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EXECUTIVE SUMMARY DSO BRIEF

ACCELERATING SMART METERING

REGULATORY DRIVERS FOR DEPLOYMENT IN LATIN AMERICA

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We thank our partner, Cyro Boccuzzi, Managing Partner of ECOEE, a pioneering consultancy in the management and technologies of intelligent energy systems, and Founder and President of the Latin American Smart Grid Forum, for his valuable contribution to the review of this document.

Electricity distribution is undergoing a transformation driven by electrification, distributed generation and the variability of energy flows, which makes the traditional model of passive grids insufficient. Advanced Metering Infrastructure (AMI) is now the digital foundation that allows the operation of more dynamic networks, integrating measurement, communications and data management. Unlike basic telemetry, AMI incorporates bidirectional communications and control functions, providing LV observability, granular data, and continuous monitoring.

On this basis, AMI enables strategic functions: high-frequency data makes it possible to identify losses and anticipate congestion; its ability to manage bidirectional flows integrates distributed generation and new load profiles, such as electric vehicles; and temporal granularity is key for hourly rates and demand response. Together, AMI is the minimum digital infrastructure to operate systems with high penetration of distributed resources.

Despite its central role, AMI deployment involves significant economic challenges. A study by ADELAT and GME estimates that the investment needed in seven Latin American economies exceeds USD 51.4 billion for an effective transition to 2040. This volume of capital is evidence of a critical trade-off: technology is indispensable for future efficiency, but its cost is difficult to assume under regulatory frameworks that have not evolved at the same pace and often privilege traditional physical infrastructure. The role of the National Regulatory Authorities (NRA) is decisive in making this modernization viable, through clear mechanisms for cost recovery, technical standards and a national Cost-Benefit Analysis. Without tariff recognition and adequate incentives, investment in AMI remains largely limited to pilot projects. In Latin America, these challenges are intensified by the persistence of non-technical losses, socioeconomic heterogeneity and the disparity of capacities between distributors, resulting in fragmented progress.

01

PROGRESS OF AMI DEPLOYMENT IN LATIN AMERICA AND IMPLEMENTATION STRATEGIES

Globally, more than 1.2 billion smart meters have been installed, with Europe and North America leading the rollout thanks to regulatory mandates and positive cost-benefit analyses. The European Union reached an average penetration of 56% in 2022, with countries such as Italy and Spain completing full replacement. The United States exceeds 68%, while China and Japan are moving towards second-generation cycles. In contrast, Latin America is in an early phase, with penetrations generally below 10% and advances concentrated in a few countries.

Within the region, Uruguay (80%), Costa Rica (54%) and Honduras (23%) show the greatest degree of progress, although with different approaches: Uruguay has followed a centralized deployment led by its state-owned company and articulated with national energy planning; Costa Rica is moving forward under an explicit regulatory strategy with defined goals and a mandatory deployment executed in geographical phases; and Honduras has promoted AMI to reduce non-technical losses, first under a concession scheme and, more recently, through targeted interventions from the State.

A second group, with penetrations between 3% and 9%, includes Chile (8.8%), where a mandatory rollout was reversed due to social rejection, which led to a voluntary and gradual implementation supervised by the regulator; Guatemala (8.4%) has advanced without a formalized national strategy, with individual initiatives by distributors aimed at commercial efficiency; Mexico (6%) concentrates the largest absolute volume of meters installed in the region, with a model centralized in the CFE to reduce losses; Brazil (5.6%) combines low residential penetration with large-scale projects under execution and a regulatory process aimed at setting minimum guidelines at the federal level; Colombia (3.9%) has a regulatory framework and goals for 2030, although physical deployment is in the initial stages, led by distribution companies based on urban pilots; Argentina (3.3%), with advances in pilots; and Ecuador (3.1%) has promoted localized interventions within the framework of energy efficiency plans, including recent initiatives in major cities with the participation of regional public distributors.

A third set of countries shows penetration of less than 1%, such as Peru (1.3%), Paraguay (0.5%) and El Salvador (0.5%), focused on pilots or initial phases. Finally, Panama and the Dominican Republic have recently begun deployments, while Nicaragua, Bolivia and Venezuela have made very limited progress due to financial and institutional limitations, without national smart metering programs and with specific or incipient efforts in a context of financial limitations, weak institutional frameworks and, in some cases, operational deterioration of electricity systems.

