around 22 million tonnes of CO_2 emissions annually. By integrating advanced converter stations and proven HVDC design, the system ensures grid stability while reducing reliance on fossil fuels.

Advanced energy storage solutions

Scaling grid-connected and distributed energy storage will be critical to enhancing system flexibility, reliability and renewables integration. A diverse set of storage technologies – including lithium-ion batteries, long-duration storage (e.g. flow batteries, pumped hydro and compressed air) and hybrid solutions combining multiple storage types – can help shift excess renewables generation, provide peak shaving and deliver ancillary services such as frequency regulation and voltage support.

Integrating storage into T&D planning can defer costly network reinforcements, improve asset utilization and enhance resilience to extreme weather events. This can be further combined with demand response mechanisms to increase flexibility.

Accelerating deployment will require clear market signals that value the multiple services of storage, technology-neutral procurement frameworks and regulatory reforms to enable both grid operators and market participants to invest in storage at scale. These must be supported by targeted incentives and streamlined permitting.

Inverter-based resources for grid stability

The growing penetration of inverter-based resources – including solar PV, wind power, battery storage and hybrid plants – is transforming the region's power systems. While these technologies offer rapid response and controllability, their displacement of synchronous generators can reduce inertia and fault current, challenging stability in weak or isolated grids.

Advanced grid-forming inverters, virtual synchronous machine controls and synthetic inertia can provide essential services, but in LAC, adoption is limited by high capital costs, lack of dedicated remuneration and competing investment priorities. Scaling these capabilities will require integrating stability requirements into renewable energy tenders and PPAs, establishing ancillary service markets and mobilizing concessional finance and co-investment from multilateral banks.

Policy and financial frameworks should recognize and reward stability services, embedding them in long-term planning to enable higher shares of renewables without compromising reliability.

3 Strategies for enhancing regional integration and cooperation

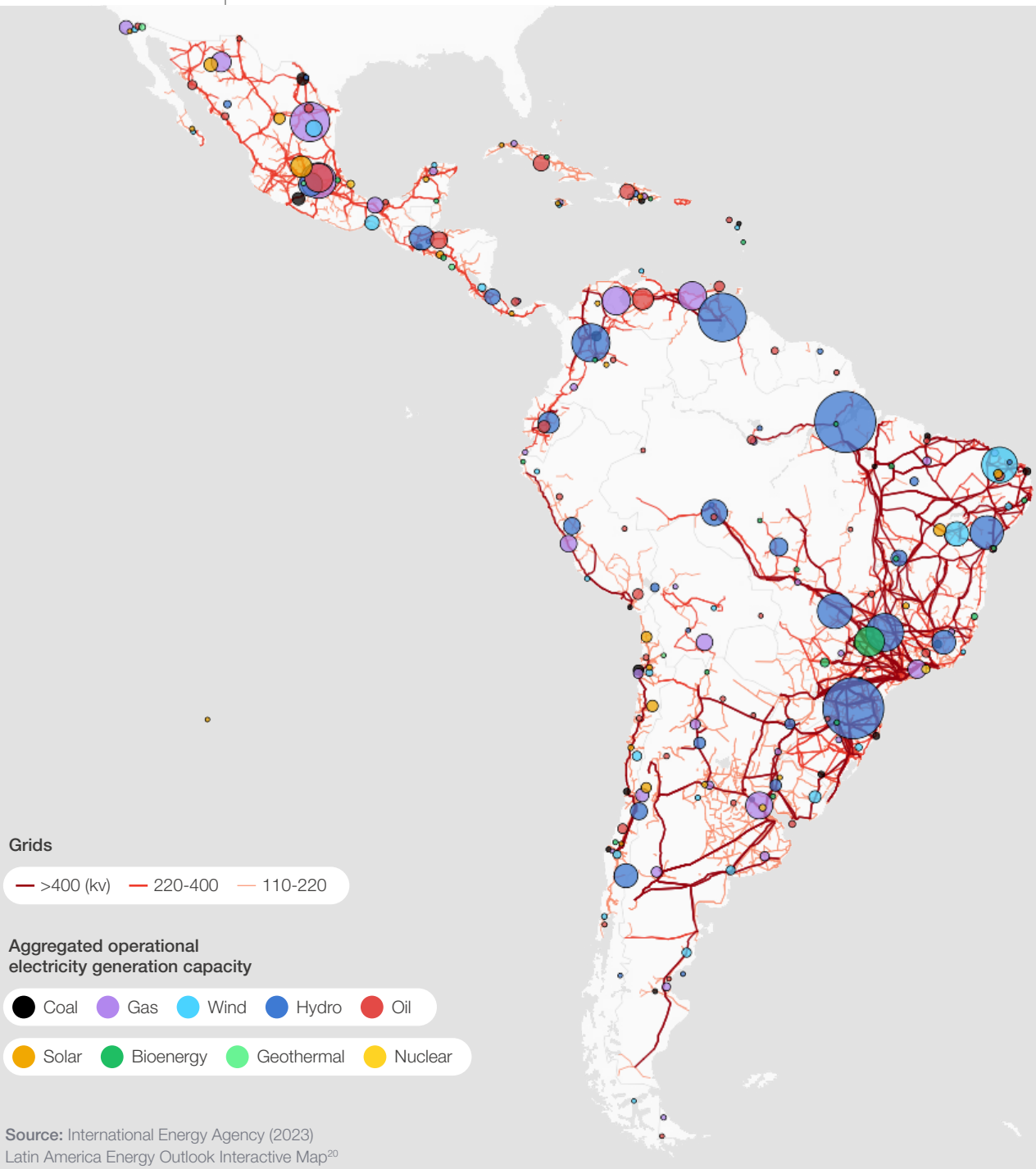
Regional integration can strengthen cross-border cooperation and infrastructure development.

