HYDROGEN AND GREEN ENERGY GENERATION PROJECT		
Thematic Focus	Energy Transition	
Sector	Mines and Energy.	
Entities/Areas	Private Project	
Contributing Partner	Private	
National Development Plan Strategy to which it points	Productive Economy through Reindustrialization	
SDG to which it points	SDG 7: Affordable and Clean Energy: The project promotes the transition to renewable energy sources, contributing to ensuring access to affordable, reliable, sustainable and modern energy for all. SDG 9: Industry, Innovation and Infrastructure: The developed technology represents an innovation in energy generation, offering a sustainable and efficient alternative that can contribute to the development of resilient and sustainable infrastructure. SDG 11: Sustainable Cities and Communities: By promoting the generation of clean and renewable energy, the project can contribute to the creation of more sustainable and climate-resilient communities. SDG 13: Climate Action: Reducing the consumption of fossil energy and greenhouse gas emissions is fundamental to addressing climate change, directly contributing to the objective by offering a cleaner and more renewable alternative.	
Project Description	Project Purpose	1. The project has several purposes that address different aspects: 2. Implement sustainable technology for energy generation and contribute to the energy transition, this involves the research and design of systems that take advantage of renewable energy sources, such as the use of low hydraulic head water currents, to produce electricity and other energy purposes. 3. Reduce greenhouse gas emissions by offering an alternative to fossil fuel-based energy generation. 4. Promote the adoption of renewable energies, such as hydroelectric, instead of conventional energy sources. This is achieved by demonstrating the feasibility and effectiveness of the developed technology, as well as through awareness and education about the benefits of clean and renewable energies.

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		5. Boost economic and social development in the communities where it is implemented. This may include creating employment in the renewable energy sector, strengthening local energy infrastructure, and improving the quality of life for residents by ensuring more secure and reliable access to energy. In summary, the aforementioned purposes are interrelated and complement each other to move towards a more sustainable and equitable future for the Department of Sucre
	Objectives	Produce equipment for hydrogen generation and energy using the low hydraulic head of water currents in the Department of Sucre
	Geographic Area of Influence	San Marcos, Caimito, Majagual, Guaranda, among other riverside towns.
	Is it included within the goals of the National Development Plan (NDP)	Yes _x_ No__
	Structuring Phase	TRL6
	Target (km), (panels, etc.):	Manufacture a 300-kilowatt unit and subsequently a 10 MW unit
	Is it located in a protected area or with indigenous/Afro-descendant communities:	Yes_X__ No____ Which Afro and indigenous communities in the municipalities of influence for the project
Duration by Phases	To initiate the scaling of the technology developed by Mentac SAS, we project to manufacture a 300 KW prototype unit to perform tests with real load and define the parameters for continuous 24/7 operation. Its value is as follows:	

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PHASE	DURATION MONTH	OBJECTIVE	VALUE COP	VALUE USD
1	3	Terrain studies and machine design	480.000.000	123.397,73
2	4	Acquisition of peripheral equipment and supplies	800.000.000	205.662,88
3	7	Manufacturing of generation equipment and testing	400.000.000	102.831,44
4	4	Assembly and commissioning	200.000.000	51.415,72
TOTAL	18		1.880.000.000	483.307,77

With the results of the operation with the 300 KW unit, we have the design basis and calculations to manufacture larger capacity units.

With this type of units, we can have several configurations:

- Energy production.
- Hydrogen production.
- Mixed production, hydrogen and energy.