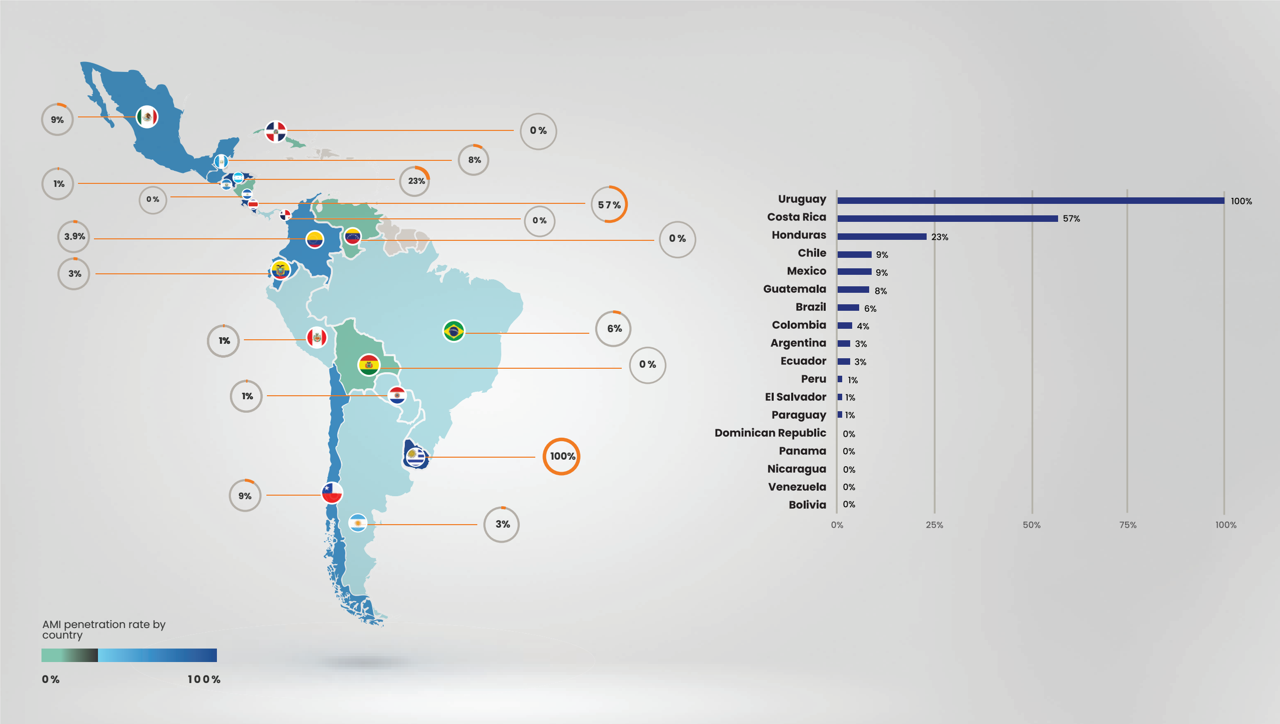

Fig. 1. Estimated penetration of LV smart meters by country in Latin America and the Caribbean (2024). Sources: ADELAT (2024b), IDB (2023), Grupo Mercados Energéticos, ICE and press releases.

The approaches to deploying AMI in the region are diverse. Costa Rica and Colombia lead with clear national goals and regulatory support. Costa Rica aims for 100% penetration by 2028, and Colombia at 75% by 2030, both with detailed roadmaps and tariff recovery mechanisms. Peru and Brazil have ambitious plans in the design phase; Peru proposes mass deployment by 2025-2035, while Brazil is advancing in a regulation that establishes mandatory minimum short-term goals as a prelude to a deployment conditioned on a cost-benefit analysis. In Ecuador, El Salvador, Guatemala and Argentina there are no defined national goals; Deployment is driven by distributors' corporate decisions for loss control or modernization. Argentina is in a stage of technological evaluation with pilots, without a national roadmap. Chile represents a unique case. An initial policy of massive and mandatory replacement was reversed in 2019 after strong public controversy, making the deployment a voluntary process. The Chilean case illustrates the risks of moving forward without effective communication and social consensus, particularly when the replacement is not accompanied by new tariff options or economic signals visible to consumers.

> The modernization of electricity distribution systems has become a central component of the energy transition

02

AMI SYSTEM TECHNICAL SPECIFICATIONS AND INFRASTRUCTURE PERFORMANCE

The success of the metering modernization depends on the technical soundness of the installed infrastructure. The definition of functionalities, the selection of communication technologies and the guarantee of interoperability are critical factors for AMI systems to respond to the operational and regulatory challenges of Latin America.

The international evolution of smart metering distinguishes two stages. The first wave (mid-2000s-2010s) focused on operational efficiency, with remote reading as the primary function, with limited communications and a reduced set of records. The second wave (since 2020) responds to the digitization and integration of distributed resources, characterized by greater data granularity, bidirectional communications, remote software updating, reinforced cybersecurity, and functions to operate dynamic networks.

The rollout in Latin America shows a hybrid pattern. Most companies declare a broad functional set that goes beyond simple telemetry, including bidirectional metering, reactive energy measurement, and tamper detection. However, there is no full adoption of second-wave capabilities, such as active flexibility management, dynamic rate-oriented granularity, or architectures designed for the systematic integration of distributed resources. The result is a Latin American AMI model that combines second-generation attributes with an emphasis on reducing non-technical losses. A distinctive aspect is the low presence of prepayment functionality. This is not due to a technological lag, but to the lack of specific regulatory frameworks that define billing, recharging and protection rules for vulnerable customers.

The capacity of an AMI system also depends on its communications architecture that supports continuous, secure and reliable data transmission. The deployment in Latin America shows a strong dependence on communication solutions designed to adapt to heterogeneous networks and complex territories, which makes technology selection a strategic element of AMI development in the region. A wide spectrum of technologies is used in the region, organized into neighborhood area networks (NANs) and wide area networks (WANs). At the NAN level, PLC is common in dense urban areas, while RF mesh is typically deployed where grid conditions and topology favor radio-based coverage. For WAN, cellular networks (2G to 5G) are used, complemented by fiber optics or satellite links. A distinctive feature is the configuration of hybrid architectures that simultaneously combine PLC, radio frequency and cellular communications within the same network. This practice responds to a structural need: no single technology offers sufficient performance in the face of the heterogeneity of Latin American networks, which include dense areas with electrical noise, large rural areas with low concentration of consumers, and sectors with complex topologies or relevant interferences. The challenges do not come from technological availability, but from operational conditions: in PLCs, electrical noise and signal attenuation are recurring problems; in radio frequency, coverage and interference are the main difficulties; and cellular communications face coverage constraints and operating costs. The coexistence of multiple communication technologies, hybrid architectures, and disparate vendors requires more robust interoperability frameworks, formal homologation processes, and communication standards that ensure operational continuity throughout the system lifecycle.

