

ENERGY TRANSITION IN NON-INTERCONNECTED ZONES OF COLOMBIA.

Project Overview

Project Title	ENERGY TRANSITION IN NON-INTERCONNECTED ZONES OF COLOMBIA.		
Sector (sub-topics)	Green hydrogen		
Country	Colombia	Location	Acandi
Project Duration	24 months	Budget	USD 9.907.500
Association with Other Projects	There is no current similar projects ongoing in this field in Acandi, Colombia		

Table 1. Project overview.

Submitter's Information

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

Table 2. Submitter's information.

Partner Country's Implementing Organization(s)

Partner Country Contact 1 (ministerial level)	
Name	
Position	(details to be provided when selected)
Organization	Ministry of Mines and Energy of Colombia
E-mail	
Partner Country Contact 2	
Name	
Position	(details to be provided when selected)
Organization	FENOGE
E-mail	

Table 3. Partner Country's Implementing Organization(s)

1. Project Background

Current Situation & Relevant National Development Plans, Policies, and Strategies

The Ministry of Mines and Energy as the entity in charge of formulating, adopting, directing and coordinating public policy in terms of the development of alternative energy sources in the country and efficient energy management, has been leading actions to contribute to the development and implementation Non-Conventional Energy Sources (NCES) and Efficient Energy Management (EEM) programs and projects within the framework of the energy transition, thus reinforcing the National Government's commitment to compliance of the country's NDC.

The Non-Conventional Energy and Efficient Energy Management Fund – FENOGE, for its name in Spanish, was created by Law 1715 of 2014 and amended by Law 2099 of 2021 as an autonomous estate administered through a merchant trust contract, to promote, execute and finance plans, NCES and EEM programs and projects and established that the Fund would be regulated by the Ministry of Mines and Energy, which updated its manual through Resolution No. 4 0045 of 26 January 2022 - FENOGE Operating Manual. This Manual establishes the funding mechanisms for NCES and EEM initiatives in the country.

This same Law, established in its Article 10, paragraph (b), that "with the resources of the Fund, plans, programs and projects, studies and research in non-interconnected areas may be partially or totally financed, among other actions, to promote, structure, develop, To implement or execute non-conventional sources of energy and efficient energy management, as well as to finance the use of RNCES for the provision of domestic public services, implementation of solution of small-scale self-generating micro-networks, in accordance with the FENOGE Operating Manual.

As its establish in the law 2099 of 2021 in the article 5, the green and blue hydrogen is a NCES.

In this context, FENOGE is analyzing alternatives to finance this kind of projects in the country, considering that among its objectives is to promote, structure, develop, implement and/or execute, finance and encourage the development of green hydrogen mainly, in order to develop an ecosystem that strategically involves and links all the actors in the value chain.

Also, The Ministry of Mines and Energy and the Interamerican Development Bank publish the Hydrogen Road Map where they establish the following goals by 2030: (i) 1-3 GW in electrolysis, (ii) Achieve competitive green hydrogen, achieving costs of 1.7 USD/kg (iii) Production of at least 50 kt of blue hydrogen by capturing CO₂ in existing plants or new plants for storage or use.

To this end, FENOGE leads the +H₂ COLOMBIA initiative, with the support of the Ministry of Mines and Energy, It adds to the realization of the hydrogen roadmap and promotes the generation of green and blue hydrogen knowledge in Colombia and its applications throughout the value chain and will allow the design of investment and financing mechanisms that promote the development of the emerging hydrogen market in the country.

The current proposal is an initiative led by FENOGE which wants to favor the development of the Hydrogen as an NCES through the financing of the programs and projects.

Association with Other Projects/Programs

This proposal will work as a complement of the ongoing efforts of the national government to move forward the implementation of the hydrogen roadmap of Colombia. Particularly in regards of the pilot projects development.

2. Project Objectives

Replace the generation of electricity non-interconnected zones with fossil sources for clean energy from the production, storage, and re-electrification of green hydrogen. The Project also seeks to reduce respiratory diseases caused by gases emitted by generation plants and create local capacities in the operation and maintenance of energy systems based on hydrogen as an energy vector.

