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ECUADOR'S ENERGY SECTOR OPPORTUNITIES

Scaling Up Renewable Energy

December 8, 2021

SCALING UP RENEWABLE ENERGY (SURE)

ECUADOR'S ENERGY SECTOR OPPORTUNITIES

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USAID Contract No. 7200AA19D00029/7200AA20F00013

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ACRONYMS

AEEREE	Ecuadorian Association of Renewable Energies and Energy Efficiency
AFD	French Development Agency
PPP	public-private partnership
ARCERNNR	Agency for the Regulation and Control of Energy and Non-Renewable Natural Resources
BID	Inter-American Development Bank
CELEC	Electricity Corporation of Ecuador
CENACE	National Center for Energy Control
CIP	Chamber of Industries and Production of Ecuador
CNEE	National Energy Efficiency Committee
COPCI	Organic Code of Production, Trade and Investment
DFC	Development Finance Corporation
EE	energy efficiency
USA	United States
RE	renewable energy
ESCO	energy service company
GIZ	German Agency for International Cooperation
IIGE	Geological and Energy Research Institute
INEN	Ecuadorian Service for Standardization (formerly Ecuadorian National Standardization Institute)
ISO	International Organization for Standardization
VAT	value-added tax
JICA	Japan International Cooperation Agency
LOEE	Organic Law on Energy Efficiency
LOSPEE	Organic Law of the Public Service of Electric Power
MEF	Ministry of Economy and Finance
MERNNR	Ministry of Energy and Non-Renewable Natural Resources
MPCEIP	Ministry of Production, Foreign Trade, Investment and Fisheries
MW	megawatt
PEC	Energy Efficiency Program for Induction Cooking and Electric Water Heating
PLANEE	National Energy Efficiency Plan
PME	Ecuador Electricity Sector Master Plan
UNDP	United Nations Development Program
PPS	public selection process
SNEE	National Energy Efficiency System
SNI	National Interconnected System
SURE	Scaling Up Renewable Energy
USAID	U.S. Agency for International Development
USFQ	Universidad San Francisco de Quito

EXECUTIVE SUMMARY

The assessment titled *Scaling Up Renewable Energy: Ecuador's Energy Sector Opportunities* has two objectives: to identify the main problems that hinder Ecuador's progress with respect to the adoption of renewable energy (RE) and energy efficiency (EE) technologies; and to help prioritize areas where USAID assistance can best be leveraged to overcome the barriers identified. The priority areas of the project are the mobilization of capital for investment in RE and EE, investment financing, procurement processes (tenders, public selection processes and other aspects) for RE and EE projects, regulatory incentives for RE and EE investment, the integration of the RE in electrical networks, technical EE standards, workforce capacity building and training, and fuel subsidies.

In addition to the revision of past studies and other documents, the project has been carried out through field work, which has involved conducting interviews and workshops with a wide variety of participants and organizations linked to the Ecuadorian electricity sector.

The key issue for RE and EE advancement in Ecuador is attracting private investment. The national government's vision is to stimulate this type of financing as a way to overcome the current challenges in terms of capital mobilization. However, achieving this goal still has significant limitations. On the one hand, regulatory advancements have been made, opening up new spaces for private investment. Also, other equally important changes are in preparation. On the other hand, there are still barriers to overcome:

- Price subsidies, strongly discouraging private investment in RE and EE and depriving the public sector of resources to contract private investment.
- A legal framework that maintains the exceptional nature of private investment, requiring either a public selection process or the delegation of the Ministry of Energy and Non-Renewable Natural Resources (MERNNR).
- Transaction limitations between entities linked to the National Interconnected System (SNI).
- Complex processes to implement investment projects.
- Terms for the sale of generation surpluses, dispatch of RE resources, and purchase and sale of ancillary services.
- Persistent concerns about legal certainty in contracts entered into with public entities.

Without a broad reform that gives more prominence to the market, financing the expansion of RE and EE mainly from private investment and deepening the regional electricity integration with Colombia and Peru will be quite hard.

Subsidies and the reform in general are not issues that USAID can solve either directly or in the short term. However, it can help overcome current limitations with tactical support actions that improve private investment incentives and leverage its resources; USAID can also directly help improve the investment environment.

Our recommendations fall into three categories: priority recommendations, which require immediate attention from USAID due to their combination of major impact, reasonable costs, and use of USAID resources; medium-term recommendations, which require a longer period of time for their development, or which have a smaller impact and, thus, do not require priority in allocating USAID resources; and opportunities to increase the effectiveness of USAID resources by collaborating with other donor initiatives in the RE and EE areas.

PRIORITY TOPICS

1. **Cost of service and rate structure studies.** Given the key importance of rate subsidies for private investment in EE and RE and the highly politicized nature of electricity rates within the country, the most effective tactical support that USAID can provide to the Government of Ecuador is carrying out studies that allow the measurement of the value of current subsidies and make the mismatch between electricity supply costs and the pricing levels transparent to the population. The first analysis should examine the current cost of service for the main types of consumers and serve as the basis for a ratemaking study that develops recommendations on the structure of electricity rates in order to stimulate RE and EE investment.
2. **Development of a roadmap to attract investments and a regulatory framework for renewable energies.** The Government of Ecuador has proposed to formulate a policy and to reform the legal and regulatory framework to promote private investment in all stages or activities of the electricity sector. A high-impact strategy would be to support the MERNNR in complying with this mandate to attract investment in non-conventional renewable energies, and the adaptation of the sectoral regulatory framework required for implementation of the mandate.
3. **Design of incentives to promote distributed renewable resources, including energy storage and renewable self-generation.** This technical assistance would consist of supporting the Agency for the Regulation and Control of Energy and Non-Renewable Natural Resources (ARCERNNR) as a sectoral regulator in developing these public policy actions established by the Government, assisting it in the design of incentives aimed at promoting distributed generation and other distributed resources, such as storage and renewable self-generation. Support could include the development of an action plan to achieve the investment goal in installed renewable self-generation capacity established by the Government for 2025.
4. **SNI code(s).** Considering the lack of a grid code, its importance in reducing the risk of investment in RE, and the extensive international experience and knowledge of USAID in integrating RE resources into electrical systems, it makes sense to support the ongoing work of preparation of the grid code and other complementary regulations concerning the interconnection, operation and planning of the SNI, particularly with regard to RE resources.
5. **Tenders.** In order to improve the bidding process to attract widespread interest and achieve optimal results for the Government, we advise to closely monitor the recently announced tender for 500 MW of ER, particularly given the U.S. Department of State's support to past bidding processes and the Development Finance Corporation's support to the financial closure of the selected projects. In this sense, USAID can monitor the processes followed and their impacts on the number of offers and conditions offered, as well as the level of international interest on the part of investors and sponsors. This option does not entail technical assistance, but will allow the subsequent development of recommendations and Government support, including a possible collaboration with the new USAID initiative on transparency in public

procurement (PADF). With the tender underway, immediate involvement would be an alternative, which would require contributing resources and complementary skills to the government work team responsible for the tender. Lastly, a complementary activity may be to support the recently created Technical Office of Public-Private Partnerships (PPP) in the adaptation of the PPP regulations.

6. **Popularization of EE and RE, including distributed generation.** To correct the lack of knowledge about EE and distributed generation that the country seems to have, and taking advantage of USAID's enormous worldwide experience in outreach and information programs for business development, here is another possibility with a significant net benefit. This possibility should also include the popularization of RE among municipalities and rural communities to enable communication and negotiation when developing local RE projects.
7. **Support for capital contribution.** USAID's close collaboration with DFC presents many synergies to help DFC mobilize its resources for RE and EE investment.

MEDIUM-TERM RECOMMENDATIONS

1. **Development of a wholesale electricity market and market instruments for ancillary services.** In view of the major impact that market mechanisms would have for the development of RE, and USAID's broad experience and knowledge on this topic, a USAID initiative in this regard would have a significant net benefit in the medium term.
2. **EE technical standards, ESCO guidelines and energy audits.** Support in this area would speed up the development of these matters. There is a particularly valuable opportunity in the case of ESCO guidelines, given that it would allow USAID to take advantage of the experience that the U.S. has with these types of entities.
3. **Targeting of hydrocarbon fuel subsidies and support for the sectors that are most vulnerable to their elimination.** The reduction or reform of fuel subsidies can have a major impact on RE and EE investment, since low fuel prices favor the use of internal combustion engines without regard to efficiency. The Government of Ecuador has requested USAID's support to develop targeting schemes for these subsidies in the groups that are most vulnerable to their reduction or elimination.
4. **Workforce training.** We propose that training programs be developed for installers of distributed generation equipment and EE items, which would complement those of the EE regulations and ESCO guidelines. By creating a skilled workforce, they would contribute to the popularization of EE and distributed generation, and would have a directly positive social impact.

