

TC Document

I. Basic Information for TC

▪ Country/Region:	REGIONAL
▪ TC Name:	Towards deep decarbonization of the electricity sector: Improving Pricing, Regulation and Governance
▪ TC Number:	RG-T4527
▪ Team Leader/Members:	Balza Angulo, Lenin Humberto (INE/ENE) Team Leader; Bagnoli Lisa Serena (INE/INE); Eguiguren Cosmelli Jose Manuel (INE/ENE); Arias Marin Karla Michell (INE/ENE); Baldivieso, Hector (INE/ENE); David Matias (INE/ENE); Yuri Daltro (INE/ENE); Jorge Luis Malpartida (INE/ENE); Guerra Silva, German Gustavo (INE/ENE); Escobar Rangel, Lina Patricia (INE/ENE); Calatayud, Agustina (INE/TSP); Landazuri-Levey, Maria C. (LEG/SGO); Aiello, Roberto Gabriel (INE/ENE); Suarez Aleman, Ancor
▪ Taxonomy:	Research and Dissemination
▪ Operation Supported by the TC:	.N/A
▪ Date of TC Abstract authorization:	.March 27, 2024
▪ Beneficiary:	Regional
▪ Executing Agency and contact name:	Inter-American Development Bank 23
▪ Donors providing funding:	OC SDP Window 2 - Infrastructure(W2B)
▪ IDB Funding Requested:	US\$350,000.00
▪ Local counterpart funding, if any:	US\$0
▪ Disbursement period (which includes Execution period):	36 Months
▪ Required start date:	August 01, 2024
▪ Types of consultants:	Individual and Firms
▪ Prepared by Unit:	INE/ENE-Energy
▪ Unit of Disbursement Responsibility:	INE/ENE-Energy
▪ TC included in Country Strategy (y/n):	N/A
▪ TC included in CPD (y/n):	N/A
▪ Alignment to the New IDB Group Institutional Strategy: Transformation for Scale and Impact (2024-2030) (CA-631)::	Diversity; Environmental sustainability; Gender equality; Persons with Disabilities; Productivity and innovation; Social inclusion and equality

II. Objectives and Justification of the TC

2.1 **Objective.** This Technical Cooperation (TC) will support the development of critical knowledge products regarding pricing/tariff schemes for electricity markets to accelerate energy transition and increase green technology adoption in Latin America and Caribbean (LAC) region. To this end, the technical cooperation has three main goals: (i) propose alternatives pricing/tariff schemes for a new paradigm: the entrance of variable renewable energy sources such as solar or wind; (ii) evaluate the feasibility of implementing new pricing models within the regional context; and (iii) analyze the design of new focalized incentive schemes related to the electrification of energy consumption.

- 2.2 **Justification.** The proper regulation of electricity markets is essential for the energy transition. Electricity accounts for approximately 30% of energy Greenhouse Gas (GHG) emissions in LAC region.¹ Moreover, a key element of economy-wide decarbonization is the electrification of energy consumption: a shift from fossil fuels to clean-based electricity within the transportation, industrial, commercial, and residential sectors, contributing considerably to the remaining 70% of energy GHG emissions.
- 2.3 However, the current design of electricity markets, designed for a world in which fossil fuel-based electricity was the backbone of electricity systems, has been considerably challenged by the entry of renewable energy sources, such as solar and wind power, which are essential for the decarbonization process. Also, the electrification of energy consumption will massify electricity use in areas where fossil-fuel use is still the rule (e.g., vehicles) and increase the total electricity demand. In this context examining how current tariff/pricing structure are ready to face this reality and propose new scheme is a critical step in the energy transition.²
- 2.4 The entry of these new technologies has challenged (and will challenge even more) the effectiveness of the current electricity market regulation at the generation, transmission, and distribution levels. At the generation level, the main challenge comes from the fact that these renewable sources are not dispatchable. In other words, neither the electrical system operator nor the plant owner can decide precisely when and at what capacity a solar or wind plant will operate. First, wind and solar resources are not always available; second, the level of the availability of the resource can change drastically from one hour to the next; and third when there is availability, its intensity cannot be accurately predicted in advance. Something drastically different occurs in the case of fuel-based electricity. System and plant operators know exactly how much fuel they have, how much the plant can generate with a given amount of it, and they can decide when to use it. In this regard, there are many open questions. For example: (i) what incentives should regulation provide to have generation capacity that will not be used regularly? (which is critical for providing security of supply when there is no wind or solar radiation or in periods of drought); or (ii) what is the optimal way to regulate the storage and to facilitate de entry of storage capacity?. Therefore, electricity markets need to consider adopting new (or adjust) pricing mechanisms to incentivize market participants to maintain adequate electricity supply to meet demand.³
- 2.5 The reforms associated with the transmission and distribution segments should not be left aside nor undervalued. In fact, the lack of transmission and distribution capacity is becoming a bottleneck for a successful energy transition. For example, while investment in variable renewables such as wind and solar has increased rapidly in the last fifteen years, global investment in grids has remained static at around

