Project Title: **Decarbonization of at least two buses of the ground fleet transport of the Antonio Agostinho Neto International Airport using Green Hydrogen Biofuel**

Project Implementing Unit

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Summary

Climate change impacts have a broad range of observed and inflicted effects on Earth and humans. Records of extreme heat, droughts, floods, storms, and other natural hazards have been experienced and scientists claim for the worse. The sources of global warming and subsequent actions of mitigation/adaptation have been identified and formulated, calling for governments to reinforce the measures.

Amongst the identified measures, include transforming and accelerating our production and consumption habits either through biotechnology or energy transition. Given the fact that the industrial revolution is mostly part of the equation in global warming, energy transition is a key response to decarbonization, and green hydrogen production, which has sparked great interest and is seen as the driver of the green revolution at the global level.

The potential to substitute fossil fuels with green hydrogen is prominent, especially in sectors that are difficult to decarbonize, such as heavy industry and aviation. These sectors contribute significantly to global emissions, and the use of green hydrogen can help reduce their carbon footprint.

However, owing to the fact that molecular hydrogen is a gas and as a chemical element, is the most common and abundant element on Earth which contains substantial chemical energy that can be harnessed safely within a hydrogen fuel cell. In fact, It's the fuel cell that powers hydrogen cars. Hence, its widely application in the automotive industry.

Among the various technologies to which the future of the automobile industry is turning into, the hydrogen fuel cell car is indeed a reality. In fact, this technology was first introduced by the Renault utility range in 2014.

Green hydrogen is an important ally in the decarbonization of some sectors, such as the chemical industry and other energy-intensive activities, such as steel and cement, aviation, and shipping.

According to several studies, hydrogen can become an essential element to accelerate the energy transition and generate important socioeconomic and environmental benefits. For example, in the scenario developed by the "Hydrogen Roadmap Europe: A Sustainable Path for the European Energy Transition", green hydrogen could cover up to 24% of final energy demand by 2050 and generate about 5.4 million jobs, thereby leading to a total reduction of 560 million tons of CO2.

It is important to highlight that there are two major types of hydrogen vehicles namely, hydrogen combustion and hydrogen fuel cell. However, both rely on hydrogen stored

under pressure in an on-board tank, which can be refuelled in a similar amount of time such as gasoline. Interestingly, refueling is one of the major advantages of hydrogen cars.

The project proposal in this sector is of imminent importance due to the accrued impact on zero emissions of CO2, thus contributing to the industry's decarbonization and a clean and healthier environment, including the socioeconomic benefits. This is a strategic opportunity to help meet the global Sustainable Development Goal 13 which calls for urgent action to combat climate change and its impacts by reducing temperatures below 2 degrees Celsius by 2030. In addition, this is also in line with the Angola Government's vision and commitment to accelerate the energy transition strategy.
In various areas aligned to the project, capacity building of students, scientists, and partners will be carried out by experts from UCAN, ANPG and International agencies. Thus, the objectives of this research project are:

1. Production of green hydrogen energy for fueling two buses at the international airport
2. Establishment of a refuelling point
3. Technology transfer
4. Capacity building

Project description

Climate change is now affecting every country on every continent. It is disrupting national economies and affecting lives, costing people, communities, and countries dearly today and even more tomorrow.

People are experiencing the significant impacts of climate change, which include changing weather patterns, rising sea levels, and more extreme weather events. The greenhouse gas emissions from human activities are driving climate change and continue to rise. They are now at their highest levels in history. Without action, the world’s average surface temperature is projected to rise over the 21st century and is likely to surpass 3 degrees Celsius this century—with some areas of the world expected to warm even more. The poorest and most vulnerable people are being affected the most.

Thus, transforming and accelerating our production and consumption habits either through biotechnology or energy transition turning to renewable energy and a range of other measures will reduce emissions and increase adaptation efforts. Green hydrogen has been identified as a prominent energy source which offers a robust impact be it environmental or socioeconomic benefits.

Hydrogen is a clean, versatile, and energy-dense fuel that has the potential to play a key role in a low-carbon energy future. However, realizing this potential requires the development of efficient and cost-effective hydrogen generation and storage technologies. Hydrogen can be generated from a variety of sources, including fossil fuels, biomass, and renewable energy sources such as solar and wind.