COMPLEMENTARITY WITH RESOURCES AND PROGRAMS FROM OTHER DONORS

Last but not least, it is worth noting the opportunities to increase the effectiveness of USAID resources through the collaboration with other donor initiatives in the RE and EE areas. These are not additional recommendations, but rather possibilities to increase the chances of success of some of the previous recommendations, by leveraging resources outside the U.S. Government that complement those of USAID and other national agencies.

INTRODUCTION

PROJECT OBJECTIVES AND SCOPE

The assessment titled *Scaling Up Renewable Energy: Ecuador's Energy Sector Opportunities* has two objectives: first of all, to identify the main problems that hinder Ecuador's progress with respect to the adoption of renewable energy (RE) and energy efficiency (EE), including technical, economic, environmental, social and other aspects; and second of all, to help prioritize areas where USAID assistance can best be leveraged to overcome the barriers identified in the following matters: private sector's role and potential, training, investment incentives, financing, energy block bidding processes, and technical standards.

The analysis of the current obstacles to RE and EE takes various types of barriers into account. The first type are technical barriers, such as the interconnection of resources to electrical grids, technical capacity and experience of available resources, and manifestations of climate change, especially on hydrology. Another type of barrier is economic, such as the scale of investment required and the incentives for private initiative to take action. Lastly, there are also political barriers, such as price and hydrocarbon fuel subsidies, local RE impacts, regulatory policies, and the governance of the public company.

At the beginning of the project, and on the preliminary basis of a desk study prepared for USAID in May 2020 and the knowledge of the project team, the following priority areas were identified: mobilization of capital for RE and EE investment; investment financing; procurement processes (tenders, PPS and other aspects) for RE and EE projects; regulatory incentives for RE and EE investment; the integration of RE in the electrical grids (particularly interconnection); technical EE standards; workforce capacity building and training; and fuel subsidies.

In addition to going over past studies and other documents, the project has been carried out through field work that has involved conducting interviews with a wide variety of participants and organizations linked to the Ecuadorian electricity sector (refer to the list in Annex 2), both public and private, and non-governmental organizations. This extensive information collection process has been successful in the two workshops held, one of which was aimed at public sector stakeholders and the other at private sector stakeholders (refer to the list of participants in Annex 3).

PROJECT CONTEXT: CHALLENGES FOR ECUADOR

CAPITAL MOBILIZATION. With a limited RE and EE project foundation, and in light of limited public sector resources, the greatest potential for quick RE expansion and EE enhancement comes from private investment, which must find ample opportunities that have not yet been exploited. For example, the widespread use of petroleum derivatives as fuels in isolated electricity systems can create significant opportunities for RE. In addition, climate change is altering the hydrological cycles on which the country's large hydroelectric plants, such as Coca Codo Sinclair, depend. However, attracting private investment is not necessarily easy in a context that has been dominated almost exclusively by the public sector for years, and whose procurement processes and legal framework maintain a structural bias in favor of the State.

TRAINING OF HUMAN RESOURCES. The lack of qualified labor for RE and EE projects in Ecuador can create important bottlenecks for investment. In the academic field, a couple of important steps have been taken in this direction, but technical institutes do not provide technical and vocational training. Given that there is a great complementarity between the development of technical regulations and the qualification of people who understand and know how to apply those regulations, the lack of qualified labor and training programs is even more discouraging for private investment in EE.

REGULATORY INCENTIVES. One of the main reasons for the current investment model in the Ecuadorian electricity sector to become depleted is the gap between the levels of current rates and generation, transmission and electricity distribution costs. These price subsidies create great disincentives for RE and EE investment, but the visibility and impact of electricity rates make it difficult to adjust them to levels that are more in line with sectoral costs.

ADAPTATION OF ELECTRICAL GRIDS AND RE MANAGEMENT PROCESSES IN SECTORAL COMPANIES. The integration of RE in electrical grids requires adaptation in terms of the intermittency of these sources, their cost structure and their location, whether close to resources (wind, sun, water) or close to demand. The rise in RE installations will bring with it additional complexity to the country's electrical grids, and create new service failure risks, which could cause a negative reaction towards RE. Therefore, adapting networks and the RE management processes in electricity companies, which requires thorough changes in company operations, is essential for RE development.

TECHNICAL EE STANDARDS. There is broad potential for the development of technical EE regulations in Ecuador, essential to educate and guide consumers, create incentives for investment in EE, and guide investment plans and mechanisms.

HYDROCARBON FUEL SUBSIDIES. The current diesel and high-grade gasoline distribution pricing band system, which establishes a limit for price increases or reductions of up to a maximum of 5% depending on the international price variation, does not allow full cost recovery, thus representing a significant fiscal burden for the Ecuadorian State, and distorting prices in favor of these fuels (some of which are imported) and against RE and EE investment. It also leads to a greater use of polluting fuels that contribute to climate change, making it more difficult to comply with the country's international commitments on this matter.

MAIN TOPICS AND KEY MESSAGES OF THE REPORT

In keeping with the above-mentioned challenge of capital mobilization, the key topic for RE and EE advancement in Ecuador is attracting private investment. The Government of Ecuador's vision — clearly expressed in our interviews — in communications with various government bodies, and more recently in Executive Decrees 238 and 239, is to stimulate this investment as a way to overcome current capital mobilization challenges. Thus, there are no major public RE and EE investments scheduled, nor more broadly in large projects for the electricity sector. However, the realization of this vision still faces major limitations for private investment, as explained below.

On the one hand, important regulatory advances that open up new spaces for private investment have been made, with the issuance of new standards on self-sufficiency (Regulation No. ARCERNNR-001/21) and distributed generation (Regulation No. ARCERNNR-002/21), and very recently, the approval of the Regulation of the Organic Law on Energy Efficiency. In addition, other equally important changes are in

preparation, specifically amendments to the Regulation for Public-Private Partnerships (Decree 1190) and the revision of the Ecuador Electricity Sector Master Plan, the latter of which intends to incorporate more ambitious goals on the development of RE resources.

On the other hand, there are still limitations to overcome. The first is price subsidies, which even affect electricity transmission rates. The primary subsidies are discounts in the electricity rate for users with limited income, which in principle must be compensated by budgetary contributions from the State to the sector, but which in practice are not. There are also implicit subsidies to the electricity rate in the form of direct financing from the State for public generation projects. This direct financing is not included in electricity supply costs and, as a result, is not carried over to the electricity tariff, resulting in rate levels that do not correspond to the true cost of electricity supply. Such subsidies strongly discourage private RE and EE investment, and deprive the public sector of resources to attract it through procurement contracts. Due to the financial impacts of the subsidies, private investors require stronger payment guarantees in concession or purchase agreements entered into with public entities, such as the guarantee fund (fideicomiso) for generation investment agreements. Subsidies also put a halt to the opening to distributed generation and self-sufficiency, given the concern of the authorities about the loss of income of the distributors, and the worsening of the financial situation of the sector that this would cause, stemming from the reduction in the volume of energy purchased from distributors (USFQ, ARCERNNR).

The second limitation refers more generally to various elements of the investment environment that can hinder the dynamism of private initiative:

- It is important to mention that, pursuant to Art. 25 of the Organic Law of the Public Service of Electric Power (LOSPEE), private investment projects can only be carried out exceptionally: they need either a public selection process or the delegation of the MERNNR, in the case of RE.
- Transactions between entities connected to the SNI are still controlled by public entities, and not guided by a market that enables competition and free contracting between generators and consumers, as is the case in Colombia.
- The implementation of investment projects requires processes that can suffer long delays and be quite uncertain, particularly for obtaining environmental permits and interconnecting to transmission or distribution networks.
- The conditions for the sale of generation surpluses, dispatch of RE resources and purchase and sale of auxiliary services are either unclear or non-existent.
- Lastly, there are concerns about legal certainty in contracts entered into with public entities. Despite the Government's efforts to enhance the conditions of the concession agreements for future projects, the LOSPEE still contains provisions that grant discretionary and asymmetric powers to State for the latter to declare the invalidation or early termination of agreements.

Generally speaking, without a broad reform that gives more prominence to the market, it will be very difficult to ensure that the financing of the expansion of RE and EE comes mainly from private investment, and to deepen the regional integration of the electricity sector with Colombia and Peru, countries that have electricity markets already in place. In turn, with limited investment the possibilities

of the national energy transition agenda and the technological transformation of the sector will be stunted.