¹ [Balza, L., Heras-Recuero, L., Matías, D. and Yépez-García, A. 2024. Green or Growth? Understanding the Relationship between Economic Growth and CO₂ Emissions. Inter-American Development Bank, Washington D.C.](#)

² [Cavallo, E. A., Powell, A., & Serebrisky, T. \(2020\). From structures to services: The path to better infrastructure in Latin America and the Caribbean. Inter-American Development Bank.](#)

³ [Wolak, F.A., 2022. Long-Term Resource Adequacy in Wholesale Electricity Markets with Significant Intermittent Renewables. Environmental and Energy Policy and the Economy, 3, pp.155-220.](#)

US\$300 billion per year.⁴ Therefore, reviewing current pricing schemes in both segments and proposing alternative reforms is essential.

- 2.6 The transmission segment is not exempt from regulatory challenges. First, renewable resources like the sun or wind are where they are and cannot be in a specific location like a fuel-based plant can be. Secondly, a fuel-based plant can run most of the time, so the transmission line built for transporting the electricity from the generation to the consumption point is used most of the time. Given that renewable resources are often located far from consumption centers and that transmission lines to transport the renewables-based electricity would sometimes be in use, the consequences when designing how the transmission is planned and expanded and how transmission infrastructure users pay for it are enormous.
- 2.7 The challenges in the distribution segment are also remarkable. For example, households and firms can now generate their electricity, so they can not only buy but sell electricity to the system, which per se, brings challenges to how the final users pay for the electricity and the use of the network. For example, under current regimes, the fixed costs associated with electricity distribution are paid more significantly by those with a higher electricity consumption. However, what about those with solar panels at home directly injecting energy into the distribution grid? Under the current structure, they generally do not pay to use the grid to sell their electricity. Is this regressive? Is this sustainable? Moreover, the technological revolution has exacerbated the distribution segment's challenges. More and more every day, it is possible for households and firms to automate their electricity consumption and control many of their appliances remotely, which finally opens the door for final consumers to decide when they will consume electricity, making the demand less predictable. Creating a tariff scheme that facilitates the automatization of electricity consumption and the control of household appliances remotely facilitates the inclusion of women in the labor market since they often require a greater presence at home. The same goes for people with limited mobility. The automation of electrical consumption frees up time dedicated to domestic tasks, in which women and people with disabilities have a greater prevalence.
- 2.8 The TC's first goal is to propose alternative pricing/tariff schemes for a new paradigm in which: (i) there are non-dispatchable sources of generation; (ii) there is a strong requirement for new transmission capacity, and new transmission lines should incorporate sources located far away from consumption centers that feed the grid intermittently; (iii) the consumers are going to be a much more active agents in the markets that they are right now; and (iv) the demand for electricity will increase. However, all the alternative pricing/tariff regimes should be proposed within the context of the LAC region.
- 2.9 Even though the regulatory systems in many LAC countries are similar to those observed in developed economies, they are not the same. They also differ in their comparative advantages in terms of their source of energy. Without mentioning their differences in the institutional capacity to implement any proposed adjustment to the regulation. To mention some of the particularities of LAC countries: (i) in the region electricity generation relies heavily on hydropower, which constitutes 45% of its electricity supply, which relativizes the statement that fossil fuels have been the

⁴ [IEA \(2023\), Electricity Grids and Secure Energy Transitions, IEA, Paris.](#)

backbone of the operation of most electricity systems;⁵ (ii) the subsidy for electricity consumption and particularly for other sources of energy are quite relevant, reaching around 1% of the Gross Domestic Product (GDP);⁶ (iii) some of the countries are very rich in fossil fuel resources, and their economies have been structured around them; (iv) many of the current electricity markets in the region still constitute vertical integrated monopolies; and (v) the role of state-owned enterprises in some countries can be remarkable.