As a reference, the manufacturing and assembly costs of a 10 MW unit for energy and hydrogen production are listed below:

PHASE	DURATION MONTH	OBJECTIVE	VALUE COP	VALUE USD
1	10	Terrain studies and machine design	2.730.000.000	701.824,58
2	6	Acquisition of peripheral equipment and supplies	30.420.000.000	7.820.331,01
3	12	Manufacturing of generation equipment and testing	15.600.000.000	4.010.426,16
4	8	Assembly and commissioning	3.900.000.000	1.002.606,54
TOTAL	36		52.650.000.000	13.535.188,30

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PHASE	DURATION MONTH	OBJECTIVE	VALUE COP	VALUE USD
1	10	Terrain studies and machine design	2.730.000.000	701.824,58
2	6	Acquisition of peripheral equipment and supplies	63.570.000.000	16.342.486,60
3	12	Manufacturing of generation equipment and testing	15.600.000.000	4.010.426,16
4	8	Assembly and commissioning	7.800.000.000	2.005.213,08
TOTAL	36		89.700.000.000	23.059.950,40

Contributions	Total Value	US $37.078.446,5 Million
	Nation Contribution	$0
	Contribution from Territorial Entities	$0
	Private Contribution	US$ 37.078.446.5 Million

Investment Opportunity

The consumption of fossil fuels is responsible for more than 75% of Greenhouse Gas (GHG) emissions. In response to this issue, the European Union has approved the ban on the sale of new gasoline and diesel vehicles from 2035, marking an important step towards reducing dependence on fossil fuels.

With the aim of further reducing these emissions, a significant increase in the demand for green hydrogen is expected by 2050, with a projected increase of 700%. At the same time, in Latin America and the Caribbean, the goal is set for at least 70% of electricity consumption to come from renewable sources by 2030.

In this context, companies such as MENTAC SAS have developed innovative technologies that offer sustainable alternatives for energy generation. Their technology takes advantage of water currents with low hydraulic head, such as in the cases of San Marcos and Guaranda, being respectful of the environment and with the ability to operate continuously 24 hours a day, 7 days a week, with reduced assembly and operating costs.

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Market Analysis

There is a dynamic market for energy generation projects, with more than 2,512 renewable projects with a total installed capacity of 15,684.52 MW registered with UPME in stages I (Pre-feasibility), II (Feasibility), and III (Detailed Engineering). Some of the developers of these projects are open to forming strategic alliances with investors willing to take the projects to construction and operation.

Solar: 7,661.30 MW, 183 Projects; Offshore Wind: 5,035.00 MW with 11 Projects; Onshore Wind: 2,614.60 MW, 15 Projects; Small Hydroelectric Power Plants (PCHs) 3,367.76 MW, 37 Projects and Biomass: 5.86 MW, 2 Projects.

Projects in Non-Interconnected Zones (ZNI), which represent 53% of the national territory (18 departments, 76 municipalities), will be promoted to replace fossil fuel generation with cleaner energy production through NCRE or hybrid sources to connect more than 460,000 families that still do not have access to the service. Currently, these areas produce 86% of their energy with Diesel (ACPM).

Financial Projections

300 KW Pilot Unit

Facturacion Energia - Hidrogeno									
	US/Kg	$/Kw-h	KW	Año 1	Año 2	Año 3	Año 4	Año 5	Año 6
Energia		225	300	583.200.000	606.528.000	630.789.120	656.020.685	682.261.512	709.5
Hidrogeno	4			673.920.000	700.876.800	728.911.872	758.068.347	788.391.081	819.9
			EBITDA E	215.333.073	209.697.248	218.024.563	226.494.878	235.546.674	244.9
			EBITDA H2	271.784.299	268.710.975	279.397.839	290.322.086	301.925.970	313.9

The projected energy and hydrogen billing over 6 years, taking the price of $225/KW-h and $4/Kg respectively, shows that the return on investment is approximately 6 years.

10 MW Unit

Facturacion Energia - Hidrogeno									
	US/Kg	$/Kw-h	MW	Año 1	Año 2	Año 3	Año 4	Año 5	Año
Energia		190	10	16.416.000.000	17.072.640.000	17.755.545.600	18.465.767.424	19.204.398.121	19.9
Hidrogeno	4			22.464.000.000	23.362.560.000	24.297.062.400	25.268.944.896	26.279.702.692	27.3

TIR % E	TIR % H2
40,79	55,96

EBITDA E	9.526.829.133	9.792.936.525	10.149.396.653	9.896.785.852	10.279.737.287	10.4
EBITDA H2	15.886.829.133	16.394.856.525	17.002.913.453	17.011.963.324	17.667.041.857	17.9

The projected energy and hydrogen billing over 6 years, taking the price of $190/KW-h and $4/Kg respectively, shows that the return on investment is approximately 6 years.

