

**STRENGTHENING COLOMBIAN INSTITUTIONAL CAPACITY TO INTEGRATE LARGE SCALE NON-  
CONVENTIONAL RENEWABLE ENERGY**

**CO-T1501**

**CERTIFICATION**

I hereby certify that this operation was approved for financing under the **United Kingdom Sustainable Infrastructure Program (SIP)**, through a communication dated February 5, 2018 and signed by Su Kim (ORP/GCM). Also, I certify that resources from said fund are available for up to **US\$1,000,000** in order to finance the activities described and budgeted in this document. This certification reserves resource for the referenced project for a period of four (4) calendar months counted from the date of eligibility from the funding source. If the project is not approved by the IDB within that period, the reserve of resources will be cancelled, except in the case a new certification is granted. The commitment and disbursement of these resources shall be made only by the Bank in US dollars. The same currency shall be used to stipulate the remuneration and payments to consultants, except in the case of local consultants working in their own borrowing member country who shall have their remuneration defined and paid in the currency of such country. No resources of the Fund shall be made available to cover amounts greater than the amount certified herein above for the implementation of this operation. Amounts greater than the certified amount may arise from commitments on contracts denominated in a currency other than the Fund currency, resulting in currency exchange rate differences, represent a risk that will not be absorbed by the Fund.

Certified by:	(original signed) _____ Sonia M. Rivera Chief Grants and Co-Financing Management Unit ORP/GCM	3-Jun-2019 _____ Date
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Approved by:	(original signed) _____ Jose Agustin Aguerre Sector Manager Infrastructure and Energy Sector INE/INE	4-Jun-2019 _____ Date
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## TC DOCUMENT

### I. BASIC INFORMATION FOR TC

Country/Region:	Colombia/CAN – Andean Group
▪ TC Name:	Strengthening Colombian Institutional Capacity to Integrate Large Scale Non-Conventional Renewable Energy.
▪ TC Number:	CO-T1501
▪ Team Leader/Members:	Maria Alexandra Planas, Team Leader (INE/ENE); Marcelino Madrigal (INE/ENE); Andrea Giraldo (CAN/CCO); Cesar Andres Negret (LEG/SGO); Elee Ismael (INO/NFP); Maria Margarita Cabrera (CSD/CCS); Juan Carlos Cardenas, Stephanie Suber and Cecilia Seminario (INE/ENE);
▪ Taxonomy:	Client Support
▪ Date of TC Abstract authorization:	February 4 <sup>th</sup> 2019
▪ Beneficiary:	Ministerio de Minas y Energía – República de Colombia
▪ Executing Agency:	Interamerican Development Bank
▪ Donors providing funding:	Sustainable Infrastructure Program (SIP)
▪ IDB Funding Requested:	US\$1.000.000
▪ Local counterpart funding, if any:	US\$0
▪ Execution and disbursement period:	36 months
▪ Required start date:	May 2019
▪ Types of consultants:	Individual and Firms
▪ Prepared by Unit:	Energy Division
▪ Unit of Disbursement Responsibility:	Country Office Colombia
▪ TC included in Country Strategy (y/n):	Yes
▪ TC included in CPD (y/n):	Yes
▪ Alignment to the Update to the Institutional Strategy 2010-2020:	Productivity and innovation; Institutional capacity and rule of law; Environmental sustainability

### II. OBJECTIVES AND JUSTIFICATION OF THE TC

- 2.1 The objective of this Technical Cooperation (TC) is to support the Government of Colombia (GoC) in strengthening its institutional, technical, and regulatory capabilities to ensure the effective adoption of Non-Conventional Renewable Energy (NCRE) in their electricity generation matrix.
- 2.2 Colombia has an installed capacity of 16,779 MW, of which 69.6% are hydro and 29.4% thermal. NCRE represent less than 1% of the installed capacity on the interconnected system. The reliability of the system on hydropower makes it highly vulnerable to extreme weather events such as El Niño. During periods of low hydrology, there is a significant risk of power supply shortages, with an associated impact on the country's economy, as it must rely on expensive thermal generation. This risk has increased as the Hydroelectric Project "Hidroituango" (2,400 MW), whose first phase (1,200 MW) was expected to start operation in December of 2018, in experiencing important delays in its completion, now expected by to 2021/2022.