Interoperability is critical for AMI systems to operate under a common architecture regardless of the manufacturer. In Latin America, this dimension is at an early stage, with a predominance of proprietary or partially open architectures, and few regulatory frameworks that establish unified standards of measurement and communication. The most widespread international standard is IEC 62056 (DLMS-COSEM), although some distributors use ANSI standards. Even with open standards such as DLMS-COSEM, their practical implementation varies between manufacturers, leading to incompatibilities. In the absence of formal guidelines, utilities manage interoperability through internal approval processes, laboratory tests, and pilots that validate compatibility between meters, hubs, data management systems, and communication technologies. This approach involves high costs, long integration times, and sometimes significant dependence on the dominant provider. The main barriers are the persistence of proprietary protocols, regulatory restrictions that limit the adoption of certain standards, heterogeneous implementations of the same protocol, lack of independent certification laboratories, and the absence of regulation that requires open standards. The region needs to move towards unified technical guidelines and formal certification mechanisms to sustain scalable and technologically open AMI deployments.

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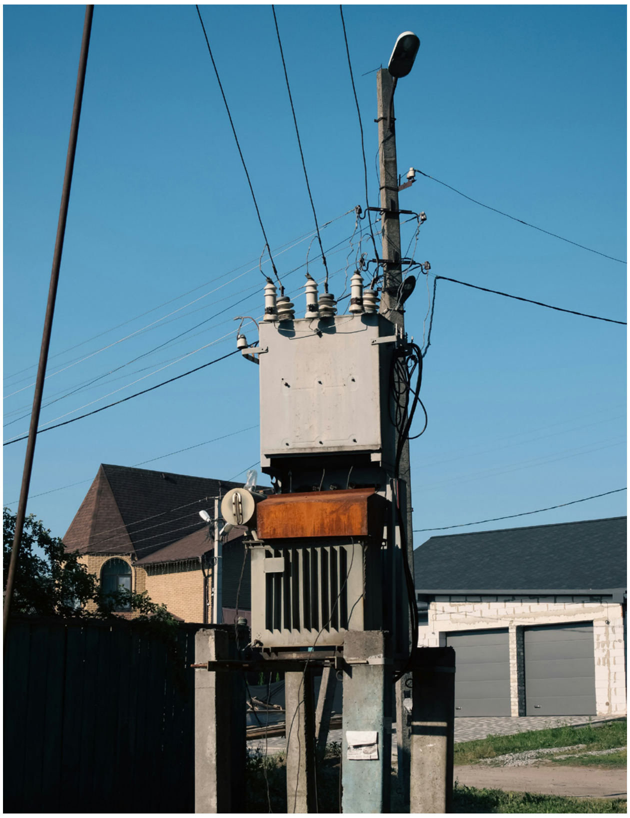
Analysis of national targets and penetration levels shows that the region is moving towards modernizing its measurement systems



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AMI INTEGRATION WITH CORPORATE SYSTEMS

An AMI's ability to generate value depends on its integration with the corporate platforms that distributors use to operate, plan, and manage their customers. Integrating AMI with corporate systems determines whether data translates into more accurate operational decisions and business processes. The distributors in the region show a diverse panorama. In most cases, AMI connects with business and billing systems first to automate reading, improve data quality, and reduce rework. In a more limited group of companies, integration with operational platforms such as SCADA is observed. A more limited group integrates AMI with operational platforms such as SCADA or OMS for fault location, network monitoring and outage management. Others are in the preliminary stages, with manual file sharing.

As for the mechanisms used to integrate AMI with operating systems, architectures based on APIs, web services and business integration buses predominate to automate information flows between MDM, business systems and operating platforms. These results suggest that the region is moving towards more modular and service-based schemes, although solutions of different scale and technical maturity still coexist.

Some vendors plan to deepen integration as their deployments mature, incorporating MDMs as central repositories and linking with operating platforms to enable advanced functionality. However, some enterprises do not yet have fully operational AMI infrastructure, others rely on proprietary solutions that hinder integration, and several face institutional or budgetary constraints to modernize their legacy systems, resulting in uneven progress in consolidating an interoperable digital architecture.

The adoption of AMI data-driven analytics in Latin America is at an early stage. Among the distributors that have developed use cases, a focus on operational and commercial efficiency predominates: detection of non-technical losses, validation of consumption, energy balances, demand forecasting and optimization of reading, billing and collection processes. Cases have been reported where these analytical tools increased the loss detection rate by about 50% compared to traditional methods. However, a significant proportion of companies do not yet have these capabilities. A number of distributors have begun to explore operational applications such as voltage deviation detection, transformer loadability analysis, and integration with OMS platforms to support fault location. Despite these advances, gaps persist such as the lack of full integration between AMI and corporate systems, insufficient quality of information and dependence on proprietary solutions, which conditions the consolidation of advanced analytics in the region.