A 10 MW energy generation installation can power around 27,000 average households, with an average energy consumption of 266 KW/h-month.

DANE reports that there are 4,600 housing units in Guaranda.

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Sustainability and ESG Considerations	The generation of green hydrogen is a topic of great interest due to its potential to reduce greenhouse gas emissions and move towards a more sustainable economy. However, this project must be evaluated from the perspective of sustainability and ESG (environmental, social, and governance) criteria to ensure its long-term viability and positive contribution to the environment and society. Here are some key considerations: Environmental. By installing 10 MW with the technology developed by Mentac, the planet can be protected by avoiding the release of 0.29 million tons of Carbon Dioxide into the atmosphere annually. The amount of water and energy required for the production of green hydrogen will be evaluated to find ways to optimize the use of water resources and minimize environmental impact. Social. This technological development is constantly improving and produces high added value, requiring specific skills in its workforce; therefore, this energy and hydrogen generation industry forms long-term careers for professionals and technicians. In this sense, the project will positively impact local communities in the department in terms of employment, economic development, and quality of life. Governance. The company will seek to evaluate its carbon footprint as part of its environmental responsibility, considering not only direct and indirect emissions but also the total impact of its operations. Furthermore, respect for human rights in all business activities is guaranteed, promoting fair and safe conditions for all employees and collaborators. Likewise, to promote transparency and fairness, the company openly discloses executive salaries, ensuring fair and proportional compensation. Finally, as part of its commitment to business ethics, a rigorous code of conduct has been implemented for all employees, establishing clear standards of ethical and professional behavior.
Risk Assessment and Mitigation	**Financial/Economic Risk** Lack of resources to manufacture commercial units may affect the acquisition of raw materials, supplies, and human talent for the development of activities. It is a high risk. Its mitigation consists of managing the corresponding actions and is the responsibility of the project's general director. **Environmental**

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	Water use permit may affect the start of activities and the commissioning of the generation plant. It is a medium risk. Its mitigation consists of managing it with the environmental entity and is the responsibility of the environmental area director. Soil, water, and air pollution during construction or operation above permitted levels may affect the development of activities due to sanctions. It is a medium risk. Its mitigation consists of taking preventive and corrective measures and is the responsibility of the environmental area director. **Socio-political Risk** The legal regulations of the territory may affect the scope of the objectives. It is a medium risk. Its mitigation consists of an in-depth study of the current regulations and is the responsibility of the general director and the legal area director. **Technical Risks** Construction techniques, assembly planning, engineering designs concerning compliance with required standards may affect the development of assembly activities and commissioning. It is a high risk. Its mitigation consists of taking preventive and corrective measures and is the responsibility of the technical area director and the SISO area director. **Managerial/Operational** Deviations in the critical path caused by the existing uncertainty in the negotiation with the communities affected by the project may affect the scope of the objectives. It is a medium risk. Its mitigation consists of taking preventive and corrective measures and is the responsibility of the general director, the legal area director, and the technical director. **Market Risks** Entry of new competitors with different technologies may affect the scope of the objectives. It is a medium risk. Its mitigation consists of analyzing the competitive environment and is the responsibility of the commercial director.
Project Team and Experience	Eng. Horacio Ramos. Designer of the technology for the production of hydrogen and green energies. Eng. Luis Sánchez. In charge of operation and maintenance at the TermoCandelaria thermal power plant - Cartagena. Eng. Orlando Lara. Designer of the electronics area.

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Additional Information	N/A