Subsidies and the reform in general are not issues that USAID can solve either directly or in the short term. As explained above, subsidies have great political resonance, and the reform requires both paradigm and regulatory changes that take time and conciliation between public and private stakeholders and citizens. However, USAID can help overcome current limitations with tactical support actions that improve private investment incentives and that draw on USAID resources; USAID can also directly help improve the investment environment, as discussed in the recommendations section of this report.

RULES AND REGULATIONS

LEGAL FRAMEWORK

The Ecuadorian electricity sector operates as a whole within a clear legal framework and structure. The Organic Law of the Public Service of Electric Power (LOSPEE), enacted in 2015, articulates the sector with clear definitions of the functions and responsibilities of its various entities. These correspond to those observed in international practice, with a vertical division between generation, coordination, transmission and distribution; a geographical division of the distribution in companies with different territorial areas; and a horizontal division between operation, regulation and planning (based on the Ecuador Electricity Sector Master Plan prepared by the MERNNR), and public policies.

However, the LOSPEE reflects the vision of past Governments, in which the State should assume the predominance in the sector and the private initiative acted exceptionally. Therefore, Art. 25 establishes that private companies can solely participate in the electricity sector with the authorization of the Ministry of Energy and Non-Renewable Natural Resources (MERNNR). Although the law allows a more flexible authorization process for renewable energy than for other types of investment, the legal framework contrasts with a framework of free private initiative, where it is only subject to obtaining environmental and construction permits, and to the requirements for interconnection with the electrical grid. Although this distinction may be diluted by government regulations that free up investment in renewable energy in practice, the current law still implies a greater legal risk than if the principle of freedom of initiative was followed, since it allows the government in power to take restrictive measures.

On October 26, 2021, the Government of Ecuador published Decree 239, reforming LOSPEE Regulations. The decree upholds the ambivalence between private investment and State control described in preceding paragraphs. Various articles seem to require bidding and concession processes and qualification certificates for self-sufficiency and distributed generation projects that, based on the LOSPEE, would not require a concession (as in the case of large consumers), or for which a simplified authorization process would suffice (such as self-generation).

As for EE, the Organic Law on Energy Efficiency (LOEE) of 2019 creates an adequate legal framework for private investment, complemented by a planning mechanism and by coordinating bodies that can guide private activity and ensure coherence between its initiatives and those of the public sector. Specifically, the LOEE requires the MERNNR to prepare a National Energy Efficiency Plan (PLANEE) and to update it every other year, and creates the National Energy Efficiency System (SNEE) and the National Energy Efficiency Committee (CNEE) in order to ensure the development and coordination of EE policies. On October 20, 2021, the Government approved the LOEE Regulation, thus completing a key element of the legal framework for EE investment.

Although the LOSPEE does not require a public tender to develop private RE projects, as previously mentioned, the current Government and its predecessor have used tenders as a way to encourage private investment, by guaranteeing the revenue of projects with successful bids through the sale of their output to distribution companies (refer to section 3 of this report). Therefore, it is also important to examine the legal framework for public selection processes (PPS) and also for public-private partnerships (PPP) within the context of this report, in the latter case due to the fact that agreements

made by and between distribution companies and successful RE bidders constitute a future obligation for the State and, thus, fall under the scope of PPP legislation.

In this sense, recent regulatory changes have introduced new potential barriers to private investment. The primary legislation that governs PPPs is the Organic Law on Incentives for Public-Private Partnerships and Foreign Investment of 2015. The most recent amendment to the regulation of this law is Decree 1190 of November 2020. For private RE investment, the most relevant element of the law and its regulations, especially from Decree 1190, is the power attributed to the Ministry of Economy and Finance (MEF), particularly with regard to the control of State financial obligations that can be created by PPP agreements and that can affect the fiscal position of the country and thus the public debt agreements with creditors. This creates the risk that tenders to attract private investment will be canceled due to these types of fiscal considerations. Although the standards of the decree and the MEF are usually aligned with international standards, they are not suitable for electricity concessions, especially for the type of tenders or auctions per power block launched by the MERNNR (described in the next section of this report). Decree 1190 also establishes a public bidding process in Section III for PPP projects managed by the private sector, which does not represent problematic aspects. This process is also shaped by the provisions set forth in Art. 52 of the LOSPEE, although in a much more general way. Furthermore, according to some interviewees (CELEC, EMELNORTE), public procurement processes suffer from constant changes, depriving them of stability for private investors, and from numerous bureaucratic demands.

Other relevant regulations for private investment in RE and EE establish important tax incentives. According to the Organic Code of Production, Trade and Investment (COPCI), equipment used for RE and EE projects benefits from import tariff exemption, a 0% value-added tax (VAT) rate, and accelerated amortization deductions and depreciation of assets, with the consequent reduction in income tax in the initial periods of the project. However, these incentives do not appear to have managed to reverse the negative situation created by the price subsidies and other limitations mentioned, in view of the little private investment observed to this day.

The standards recently issued by the ARCERNNR on self-supply (Regulation No. ARCERNNR-001/21) and distributed generation (Regulation No. ARCERNNR-002/21) represent a significant advance to start opening the market to private investment: just in the area of self-supply, the RE potential is estimated at 400 MW—according to a study by Escuela Politécnica Nacional cited by the MERNNR—, especially for Petroecuador and more broadly for the oil sector (Petroecuador, Legge Abogados). According to CELEC, there is no use of RE in isolated electricity systems. These regulations simplify the administrative process to develop private RE projects (within the conditions established in these regulations), establish an hourly net balance mechanism for the sale of surpluses to generation companies (i.e., they set the price of RE at the rate level paid by the energy consumer/producer), and set preferential dispatch for RE. However, the impact of these regulations is uncertain due to several factors: the significant price subsidies that are still in force, entailing a low RE price under the net balance system, as explained below; uncertainty about the capacity and willingness of distributors and, in relevant cases, of Transelectric, to meet the interconnection deadlines set by regulations (according to some public sector entities, there are no studies or experiences in this regard); the limitations on the application of these standards, outside of which a bidding and procurement process is still required with a maximum price set by ARCERNNR based on levelized production costs; the requirement of the bureaucratic process of

authorization by the MERNNR for distributed generation installation; and large hydrocarbon fuel subsidies, limiting the economic benefits of using RE for self-supply.

Lastly, Executive Decree No. 238, issued on October 26, 2021, aims to give momentum to electricity sector priorities of the current Government's policy, indicating some obligations of public sectoral entities that must be fulfilled within three months, and that will determine the bases for the greater incorporation of RE and EE in the energy matrix. By establishing these priorities, the decree offers a basis for the development of USAID actions with a greater probability of a positive response from the Government, as reflected in our recommendations.

NATIONAL INTERCONNECTED SYSTEM (SNI) REGULATIONS

A significant deficiency in Ecuador is the lack of a grid code that establishes the SNI norms for all entities directly connected to it, and especially generation plants, including RE. We understand that this code is in the development stage, the completion and approval of which will reduce the uncertainty of RE project investors, provided the code regulates the following aspects of the interaction of RE plants with the SNI:

- **Rules and deadlines for interconnection with the SNI.** Concerning this matter, some public entities have notified their concern about the impacts of RE on the SNI, as it is a not very dense system and, therefore, there is a higher risk of congestion. In particular, many areas of the country with great potential for RE (whether wind, solar irradiance or waterfalls) lie in places with little capacity in the transmission network, thus making the RE evacuation capacity limited, or require significant investments in the grid. On the other hand, delays or additional costs in interconnection can mean the loss of profitability of a project for RE investors. However, the MERNNR foresees the completion of the interconnection code by 2021, a major advance on this topic.
- **RE resource dispatch scheme.** RE installations tend to have priority in dispatch, subject to the availability of backup resources for intermittency, given their practically zero marginal cost and intermittent production. Dispatch criteria must be sufficiently clear to reasonably foresee the volume of energy generated that may be injected into the network and generate income or benefits for RE installations.
- **RE forecast integrated into system operations.** This involves developing short-term forecasts of the future production of the variable renewable energy power plant, usually one week ahead, one day ahead, or within the same day in advance. The integration of such forecasts into the dispatch scheme has emerged as a cost-effective tool to reduce forced demand reductions, improve matrix flexibility, and increase RE penetration at the lowest cost. CENACE confirms that it is already developing internal procedures and improved forecasts for the adequate integration of RE into the SNI.
- **Assessment of RE (generation surplus).** In connection with the above, the valuation criteria for generation surpluses allow the forecasting of the revenues for this item, which may have an effect on the profitability of RE projects.
- **Ancillary services.** RE installations can both provide and make significant use of ancillary services, especially by reason of their intermittency. Therefore, RE project profitability may be affected by the definition of these services and the criteria for calculating the rates or

surcharges for their consumption, or, otherwise, the payments to the providers of these services. Ancillary services are currently not defined and priced adequately in the SNI (Neoen).