3. Project Components

Component 1	Installation of Power to gas to power system.
Component 2	Sensitization and socialization with the community
Component 3	Monitoring and verification of results
Component 4	Launch of the project.

Table 4. Components required

4. Project Location, Period, and Estimated Cost

- **Duration:** The project will be executed in 2 years (24 months).

FIRST YEAR	Supply and installation of solar generation plant, electrolyser, storage systems and fuel cells to produce electrical energy with the technology, Power to gas to power. Also, socialization of the project with the community.
SECOND YEAR	Testing, conditioning, and commissioning of the generation system.

Table 6. Timeline Projection

- **Expected Project Cost:** 16.063.750 (USD)

Item	Amount (USD)
Green Hydrogen pre-feasibility projects	50.000
Solar generation plant of 5000 kWp	3.368.750
PEM electrolyzer and fuel cell	4.250.000
Storage System	950.000
Conditioning, communication and others	1.288.750
Total	9.907.500

Table 7. Proposed Project Cost

- **Location:** Colombia. Acandí.

Acandí is a Colombian municipality on the border with Panama located in the extreme north of the department of Chocó, in northwestern Colombia, on the shores of the Caribbean Sea. It is located 366 km from the capital of the department, Quibdó.



The department of Chocó has a great ecological wealth, as well as an important potential for the generation of solar energy and for sustainable tourism; however, it also has one of the highest rates

of multidimensional poverty in the country, standing 18 percentage points above the national average, according to figures from the National Planning Department. In particular, the municipality of Acandí is one of the most affected by poverty in the department, which is the result of multiple factors, among which one of the most important is the lack of access to a constant supply of electricity. Currently the districts of Triganá, San Francisco and Río Ciego have intermittent energy supply, that is, they only receive electricity in a limited time slot. This directly affects the economic activity and the social dynamics of the population.

This project will carry out the scaling of a green hydrogen generation, storage and re-electrification plant (Known in the literature as power to gas technology, from now on PtG, in this document) to provide energy support to communities of Triganá, San Francisco and Río Ciego. Additionally, it will promote the development of a bio-inspired electrolyser, which will use low-cost nanofabrication techniques, will allow high efficiency in the generation of hydrogen and will lead the country to the world forefront in the development of electrolyzers that can be used both at home and industrial. The PtG system has an installed power of 200 kWp solar panels, a 100 kW electrolyser, storage for 20 kg of hydrogen. In addition, for the re-electrification of hydrogen, the implementation of a fuel cell and 70 kW of fuel cell is proposed.

5. Project Implementing Organization

The Non-Conventional Energy and Efficient Energy Management Fund – FENOGE

6. Required Coordination at National/Regional Level

At National level coordination with the head of the Energy sector of Colombia will be needed, therefore as result this proposal have been built jointly with the technical team of the Ministry of Minas and Energy of Colombia to work together in the future stages of this proposal. At regional level the energy company of the island will be the focal point to coordinate local actions to be develop in the frame of this proposal.

7. Risks and Opportunities

Risks

- Automated operation of the system through an energy management system (EMS-Energy Management System).
- Improvable cost-efficiency ratio. Ten megawatt-hours of generated power produces about three megawatt-hours of usable energy by the time it is converted back into electricity for consumption.

Opportunities

Some of the benefits of this project are detailed below

- Hydrogen storage systems can address much longer storage time scales than batteries (suitable for discharge times of 4 hours or less) reaching days or weeks.
- Reduction/elimination of diesel backup systems reducing CO2 emissions and pollution.
- Improvement in the energy self-sufficiency of the ZNI by eliminating the dependency on fuel supplies.
- Backup against variability of renewable resources. The fluctuations in the production of renewable energies require an energy storage system that optimizes the use of the energy captured and, at the same time, introduces the minimum of distortions to adapt the generation curve to the demand curve, and ensuring availability energy when the renewable generation system is not available.