04

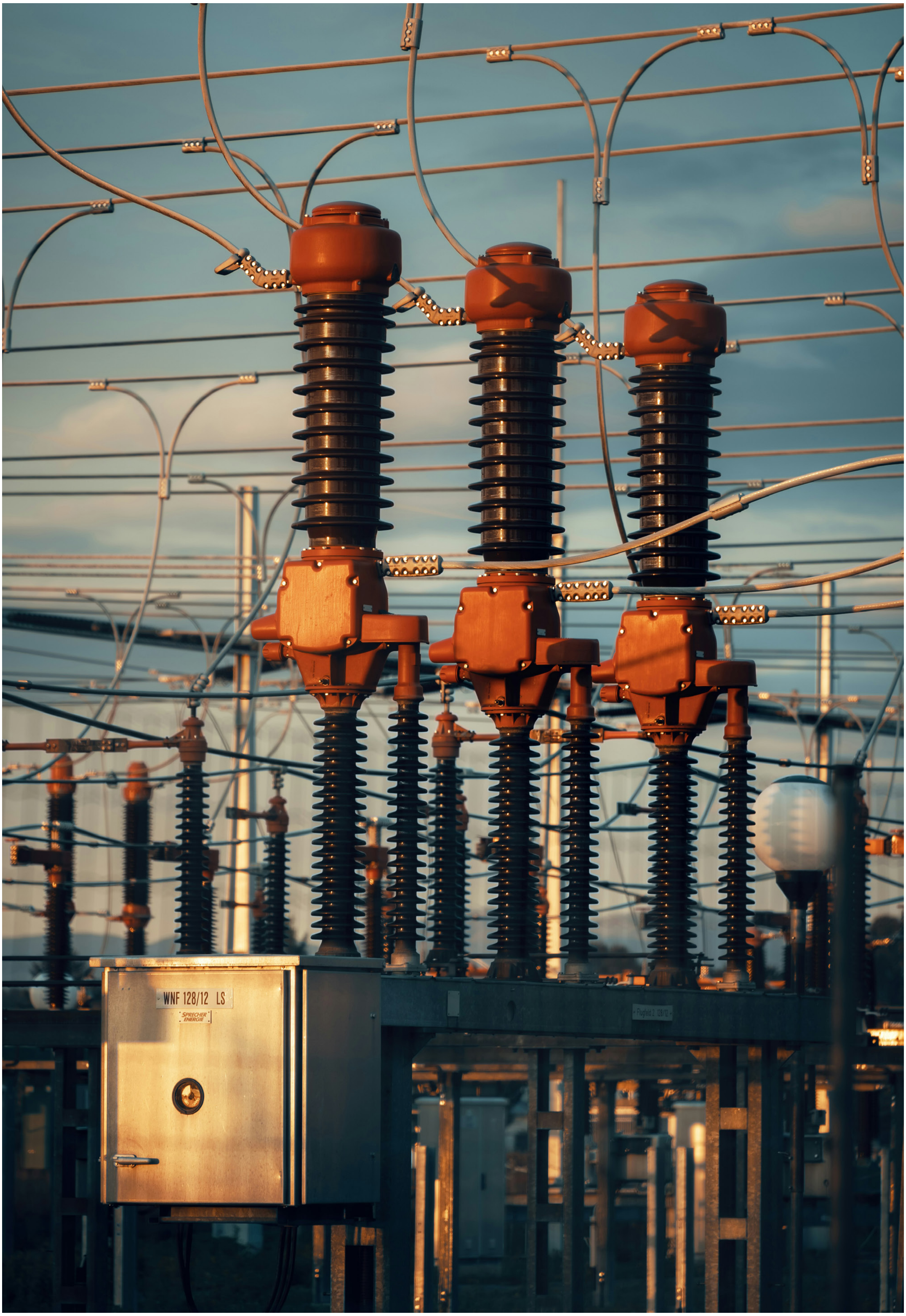
DATA GOVERNANCE, CYBERSECURITY AND CONSUMER ENGAGEMENT

The adoption of AMI poses challenges of data governance, cybersecurity, and end-consumer engagement. These aspects determine the institutional viability and social legitimacy of the deployment, as well as the consumer's confidence in the handling of their information.

Transparent access to usage information is a core attribute of modern AMI systems, allowing consumers to understand their usage patterns, better manage their demand, and participate more actively in electric service. In Latin America, progress is partial. Some distributors have enabled web portals and mobile applications that allow customers to consult consumption almost in real time, view load curves, review billing history and, in some cases, access specific modules for customers with AMI. Others provide more basic information or are designing these channels. Gaps persist such as the absence of common formats for data delivery, limited interoperability with third-party applications, the lack of unified channels to visualize cost information or operational events, and the reduced deployment of connected smart meters, which restricts the potential for active consumer involvement.

The increasing digitalization of measurement requires a central role for cybersecurity. AMI infrastructure introduces millions of entry points that must be securely integrated with corporate platforms and network operating systems. Although the region is making progress in this area, there is significant variability in the adoption of formal policies. The most advanced utilities follow international standards such as ISO/IEC 27001 for information security management and ISO/IEC 27019 for industrial systems in the energy sector, and implement end-to-end encryption and penetration testing during the approval processes of meters and MDMS/HES systems. However, an important part of the companies are in early stages, with general security guidelines, basic network hardening measures and controls on the handling of credentials, without yet having specific frameworks oriented to AMI. Progress in access to information and analytics must be accompanied by a systematic strengthening of cybersecurity practices to safeguard critical infrastructure and protect consumer data.

The increasing availability of granular consumer data increases the relevance of the privacy frameworks that regulate the processing of this information. In Latin America, the applicable regulation comes mostly from general personal data protection laws, not from sectoral regulations dedicated to AMI, generating a fragmented panorama where the safeguarding of information depends both on the national legal framework and on the internal practices of each distributor. Countries with advanced legislation apply principles such as consumer consent, limitation of use to authorized purposes, anonymization for operational analytics, and security obligations for data controllers. In some cases, sectoral regulations complement these requirements, as is the case in Chile with the provisions on Measurement, Monitoring and Control Systems, or in Colombia, where the regulation of smart metering explicitly refers to habeas data laws. However, a significant proportion of distributors indicate that there is no specific regulation, which shows institutional gaps. The observed heterogeneity suggests the need to move towards clear frameworks that define consumer rights and processing obligations for consumption data.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ECONOMIC MODELS, FINANCING AND COST RECOVERY

The viability of AMI is determined by the financing models, the economic criteria of the distributors and the regulatory mechanisms to recover investments. The analysis reveals a structural transition in ownership models, driven more by technological necessity than by regulatory definitions. Historically, a scheme where the electromechanical meter was owned by the end consumer, who paid for the device at the time of connection, predominated. However, the nature of the AMI—from an isolated asset to an integrated network sensor that requires centralized data management, cybersecurity, and constant technological renewal—is forcing a shift toward schemes where ownership and responsibility for the investment rests with the distributor. However, assigning ownership alone is not enough unless regulatory accounting for recognition of assets is updated.