- 2.10 The second goal of this technical cooperation is to consider the feasibility and practicality of implementing new pricing models within the regional context, and to make evidence available to policymakers and key stakeholders (politicians, government officials, representatives of the private sector, civil society, and media) in the region. This TC aims to provide support to integrate cutting-edge research and applied knowledge generated to answer the most compelling practical challenges of the functioning of electricity markets, pushing the knowledge frontier forward and develop high quality products with important policy implications.
- 2.11 The third goal of this TC has to do with exploring the design of new focalized incentive schemes to accelerate the energy transition and increase green technology adoption, which in the context of this TC, is to consider in any proposed tariff/price scheme the fact that the electrification of energy consumption should play a central role in the energy transition. All the proposals related to reforms to the regulatory framework of LAC electricity markets should consider not only the fact that they should be put in place in a specific context (second goal) but also think that the electricity demand will increase considerably along with new uses. Any pricing structures should facilitate electromobility, the use of storage sources with different capacities and discharge times, and electricity use to produce green hydrogen.
- 2.12 **Strategic Alignment.** This project is aligned with the mutually reinforcing objectives of the IDB Group's Institutional Strategy: Transforming for Scale and Impact (2024 – 2030) to address climate change, promote sustainable growth, and reduce poverty. The project is aligned with each of its three strategic objectives. Regarding the first objective, incorporating renewable sources of electricity and electrifying energy consumption are among the central policies to mitigate climate change. In this TC, we will propose alternative tariff/pricing schemes to facilitate the incorporation of renewables and the electrification of consumption. The contents of this TC are aligned with the promotion of sustainable growth. New tariff/pricing schemes are essential for developing new markets, such as the massive adoption of electric vehicles, the production of green hydrogen, the use of critical minerals to develop electromobility and storage technologies, etc. Without mentioning all the benefits of sustainable development goals of covering the current electricity use with electricity generated from renewable sources. Finally, proposing new tariff/pricing schemes is aligned with reducing poverty and inequality. Tariffs in the region are often subsidized, and in general, they could be better targeted to people in need. In other cases, electricity consumption represents a significant burden on household incomes. The TC will incorporate, in the proposed schemes the idea that electricity should be affordable and fiscal resources should be optimally used. In addition, this TC is aligned with the Strategic Program for the Development of Infrastructure Financed with

⁵ [IEA \(2021\), Climate Impacts on Latin American Hydropower, IEA, Paris.](#)

⁶ [Black, M.S., Liu, A.A., Parry, I.W. and Vernon, N., 2023. IMF Fossil Fuel Subsidies Data: 2023 Update. International Monetary Fund.](#)

Ordinary Capital (GN-2819-1) by strengthening the technical capacity of the public sector and promoting knowledge.

- 2.13 The TC is also aligned with two sector frameworks. First, the Energy Sector Framework Document (GN-2830-8) and, in particular, with the lines of action such as: promotion of universal, reliable, and affordable access to energy services; promotion of efficient and sustainable power generation; analysis of technical and economic viability of substituting conventional generation with renewable sources; promotion of the “prosumers” models; analysis of the impacts of electric transportation on the grids; and assist countries in establishing regulations that give clarity to potential investors. Second, the Climate Change Sector Framework Document (GN-2835-15) and its second line of action: decarbonize rapidly. In particular with : implement already available decarbonization solutions; and ensure a just transition to net-zero emissions. In addition, this TC is aligned with the Strategic Program for the Development of Infrastructure Financed with Ordinary Capital (GN-2819-1) by strengthening the technical capacity of the public sector and promoting knowledge.

III. Description of activities/components and budget

Activities will be organized under the following components:

- 3.1 **Component 1. Primary data collection (US\$100,000).** This component aims to collect valuable data on electricity market operations, including wholesale markets, transmission, distribution, and commercialization segments. The data will encompass historical data from selected LAC countries. The countries selected for the analysis will be chosen based on data availability and their representativeness of the region's reality. They will be fundamental for diagnosing the sector's performance, understanding challenges, and providing recommendations to improve the efficiency and equity of electricity markets in an era of new paradigms. Activities in this component include the collection, homogenization, and systematization of information on some of the following topics: a) wholesale electric market operations at the plant level, including electricity prices, generation, capacity, and fossil fuel consumption; b) commercialization data such as long-term contracts and volumes traded in short-term markets; c) distribution and transmission data, including distribution and transmission fees; d) key regulatory data to identify the main characteristics in the operation of electricity markets; and e) qualitative data about the main characteristics of electricity markets such as private sector participation, market structures, ownership of transmission and distribution companies, the number of participants in each segment, and the main actors in market operations.
- 3.2 **Component 2. Applied Research in Electricity Market Design, particularly in Tariff/Pricing (US\$185,000).** This component will support the development of new and innovative applied knowledge products in areas related to tariff/pricing schemes in electricity markets in LAC. Papers are expected to cover, among others, the following topics: a) what is the best way to structure tariffs at the household level? Should they rely more on fixed or variable charges?; b) who should pay for the new transmission capacity? The supply or the demand? If the demand, should all users of the system or just the ones who get the benefit of the new infrastructure?; c) What is the right way to remunerate the storage capacity in the system?; d) What is the role of the capacity market in facilitating the entry of variable renewables into electricity systems?; and e) What are the best tariff structures to introduce the adoption of electric vehicles?.