- 2.3 In addition to the large hydropower potential, the country is endowed with abundant clean energy resources, including wind, solar, geothermal, and biomass. These resources are mostly untapped and could be countercyclical to the country's rain patterns. The risk of electricity shortages during extreme weather events and the higher costs of electricity due to the reliance on thermal generation during those periods can be mitigated with the installation of generation plants based on NCRE. This would also bring important climate change benefits by reducing CO2 emissions from the thermal plants, contributing to the country's Nationally Determined Contributions (NDC's), and enhancing the resilience of the system. In that context, the GoC has announced its intention to incorporate 1,500 MW of NCRE by the end of 2022, from approximately 100 MW at present. The NCRE projects will partially compensate the capacity that was expected to be added by the Hidroituango project. This requires important support and advice to adequately incorporate the new generation into their system and to ensure that the institutional and regulatory frameworks are in place.
- 2.4 In recent years, the GoC has introduced some important pieces of legislation and regulation aimed at promoting the introduction of NCRE in the National Interconnected System and in the Non-interconnected areas. These include the Renewable Energy Law (Law 1715 of 2014) that promotes the development of NCRE and energy efficiency), Decree 0570 of March 2018 (providing policy guidelines for the long term contracting of NCRE) and associated resolutions that establish the framework for the introduction of large-scale NCRE. The first NRCE auction was held on February 26, 2019 but unfortunately no projects were awarded as two of the three competition requirements established by the Regulatory Commission (CREG) were not met. The Ministry announced a new auction for the second semester of 2019. Moreover, in 2018, the Energy and Mining Planning Division (UPME) completed the procurement of the construction and operation of a 500 kV transmission line connecting La Guajira region, it will allow the development of large wind and solar projects in a region that has the best wind and solar resources in the Country.
- 2.5 Despite these positive signals, important institutional, regulatory, implementation, and risk mitigation barriers remain and if not properly addressed could hinder the development of NCRE. Therefore, it is important to strengthen the institutional regulatory and technical capabilities of the key sector players (i.e. Ministry of Energy and Mines, CREG, National Planning Department, UPME, and XM) in the energy sector to ensure an optimal development of the NCRE in the country.
- 2.6 **Bank support to the Colombian electricity sector reforms.** The Bank has supported the Government of Colombia in the preparation and implementation of technical and institutional reforms of the electricity sector, which has been identified as priorities by the the Programmatic Operation (PBP), Nacional Program to Ensure Sustainable and Efficient Energy Supply (4415/OC-CO and 4773/OC-CO). This PBP was conceived to support reforms that would: (i) ensure a sustainable and efficient energy supply that reduces the sector vulnerability to the climate change effects through the incorporation of Non-Conventional Renewable Energy Sources (FNCER); (ii) increase the coverage of electric power in the ZNI; (iii) promote regional electricity integration; (iv) improve demand management; and (v) strengthen institutional aspects. The current TC will support the consolidation of the reforms by: (i) strengthening the sector institutions to promote and incorporate NCRE in the

Colombia; (ii) proposing strategies to increase the participation of the NCRE in the electricity matrix, further than the original 20% target, and (ii) developing instruments that facilitate the investments in the NCRE.

- 2.7 **IDB's Country Strategy for Colombia 2014-2018 (GN-2832).** The TC is consistent with the objectives of increasing economic productivity by progressively reducing the subsidies in public sectors and promoting economic efficiency in view of life-cycle costs, which match the principal concept of quality infrastructure. It will also contribute with the objective of strengthening the resilience of infrastructure to climate change. This TC will specifically support developing mechanisms to implement quality infrastructure by: (i) ensuring alignment with socioeconomic development and strategies of developing countries/regions as well as comprehensive response to the needs; and (ii) economic efficiency of infrastructure. The TC is also consistent with the objectives of the Country Strategy for Colombia 2019-2022, which will be approved in July 2019.
- 2.8 **Update to the Institutional Strategy 2010-2020 (AB-3008).** The TC objective is consistent and aligned with the development challenge of productivity and innovation, and the cross-cutting theme of climate change and environmental sustainability the introduction of NCRE in the Colombian electricity matrix. Additionally, the TC is aligned with the Sustainable Infrastructure Strategy of the IDB by supporting ongoing improvements in energy infrastructure to enhance the resiliency of the electricity system. The TC is also consistent with the Energy Sector Framework Document (GN-2830-3), in the thematic area of sustainability, and the Climate Change Framework (GN-2835-8) in the area of mitigation as it will support the development of clean energy technologies in Colombia. The TC is aligned with the Sustainable Infrastructure Fund's (SIP) objectives of financing TC operations, investment grants, and blended-finance operations in sustainable low carbon infrastructure sectors, including renewable energy and lower-carbon and efficient energy generation.