Based on the information collected from the companies associated with ADELAT, three types of financing are identified:

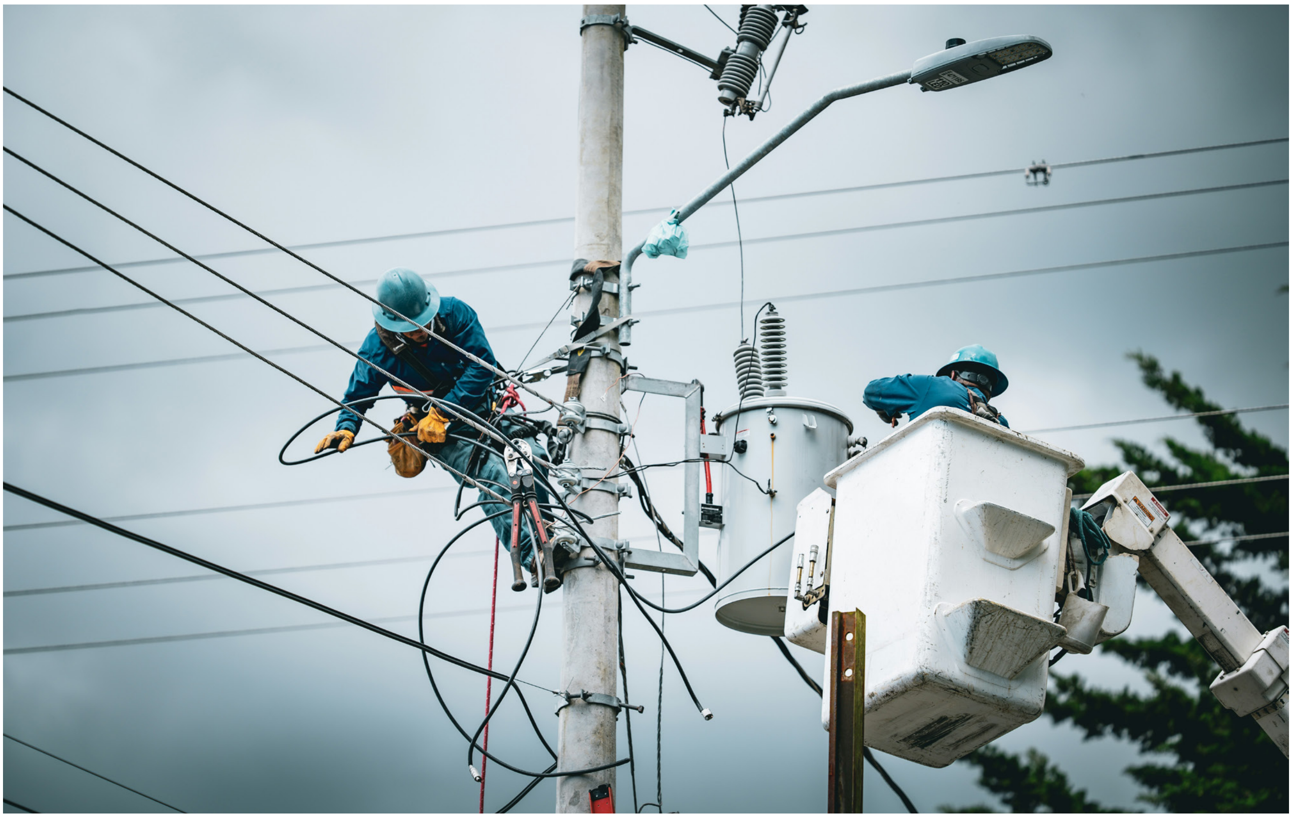
A utility-owned model with explicit regulatory recognition is the most sustainable and corresponds to markets such as Brazil and Costa Rica, where the regulation recognizes the smart meter as a network asset remunerated in the tariff. In Brazil, this approach has been clearly proposed in the framework of Public Consultation 198/2025. However, challenges remain, such as the need to adapt regulatory asset lives, because unlike electromechanical assets that can be amortized over 30 years, AMI components (communication modules, software) have much shorter technological obsolescence cycles. In Costa Rica, AMI ownership rests with the state-owned utility, and financing is structured through a combination of equity capital and leverage with multilateral banks. The lesson of this group is that ownership of the distributor works, as long as the regulation accepts that the costs of licensing, cybersecurity and telecommunications are essential investments and not operational “inefficiencies”.

Other countries are in a regulatory transition phase, migrating from a regime where the customer bought the meter to one where the law assigns responsibility to the distributor, generating unresolved financial frictions. Countries such as Chile and Colombia have assigned the responsibility for the investment to the distributor, but without resolving financial frictions such as “stranded assets”: how to finance the new smart meters without having finished depreciating or recovering the value of conventional meters that will be retired early. This forces companies to finance modernization with their own capital and/or high risk, limiting deployment to pilot projects.