- **Energy storage.** In a growing number of electricity systems with commercial transactions (e.g., Chile), energy storage is being accepted as a differentiated and remunerative product, thus creating incentives for investment in storage, which is highly complementary to RE and, thus, a facilitator of investment in this type of energy.

PRICING

Although the LOSPEE and its regulatory development on pricing issues are quite consolidated — mainly thanks to the work carried out by the ARCERNNR—, as mentioned above, the electricity rate subsidies represent a great disincentive to RE and EE investment. In this sense, we first need to understand and make the cost of the service transparent to electricity consumers in Ecuador. This information would make it possible to be aware of the precise level of subsidy in the different types of rates. The calculation of this cost must include investments in the sector financed directly by the State, as it seems is the case of loans with Chinese entities for the financing of Coca Codo Sinclair, and not only investments financed from the balance of sectoral companies. The incorporation of RE resources — with the aforementioned cost scheme — also creates additional challenges to value the energy generated by these resources.

REGIONAL TRANSACTIONS

Electricity purchases and sales with Colombia and Peru may have an impact on RE in Ecuador, in the sense of offering better support possibilities for intermittency, and expanding the potential market for RE, especially in view of the complementarity of hydrological cycles between Ecuador and Peru (Transelectric). This makes it advisable to analyze these potential impacts, and those of the changes that may need to be made to the regulations that currently govern regional transactions, in order to adapt these regulations to the incorporation of RE. In view of the development of RE in Colombia, it would only be logical to expect a reciprocal interest in this adaptation on the part of the Colombian Government.

TENDERS AND FINANCING

RECENT EXPERIENCE AND ONGOING PROCESSES

The MERNNR recently announced concession processes for three blocks of electricity generation and transmission projects, which add up to expected investments totaling \$1861 million. As for RE, it is a 500 MW block, which constitutes the initial block of a total of 1,400 MW expected for 2024-2028, according to the most recent revision of the Ecuador Electricity Sector Master Plan (PME) of August 5, 2021 (Agreement No. MERNNR-VEER-2021-0008-AM). These public selection processes (PPS), which were promotionally launched by the MERNNR and the Electric Corporation of Ecuador (CELEC), have caused much expectation within the energy investment sector in Ecuador. The vision of the State, with these processes, is oriented to the incorporation of private investment in sectors that were completely monopolized by different state companies and that now must and will be executed with a private vision, from a technical and financial efficiency perspective.

In the PPS announced in September, the block sizes, both for RE and thermal generation, conform to the long-term system energy needs, in accordance with the policies, assumptions and restrictions contemplated in the PME, ensuring power reserves and energy, as well as the reliability of the system to supply the demand. Renewable generation projects have certain incentives, such as specific processes for technology and preferential dispatch conditions (MERNNR).

This contracting modality was used for the first time in plans initially launched in August 2019, with renewable energy projects such as Aromo (200 MW photovoltaic solar energy) and Villonaco II and III (110 MW wind energy), awarded in December 2020. However, the effectiveness of this modality has not yet been fully proven, since the Aromo and Villonaco II and III processes are still open, without any purchase and sale agreements having been signed to date.

During the structuring of the PPS, technical, financial and legal aspects were analyzed to establish an adequate risk allocation between the public sector and the private investor, and to make the projects feasible and maximize end user benefits (MERNNR). The agreements to be executed will previously require a favorable decision on the financial sustainability and fiscal risks they pose, issued by the governing body of public finances, so as to ensure the proper recording of possible contingent liabilities assumed by the State (MERNNR, CELEC).

The recent experience of Ecuador shows that carrying out successful tenders (i.e., to attract private financing) is possible, but results can be improved in the terms and conditions offered by private investors, especially as regards prices and the times to reach financial closing and completion.

Due to the COVID-19 pandemic, the PPS launched in 2019 and 2020 (Villonaco II and III, Aromo and Conolophus) suffered certain delays that have been exceeded. They have currently been awarded and are in the process of execution of the concession agreement (MERNNR, CELEC).

POSITIVE ASPECTS AND RECENT IMPROVEMENTS

Both national and international banks have highlighted Ecuador's competitive advantages over other countries, such as its dollar exchange system and the 20-25-year duration of concession agreements (compared to shorter terms in Colombia and Peru). The consolidation of the guarantee fund established

to backstop the payment obligations to the successful bidding projects will also allow the bankability of State-granted agreements, by providing certainty of compliance with obligations and legal security.

Recent changes in tender (PPP, PPS) rules and regulations simplify processes and bring them closer to international standards, although the PPP unit suffers from a lack of resources (IDB, 2021).

New tenders and the announcement of the PME revision are valuable signs of the Government's commitment to a greater participation of RE.

PENDING LIMITATIONS AND CHALLENGES

Clear capabilities and processes are still required, especially for RE integration; including data on how much renewable generation can be injected at different points on the grid.

Tenders must be consistent with the conditions for implementing investment projects: environmental permits, interconnection, consistency of information on the process, risk allocation, etc. There is also a lack of specialists in the Ministry of the Environment to analyze electricity projects requesting permits (CELEC), and there are constant changes in the procurement processes (CELEC, Legge Abogados).

The allocation of risks is still pending the consolidation of the guarantee fund, which is still being negotiated between the MERNNR and the Ministry of Economy and Finance (MEF), due to the financial obligations for the State that may derive from PPP agreements and the purchase of electricity (CELEC, MERNNR). The fund has been a bottleneck: it has motivated new investors to continue to hold back until they can see how it is applied to the Villonaco and Aromo cases. The main problem seems to be the State's resistance to issue guarantees (Petroecuador), but as long as the pricing deficit is not resolved, private investors will demand solid guarantees, so the fund will need to have the necessary resources and transparency.

Legal risk (the government's ability to declare agreements with private investors and lenders null and void) continues to concern investors. In this sense, international standards usually require international arbitration of disputes that arise in PPP agreements, in addition to financial guarantees such as escrow funds.

ENERGY EFFICIENCY

The LOEE and its Regulations — issued recently — offer an adequate legal framework to stimulate private investment in EE. The law specifically stipulates a planning process to define objectives that can guide public policies and private activity. The LOEE also establishes a coordinating entity (the National Energy Efficiency Committee, CNEE) that can ensure the development of the National Energy Efficiency System (SNEE) as a set of programs, standards, resources and other elements that lead to compliance with National Energy Efficiency Plan (PLANEE) goals. The CNEE was constituted in 2021, and the first PLANEE was created in 2019 (MERNNR). Regulatory agencies, especially the Ecuadorian Standardization Service (formerly, INEN), have developed EE standards for a variety of equipment (MPCEIP), and have adopted an International Organization for Standardization (ISO) standard for the construction industry (IIGE), all of which is in line with the responsibilities assigned by the LOEE. Some interviewees, however, point towards the weakness or non-existence of EE standards and of non-compliance with the existing ones (USFQ).

In view of price and fuel subsidies, which strongly discourage private investment in EE, the efforts in favor of EE have come from the public sector, but the tax incentives and some initiatives of the banking sector to finance EE projects (programs such as “Líneas Verdes y Cuenta Verde,” from Produbanco, and “Eco Credit”, from Banco ProCredit) have been insufficient to alter the effect of the subsidies.

Thus, public investment seems to be limited to Petroecuador’s initiatives to improve EE in its hydrocarbon extraction, processing and transportation operations, since the scarcity of private investment means that tax incentives do not result in a significant contribution of fiscal resources to private projects. The main public EE investment programs have focused on replacing equipment, either directly delivering new products or equipment — such as light bulbs — in exchange for the old ones, or through low-interest loans for the purchase of new equipment, as is the case of the Energy Efficiency Program for Induction Cooking and Electric Water Heating (PEC) (MERNNR, ARCERNNR). More indirectly, public investment in the extension of the transmission network should increase EE by making the replacement of combustion engines with electric ones easier, as is expected for 671 shrimp farms (MERNNR).