3.1 Current landscape

The post-pandemic economic landscape and effects of climate change in LAC have led to a rethinking of the importance of energy integration, building on the benefits achieved and anticipating a greater impact. Although renewable sources already account for nearly 70% of electricity generation in LAC, improving transmission systems is essential to further integrate renewables into the region's power sector and facilitate the incorporation of new generation plants.[19]

Investments in the expansion of high-voltage transmission lines and substations are crucial to enhance the capacity of LAC electricity systems in response to increasing demand, driven by the electrification of multiple sectors. These investments are essential to support the energy transition and to expand access to reliable, affordable and modern energy, as outlined in Sustainable Development Goal 7 (SDG 7) of the 2030 Agenda for Sustainable Development.

FIGURE 1 | **LAC electricity grid and generation capacity**



Source: International Energy Agency (2023) Latin America Energy Outlook Interactive Map[20]

Furthermore, the evolution of exchanges in recent years has shown increased utilization of the available regional infrastructure, associated with the occurrence of adverse weather events, the complementarity of renewable energy resources and the availability of larger renewables-generated surpluses.

It has been observed that countries with regional physical integration infrastructure have been able to reduce or, in some cases, avoid adverse impacts on energy supply due to climate phenomena, even though this infrastructure has shown a low utilization factor in the past in some countries.[21]

Securing timely agreements for new electrical interconnections and increasing energy exchanges by making better use of existing infrastructure are top short-term priorities for regional integration among countries. Progress on these agreements will trigger new investments in power generation and interconnection projects that are currently in the pipeline.

In addition to strengthening system resilience, regional interconnection also promotes greater economic efficiency. An IDB analysis indicates that it helps avoid investments in reserves, leverage economies of scale, optimize infrastructure use and foster more competitive markets.[22]

Indeed, in Central America, the development of a regionally integrated system demonstrated cost reductions and improved energy diversification thanks to the extended interconnection. Likewise, the International Energy Agency (IEA) notes that a more robust power integration accelerates the penetration of storage and renewable energies, which could increase their share to 80% in the region by 2050, by linking diverse resources and weather conditions, thereby enhancing flexibility and supply resilience.[23]

Evidence from other regions reinforces these benefits: for example, studies in the United States project that expanded high-voltage transmission, coupled with new renewables, could cut CO_2 emissions by up to 73% and reduce generation costs by more than 30%.[24] While the specific figures will vary, similar mechanisms – better use of renewable surpluses, reduced curtailment and more efficient dispatch – are directly applicable to the LAC context.

Taken together, these benefits reinforce the role of power interconnection as a key driver of efficiency, decarbonization and regional resilience.

BOX 2 **Lessons from Europe and Central Asia**

Other regions offer valuable insights for LAC. In Central Asia, regional energy modelling has demonstrated substantial economic and climate benefits from integration, underpinned by fiscal instruments such as carbon markets and subsidy reforms.

In Europe, the adoption of interconnection targets and regional market frameworks has improved security, affordability and renewable integration, though persistent bottlenecks in less-connected areas highlight the challenges of uneven progress.

3.2 Common challenges

Cross-border electricity projects offer significant long-term economic, social and environmental benefits by connecting countries and promoting trade, mobility and regional integration. However, building the significant energy infrastructure that spans the region presents considerable challenges. Implementing these projects is complex due to the need for coordination among diverse stakeholders, asymmetries in benefits and costs, and differing regulatory and financial sysems.

BOX 3 **Key factors for electricity integration projects[25]**

Cross-border electricity integration projects must meet three key criteria to be successful: (1) a **solid economic rationale and efficient planning**, with emphasis on distributional analysis, stakeholder alignment and integration with national development goals; (2) **strong political support and effective governance**, requiring high-level political will, intergovernmental agreements and strong institutional arrangements; and (3) **effective financing and management strategies**, including tailored financial structures, risk mitigation and the involvement of key sponsors who implement innovative de-risking tools, such as multilateral development banks.