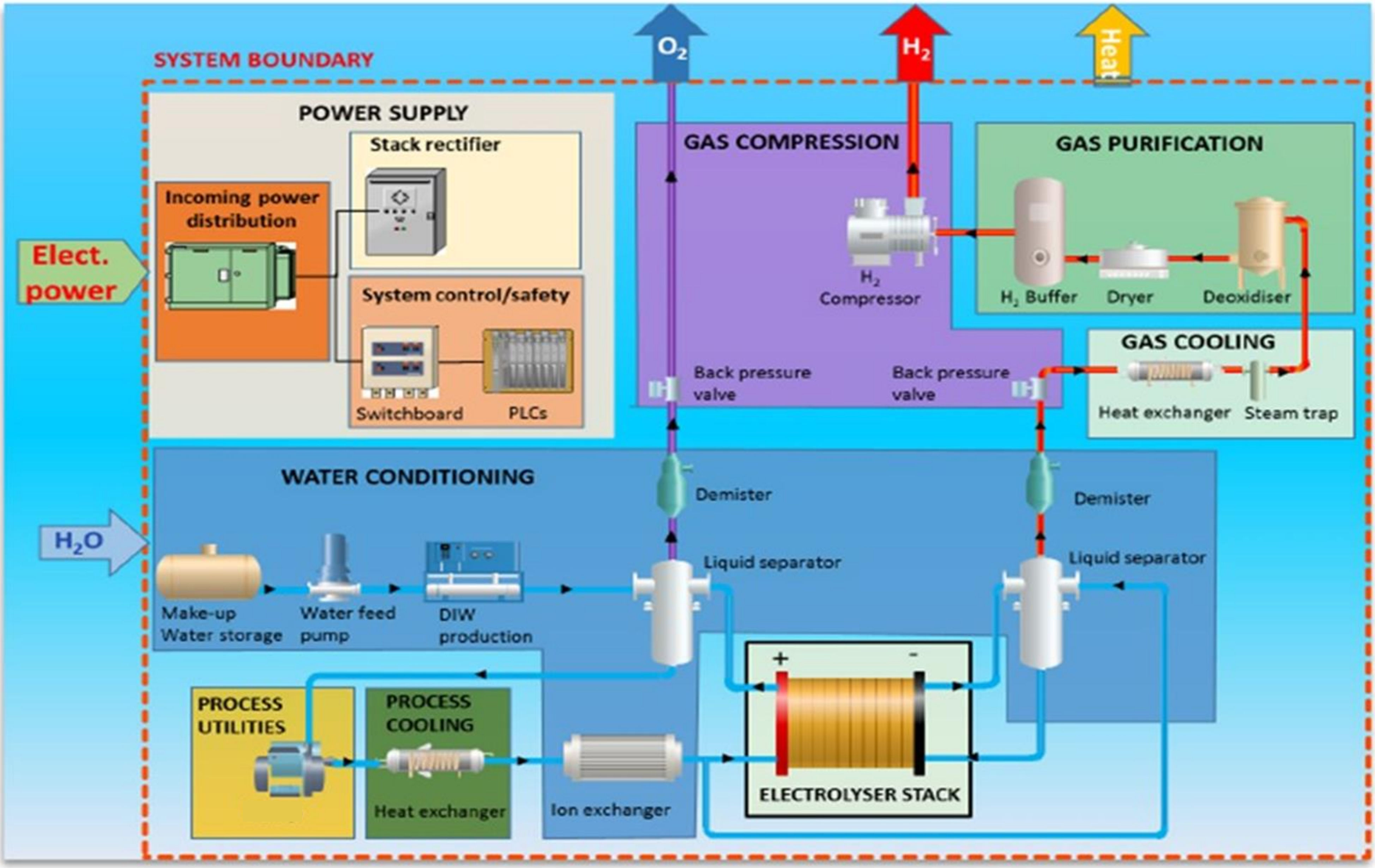
Currently, the world produces about 70 million tons, two-thirds of which are used in the production of mineral fertilizers, and about one-third in the oil refining industry in the processes of hydrogenation and desulfurization. Around 95% of this hydrogen is produced by the reforming (conversion) of hydrocarbons or coal. It is called "grey" because its production is accompanied by emissions of carbon dioxide -10kg CO_2/kg H_2. "Blue" refers to the hydrogen obtained by the conversion, with carbon dioxide being removed from the converted gas mixture and stored (CCS process - Carbon Capture and Storage). The cost of CO_2 utilization is 70euros/t. A small amount of hydrogen (1-5%) is produced by electrolysis, it is called "green". It is used for machinery and food industry. Such hydrogen is considered for possible widespread use. Currently, there is no economically viable technology to use "green" hydrogen. This is due to the high cost of its production, its thermophysical properties and its features of transportation and storage. The process of electrolysis is an endothermic process of decomposition of water by electric current:

H_2O (w) + 286 kJ = H_2 (g) + ½ O_2 (g)

In the world energy sector, the problem of the production and use of "green" hydrogen produced by electrolysis attracts considerable attention. Per 1m^3 of electrolytic hydrogen consumes from 4 to 5kWh of electricity, even though it contains chemical energy of 3.0kWh. The calorific value of hydrogen is 3.3 times less than that of methane. Hydrogen properties such as wide explosive limits, high torch propagation speed, and corrosion activity against many metals require special measures during transportation, storage, and use. However, its potential energy can be harnessed safely within a hydrogen fuel cell.

