

IDB-KIAT Collaboration Project Proposal

Project Overview

Project Title	Scaling-up Universal access in off-grid areas of Colombia		
Sector (sub-topics)	<i>Energy Storage System (ESS)</i> <i>Micro-grid (MG)</i> <i>Small scale hybrid power plant (Solar PV and or SHP)</i>		
Country	Colombia	Location	Department of Chocó
Project Duration	2 years implementation	Budget	USD 10.000.000 (max. value per each implemented project)
Association with Other Projects	Yes		

Submitter's Information

IDB (country office)	
Name	(details to be provided when selected)
Position	
E-mail	
Telephone	

Partner Country's Implementing Organization(s)

Partner Country Contact 1 (ministerial level)	
Name	(details to be provided when selected)
Position	
Organization	Ministry of Mines and Energy of Colombia
E-mail	
Partner Country Contact 2 (regional level or implementing agency)	
Name	(details to be provided when selected)
Position	
Organization	IPSE (Instituto de Planificación y Promoción de Soluciones Energéticas para Zonas No Interconectadas)
E-mail	

1. Project Background

Current Situation

- The government of Colombia (GoC) has the ambitious goal of achieving universal access by 2030, this implies increasing the current electrification rate from 96.45% to 100%, according to the most recent indicative national plan for expanding electricity access (PIEC 2019-2023 in Spanish). Unfortunately, deficits in access to electricity still prevail in rural areas, where the electrification rate corresponds to about 86.54%, compared to urban areas where 99.51% of the people have electricity access (UPME, 2019a). Estimations of the electricity access index (ICEE in Spanish) indicate that 9 out of the 33 states have total indexes below 90% and rural indexes below 65%.
- The Colombia's national electricity system is divided into the National Interconnected System (SIN in Spanish) and the off-grid system, also known as the Not Interconnected Zones (ZNI in Spanish) (See Figure 1). The Colombian off-grid system spans over 53% of the national territory and corresponds to a set of geographical areas where the public electricity service is not provided through the SIN, according to Law 855 of 2003. It comprises more than 1797 localities (as of November 2021) grouped in 76 municipalities within the country. In these areas, the total installed capacity is about 299.43 MW, relying mainly on diesel-powered plants (88%) in contrast to 12% or 34.53 MW that depends on non-conventional renewable energy (IPSE, 2022).

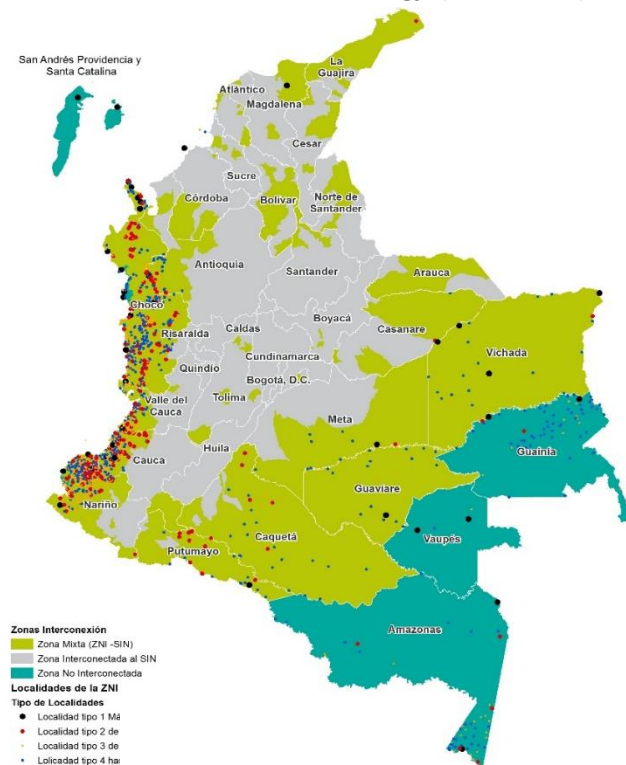


Figure 1. Location of the non-interconnected zones (ZNI) or off-grid areas in Colombia (2021)

- Since the publication of the PIEC until August 31, 2021, nearly 59,166 new households have gained access to electricity through stand-alone PV systems or with the grid interconnection (MME, 2021a). Additionally, by 2022, it is expected to provide the electricity service to about 57,000 new households. Based on this progress, 379,633 households (out of 495,799 as of 2018) or nearly 1.5 million people will still lack access to electricity by 2023. This number suggest that in order to achieve universal access by 2030, investments should focus on providing electricity to nearly 47,000 households per year, between 2023 and 2030. However, this projection does not quantify the COVID-19 pandemic which has threatened the electrification progress by increasing investors' risk perception and shifting public funding priorities in developing countries (IEA et al., 2021). Also, public funds allocated to expand coverage in the ZNI are insufficient to achieve universal coverage within eight years if new requirements arising from population growth and the current post-conflict stage are also considered. Thus, as public financing may remain limited over the next few years, it is critical to unlock and promote private and international donors financing in the rural electrification sector.
- This proposal requests support from the KIAT to accelerate the energy access expansion in the last-mile communities of Colombia through renewable energy-based systems and thus, to contribute to the national policy of achieving universal access by 2030.