An area underdeveloped to date by public policies — and which can constitute an important complement to existing incentives and programs — is the training of human resources for the design and implementation of EE and distributed generation projects. At present, there appear not to be any labor qualification standards, although there are some academic training programs in various higher education institutions (CELEC, MERNNR). Furthermore, the MERNNR, together with the Ministry of Labor, is initiating the process of developing a competency profile for implementers of energy management systems (MERNNR). In the projects carried out to date, international technical standards for the equipment and qualification of technical personnel (MERNNR) have been used. However, it is not clear that there is a sufficient supply of skilled labor. In general, the information we have collected points to the shortage of labor and adequate qualifications, even for distributed generation projects and not only for EE (Petroecuador, CELEC, CIP, BID [2021], MERNNR, workshop with the sector private, USFQ).

Nor does there appear to be an effective policy to develop energy service companies (ESCOs), despite the fact that Art. 19 of the LOEE defines the category of energy service providers, and that Section III of the regulation of this law develops the requirements for their inclusion in the Energy Service Provider

Catalog, as well as the types of ESCOs (MERNNR). In other countries like the U.S., ESCOs have significantly contributed to private investment in EE, by developing a business model that allows them to raise financial resources and invest them in EE projects for third parties (their clients), in exchange for receiving a portion of the monetary savings obtained. For unclear reasons, attempts to stimulate the creation of these companies in past years have been unsuccessful, and there is currently little activity in this regard. In fact, in the case of Petroecuador, agreements have been sought with ESCO for investment programs in the company's EE, but the payment guarantees required by these companies have not had the necessary approval from the MEF, as required by law for PPP schemes, which would apply in this case (Petroecuador).

CONCLUSIONS

The evidence presented in the previous sections focuses on two key factors that hold back private investment in RE and EE: price subsidies and the investment environment. Rate and hydrocarbon fuel subsidies create an important distortion for private investment in EE and RE, by drastically reducing their economic benefits, since the savings achieved with the drop in energy consumption or with the use of renewable sources are very low. Price subsidies also have another harmful effect. By depriving the electricity sector of income from electricity consumption, they weaken its ability to purchase RE and invest in EE. This is reflected in the demand for solid payment guarantees by the private initiative when negotiating electricity sales agreements with distribution companies. Thus, in this context, some RE incentive policy instruments that could be used in Ecuador, such as RE purchase quotas and guaranteed purchase prices (feed-in tariffs), lose their effectiveness.

For its part, the investment environment encompasses a series of conditions that discourage private investment. First comes the bureaucratic paperwork, which requires the intervention of the MERNNR for any RE investment, and in general legislation that continues to give a leading role to the public sector, instead of promoting the free entry of private investment. Another factor that limits the investment environment is the lack of a wholesale electricity market, or at least a transparent and open system to buy and sell electricity between entities interconnected to the SNI, or even the incorporation of intermediaries and commercialization companies of energy. The existence of a market of this type would allow the sale of surpluses and the purchase of short-term shortages by RE producers or buyers (depending on who has the usufruct of the energy produced), which would notably reduce financial risk of RE investment and would allow the management of uncertainty about production levels much more efficiently. These conditions, together with the financial risks derived from price subsidies (refer to the preceding paragraph), create an adverse environment for RE and EE investment, counteracting the Government's incentives with respect to taxation, preferential purchases and guarantees of payment.

RECOMMENDATIONS FOR USAID

PRIORITY CRITERIA

In order to select recommendations, our emphasis is of a strategic nature: i.e., the identification of opportunities that advance the development of RE and EE in Ecuador through the most effective use possible of both USAID, and third-party resources that USAID can mobilize, for example by working together with the DFC. Under the concept of effective use, we consider the costs and benefits of the possible actions we have evaluated, as explained below.

However, we also recognize that there are important trade-offs when setting priorities, due to contradictory or incompatible effects between the various criteria to select recommendations. These dilemmas arise when considering three elements:

- The benefit of the measures under consideration, with respect to achieving the project objectives: the elimination of price subsidies and the sectoral reform towards a greater use of market mechanisms would have the greatest positive impact on RE and EE investment, with much difference.
- The political, financial, technical or temporal costs (time required) to make the recommendations effective: from this perspective, price subsidies cannot be eliminated by USAID, due to their strongly political nature; by contrast, technical and educational measures do not, in general, present great costs.
- Lastly, the effectiveness of the resources of USAID and other U.S. Government agencies to promote different types of actions: USAID can support technical measures, training and popularization programs with its extensive international experience and internal and contracted resources; it can also collaborate with the DFC to mobilize financial resources that encourage investment. However, as it is a foreign agency, it does not have the conditions to engage in measures of a clearly political nature, which correspond to the Government of Ecuador as the representative of national sovereignty. Even so, USAID can provide support to the priorities defined by the Government of Ecuador once the project is underway, and which therefore have a greater possibility of being carried out.

Also, and in accordance with USAID guidelines, the social aspects of the recommendations under consideration must be taken into account, especially the implications for groups at a disadvantage on the basis of gender, poverty or ethnicity, both indigenous and Afro-Ecuadorian. It should be noted that natural resources for RE, such as waterways or windy areas, can be located in areas that are traditionally used or occupied by indigenous or Afro-Ecuadorian communities, or by communities with high levels of poverty, in which case it is strictly necessary to obtain community consent to develop projects, as well as to prevent negative impacts, e.g., when extending transmission lines.

In view of the foregoing considerations, we can summarize the opportunities for action for USAID with respect to the net benefit (cost-benefit) and effectiveness criteria below:

		USAID EFFECTIVENESS		
		HIGH: SHORT TERM AND LEVERAGING USAID RESOURCES	MEDIUM: MEDIUM-TERM COMPLETION; NEED FOR ADDITIONAL RESOURCES	LOW: LONG-TERM COMPLETION; LOW USE OF USAID RESOURCES
NET BENEFIT FOR THE GOALS OF THE SURE PROGRAM	HIGH	Pricing analysis; RE investment attraction plan; design of incentives for distributed generation; improvements to the SNI; improvement of bidding terms and conditions; popularization of RE and EE; collaboration with DFC	Wholesale market development; development of EE standards; targeting of subsidies; workforce training	Direct investment in RE and EE (lack of own resources; relatively long completion period)
	LOW	Reform of price subsidies (high political cost)	Reform of the LOSPEE (political process that requires legislative procedures)	Fuel subsidy reform (high political cost, little use of USAID resources)

The application of this table shows us various recommendations, which we have divided into priority (high net benefit and effectiveness) and medium-term (high net benefit, medium effectiveness). The recommendations are listed below.

PRIORITY TOPICS

The priority issues for USAID are initiatives that should be developed in the short term due to their combination of significant impact, non-excessive costs, and use of USAID’s own resources.

- I. **Service cost and pricing structure studies.** Given the key importance of rate subsidies for private investment in EE and RE and the highly politicized nature of electricity rates within Ecuador, the most effective tactical support that USAID can provide to the Government of Ecuador is carrying out studies that allow the measurement of the value of current subsidies and make the mismatch between electricity supply costs and the pricing levels transparent to the population. This recommendation is also supported by the Government’s request, communicated to the consulting team of this project, to develop a study of technical criteria for the components of the cost of electric power service, especially the cost of intermittent RE resources, including the reserve price calculation methodology that allows adequate remuneration of backup resources. Such a study can be a major step in developing more reliable revenue forecasts for RE projects, and in allowing a more objective discussion of price subsidies.

We should first examine the current service cost for the main types of consumers, i.e., according to voltage level, geographical location and other parameters that produce significant differences with the supply to other consumers. This study should serve as the basis for another study that develops recommendations on the pricing structure, in order to stimulate

investment in RE and EE, and also to enable access to electricity to the most vulnerable socioeconomic strata.