But the predominant scenario is that of ownership of the distributor without explicit recognition, in countries such as Argentina, Peru and Guatemala. There, investments are made with the company’s operating cash flow, motivated by specific emergencies such as the reduction of non-technical losses or the attention to large consumers, but without a mechanism for transferring to the tariff. The lack of regulatory categories to capitalize on software or recognize technological OPEX condemns AMI to be a high-profitability niche technology and not a universal infrastructure.

While the technical consensus points to smart metering as the backbone of the energy transition, the local economic equation to justify its investment (business case) is much more complex to close than in developed economies. The construction of the business cases follows two main orientations: the focus on loss recovery, predominant in Argentina, Peru, Guatemala and specific areas of Brazil, where the Cost-Benefit Analysis (CBA) is positive only in areas with high fraud rates, and which results in a fragmented deployment, concentrated in problem areas or large industrial consumers; and the operational efficiency approach, used in Chile and mature areas of Brazil and Colombia, which incorporates operational savings (OPEX) in manual reading, disconnection/reconnection and reduction of customer complaints. However, its impact is limited by the relatively low cost of labor in the region, unlike in Europe or the United States, where eliminating manual reading yields savings that make the investment self-financing.

Traditional financial evaluation models, restricted to the company's cash register (utility cost test), are insufficient for universal deployment. If AMI is only installed where it is profitable for the company (theft areas or large customers), an energy digital divide will deepen. To overcome this stagnation, it is imperative to move towards a social and systemic Cost-Benefit Analysis that monetizes benefits such as improved resilience, quality of service, and postponement of investments in networks and generation. If the NRA allows the distributor to capture a fraction of that deferred capital savings, deployment becomes viable. Evaluation criteria should abandon the idea of a "national average cost". The regulation should allow evaluations by clusters or zone typologies, recognizing that the costs and benefits are not homogeneous, and adjust the amortization horizons to the technological replacement cycles of digital assets.



06

BARRIERS TO SCALING UP AND ENABLING CONDITIONS

AMI deployment in Latin America faces an “implementation paradox”: despite consensus on its indispensable role, the move from limited or pilot deployments to mass adoption is fragmented due to structural barriers.

Regulatory and economic barriers: The main one is the absence of an explicit regulatory framework that defines obligations, incentives, and remuneration mechanisms, making deployments depend on internal business cases and pilots, rather than massive programs with revenue predictability and clear gradual approach. Regulation based on an “efficient model enterprise” for static and long-life physical assets, while AMI challenges that logic, as it behaves like a digital investment with faster innovation cycles. CAPEX/OPEX asymmetry weakens the business case by failing to recognize key operational costs such as software and cybersecurity. Moreover, even with asset recognition, tariff schemes do not always capture the systemic benefits attributable to AMI (loss reduction, operational efficiency, advanced demand management). The result is a gap between the social/sectoral value of the investment and its financial recoverability. Finally, the mass replacement of legacy meters may involve retiring equipment that still has book value; If there is no recovery mechanism or clear regulatory treatment, modernization translates into an immediate destruction of value for the distributor, even when the long-term benefits are positive.

Technological and infrastructure barriers: The limitations do not lie only in the meter, but in the ecosystem that surrounds it: communications, interoperability, integration with corporate systems and data governance. Connectivity is a sensitive challenge, with stability issues in PLC networks and limited cellular coverage. Added to the above is a last-mile gap that forces, in certain territories, to deploy expensive private networks. At the same time, the progressive shutdown of 2G/3G networks introduces a risk of accelerated obsolescence that is not controlled by the electricity sector. The lack of interoperability between multiple measurement and communication technologies increases operational complexity and demands continuous integration processes. At the same time, the lack of mandatory standards and local certification increases the risk of technological lock-in and hinders multi-vendor integration. Cybersecurity also emerges as a barrier, as it expands the attack surface and requires investments not always recognized by regulation.

Operational and implementation barriers: Extended equipment manufacturing and delivery timelines that hinder scheduling and can impact compliance with regulated plans or corporate goals. Added to this is the dependence on international technical support, which in some cases introduces delays in the resolution of problems and limits the ability to respond to operational contingencies. This dependence becomes more critical as the installed fleet increases, because incidents are no longer exceptional and become part of the daily operation. Scaling requires a sustained strengthening of internal capabilities: AMI platform management, database operation, monitoring, cybersecurity, and IT infrastructure management. The available experiences also underscore the relevance of a procurement and contracting strategy aligned with the program’s risk

Social and cultural barriers: Scaling requires a “social license” that can be threatened by misinformation, misperceptions, or fears about privacy. As a result, communication and transparency cease to be complementary activities and become structural components of the program. In rural or hard-to-reach areas, the installation may require greater efforts of community coordination, technical accompaniment, and differentiated relationship strategies. In territories with high social vulnerability, the meter can be perceived as a threat to informal economies, increasing the risk of vandalism, theft of equipment and violence against personnel, which raises costs and conditions the prioritization of deployment.

These barriers tend to reinforce each other. Imperfect connectivity or weak interoperability increase costs and deadlines, which aggravates the problem of tariff recovery and bankability; in turn, the lack of regulatory clarity on digital OPEX and cybersecurity reduces the ability to sustain the ecosystem that makes AMI valuable; and, in environments of low trust or high territorial conflict, deployment becomes more expensive and slower, just when programming and operational continuity are essential to capture benefits.

Enabling conditions: Overcoming these barriers requires regulatory frameworks that recognize the entire AMI ecosystem, including OPEX, and monetize its social benefits. It is a priority to establish mandatory technical standards and certification mechanisms to reduce technological frictions. Scaling should be managed as a comprehensive operational program, strengthening internal capacities and hiring strategies. Finally, a consumer engagement strategy that generates trust and addresses local realities, especially in vulnerable territories, is essential.

