

TC Document

I. Basic Information for TC

▪ Country/Region:	COLOMBIA
▪ TC Name:	Renewable Energy Integration - support to green hydrogen projects
▪ TC Number:	CO-T1731
▪ Team Leader/Members:	Planas Marti, Maria Alexandra (INE/ENE) Team Leader; Sandoval, Jose Manuel (CSD/CCS) Alternate Team Leader; Hoffman, Nathalie Alexandra (SEC/TRD); Ansaldo, Mariano (INE/TSP); Davila Rueda Erik Julian (INE/ENE); Catacoli Jimenez, Ruth (VPS/ESG); Juan Tulande Lopez (INE/ENE); Juarez Olvera, Mariel (CSD/CCS); Ayala Roa, Mauricio (DSP/ADV); Liliana Chacon (CAN/CCO); Gonzalez Martinez, Julian Eduardo (DSP/ADV); Alvaro Mejia (INE/ENE); Oscar Paramo (INE/ENE); Vila Saint Etienne, Sara (LEG/SGO) Team Leader; Sandoval, Jose Manuel (CSD/CCS) Alternate Team Leader; Hoffman, Nathalie Alexandra (SEC/TRD); Catacoli Jimenez, Ruth (VPS/ESG); Juan Tulande Lopez (INE/ENE); Juarez Olvera, Mariel (CSD/CCS); Liliana Chacon (CAN/CCO); Alvaro Mejia (INE/ENE); Oscar Paramo (INE/ENE); Vila Saint Etienne, Sara (LEG/SGO) Oscar Páramo and Juan Tulande Lopez (INE/ENE); Liliana Chacon (CAN/CCO); and Alejandra Catacolí (VPS/ESG)
▪ Taxonomy:	Client Support
▪ Operation Supported by the TC:	N/A
▪ Date of TC Abstract authorization:	N/A
▪ Beneficiary:	Ministry of Energy and Mines through FENOGE
▪ Executing Agency and contact name:	Inter-American Development Bank
▪ Donors providing funding ¹ :	Strategic Climate Fund(SCX)
▪ IDB Funding Requested:	US\$2,000,000.00
▪ Local counterpart funding, if any:	US\$0
▪ Disbursement period (which includes Execution period):	36 months
▪ Required start date:	April 2024
▪ Types of consultants:	Firm and Individual Consultants
▪ Prepared by Unit:	INE/ENE-Energy
▪ Unit of Disbursement Responsibility:	CAN/CCO-Country Office Colombia
▪ TC included in Country Strategy (y/n):	Yes
▪ TC included in CPD (y/n):	No
▪ Alignment to the Update to the Institutional Strategy 2010-2020:	Gender equality; Productivity and innovation

II. Objectives and Justification of the TC

2.1 The objective of this Technical Cooperation (TC) is to provide technical assistance to accelerate the country's clean and inclusive energy transition, by supporting the

¹ This TC is funded with resources from the Climate Investment Fund (CIF) - Renewable Energy Integration Program (REI).

development of clean and low carbon hydrogen projects that will contribute to the decarbonization of difficult-to-electrify sectors.²

- 2.2 This TC will have two specific objectives: (i) Support the development of at least five pre-feasibility/feasibility studies for low-emissions hydrogen pilot projects and its value chain; and (ii) specific objective is to build technical capabilities in the private, financial, and public sectors around the renewable energy and low-emission hydrogen industry through the support of pilot projects and knowledge dissemination activities.
- 2.3 As result of the Paris Agreement (COP 21), Colombia was committed to reduce its greenhouse gas emissions in 51% by 2030, compared to the business-as-usual case, and its carbon neutrality by 2050. These goals are confirmed by the country's current government through its "National Development Plan 2022–2026: Colombia World Power of Life" (in its Spanish short, PND 2022–2026), which declares its purpose to accelerate the energy transition and decarbonization of the economy by promoting the power generation from non-conventional renewable sources (such as wind, solar, geothermal), the development of new energy sources like the clean and low carbon hydrogen and energy efficiency measures, among others³.
- 2.4 The PND 2022–2026 states that Colombia will take steps to advance in the production of clean and low carbon hydrogen and other key synthetic fuels for the decarbonization of sectors where electrification is difficult to achieve and for non-energy uses such as the production of fertilizers. All of that, building on the policy efforts from recent years by the Ministry of Mines and Energy – MME, such as the Law 2099 of 2021⁴, MME's Decree 1476 of 2022⁵ and the Hydrogen Roadmap, as an effort to diversify the energy matrix and decarbonize of difficult-to-electrify sectors.
- 2.5 The IDB has financially supported Colombia in its efforts to implement some of the actions proposed in the Hydrogen Roadmap, financially supported by IDB. For example, in 2021, the Bank financed a study aimed at defining the applicable regime for the implementation of the Regulatory Sandbox in the Hydrogen Industry⁶. Now, the Bank is collaborating with the development of pilot projects to assess the technical and economic feasibility of low-to-zero emissions' hydrogen projects, looking to incentivize the technological development and knowledge generation along different parts in the value chain. For example, the bank is supporting the elaboration of an advanced conceptual engineering study for a pilot project that explores the use of hydrogen to produce ammonia and green fertilizers⁷. Similarly, the bank recently published a call for consultancy studies related to a hydrogen plant that uses sugar cane.⁸
- 2.6 Moreover, the Hydrogen Roadmap identified 28 actions grouped in 4 topics/strategic lines: (i) legal regulatory enablers; (ii) market development instruments; (iii) support for the deployment of infrastructure; and (iv) promotion of technological and industrial development. It is estimated that the implementation of this roadmap would help to mobilize investments between US\$2,500 and US\$5,500 million between 2020 and