2. **Development of a roadmap to attract investments and a regulatory framework for renewable energies.** In the recent Executive Decree 238, the Government of Ecuador has sought to formulate a public policy and a reform of the legal and regulatory framework to promote private investment in all stages or activities of the electricity sector. A high-impact strategy would be to support the MERNNR in complying with this mandate, supporting it in the development of a roadmap, to attract investment in RE and adapting it the sectoral regulatory framework required for its implementation. This roadmap would help the MERNNR to define and prioritize a strategic change agenda in which the current and desired scenarios are defined for each key dimension. It would also support the development and preparation of regulatory changes and complementary tools necessary for their implementation, including adjustments at the level of electricity laws and their implementing regulations. The roadmap will also help articulate energy policy with the recently announced decarbonization transition plan to 2050.
3. **Design of incentives to promote distributed renewable resources, including energy storage and renewable self-generation.** The policy for the electricity sector approved in Decree 238 has proposed, among immediate actions, the development of the necessary regulatory standards that concern incentive rates and preferential conditions for RE promotion, including energy storage, as well as the creation of a plan that defines the pricing and incentives scheme for the private sector to increase renewable self-generation to 250 MW by 2025. USAID technical assistance could support ARCERNNR as a sectoral regulator in developing these public policy actions established by the Government, with regard to the design of incentives aimed at promoting distributed generation and other distributed resources, such as storage and renewable self-generation. This activity would allow the implementation of the recommendations of the evaluation of the current distributed generation regulations, which is now being completed under SURE II within the broader Government-defined policy actions. Complementing the design of incentives and the development of regulatory adjustments, USAID support could include the development of an action plan to achieve the investment goal in installed renewable self-generation capacity established by the Government for 2025, and other goals that may arise in connection to this plan within this technical assistance plan. At the same time, the roadmap would contribute in parallel to the coordination of actions and regulatory design between ARCERNNR and MERNNR, promoting both initiatives within a broader framework of sectoral governance improvement.
4. **SNI code(s).** In view of the lack of a grid code, its importance in reducing the risk of investment in RE, and USAID's extensive international experience and knowledge in integrating RE resources into electrical systems, it makes sense to support the ongoing work in preparing the grid code (see the section on complementarity with resources and programs from other donors) and, if necessary, other complementary regulations concerning the interconnection, operation and planning of the SNI, particularly with regard to RE resources. These complementary rules must include regional transactions with Colombia and Peru, so that they are not discriminatory to RE, but rather enhance their development through regional support

and opportunities for the purchase and sale of electricity from renewable sources between the three countries. Although the schedule to develop the grid code envisages its enactment by the end of 2021 (ARCERNNR), there may still be opportunities for USAID's participation in this process, through communication with the Government to incorporate USAID's observations and suggestions.

5. **Tenders.** This section also includes a combination of the urgent need to ensure that, on one hand, bidding processes and conditions appeal to investors and project promoters and, on the other hand, that USAID's experience and knowledge are fully leveraged. In order to improve the bidding process to attract the greatest interest, and achieve optimal results for the Government, we recommend closely monitoring the recently announced tender for 500 MW of ER, particularly given the U.S. Department of State's support to past bidding processes and the Development Finance Corporation's support to the financial closure of past selected projects. In this sense, USAID can monitor the processes followed and their impacts on the number of offers and conditions offered, as well as the level of international interest on the part of investors and sponsors. This option does not entail technical assistance, but will allow the subsequent development of recommendations and Government support, including a possible collaboration with the new USAID initiative on transparency in public procurement (PADF). With the tender underway, immediate involvement would be an alternative, which would require resources and complementary skills for the government work team responsible for the tender. Lastly, a complementary activity in the immediate future may be to support the recently created PPP Technical Office in adapting the PPP regulations to the electricity sector. This is essential to allow the approval by the MEF of the tender for the 500 MW block and of those that will succeed them in the future, by making it easier to assess the risks and fiscal contingencies that the Government will assume in the award of these RE agreements.
6. **Popularization of EE and RE, including distributed generation.** Because they are highly decentralized and dispersed activities, EE investment and distributed generation depends, to a large extent, on the dissemination of information about these activities among the population, particularly the business community, without losing sight of commercial finance institutions, which have a key role in the offer of bank loans for these types of projects. To correct the lack of knowledge about EE and distributed generation that seems to exist in the country, this is another possibility with a significant benefit, promoting the participation of, and strengthening, the private sector through collaboration and the creation of workshops, seminars, talks and round tables with business partnerships, chambers of commerce and companies in the RE and EE sector. This possibility should also include the popularization of RE among municipalities and rural communities to enable communication and negotiation when developing local RE projects.
7. **Support for capital contribution.** As a final short-term recommendation, we advise strengthening and further structuring the collaboration with DFC given the complementary strengths of DFC and USAID to achieve greater impact for the sector. As an international development agency, USAID has local presence, close relationships with government organizations, the private sector, and civil societies, and extensive technical and development experience. Through its technical assistance, it can help the DFC to identify bankable projects and mobilize its resources for RE and EE investment. USAID can also help identify and remove

obstacles or limitations that the DFC may encounter through its work with the government and the private sector. On the other hand, the DFC offers financial products that could have a major impact on the sector, even in transmission lines that allow the exploitation of RE resources located in areas with limited capacity in this regard. The capital available to the DFC, as well as its public and development-oriented nature, makes it an excellent vehicle to drive projects that demonstrate the viability and benefits of investing in RE and EE. These coordinated contributions also signal the U.S. Government's commitment to developing RE and EE in Ecuador, and as such will facilitate a closer collaborative relationship with Ecuadorian authorities.

MEDIUM-TERM RECOMMENDATIONS

These recommendations refer to actions that either require a longer period of time to be developed, or that have a lesser impact and are, therefore, not urgent in allocating USAID resources, although due to their longer maturation period, it is advisable to initiate them as soon as possible. These recommendations generally seek to improve the investment environment and the conditions for private initiative in RE and EE.

1. **Development of a wholesale electricity market and market instruments for ancillary services.** The current legal framework of the Ecuadorian electricity sector would need large and complex changes to introduce market mechanisms at the level of the SNI. Therefore, it is not realistic to propose an objective of this type in the short term. However, in view of the major impact that market mechanisms would have for the development of RE, and USAID's broad experience and knowledge on this topic, a USAID initiative in this regard would have a significant net benefit in the medium term. More specifically, the market structure in Colombia, where multiple buyers and sellers interact, can be an example and a model to follow, in view of the similarities of the electricity sector in terms of generation resources, and the commercial relationship already existing between the two countries. The medium term will also provide an opportunity to adequately explain and popularize the reform, to clearly distinguish it from privatization, which is a very different measure from what is intended. Private investment in RE and EE, and participation in market mechanisms, is perfectly compatible with public ownership of distribution, transmission and large hydroelectric plants.
2. **EE technical standards, ESCO guidelines and energy audits.** The development of EE technical standards has followed a positive trajectory in Ecuador, which is why it is not as urgent as other investment promotion measures in EE. However, support in this area would speed up the process. There is a particularly valuable opportunity in the case of ESCO guidelines, given that it would allow to take advantage of the experience that the U.S. has with these types of entities and the key role that ESCOs can have in mobilizing capital for EE investment. This activity could be developed in collaboration with business chambers and partnerships to bring their perspective on the matter, and to mobilize private initiative for the creation of ESCO, taking advantage of USAID's extensive experience and capacity in business support programs. Lastly, the Government of Ecuador has expressed its interest in supporting USAID to develop an incentive program for technological replacement in the productive sector, by improving the existing "Producción Más Limpia" [Cleaner Production] of the

Ministry of Production, Foreign Trade, Investment and Fisheries (MPCEIP), according to communication from the MPCEIP itself, and also to develop energy audits, an instrument widely used in other countries to show the potential of EE investment or even verify compliance with minimum EE levels, as indicated by the Chamber of Industries and Production (CIP).

3. **Targeting of hydrocarbon fuel subsidies and support for the sectors that are most vulnerable to their elimination.** The reduction or reform of fuel subsidies can have a major impact on RE and EE investment, since low fuel prices favor the use of internal combustion engines without regard to efficiency. However, it is a relatively indirect issue with respect to this project, given that it also involves the transport sector and key industries for the country, such as oil and fishing. For this very reason, it is an issue with very complex political implications. Therefore, while USAID activity can bring great benefits in terms of private investment in RE and EE, it makes sense to focus it on specific aspects of support to the Government. The MPCEIP has asked for USAID support to develop targeting schemes for these subsidies towards the groups that are most vulnerable to their reduction or elimination. In this sense, the Geological and Energy Research Institute (IIGE) suggests that USAID could collaborate in creating a program to replace inefficient vehicles and equipment.
4. **Workforce training.** As a fourth recommendation for the medium term, due to its longer execution times, we propose that training programs be developed for installers of distributed generation equipment and EE works. These programs would very closely complement EE and ESCO guidelines by creating a skilled workforce. They would also contribute to the popularization of EE and distributed generation, and would have a directly positive social impact, by improving the income and employment possibilities of those trained. In addition, they would open an opportunity to promote participation of the private sector, taking advantage of the labor development knowledge of the USAID economic growth office, and strength the relationship between North American and international associations, on the one hand, and the extensive set of entities in Ecuador who can act as executors of training programs, on the other. A good example would be the development and implementation of training programs in vocational training entities, with the issuance of certificates recognized by companies. Along the same lines, there is also the possibility of working with entrepreneurship programs and business incubators in the university sector, to develop energy service companies.