Cross-border infrastructure requires the coordinated efforts of many stakeholders – both public and private, at national and regional levels. International financing, consistent regulatory frameworks and demonstration of a balanced distribution of shared benefits and risks are some aspects that need to be addressed. Overcoming these hurdles demands strategic solutions and robust international collaboration.

BOX 4 **Innovative financing for cross-border integration**

Cross-border electricity projects face higher political, environmental and financial risks than domestic ones. To make them genuinely bankable, innovative approaches are needed.

Blended finance – combining concessional and commercial capital – can help rebalance risk-return profiles, while strategic public partnerships that mix equity from multilateral development banks, state participation and private financing have shown strong potential.

These models can reduce financing costs, increase transparency, and build long-term investor confidence, making regional integration more attractive to institutional capital.

Regional electricity trade is gaining importance in many parts of the world. In LAC, however, most electricity is still traded bilaterally, as seen in the interconnections between Brazil, Paraguay and Argentina. The volume of cross-border electricity trade in the region makes up less than 5% of the total regional generation (6% in Central America, 1.5% in the Andean region and 5% in the Southern Cone). In the Caribbean, cross-border electricity trade is at an early stage, with progress limited to initial studies for binational interconnections.

Bilateral trade, while valuable, is limited to direct exchanges between two countries, often based on specific contracts, treaties or physical interconnections, which restricts market flexibility and the optimization of resources at a broader scale. In contrast, progressive market integration involves establishing regional electricity markets with multilateral trading platforms, enabling multiple participants to buy and sell electricity across borders more freely and efficiently. Moving from bilateral trade to deeper, multilateral market integration represents a critical pathway to fully exploit regional complementarities, reduce costs, increase renewables integration and improve system reliability.

Some of the primary obstacles to regional electricity trade in LAC include a fragmented vision for regional planning and benefits, the need to enforce existing regulations and treaties to maximize the use of available infrastructure, and limited or slow investment in new transmission infrastructure. The region must also strengthen existing assets to ensure continuity in transactions. Another impediment is the willingness to support the structure of ad-hoc financing mechanisms that maximize benefits, and multilateral development banks can play a catalytic role here.

BOX 5 **Platforms for cooperation and trust-building**

Beyond infrastructure and finance, effective integration requires institutional mechanisms that sustain dialogue and build trust.

Regional cooperation platforms play a critical role by enabling countries to share experiences, align standards and coordinate long-term planning. Such platforms are indispensable for moving beyond ad-hoc bilateral exchanges and laying the foundations for true multilateral electricity markets.

3.3 Ongoing initiatives

The LAC energy integration has traditionally centred on bilateral exchanges but is now evolving towards comprehensive models that align tailored regulatory frameworks with coordinated infrastructure development. These efforts, implemented through regional interconnection systems (RIS), seek to establish sub-regional electricity markets and eventually interconnect them for greater regional integration. The IDB is instrumental in this process, serving as technical secretariat, key financier and facilitator of technical assistance.

Key RIS initiatives include:

Andean region
SINEA

SINEA aims to interconnect five countries across an extensive 7,000 km network to create a fully integrated electricity market. In 2024, the Andean Community approved regulations establishing the Andean short-term electricity market (MAERCP), strengthening market governance and operational coordination. Significant progress has been made, with financing secured for the Ecuador-Peru 500 kV transmission line (600-MW capacity), while feasibility and design studies are underway for Peru-Chile and Chile-Bolivia interconnections, which will improve supply security and optimize resource complementarity.

Caribbean
Arco Norte

The Arco Norte RIS aims to connect three Caribbean countries with Brazil, mirroring the governance models of other RIS initiatives. It focuses on advancing agreements and laying the groundwork for the Caribbean's first regional electricity interconnection infrastructure, notably between Suriname and French Guiana, which will help boost energy access and regional cooperation in the Caribbean basin.

Southern Cone
SIESUR

SIESUR brings together Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay, leveraging underutilized binational interconnections to increase electricity trade. Since its launch in 2018, electricity exchanges have quadrupled. The initiative is developing a Southern electricity market and prioritizing infrastructure upgrades to enhance grid reliability and further expand cross-border energy flows, capitalizing on the region's diverse renewable energy resources.

Central America
SIEPAC

SIEPAC connects six countries – Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica and Panama – via a single 230 kV transmission line stretching nearly 1,800 km with a capacity of 300 MW.[26] This infrastructure underpins the Central American regional electricity market (MER), which now supplies 6% of the region's electricity demand. The MER features a robust institutional framework and supports active trading by over 300 private market participants, promoting competition and efficiency.