² [Hoja de Ruta del Hidrógeno en Colombia.](#)

³ [Plan Nacional de Desarrollo 2022 – 2026.](#) Colombia Potencia Mundial de la Vida, Chapter 4.C. [Law 2099 of 2021](#) which included the concepts of Green Hydrogen and Blue Hydrogen into the current legal framework for Non-conventional Sources of Energy.

[Decree 1476 of 2022](#) which adopts some legal dispositions to promote the innovation and research related to the Hydrogen and its technologies of production, storage, distribution, and different uses.

⁶ [RG-T3988-P001.](#)

⁷ [CO-T1663-P001.](#)

⁸ [RG-T3988-P007.](#)

2030, to create between 7 to 15 thousand direct and indirect jobs along the value chain, and to avoid between 2.5 and 3 MTons of GHG in the same period.

- 2.7 On February 2nd,2024 the governing board of the Climate Investment Fund endorsed Colombia's Renewable Energy Integration (REI) Investment Plan, to help enable the penetration of renewable energy sources into its generation matrix. Under this investment plan, Colombia can access US\$70 million of concessional funds, including a US\$2 million grant for technical assistance to the Colombian government through the Non-Conventional Energies and Energy Efficiency Fund (known in Spanish as FENOGE), as the entity called in Colombia to promote the NCER, to support the implementation of Colombia's Hydrogen Roadmap, by promoting technical knowledge and supporting the preparation of pre-feasibility and feasibility studies of promising clean and low carbon hydrogen projects, resources that will be executed with this technical cooperation.
- 2.8 In terms of gender equality, the sector has a significant gender gap in knowledge and employment. Women tend to be under-represented in certain fields of science, technology, engineering, and mathematics (STEM), for instance, in 2019 women represented 31% of new entrants in engineering, manufacturing and construction programs. There is also a challenge related to occupational segregation: the International Labor Organization (ILO) estimates that female labor force participation is significantly lower than male in mining and quarrying, electricity, gas, and water supply (of the total of people employed in these sectors, 83% are men and only 17% are women). Colombia does not have statistics on gender gaps for the hydrogen industry. This industry is new in the country and information will be collected as it develops.
- 2.9 In this context, this technical cooperation seeks to support pre-investment studies (pre-feasibility or feasibility) of Clean and Low Carbon Hydrogen– pilot projects related to production, storage, conditioning, distribution, innovation, research and/or industrial uses, which will contribute to the decarbonization of difficult-to-electrify sector. Through the knowledge built from these studies, the bank expects to create technical capacity building in the government, the local industry, the financial sector and to build public confidence in Clean Hydrogen projects to increase future market demand for this product and its derivatives. This TC will also support knowledge sharing and dissemination activities that will include a gender perspective and build capacities to promote gender equality.
- 2.10 **Strategic Alignment.** This TC is consistent with the IDB Group Institutional Strategy: Transforming for Scale and Impact (CA-631) and is aligned with the objectives of: (i) address climate change and (ii) bolster sustainable regional growth as it will support pre-investment studies of pilot projects for the development of the clean and low carbon hydrogen industry in the country. The Program is also aligned with the operational focus area(s) of: (i) biodiversity, natural capital and climate action, because clean hydrogen projects provide a mean to decarbonize difficult-to-electrify sectors (ii) gender equality and inclusion of diverse population groups, by including training activities that will promote gender equality in the energy sector; (iii) institutional capacity, rule of law, and citizen security; and (iv) productive development and innovation through the private sector, as the support to pilot projects and knowledge dissemination activities will help to build capacities across financial, public and private sectors and build confidence for the devolvement of the green hydrogen sector.