### III. DESCRIPTION OF ACTIVITIES/COMPONENTS AND BUDGET

- 3.1 To achieve the proposed objectives, the TC will finance three components:
- 3.2 **Component I: Institutional Support for the Development of NCRE.** This component will support the Ministry of Mines and Energy (MME), the National Planning Department, the UPME, and the FENOGE to strengthen their capacity to adequately promote and incorporate NCRE in the Colombian Electricity System. It will also support the design of mechanisms to manage risks resulting from the auction of NCRE and to compensate impacts of those projects that will benefit the local communities. Studies and activities to be financed under this component include:
- (i) *Design and establishment of a renewable energy Directorate/Unit at the MME.* The study will design a new directorate/unit in the MME in charge of the policy to promote the use of NCRE sources. The design should consider, the responsibilities to be assigned to the new Unit, the harmonization of roles within the Ministry and other agencies, such as UPME and CREG, and the staffing required. The new Directorate/Unit will initially be established under a zero-cost strategy to MME and the study should propose a means to secure budget and staff for the new Directorate/Unit in the long term.

- (ii) *Design of risk mitigation mechanism for contracting large scale wind and solar resources.* Designing the adequate guarantees and guarantee management structures, such as compensation chambers, clearing houses, or others, for managing contracts that result of organized auctioned mechanisms. The objective of such mechanisms is to reduce counterpart (off-taker) risks in the market. The study should evaluate if it's necessary to create a new institution in the Colombian electricity market or if XM or another entity will take on these functions. It also will summarize the regulatory arrangement needed to implement this clearing house.
- (iii) *NCRE socioeconomic compensation mechanism.* It will propose an economic mechanism to compensate the impacts to the regions where the NCRE will be developed. The study will evaluate the current mechanism established by Law 99 of 1993, which is a monetary transfer to the regions where power plants are located, based on a percentage of the energy sales of the plants (6% for hydro and 4% for thermoelectric plants). The proposed mechanism will consider the possible impacts to the environment and communities by technology (wind, solar, geothermal, and biomass) and if the mechanism should be the same for all the technologies or different. The proposal should also include a possible distribution of the sources within the regions.<sup>1</sup>

### 3.3 **Component II: Integrating Variable Renewable Energies to the Colombian Grid:**

This component will finance key studies to solve critical aspects in integrating large variable power sources into the power grid. The studies are important to improve both the commercial and technical viability of integrating large-scale variable power sources into the Colombian System. Activities to be financed under this component include:

- (i) *Optimization of the Colombian Energy Matrix using NCRE.* The study will propose a strategy to optimize the Colombian generation matrix incorporating the new NCRE awarded in the Reliability Charge and NCRE auctions. The study will consider the current electricity mix, the electricity grid capacity and its restrictions, and the new NCRE to be developed. Most importantly, the complementarity of wind and solar resources in the mix will be analyzed with the objective to inform strategy on how to stagger the development of wind resources so that system flexibility needs are managed adequately as well as maximizing resource impact on supply adequacy.
- (ii) *Wind Resources in La Guajira.* The consultancy will model the wind patterns in la Guajira considering meteorological variables such as: solar radiation, wind speed, temperature, among others. Based on such results the study will also analyze and design storage solutions for La Guajira, to both help manage variability in the region and help with grid congestion. The study should look into the optimal sizing and complementarity of projects in La Guajira aiming at defining if there should be staggered, phased, or development of the sources in the regions to make sure complementarities of resources developed help with system flexibility and adequacy.

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<sup>1</sup> The current mechanism establishes that the region's transfers are split between the Regional Environmental Autonomous Corporations, the municipality where the power plant is located and, in the case of hydroelectric, the municipalities of the hydrographic basin that supply the dam.

3.4 **Component III: Developing markets and instrument for mid-scale corporate procurement of renewables.** Considering that that midscale (a few tens of MWs to a few MWs projects) projects are becoming more and more attractive to mid and large commercial consumers, the objective of this component is to develop instruments that enable new business models for corporate procurement of renewable energy, making the generation sector more competitive and distributed, and easier to access to new entrants. This component will include:

- (i) *Designing regulatory instruments to enable new business models for corporate procurement of renewables.* Proposal to review or write new regulation that should allow large commercial or industrial energy consumers to produce their own electricity with on-site generation schemes or with collective arrangements that should facilitate in a balanced manner the sharing of renewable energy and other products among resources with distributed or peer to peer energy exchange mechanisms. The objective is to craft regulations that allow for new innovative business model to emerge with the use of new digital technologies.
- (ii) *On site storage regulations.* Storage is becoming more and more attractive to large consumers or renewable energy producers. The objective of this chapter is to study the experience on technical and economic regulation of onsite energy storage installations coupled with demand or generation centers at mid scales. The aim is removing regulatory barriers that consumers or producers may have to adopt storage technologies inside their premises.