- 3.3 Component 3. Knowledge Management and Dissemination (US\$65,000).**
 This component supports project coordination, promotion, synergies, exchange, and dissemination of generated knowledge necessary for the project’s success. Relevant knowledge products generated by this TC will be integrated into the IDB research & policy discussion paper series. More specifically, this component will provide support for editing, systematization and dissemination of the knowledge products generated under components 1, and 2. All knowledge products prepared and generated by this TC will be the sole and exclusive property of the Bank and as such the Bank has exclusive title, rights (including copyright) and interest in the products. The Bank may copy, reproduce, distribute, disseminate, publish and/or display the products in any format or media now known or hereafter developed, in any publication, website, blog, catalog, event, exhibit, archive, as well as in any Bank materials. The cost of publications is included in this component.
- 3.4 The total project cost amounts to US\$350,000 and is financed entirely by the Ordinary Capital Strategic Development Program (OC SDP) Window 2 - Infrastructure (W2B).

Indicative Budget

Activity/Component	IDB/Fund Funding (US\$)	Total Funding (US\$)
Component 1: Primary data collection	100,000	100,000
Component 2: Applied Research in Electricity Market Design, particularly in Tariff/Pricing Regulation.	185,000	185,000
Component 3: Knowledge Management and Dissemination	65,000	65,000
Total	350.000	350,000

IV. Executing agency and execution structure

- 4.1 The Bank, through the Energy Division (ENE), will be responsible for the execution and supervision of activities, in accordance with the guidelines and requirements established in the Technical Cooperation Policy (GN-2470-2). The Bank is ideally positioned, given its vast presence in the region, its capacity to engage the most relevant stakeholders, and its knowledge across all infrastructure sectors, to undertake the data collection and studies necessary to complete the project, and to disseminate the results among relevant actors in the region. The Bank is expected to serve as a catalyzer of knowledge, innovation, and impact policy on multiple scales within the region, making the regional coordination of the IDB - 7 - a necessary condition of this TC. ENE is best equipped to manage this operation and to ensure the coordination needed. Active engagement with and awareness of the work of other organizations operating in the field will also help avoid any potential overlaps with on-going efforts. Prior to the initiation of specific in-country activities in the beneficiary countries, the Bank will obtain the letter of non-objection from the corresponding liaison office.
- 4.2 All procurement to be executed under this Technical Cooperation have been included in the Procurement Plan (Annex IV) and will be hired in compliance with the applicable Bank policies and regulations as follows: (a) Hiring of individual consultants, as

established in the regulation on Complementary Workforce (AM-650) and (b) Contracting of services provided by consulting firms in accordance with the Corporate procurement Policy (GN-2303-33) and its Guidelines.

V. Major issues

- 5.1 The risk assessment carried out has identified two implementation risks and defined mitigation risks for each. First is that findings and policy recommendations are not adopted by policymakers and practitioners. To that end, the project team will work closely with partners, policymakers, and stakeholders in all phases of the project to ensure findings resonate with policymaker's needs and priorities.
- 5.2 A second implementation risk is scarcity and quality of reliable data and information. In this regard, the team will leverage IDB's relationship with governments and stakeholders in LAC to facilitate access to information. Project partners will engage with data collection agencies, civil society organizations, and relevant private firms to achieve its goals.

VI. Exceptions to Bank policy

- 6.1 It is not expected to request exceptions to any Bank policy.

VII. Environmental and Social Aspects

- 7.1 This TC is not intended to finance pre-feasibility or feasibility studies of specific investment projects or environmental and social studies associated with them; therefore, this TC does not have applicable requirements of the Bank's Environmental and Social Policy Framework (ESPF).

Required Annexes:

[Results Matrix_33534.pdf](#)

[Terms of Reference_42837.pdf](#)

[Procurement Plan_29789.pdf](#)