Next steps and solutions

Across LAC, nations are working together to weave a stronger web of energy. Through RIS, countries aim to increase the flow of electricity by developing regional power markets and linking these markets together.

In Central America, SIEPAC is seeking to expand its regional electricity market northwards, integrating with Mexico and Belize, and southwards, reaching Colombia in South America. This regional integration is accompanied by critical capacity expansion investments, such as the construction of a second SIEPAC circuit to increase transfer capacity to 600 MW and the planned Panama-Colombia interconnection project, designed to enable 400 MW of cross-border transmission.

In the Andean region, SINEA is making great strides, laying the groundwork for new interconnection infrastructure. This new backbone will enable the Andean short-term electricity market to begin commercial operations. A key part of this is the Ecuador-Peru interconnection project, which is currently under construction. Projects like the Chile-Peru and Chile-Bolivia interconnections are next in line. At the same time, SINEA is strengthening the very foundation of this new market with the regulatory and normative frameworks already approved, which establish regional regulations.

Further south, SIESUR has woven into its "roadmap" the initial design for a Southern electricity market. This vision is expected to significantly boost electricity exchanges in the future, aiming to surpass the current goal of 6%.

Conclusion

The recommendations outlined in this report can enable Latin American stakeholders and government entities to create a conducive environment for power system transformation across the region.

The LAC power sector holds unparalleled potential for a clean energy future, but realizing it will require decisive action. Grid modernization must be prioritized, including through expanding T&D, adopting advanced technologies and embedding resilience and digital intelligence across networks.

Achieving this transformation demands a significant scale-up in investment, with annual clean energy financing required to more than double by 2030, including $30 billion per year for grids alone. Mobilizing such capital will hinge on stable regulations, robust risk-mitigation tools and innovative financing mechanisms.

At the same time, strengthening regional integration through initiatives such as SIEPAC, SINEA and SIESUR can optimize resources, enhance flexibility and lower costs across the region. The Working Group on Advancing Latin America's Power System Transformation remains actively engaged in advancing and implementing the solutions outlined, fostering collaboration to support the region's climate goals, economic resilience and energy security over the long term.

Abbreviations

DLR	Dynamic line rating
FACTs	Flexible AC transmission systems
GET	Grid-enhancing technology
GW	Gigawatt
GWh	Gigawatt-hour
HVDC	High-voltage direct current
IDB	Inter-American Development Bank
IEA	International Energy Agency
KV	Kilovolt
LAC	Latin America and the Caribbean
MW	Megawatt
MER	Central American regional electricity market (Mercado Eléctrico Regional)
MERCP	Andean Short-Term Electricity Market (Mercado Eléctrico Regional de Corto Plazo)
OECD	Organisation for Economic Co-operation and Development
PPA	Power purchase agreement
PV	Photovoltaic
QED	Quantum edge device
RAB	Regulatory asset base
RIC	Regional interconnection system
SDG	Sustainable Development Goal
SIEPAC	Central American Electrical Interconnection System
SIESUR	Energy Integration System of the Southern Cone Countries (Sistema de Integración Energética del Cono Sur)
SINEA	Andean Electrical Interconnection System (Sistema de Interconexión Eléctrica Andina)
TWh	Terawatt-hour
T&D	Transmission and distribution

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Acknowledgements

The authors thank the more than 50 active members of the Working Group on Advancing Latin America's Power System Transformation, including:

Acciona, ADELAT, Actis, Associação Brasileira das Empresas de Transmissão de Energia Elétrica (ABRATE), Brazilian Centre for International Relations (CEBRI), Brazilian Development Bank (BNDES), CAF – Development Bank of Latin America, Catavento, Clean Energy Ministerial, Climate Strategies, Columbia University, Comisión de Integración Energética Regional (CIER), Ecopetrol, EDP, Enel, Energy and Gas Regulatory Commission of Colombia (CREG), Energy Research Office of Brazil (EPE), French Development Agency (AFD), Fundação Getulio Vargas, General Directorate of Energy, Hydrocarbons and Mines of El Salvador, Global Renewables Alliance, GME - Global, Gridspertise, Growald Climate Fund, Hitachi Energy, Interconexion Electrica (ISA), International Energy Agency (IEA), Latin American Energy Organization (OLADE), Ministry of Energy of Chile, Ministry of Mines and Energy of Brazil, National Electric Energy Agency (ANEEL), National Energy Commission of Chile, National Environmental Licensing Authority of Colombia, National Secretariat of Energy of Panama, Neoenergia, ONS – Operador Nacional do Sistema Elétrico, Pampa Energia, Petroleo Brasileiro SA – PETROBRAS, Promigas, Siemens, Colombian Association of Electric Power Generators (ACOLGEN), Inter-American Development Bank (IDB), International Renewable Energy Agency (IRENA) and United Nations Development Programme (UNDP).

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