3.5 The total cost of this TC will be US\$1,000,000 which will be financed by the Sustainable Infrastructure Program (SIP):

**Indicative Budget**

Activity/Component	Description	Total Funding SIP
<b>I. Institutional Support for the Development of NCRE</b>	Design and establishment of a renewable energy Directorate/Unit at the MME	<b>250,000</b>
	Design of risk mitigation mechanism for contracting large scale wind and solar resources	<b>200,000</b>
	NCRE socio economic compensation mechanism	<b>50,000</b>
<b>II. Integrating Variable Renewable Energies to the Colombian Grid</b>	Optimization of the Colombian Energy Matrix using NCRE	<b>100,000</b>
	Wind curves in La Guajira	<b>150,000</b>
<b>III. Developing markets and instrument for mid-scale corporate procurement of renewables.</b>	Designing regulatory instruments to enable new business models for corporate procurement of renewables	<b>150,000</b>
	Regulation for on-site storage	<b>100,000</b>
<b>Total</b>		<b>1,000,000</b>

#### **IV. EXECUTING AGENCY AND EXECUTION STRUCTURE**

- 4.1 By request of the Ministry of Energy and Mines and the National Planning Department (DNP), and in accordance with Point D of Annex 10 of GN-2629-1 and Point D of Annex 10 of OP-1155-2, this TC will be executed by the IDB. The IDB will execute this TC to: (i) avoid lengthy internal budgeting procedures that can jeopardize the achievement of its objectives by delaying the start of procurement of key studies and consultants' payments, as the TC is not included in the DNP 2018 budget, and (ii) to facilitate coordination between the different public-sector entities (DNP, Ministry of Mines and Energy, UPME and Renewable Energy and Energy Efficiency Fund (FENOGE)).
- 4.2 The Energy Division (INE/ENE) will be responsible for its execution, in coordination with the IDB Country Office in Colombia (CAN/CCO). The Bank will contract individual consultants, consulting firms, and non-consulting services in accordance with the Bank's current procurement policies and procedures: (i) the individual consultants will be hired in accordance with the guidelines set out in the AM-650; (ii) the procurement process for consulting firms will follow the Bank Policy for the Selection and Contracting of Consulting Firms for Bank-executed Operational Work (GN-2765-1) and the related Operational Guidelines (OP-1155-4), and (iii) the procurement of non--consultant services will follow the Bank Corporate Procurement Policy (GN-2303-20).
- 4.3 In compliance with the Operational Guidelines for Technical Cooperation Products Revised version (GN-2629-1), this TC is classified as Client Support. The technical responsibility is in INE/ENE.
- 4.4 The focal point designated and sector specialist responsible for executing and supervising this TC will be the Senior Energy Specialist based in Bogota, Colombia, with the support of the Bank Country Office in Colombia (CAN/CCO) and the INE/ENE Team.

#### **V. MAJOR ISSUES**

- 5.1 No major risks are anticipated for the development of the TC. However, there could be eventual delays in the development of the studies, due to potential difficulties in coordinating the different counterparts involved: DNP, MME, UPME, and FENOGE. This risk can be mitigated by involving the counterparts from the beginning of the execution of the TC. The execution from INE/ENE, with the support of specialized consultants, will help to mitigate these potential risks. The draft of Terms of Reference (ToR) of the studies to be financed have been prepared and agreed by the counterparts. The ToR for the key studies is ready and the consultants will be procured once the funds become available.

#### **VI. EXCEPTIONS TO BANK POLICY**

- 6.1 No exceptions to the Bank's policies are requested.

#### **VII. ENVIRONMENTAL AND SOCIAL STRATEGY**

- 7.1 According to the Environmental and Safeguards Compliance Policy (OP-703), this TC has been classified as Category "C". The latter ratifies a negative minimum or inexistent environmental, social and/or cultural impact; therefore, no environmental

assessment studies or consultations are required for Category “C” operations. (see [Safeguard Policy Filter Report](#) and [Safeguard Screening Form Report](#)).

**Required Annexes:**

- Annex I: [Request from the client](#)
- Annex II: [Results Matrix](#)
- Annex III: [Terms of Reference](#)
- Annex IV: [Procurement Plan](#)