To reduce the climate-changing emissions of the sector, technological solutions based on the use of green hydrogen electrification are currently the most promising for various sectors, especially that of road transport. Furthermore, green hydrogen could be used to decarbonise transport that is more difficult to electrify. Therefore, this project proposal addresses the decarbonization of at least two buses at the Agostinho Neto International Airport in Luanda.

The Project to be implemented at the Catholic University of Angola responds to the need to provide a solid knowledge base, based on the state of research on technologies for the decarbonisation of transport, to make the most appropriate political decisions to accelerate the ecological transition and the achievement of the objectives of reducing CO2 and polluting emissions with the best cost-benefit ratio, as well as strengthening the competitiveness of the Angolan economy and improving the quality of life of citizens.



SYSTEM BOUNDARY
O2
H2
Heat
Elect. power
POWER SUPPLY
Stack rectifier
Incoming power distribution
System control/safety
Switchboard
PLCs
GAS COMPRESSION
H2 Compressor
Back pressure valve
Back pressure valve
GAS PURIFICATION
H2 Buffer
Dryer
Deoxidiser
GAS COOLING
Heat exchanger
Steam trap
WATER CONDITIONING
H2O
Demister
Demister
Liquid separator
Liquid separator
Make-up Water storage
Water feed pump
DIW production
PROCESS UTILITIES
PROCESS COOLING
Heat exchanger
Ion exchanger
+
-
ELECTROLYSER STACK

1. **Goals and technical working objectives for the project**

1.1 Production of green hydrogen energy for fueling two buses at the international airport

This will consist of establishing a green hydrogen plant at UCAN premises to produce energy to feed at least two buses as a pilot project.

1.2 Establishment of a refueling point

A refueling point will also be established.

1.3 Technology transfer

Technology transfer, and engagement of policymakers to adopt and disseminate the use of green hydrogen to other industries.

1.4 Capacity building of students and scientists

Fig 1: Decarbonization process

State-of-the-art science and technology

People are experiencing the significant impacts of climate change, which include changing weather patterns, rising sea levels, and more extreme weather events. The greenhouse gas emissions from anthropogenic activities are driving climate change and continue to rise. They are now at their highest levels in history. Without action, the world's average surface temperature is projected to rise over the 21st century and is likely to surpass 3 degrees Celsius this century—with some areas of the world expected to warm even more. The poorest and most vulnerable people are being affected the most. Therefore, global actions to curb the effects of climate change are a top priority among governments.

The potential to substitute fossil fuels with green hydrogen is promising, especially in sectors that are difficult to decarbonize, such as heavy industry and aviation. These sectors contribute significantly to global emissions, and the use of green hydrogen can help reduce their carbon footprint. Hydrogen can be used as a fuel source in cars, trucks, ships, and aviation. Nowadays, several companies are working on hydrogen vehicles. A vivid example is the two car models in Australia - Toyota Mirai sedan (and the Mirari second generation) and the Hyundai Nexo SUV.

Basically, the process consists of, a fuel cell which is a device that takes chemical energy, in the form of hydrogen, and turns it into electricity that can power an electric motor, just like battery hydrogen stored in a tank (that is thick-walled and crash-tested, and usually under the rear seat) is mixed with air and pumped into the fuel cell. Inside the cell, a chemical reaction extracts electrons from the hydrogen.

The leftover hydrogen protons move across the cell and combine with oxygen from the air to produce water. Meanwhile, the electrons create electricity, which charges a small storage battery used to power an electric drivetrain (just like in an electric vehicle). This is why the vehicles are called Fuel Cell Electric Vehicles (FCEV), as compared to the battery electric vehicles (BEV) which are seen increasingly on our roads already.

In fact, it has been tested that Hydrogen cars are environmentally friendly because they do not produce the same emissions as petrol or diesel vehicles. Hydrogen-powered fuel cell vehicles emit only water (H 2 O) and warm air. However, that is not the whole story, as hydrogen production plays a large part in exactly how environmentally friendly the car is.

The system works through an electrolyser, or electrolytic cell, where water is separated into its constituent elements, hydrogen and oxygen. The water is brought into contact with two electrodes, a positively charged anode and a negatively charged cathode. The electric current dissociates the molecules into hydrogen ions H+ and hydroxide ions OH-. At the cathode, hydrogen ions acquire electrons in a reduction reaction and become hydrogen gas. At the anode, hydroxide ions release electrons in a reduction of oxidation, leading to the formation of oxygen.