- 2.11 This TC will be funded by resources from the REI of the Climate Investment Funds (CIF) to contribute to the promotion of new installed capacity of NCRE in the Colombian electricity matrix, contributing to the reduction of GHG emissions.
- 2.12 The TC is also aligned with the development challenge of Gender equality because includes two activities that will promote gender equality. The first one is the implementation of a training program that will prioritize women participation to develop capacities and knowledge on the economic, financial, technical, regulatory elements of projects across the clean energy and low carbon hydrogen value chain. This training program will also incorporate a module about the promotion of gender equality in the energy sector. The second activity will implement a dissemination strategy about green hydrogen and the relevance of integrating gender and diversity aspects in clean energy projects.
- 2.13 The TC is also consistent with (i) the Energy Sector Framework document (GN-2830-8) and the Climate Change Sector Framework (GN-2835-13) on sustainability and renewable energies. The TC is in line with the IDB Group Country Strategy with Colombia 2019-2022 (GN-2972-1) in the strategic area such as: (i) increasing economic productivity; and (ii) climate change through cost reduction, competitiveness improvement of energy transition project.

III. Description of activities/components and budget

- 3.1 **Component I. Pre-feasibility and feasibility studies for clean and low carbon hydrogen projects (US\$1.820.000).** This component will co-finance at least five pre-feasibility and/or feasibility studies for prioritized clean and low carbon hydrogen pilot projects related to the production, storage, distribution, heavy industry, heavy transport, and/or other difficult-to-decarbonize sectors.
- 3.2 Prioritized projects were jointly selected between the IDB, IDB Invest and FENOGE based on their preparation stage, the project sponsors, and the likelihood of their development. As selection criteria, only those projects where hydrogen will be produced from renewable sources such as biomass, small hydroelectric, wind, geothermal, or solar were considered.
- 3.3 The studies could include the technical, environmental, economic, financial, and legal aspects that are required to determine the pre-feasibility and/or feasibility of clean and low carbon hydrogen production pilot projects and/or its potential uses, in the following sub-sectors:
- freight or mass public transportation systems
 - production of clean and low carbon hydrogen derivatives such as green ammonia, urea, and fertilizers, in rural areas for communities
 - production of clean and low carbon hydrogen from sanitary filling gas to decarbonize garbage collection trucks
 - industrial uses of GH₂ and other uses
 - Environmental and social studies, including strategic environmental and social assessments (SESAs) regarding the IDB's Environmental and Social Policy Framework
 - Clean and low hydrogen certification for local and regional requirements

- 3.4 Finally, this component will also co-finance two conceptual analyses on the production and use of GH₂. The first one, on the potential production of green hydrogen using the geothermal energy resources available in the country, which are another source of renewable energy; and the second one, on the potential for the producing Sustainable Aviation Fuels (SAF) from biomass and clean and low carbon hydrogen.
- 3.5 **Component II. Capacity building and knowledge dissemination (US\$180.000).** This component aims to provide technical assistance to enable effective knowledge sharing activities related to clean energy and low carbon hydrogen, including: (i) training of government officials/advisors; (ii) knowledge sharing of case studies/projects and/or policies carried out by the government, the private sector, or international institutes; (iii) workshops to analyze and discuss potential production technologies and uses of clean and low carbon hydrogen; and (iv) Dissemination of study results.
- 3.6 In the development of this component is important to secure an increased number of people (including women and people with disabilities) trained on clean energy, hydrogen production and conversion, hydrogen technologies, storage, sustainability, and financial market opportunities.
- 3.7 Invitations will be sent to leaders from financial institutions, the private sector and government entities related to the hydrogen value chain, requesting them to select members of their teams who they consider key to strengthening their capabilities around renewable energies and hydrogen. In addition, they will be asked to try to prioritize the participation of women.
- 3.8. It is expected to implement hybrid workshops, where the first lessons will be conducted by teams, zoom, google meets or other related virtual meetings app. The last lesson is expected to be conducted in-person, in a location to be defined in Bogota.
- 3.9. Finally, this component will also finance individual consultants to provide technical support to FENOGE. The consultants will support the contracting activities and quality supervision of the studies, training programs and knowledge dissemination strategies that are part of this technical cooperation. It is anticipated that one specialist in renewable energy and hydrogen and one specialist in project management will be financed through this component.
- 3.10. **Expected Results.** The expected results from this technical cooperation are: (i) five clean and low carbon hydrogen projects with pre-feasibility and/or feasibility studies ready for financing; (ii) two conceptual analysis related with the production and use of clean and low carbon hydrogen; (iii) increased number of people (including women) trained on clean energy, hydrogen production and conversion, hydrogen technologies, storage, sustainability, and financial market opportunities; (iii) increased capacity in financial, governmental and private sector actors about the technical, social, environmental and economic feasibility of clean and low carbon hydrogen projects as an effective mean to tackle the goals GHG emissions and promote sustainable energy, particularly among difficult-to-electrify sectors.
- 3.11. **Budget.** The total cost of this TC will be US\$2,000,000, financed with resources from the Renewables Energy Integration program from the SCX, under the Investment Plan