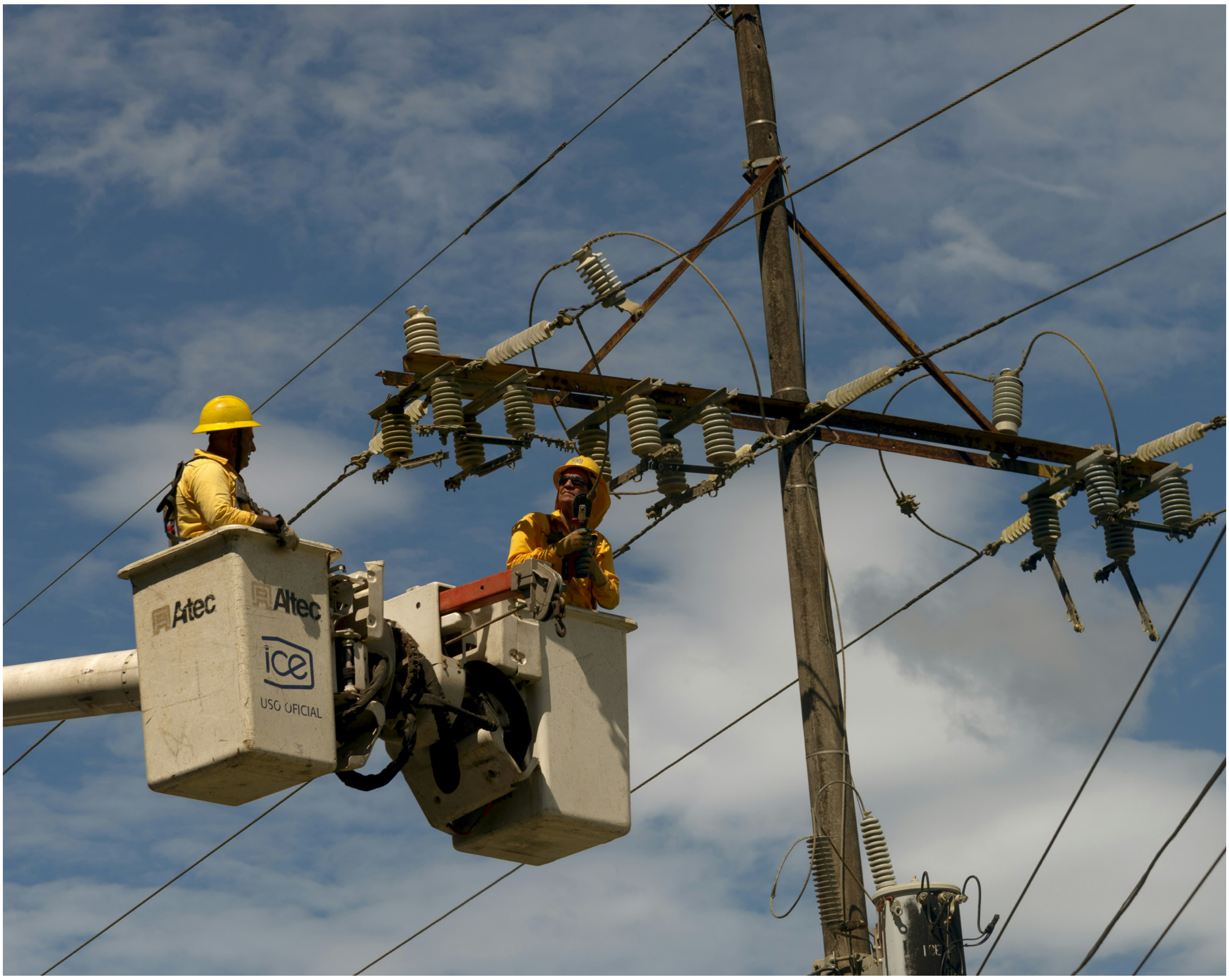


Table 1. Summary of barriers to scaling up and enabling conditions.

Group	Barrier	Enabling condition
Regulatory and economic	Absence of an explicit regulatory framework (obligations, incentives and remuneration mechanisms) that allows for the transition from pilots to mass programs	AMI regulatory roadmap (goals, phased rollout, governance, minimum performance obligations) and cost recovery mechanism (recognition on a regulatory basis/allowed income or equivalent scheme).
	"Model enterprise" approach that standardizes static physical assets and shifts risks to the distributor versus digital investments	Adjust efficiency criteria for digital investments: benchmarks by results, KPIs and recognition of costs associated with technological evolution.
	CAPEX/OPEX Asymmetry: The value of AMI depends on software, cloud, and telecom	Adopt total cost logic and/or TOTEX schemes; create regulatory categories to capitalize on software or recognize technology OPEX.
	Tariff schemes do not capture systemic benefits of AMI (loss reduction, operational efficiency, demand management)	Methodologies for monetizing and sharing benefits: part of the value is transferred to consumers and part is retained as an incentive for performance.
	Non-amortized assets	Implement regulatory treatment for early retirement assets (accelerated amortization, transition fund, regulatory deferral, or equivalent mechanism) and rules to avoid tariff shocks.
	Exchange rate risk and difficulty in accessing financing	Hedging/mitigation mechanisms (partial indexation, recognition of technology cost variations, multilateral financing/blended finance).
Technology and infrastructure	Last mile gap	Communications master plan (by territorial typology), prioritizing hybrid solutions and agreements with telcos
	Switching off 2G/3G networks: uncontrolled risk of obsolescence	Incorporate technology lifecycle criteria into specifications and procurement and a planned transition strategy.
	Complex interoperability: multiple technologies and standards generate incompatibilities, approvals and cost overruns.	Establish interoperability profiles, conformance testing, and a "compatibility catalog"
	Absence of mandatory standards and local certification	National/sectoral standardization and certification schemes that reduce interoperability risks and costs.
	Risk of technological captivity (vendor lock-in)	Multi-vendor strategy with data portability requirements, open APIs, exit clauses and continuity; preferring open standards verified by certification.
	Cybersecurity	Minimum requirements (encryption, authentication, segmentation, hardening, penetration testing), and explicit recognition of security costs
	Internal capabilities gap (AMI platforms, databases, monitoring, cybersecurity, IT)	Create PMO/AMI Transformation Office and capability plan (profiles, training, platform operation, analytics, cybersecurity); Define KPIs and data quality from the start.
Social and cultural	Lack of "social license": distrust and misinformation	Relationship strategy: proactive communication (tangible benefits), privacy protocols, service channels and early dispute management; Segment messages by type of consumer/territory.
	Rural or hard-to-reach areas	Differentiated deployments (rural/peri-urban/urban), with local partners, adapted schedules, reinforced logistics and a "first benefits" approach (use cases that the consumer perceives early).
	Physical security and fraud in territories with high vulnerability and non-technical losses	Comprehensive security plan: installation protocols, coordination with authorities/community, anti-fraud measures, personnel protection, replacement and explicit maintenance costs in the design of the program.