Relevant National Development Plans, Policies, and Strategies

- Regarding the legal and regulatory framework applicable to the rural electrification sector, the Colombian State Constitution of 1991 and Laws 142 and 143 of 1994 declare that access to electricity is a civil right that should be guaranteed by the state. In addition, there are a set of resolutions and decrees that set the regulatory and policy directives to regulate and promote the energy provision within the ZNI. They are mainly focused on defining a set of policies to promote electricity access, the definition of the tariff scheme, the subsidies regime, and the role of different stakeholders.

Table 1. Excerpt of the main policy, regulatory and legal framework associated with the off-grid electrification sector in Colombia. Source: Author's own from current legislation

National Policy	• CONPES Document 3108 of 2001- "Energy Programme for the off-grid areas (ZNI)" • CONPES Document 3055 of 1999- "Strategies and actions for the Energization of off-grid areas (ZNI)" • CONPES Document 3453 of 2006- "Management Schemes for the energy service provision in off-grid areas (ZNI)" • Documento CONPES 3453 de 2006 - "Esquemas de Gestión para la Prestación del Servicio de Energía en las Zonas No Interconectadas" • Document CONPES 3587 of 2009- "Concession of exclusive service areas declared as projects of strategic importance for the country." • Decree 1073 of 2015, 1623 of 2015, 1513 of 2016 and 099 of 2021- Main Decree of the Mining and Energy Sector policy and amendments associated with the policy guidelines for the expansion of the electricity service coverage in the national interconnected system (SIN) and the off-grid areas (ZNI). • Decree 847 of 2001 and 201 of 2004-FSSRI regulation • Decree 1124 of 2008: FAZNI regulation
Laws	• National Constitution of 1991- Access to electricity as a civil right • Law 142 of 1994- Public Services Law • Law 143 of 1994- Electricity Sector Law • Law 855 of 2003- Definition of off-grid areas (ZNI) • Law 633 of 2000- FAZNI creation • Law 788 of 2002- FAER creation • Law 286 of 1996- FSSRI creation • Law 1715 of 2014-FENOGE creation • Law 413 of 2018- SGR resources for rural electrification • Law 1955 of 2019-National Development Plan 2018-2022 • Law 2099 of 2021-FONENERGIA creation
Planning	• Indicative Plan for the Electricity Coverage Expansion (PIEC) 2019-2023 • Sustainable Rural Energy Plans (PERS) • National Rural Electrification Plan (PNER) 2018-2031 • Development Programs with a Territorial Approach (PDET) • "We are all Pazcífico" Plan (PTSP)
Regulations	• CREG resolution 091 of 2007- Tariff scheme for the electricity service in off-grid areas (including exclusive service areas) based on Diesel generation, small hydro power plants, hybrid microgrids and stand-alone systems ($\leq 500\text{Wp}$) • CREG resolution 166 of 2020- Transitory Tariff scheme for the electricity service in off-grid areas based on stand-alone systems ($> 500\text{Wp}$) • CREG resolution 701 001 of 2022 (pending approval)- Tariff scheme for the electricity service in off-grid areas based on stand-alone systems ($> 500\text{Wp}$) • MME resolution 182138 of 2007- Subsidies definition for the off-grid areas • UPME resolution 045 of 2016- Non-conventional energy resources (FNCE) incentives

- In addition, the proposed project is fully aligned with the Sustainable Development Goals as well as with the UN's Sustainable Energy for All.

Association with Other Projects/Programs

Table 3. Related projects funded by Korean government

Project Name	Type
Green energy electrification project for ETCR (Regional Unit of Territorial Spaces of Training and Reincorporation) peacekeeping in Pandores, Colombia	Grant
Solar Power Plant in Departamento del Vichada	Grant
Establishment of hybrid power supply for Bogota USME area	Grant

In addition, this proposal is also related to the proposal “Fostering Colombia’s transition from existing diesel-powered mini-grids to low-carbon mini-grids in remote and rural off-grid areas of the country”, which also is intended to be implemented in the department of Chocó, but with a different focus. This one is focused on improving the electricity service provision with cleaner energy systems, and the one presented in this proposal is focused on expanding energy access for user who do not currently have access to the electricity service.