approved for Colombia⁹ in February 2023 by the Global Climate Action Program (GCAP) Committee. No financial local counterpart is foreseen.

Indicative Budget (US\$)

Component	Description	CIF - REI
Component I	Pre-feasibility and/or feasibility studies to support Clean and Low Carbon Hydrogen production and/or use pilot projects	1,600,000
	Conceptual analysis of clean and Low Carbon Hydrogen production using Geothermal Energy	110,000
	Conceptual analysis on the potential to produce Sustainable Aviation Fuels (SAF) from biomass and Clean and Low Carbon Hydrogen	110,000
Component II	Training sessions on the technical aspects of clean energy and Low Carbon Hydrogen	50,000
	Dissemination strategy about clean and low carbon hydrogen and the relevance of integrating gender and diversity aspects when submitting proposals to FENOGE	30,000
	Technical Support	100,000
Total		2,000,000

IV. Executing agency and execution structure

- 4.1. As requested by the Ministry of Energy and Mines, this TC will be executed by the IDB, through the Energy Division (INE/ENE). This execution will facilitate the coordination of the multiple private and public sector actors that will be involved in its implementation of and to benefit from the expertise of the Bank in the execution of H₂V studies and projects. The Bank will be responsible for hiring the consulting firms and individual consultants that will perform the consulting services described in each of the components, following the guidelines set out in Appendix II (Procurement Criteria by the Bank) of the Operational Guidelines for TC Products (OP-619-4).
- 4.2. All activities to be executed under this TC have been included in the Procurement Plan (see Annex IV) and will be contracted in accordance with Bank policies as follows: (a) AM-650 for Individual consultants; (b) GN-2765-4 and Guidelines OP-1155-4 for Consulting Firms for services of an intellectual nature; and (c) GN-2303-28 for logistics and other related services. The execution/disbursement period has been calculated as 36 months.
- 4.3. The Energy Division (INE/ENE) and the Bank's Representation in Colombia (COF/CCO) will maintain constant dialogue with all relevant actors for the execution

⁹ [The governing board of the CIF](#) endorsed a wide-ranging investment plan of US\$70 million to fast-track the transformation of Colombia's energy system and help enable its grid system to absorb and channel more clean power. The Investment Plan includes US\$2 million to finance feasibility studies for prospective green hydrogen projects.

of this TC including the Ministry of Energy and Mines and FENOGÉ. To guarantee a constant and effective dialogue, both the Energy Division (INE/ENE) and the Bank's Representation in Colombia (COF/CCO) will establish a working group with representatives of the relevant public entities to coordinate the execution of the components. Finally, this working group will be in charge of providing technical support to the Energy Division (INE/ENE) and the Bank's Representation in Colombia (COF/CCO) during the monitoring activities of the contracted consulting firms that are contracted with resources of this TC.

- 4.4. The focal point designated and sector specialist responsible for executing and supervising this TC will be the Lead Energy Specialist based in Bogota, Colombia, with the support of the Bank Country Office in Colombia (CAN/CCO) and the INE/ENE Team. INE/ENE will be the unit responsible for making the disbursements.

V. Major issues

- 5.1. No significant risks are expected during the execution of the TC. One minor risk is identified, related to the availability of the information necessary for the studies. The execution of the INE / ENE, with the support of specialized consultants, continuous follow-up meetings with the government and indicating the information necessary for the study from the beginning will help mitigate these potential risks.
- 5.2. All knowledge products derived from this Technical Cooperation will be the Bank's intellectual property.

VI. Exceptions to Bank policy

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

VII. Environmental and Social Aspects

- 7.1. This TC will finance feasibility (or pre-feasibility) studies of investment projects and associated environmental and social studies, whose terms of reference and products will be consistent with the applicable requirements of the Bank's Environmental and Social Policy Framework (ESPF) and related environmental and social technical guidelines.

Required Annexes:

[Request from the Client_64751.pdf](#)

[Results Matrix_79296.pdf](#)

[Terms of Reference_71151.pdf](#)

[Procurement Plan_44252.pdf](#)