COMPLEMENTARITY WITH RESOURCES AND PROGRAMS FROM OTHER DONORS

Last but not least, it is worth noting the opportunities to increase the effectiveness of USAID resources through the collaboration with other donor initiatives in the RE and EE areas. These are not additional recommendations, but rather possibilities to increase the chances of success of some of the previous recommendations, by leveraging resources outside the U.S. Government that complement those of USAID and other national agencies.

- Inter-American Development Bank (IDB) There is great potential for complementarity with the current IDB program on distributed generation. In fact, as it seems that the IDB's lines of action have not yet been defined due to its own ongoing project, there would be an excellent opportunity here to coordinate complementary actions through agreements on division of

responsibilities between USAID and the IDB, e.g., where the IDB could develop investment financing programs in distributed generation, such as special lines of credit, and USAID could develop training programs for skilled labor.

- The IDB also has two ongoing programs that may be of interest to USAID: a program to support the change of the Ecuadorian energy matrix, which ends on November 30, 2021; and a program for the modernization of the National Distribution System, scheduled for completion in June 2022, in which the distributed generation connection conditions and their improvement in cases of need could be examined.
- French Development Agency (AFD): AFD is working with CELEC and CENACE to prepare the Ecuadorian grid code. Given its importance, it would be desirable to contribute USAID's experience and knowledge to this process, which would also require more limited resources than if USAID was the only entity supporting the Ecuadorian State agencies.
 - AFD also supports the identification of the country's photovoltaic potential, thereby avoiding the duplication of efforts for this objective.
- World Bank: Its programs focus on electromobility and regulatory strengthening, and even on EE regulation. USAID could collaborate in hiring experts to develop the ratemaking study, or to divide responsibilities with respect to different regulatory areas, e.g., RE vs. EE.
- Japan International Cooperation Agency (JICA): Because its focus is the development of the country's geothermal potential, USAID may pay less attention to this technology and direct its efforts towards other RE technologies.
- United Nations Development Program (UNDP): Apart from supporting electromobility, UNDP is developing RE demonstration projects that could be used by USAID in the case of creating RE outreach and popularization programs, and as "proofs of concept" for private investment, especially in distributed generation.
- German Academy for International Cooperation (GIZ)/Euroclima: working to support EE in terms of the regulatory framework and financing, i.e., areas directly related to USAID's objectives.
- Other relevant initiatives for USAID are the Project for Strengthening the Quality Infrastructure for Electric Energy Efficiency (3E), developed by the German organization PTB; and the CIP's Greenpyme Program and the Center for Resource Efficiency and Cleaner Production, with financing from the IDB, which conducts awareness-raising training and the development of free energy audits for companies. These projects, such as those of GIZ/Euroclima, provide additional impulses for EE investment, so USAID could develop initiatives that complement them, thus achieving greater impact.

SOCIAL ASPECTS

Our evaluation and selection of possible recommendations has not found or highlighted negative dimensions in the social sphere, with the limitation that we interviewed civil society stakeholders.

According to CELEC, the Villonaco Project is setting a good example of its relationship with the local community. The social considerations evident in our recommendations are the possible impacts of the reduction or elimination of subsidies. Therefore, our medium-term recommendations include the development of programs of targeted assistance and temporary support for the groups that are most vulnerable to the elimination of subsidies.

IMPLEMENTATION

In order to facilitate the actionability of our recommendations, in the following table we indicate the specific tasks, the stakeholders with whom USAID would collaborate on the execution of each task, and the stakeholders to whom the outcomes would be addressed.

TABLE 2. SPECIFIC TASKS			
RECOMMENDATIONS	TASKS	COLLABORATORS	TARGET AUDIENCE
Priority	Cost of service and rate structure studies	Cost of service analysis	ARCERNNR
		Ratemaking study	ARCERNNR, MERNNR
	Support for the transition plan to 2025	Roadmap for attracting investment and adaptation of the regulatory framework	ARCERNNR, MERNNR
	Design of incentives to promote distributed renewable resources	Design of incentives	ARCERNNR, MERNNR
		Action plan for the 2025 investment goal	MERNNR, MEF
SNI code(s)		Grid code completion	CENACE, ARCERNNR, Transelectric, AFD
		Interconnection code completion	CENACE, ARCERNNR, Transelectric, distributors, distribuidoras, MERNNR
Tenders		Support in the tender for the 500 MW block of RE	MERNNR, MEF
		Adaptation of Decree 1190	MERNNR, MEF
	Popularization of EE and distributed generation	Development of popularization program	MERNNR, MPCEIP, UNPD
	Support for capital contribution	Development of recommendations for financing program	DFC
			Society, business associations
			MERNNR, MPCEIP, DFC, financial entities, IDB

TABLE 2. SPECIFIC TASKS

Medium term	Wholesale market development	Development of a proposal for the wholesale market	MERNNR, ARCERNNR, CENACE	MERNNR, ARCERNNR, CENACE, CELEC, private generators
		Development of proposal for auxiliary services	ARCERNNR, CENACE	MERNNR, ARCERNNR, CENACE, CELEC, private generators
	EE technical standards, ESCO guidelines and energy audits	Development of technical EE standards	MPCEIP, World Bank, GIZ	MPCEIP, labor unions and industry chambers
		Development of ESCO guidelines	MPCEIP	MPCEIP, universities
		Development of an energy audit program	MPCEIP, CIP	MPCEIP, CIP
	Targeting of fuel subsidies	Development of targeting mechanisms	MERNNR	MERNNR
	Workforce training	Development of training programs	MERNNR, MPCEIP, Ministry of Education, Ministry of Labor	Ministry of Education, Ministry of Labor, MPCEIP, schools and universities, business associations

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ANNEX I: PROJECT SCHEDULE

TABLE 3 PROJECT SCHEDULE

STAGE	ACTIVITY	DELIVERABLES	DATE OF COMPLETION OR DELIVERY
Project kickoff and detailed planning	Project kickoff meeting with USAID/Washington and Mission	Kickoff presentation, with an evaluation of the main issues of the Ecuadorian electricity sector at present	May 4th
	Preparation of a brief project kickoff report with information on the priority areas for analysis, the criteria for selecting recommendations, and a detailed work plan	Kickoff report	May 17th
Secondary source review	Update of the report from secondary sources, with the addition of relevant information since the report was drawn up	Included with the kickoff report	May 18th
Work calendar	Completion of the stakeholder map and list of stakeholders to interview	Stakeholder map with list of interviewees and contact information	June 4th
	Preparation of the interview questionnaire	Interview questionnaire	June 4th
	Determination (with interviewees) of dates and times of interviews	Interview schedule	June-September
Interviews and data collection	Conducting stakeholder interviews	Meeting minutes	July-September
	Participation in the Renewable Energy Fair organized by AEEREE, together with participants from the relevant ministries, companies from the electricity sector, donors and private sector partnerships	Recordings of plenary sessions, panels, round tables and other sessions	July 12-16
Preliminary report	Preparation of the preliminary status report	Report [presentation]	September 20th
Validation		Guest list for each workshop	September 17th
	Preparation and execution of two half-day workshops:	Stakeholder report incorporating USAID observations	September 27th
	(1) With public sector stakeholders	Workshop agenda and session plan	September 17th
	(2) With private sector stakeholders	Execution of workshops	September 28th and 29th

		Minutes of workshops	October 1st
		Main workshop findings, including participant responses to the questionnaire	October 31st
Conclusion	Organization of the USAID feedback process and preparation of the final report	Final report	October 21st- November 15th

ANNEX 2: ENTITIES AND INTERVIEWEES

TABLE 4. ENTITIES AND INTERVIEWEES

DATE	INTERVIEWEE	INSTITUTION	POSITION
09/07/21	Paulo Peña and his work team	Empresa Eléctrica Quito	General Manager
09/09/21	Gonzalo Uquillas and his work team	CELEC	General Manager
09/10/21	Jaime Cepeda and his work team	ARCERNNR	General Manager
09/13/21	Raúl Canelos and his work team	Transelectric - CELEC	General Manager
09/14/21	Ulrike Stieler	Ecuadorian-German Chamber of Commerce and Industry (AHK)	DEinternational Director
09/14/21	Carla Muirragui and her work team	Ministry of Production, Foreign Trade, Investment and Fisheries	Vice Minister
09/22/21	Gabriel Argüello and his work team	Ministry of Energy and Non-Renewable Natural Resources	Vice Minister of Electricity and Renewable Energy
10/01/21	Pablo Luna and his team	PetroEcuador	General Manager
10/01/21	Juan Carlos Proaño and his work team	Ministry of Economy and Finance	Undersecretary
10/13/21	Hernán Flores	Association of Private Generation and Self-Generation Companies of Ecuador (ADEGEL)	General Manager