2. Project Objectives

The objectives of the proposed Project are to:

- Provide a reliable and efficient electricity service to last-mile communities where there is a lack of access to electricity.
- Increase the energy access index in off-grid areas of Colombia by implementing renewable energy-based projects in off-grid areas of Colombia.
- Increase the renewable energy share in the energy matrix of the off-grid areas of Colombia.
- Diversify the energy generation matrix in off-grid areas of Colombia by integrating renewable energy-based solutions.
- Improve the communities’ living conditions and the energy service supply in rural and remote off-grid areas of the country.

3. Project Components

The proposed Project will have the following components.

- **Component 1: Review of existing Feasibility studies.** There is no need for a feasibility study for electrification of proposed potential projects since IPSE has already defined the potential energy technology to implement in each location. However, KIAT could analyse, review and validate the techno-economic indicators associated to each project.
- **Component 2: Construction of selected projects within the ZNI of Colombia.** This phase includes the design, supply, and installation of selected off-grid projects. In particular: (a) construction of electricity generation infrastructure; (b) distribution infrastructure, including expansion of the distribution lines and distribution transformers. It is expected that the proposed systems will allow target settlements to have an average of 24 hours of electricity service per day.

- **Component 3: Capacity Building.** This phase includes providing and implementing a capacity building program by selecting trainees to operate the off-grid systems and thus, on-site training will be provided.

4. Project Location, Period, and Estimated Cost

- **Location**

In order to close energy access gaps in the ZNI, more intervention is required in the localities of Chocó. Chocó corresponds to the department with one of the highest deficits in infrastructure improvement. Of the 1769 localities of the ZNI, 554 are in this department. Additionally, 97% of users in these locations only receive electricity service for 4 to 8 hours (CNM Report-Feb22). Therefore, there is a high deficit in infrastructure improvement and, therefore, a high need to improve the provision of electricity service, with more efficient, reliable, and sustainable generation systems. Also, according to the Indicative National plan for the electricity expansion in Colombia (PIEC 2019-2023), Chocó is the fourth department with the highest number of households lacking access to electricity, nearly about 29.558 households (as of December 2018).

The proposal includes two types of potential projects depending on the selected technology. Table 2 includes a brief description of the identified projects focused on expanding electricity access through stand-alone systems or hybrid minigrids (Solar PV with Battery energy storage). In addition, Table 3 presents an additional list of projects where it is feasible to implement small hydro power projects in the department of Chocó.

Table 2. List of potential projects (Solar PV stand-alone systems and hybrid minigrids)

No.	Technology	Municipality	Department	Type of users	Potential Beneficiaries	Expected investment (\$US)
1	Solar PV with Battery energy storage minigrid	ALTO BAUDÓ	CHOCÓ	Community services, schools and/or households in rural areas	114	\$ 621.475
2	Solar PV with Battery energy storage minigrid	BAJO BAUDÓ	CHOCÓ	Community services, schools and/or households in rural areas	65	\$ 349.092
Total						\$ 970.567

Table 3. List of potential small hydro power projects

No.	Department	Municipality	Potential Beneficiaries	Local hydro resource	Expected investment (\$US)
1	Chocó	Juradó	910	Partadó River	\$ 13.270.143
Total					\$ 13.270.143*

*Preliminary Estimation

- **Period and Estimated Cost**

Each project will require approximately \$10 million to cover detailed engineering, construction, equipment procurement, and related activities such as consultancy service, knowledge dissemination, etc., in the form of grant ODA. The selected project(s) can serve as a demonstration to be replicated and/or to be scaled up to other regions.

Component	Total expected duration	Amount (US\$)
• Review of existing Feasibility Studies	1-2 months	TBD
• Engineering and Construction	Project to start in January 2024	Up to \$10,000,000 per project
• Capacity building (for technicians, policymakers, etc.)	2-3 months	\$100,000

5. Project Implementing Organization

- IPSE (Instituto de Planificación y Promoción de Soluciones Energéticas para Zonas No Interconectadas)

6. Required Coordination at National/Regional Level

- N/A

7. Risks and Opportunities

Risk identification and mitigation measures

- Controlling the provision of equipment will be of the utmost importance. Quality control of procurement processes and suppliers of scientific devices and equipment will be essential.
- A moderate level of risk associated with high maintenance requirements is expected as devices and equipment parts will not be available locally when needed for replacement. Thus, high-quality project management is required to ensure well-timed implementation of planned activities.
- Progress control for the project implementation is essential. Therefore, well-designed administrative procedure and condition check must be set in advance.
- High maintenance cost due to replacement of expendable supplies and others after the completion of the project.

Opportunities

- Availability of high-quality project management support from local institutions.
- Government's support in selecting government staff to be trained, and their availability during the training sessions and exchange training visits to Korea.