07
INTERNATIONAL REGULATORY APPROACHES

International experience shows that AMI deployment depends on the coherence of the regulatory framework. Different jurisdictions have adopted divergent approaches depending on their challenges, from national mandates to models based on economic analysis or market incentives.

Mandated rollout models with massive deployment: Countries such as Italy, Spain, and Japan established mandatory penetration goals and defined deadlines, with regulatory support for cost recovery. This approach accelerates deployment and achieves high standardization, but requires strong institutions and may be less flexible.

Models based on cost-benefit analysis and phased rollout: Jurisdictions such as Germany and the United Kingdom conditioned the deployment on verifiable results of pilots and economic analyses. This model reduces financial risk and allows technology to be adapted, but it can significantly delay the process and generate territorial heterogeneity.

Hybrid Models and Economic Incentives: Approaches Like Those in Texas (USA) and Ontario, Canada, combine flexibility with clear economic signals, such as early cost recovery and performance incentives, to make investing in AMI advantageous. It encourages innovation, but can result in uneven deployment speeds.

Operational efficiency-oriented models: Countries such as India have used AMI to address inefficiencies such as high losses and delinquencies, with targeted deployments in critical areas. This model generates rapid and measurable benefits, but it does not lead to universal penetration and may limit the evolution towards more advanced uses.

In terms of AMI functionalities, the first wave of implementations focused on basic functionalities such as automatic remote reading, hourly data, remote cut-off/reconnection and interruption detection. Although they were a significant improvement, their ability to enable advanced uses was limited. The second wave (AMI 2.0) arises to manage networks with distributed resources and greater cybersecurity demands. It requires advanced functionalities such as higher temporal granularity (5-15 minutes), edge computing, smart home interfaces, detailed bidirectional metering, and enhanced security. Countries such as Italy, Sweden and France are already in renewal cycles towards AMI 2.0. For countries that have not yet massively used measurement, this evolution offers an opportunity to directly adopt second-generation specifications.

The evolution of smart metering has shown that there is no single trajectory or set of functionalities that is optimal for all jurisdictions. Countries prioritize functionalities based on their challenges: tamper detection and remote shut-off for loss reduction; granular metering and low-latency communications for dynamic pricing and flexibility; bidirectional flow information for distributed generation integration; and event logging for resiliency and quality of service. Latin America can selectively adopt AMI 2.0 functionalities aligned with its priorities, avoiding investments in technologies that would become obsolete.

Technology is universal, but regulation must be contextual. While in Europe the driver was energy efficiency and in the US demand management, in Latin America the drivers are multiple, from loss control to the management of distributed generation. Success depends on a sophisticated incentive architecture. In jurisdictions with high losses, regulation must recognize real costs and prioritize functionalities such as transformer-level energy balancing and remote shut-off, with massive and geographic deployment. In markets with high penetration of distributed generation, regulation should value flexibility and grid services, justifying investment in AMIs by their ability to avoid grid reinforcements. This requires dynamic rates and high-granularity data. At the same time. Latin American NRAs must move directly (leapfrog) towards AMI 2.0 standards to avoid technological obsolescence. This means requiring low latency and high visibility for real-time management, promoting meters with edge computing capability, and regulating a local communication interface for the consumer (HAN).

To advance these strategies, four pillars of regulatory reform are proposed designed to mitigate region-specific risks and accelerate efficient deployment.

1. Phased deployment by value segments: Adopt a gradual mandate, starting with high-value consumers (large consumers, prosumers, critical loss zones) to validate the technology and fund later stages, but within an explicit trajectory towards full deployment.

2. Adoption of a TOTEX approach: Reduce the regulatory bias that favors CAPEX over OPEX. It's crucial to recognize the costs of software, cloud platforms, and cybersecurity in the tariff so as not to underinvest in system intelligence.

3. Cost-Benefit Analysis with a comprehensive approach: Be guided by social cost-benefit analyses that incorporate positive externalities such as resilience, improved quality of service and decarbonization. Quantify systemic savings in generation and transmission to strengthen the business case.

4. Technological neutrality and open standards: Regulation must be neutral in communication technology but strict regarding interoperability, requiring open standards. This prevents vendor lock-in, ensures future compatibility and encourages competition, reducing the final cost to the consumer.

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The accelerated adoption of advanced metering infrastructure has been made possible in several countries thanks to regulatory frameworks adelat