ANNEX 3: WORKSHOP PARTICIPANTS (PUBLIC SECTOR AND PRIVATE SECTOR)

TABLE 5. PUBLIC SECTOR WORKSHOP PARTICIPANTS, SEPTEMBER 29, 2021

	NAME	INSTITUTION	POSITION
1	Mauro Intriago	AEEREE	Electrical Specialist Consultant
2	Danilo Ojeda	ARCERNNR	Regulation Technical Coordinator
3	Iván Sánchez	ARCERNNR	Professional
4	Istvan Hervás	ARCERNNR	Professional
5	Diego Arias Cazco	ARCERNNR	Technical Regulation Director
6	Andrés Gonzales	CELEC	Advisor
7	Ana Correa	CELEC	Technical Specialist
8	Raúl Canelos	CELEC / Transelectric	General Manager of Transelectric
9	Matilde Urquizo	CELEC	Project Specialist
10	Patricio Cañizares	CELEC	Technical Specialist
11	Patricio Alzamora	CENACE	Executive Director in Charge
12	René Chumbi	ELECGALAPAGOS S.A.	Planning Chief
13	Jorge Ponce	Empresa Eléctrica Quito	Technical Specialist
14	Paulo Peña	Empresa Eléctrica Quito	General Manager
15	Sebastián Espinoza	IIGE	Information Management Director
16	Gabriel Salazar	MERNNR	Vice-Ministerial Advisor
17	Luis Manzano	MERNNR	Director of Management and Promotion of Energy Efficiency Projects
18	Patricio Villavicencio	MERNNR	Undersecretary of Distribution
19	Rommel Aguilar	MERNNR	Vice-Ministerial Advisor
20	Washington Barriga	Ministry of Production	Technical Specialist
21	Daniel Segura	Ministry of the Environment	Technical Specialist
22	Daniel Chiriboga	PetroEcuador	Technical Specialist
23	Sofía Zarate	US Embassy in Ecuador	Specialist
24	Augusta Abrahamse	USAID	Energy Specialist

25	Kristen Madler	USAID	Energy Specialist
26	Patrick Coatar Peter	USAID	Energy Analyst
27	Cristian Fernández		
28	Santiago Fernández		
29	Juan Pablo Palacios		
30	Luis Bedoya		

TABLE 6. PRIVATE SECTOR WORKSHOP PARTICIPANTS, SEPTEMBER 30, 2021

	NAME	INSTITUTION	POSITION
1	Hernán Flores	Association of Private Generation and Self-Generation Companies of Ecuador (ADEGEL)	President
2	Marcelo Arias Castañeda	Association of Private Generation and Self-Generation Companies of Ecuador (ADEGEL)	Technical Advisor
3	Ulrike Stieler	Ecuadorian-German Chamber of Commerce and Industry (AHK)	Project Manager
4	Kenol Thys	Inter-American Development Bank (IDB)	Energy Specialist
5	Carlos Romero	French Ecuadorian Chamber of Commerce and Industry (CCIFEC)	President
6	Xavier Andrade	Guayaquil Chamber of Industries	Technical Specialist
7	Leonard Quinde Allieri	Guayaquil Chamber of Industries	Technical Specialist
8	Cynthia Rodríguez	Chamber of Industries and Production of Ecuador	Environment and Industrial Security Director
9	Edison Estévez	Ecuadorian Center of Resource Efficiency (CEER)	Technical Specialist
10	Carlos Pérez	Consultant	Former Minister of Energy and RNNR
11	Mauro Intriago	AEEEEE Consultant	Former Vice Minister of Electricity and Renewable Energy
12	Renato Oña	Consultant	Energy Consultant
13	Hernán Verdugo	ECUACIER	CEO
14	Patricia Aparicio	Large Energy Consumer Association of Ecuador (EGRANCONEL)	Executive Director
15	Norma Mooze	US Embassy in Ecuador	Energy Specialist
16	Karina Sánchez	Escuela Politécnica del Litoral	Professor
17	Guillermo Soriano	Escuela Politécnica del Litoral	Professor
18	Danilo Arcentales	Escuela Politécnica del Litoral	Professor
19	Gonzalo Pizarro	Escuela Politécnica del Litoral	Professor
20	Ángel Ramírez	Escuela Politécnica del Litoral	Professor

TABLE 6. PRIVATE SECTOR WORKSHOP PARTICIPANTS, SEPTEMBER 30, 2021

	NAME	INSTITUTION	POSITION
21	Daniel Salas	Escuela Politécnica del Litoral	Professor
22	Marcelo Pozo	Escuela Politécnica Nacional	Professor
23	Patricia Otero Valladares	Escuela Politécnica Nacional	Professor
24	Santiago Vaca Jiménez	Escuela Politécnica Nacional	Professor
25	Andrés Chico	Escuela Politécnica Nacional	Professor
26	Carlos Naranjo Mendoza	Escuela Politécnica Nacional	Professor
27	Johanna Núñez	Sustainable Environmental Investment Fund of Ecuador (FIAS)	Environmental Specialist
28	Marco Karolys	Trust Funds and Trusts	CEO
29	Hassan Becdach	HJBecdach	Executive Director
30	Karina Escobar	Legge Abogados	Founding Partner
31	Eduardo Escobar	Legge Abogados	Founding Partner
32	Ulises Alvear	Metrovalores Casa de Valores S. A.	CEO
33	Noel Dekking	Neoen	Country Manager - Ecuador
34	Sebastián Abad	Neoen	Technical Advisor
35	Robert Peñaranda	Neoen	Technical Project Development Specialist
36	Mónica Andrade	United Nations Development Program (UNDP)	Environment and Energy Lead
37	Efraín Bastidas	United Nations Development Program (UNDP)	Project Coordinator
38	Andrés Sarzoza	RED CERES - Ecuadorian Consortium for Social Responsibility	Analyst
39	Francisco Hugo	UISEK	Professor
40	Jesús López Villada	UISEK	Professor
41	Luis Bedoya	UNIDO	Consultant
42	Rafael Soria	USFQ	Professor
43	Patrick Coatar Peter	USAID	Specialist

TABLE 6. PRIVATE SECTOR WORKSHOP PARTICIPANTS, SEPTEMBER 30, 2021

	NAME	INSTITUTION	POSITION
44	Augusta Abrahamse	USAID	Specialist
45	Kristen Madler	USAID	Energy and Environmental Specialist
46	Carlos Ávila	Universidad UTE	Engineering Professor
47	Paul Vandebeuque	Voltaia	Manager
48	Andrea Espinoza	World Energy Council (WEC) Ecuador	Executive Director
49	Daniel Rosero		
50	Diego Aguirre		
51	Humberto Re		
52	Juan Carlos Bonilla		
53	Francesco Ponticelli		
54	Manuel Echeverría		

ANNEX 4: INTERVIEW QUESTIONNAIRE RESPONSES PENDING

TABLE 7. QUESTIONNAIRES RECEIVED FROM PARTICIPANTS

DATE RESPONSE RECEIVED	RESPONDENT
Thursday, October 14, 2021	IIGE
Friday, October 15, 2021	CIP
Friday, October 15, 2021	Ministry of Production
Friday, October 15, 2021	ARCERNNR
Monday, October 18, 2021	Legge Abogados
Monday, October 18, 2021	CENACE
Monday, October 18, 2021	CELEC
Monday, October 18, 2021	EMELNORTE
Tuesday, October 19, 2021	Neoen
Friday, October 22, 2021	MERNNR
Friday, October 22, 2021	FIAS
Wednesday, October 27, 2021	USFQ
Tuesday, November 30, 2021	MEF

TABLE 8. QUESTIONNAIRES PENDING COMPLETION

DATE RESPONSE RECEIVED	RESPONDENT
	Empresa Eléctrica Quito
	Ministry of the Environment, Water and Ecological Transition
	Ministry of Economy and Finance
	Association of Private Generation and Self-Generation Companies of Ecuador (ADEGEL)
	Ecuadorian-German Chamber of Commerce and Industry (AHK)
	RED CERES - Ecuadorian Consortium for Social Responsibility
	World Energy Council Ecuador / ECUACIER
	VOLTALIA
	Ecuadorian Center of Resource Efficiency (CEER)
	Produbanco
	Banco del Pichincha
	Universidad UTE