If the electrolytic cell is located close to a renewable source power plant, part of the electricity production, for example, that exceeds the transmission capacity of the grid, can be used to feed it. In this way, the hydrogen produced performs the function of chemical "storage", which can be used later, when necessary, as a raw material in the steel production process or as a fuel to provide heat at high temperatures.

Hydrogen is the most energy-dense fuel: 1 kg contains the same energy as 2.4 kg of methane or 2.8 kg of gasoline.

• Due to the ease with which electricity can be converted to hydrogen, it is the most efficient energy carrier at our disposal for storing any surplus electricity production from renewable sources.

An in-depth analysis of the different electrolyser systems is then provided, in which the differences between the three main electrolyser systems are provided, in terms of working mechanism, materials used, system performance and - a key parameter from IDTechEx's point of view - the different ongoing degradation processes.

At the current stage of development, the market is populated by three electrolysers: alkaline water electrolyser (AWE), proton exchange membrane electrolyser (PEMEL) and solid oxide electrolysers (SOEL), although only the first two are actively marketed. All three devices use electricity to split water molecules into H2 and O2 and the differences between the three technologies are given by the ions exchanged between the two electrodes (OH-, H+ and O = respectively for AWE, PEMEL and SOEL) which involve the adoption of different electrolytes and materials. Different mechanisms and materials directly affect the performance and properties of each of the three electrolysers.

Sustainable mobility is described as a ubiquitous, effective, clean and environmentally beneficial transport system. While transport does not have its own Sustainable Development Goals (SDGs), it is critical to achieve other SDGs in order to achieve the desired growth and development. Countries with the highest scores on the Sustainable Development Goals have more robust and long-term mobility policies, while countries with the lowest scores are criticized for having inadequate transport infrastructure.
The origin of the term "sustainable mobility" comes from the broader definition of "sustainable development". "Sustainable development" is "development that meets current needs without jeopardizing the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987).

Previous work/experience of the Project Implementation Unit and Partners

1. **CATHOLIC UNIVERSITY OF ANGOLA**

Plastic Processing Use Based on Integrated Biorefining Principles

The solid waste treatment process consists of the use of technologies or procedures that aim to reduce the quantity or polluting potential of waste when discarded in suitable environments or the transformation of these into an inert or biologically stable material.

The main objective of the technological alternatives available for the treatment and recovery of waste and reduction of environmental impacts is to reduce the rates of exploitation of natural resources and pollution, in addition to promoting employment opportunities, income generation and increasing the quality of life of people.

Recycling is a process that consists of reusing post-consumer products to insert them back into the production cycle, transforming them into new products with added economic value. However, recycling is associated with the 3 R policies that cover:

a) Recycle – to obtain new products using used materials;

b) Reuse – reuse waste for new functionalities;

c) Reduce – minimize the exposure of polluting waste, or not, to the environment.

This new concept establishes, in addition to the principle of preventing waste generation, the principles of solid waste recovery, defined as a treatment process that produces energy, based on anaerobic digestion, incineration for energy recovery, pyrolysis and gasification, among others.

From the point of view of urban waste in Angola, the use of the energy potential of such waste is linked to the development of processes and technologies, based on physical, chemical and biological processes, involved in process flows, carried out in an industrial unit that guarantee the production of various products, fuels and energy.

Integrated Refinery

The accelerated process of transforming raw materials into products used by modern society leads to a greater generation of solid waste and domestic effluents, which, when poorly disposed of and treated, generate drastic environmental consequences, such as air, water and soil pollution. These problems, currently, have raised concern and have been the subject of study and analysis by governments and society in general.

The production of solid waste is present in the routine and daily life of human beings, ruling out the possibility of having a life routine that does not generate solid waste. However, the problems caused by poorly treated solid waste are visible. Reducing millions of tons of waste and the intrinsic environmental impacts of civilization, and ensuring the sustainable use of natural resources are goals of current environmental management policies in several countries (UIEDA, 2009).

For the development of this Bio refinery, a flowchart of the fuel production process was created from plastic waste.

The referenced unit can process 300 kg of plastic per hour and with ten hours of work per day, therefore, 3,000 kg per day. The conversion rate of solid material into liquid fuels is 67%, which results in the production of 2,010 kg of fuel per day. Working 22 days a week can produce 44,220 kg of fuel monthly. With an average fuel density of 889 kg/m3, 49,741.3 litres of fuel can be produced per month.

Within the context presented, it is observed that the unit provides significant environmental gains that should result in strong harmony with the health of the population, constituting a differentiator for social, economic, cultural, tourist and technological development.

The Integrated Refinery project contributes to the transformation of economic systems into “sustainable” systems, also from an environmental point of view, referring to the concepts of “Green Transition” and “Circular Economy” that can contribute to the decarbonisation of the environment.

To develop an “Energy Recovery” scenario, it is necessary to delve deeper into the topic of converting waste into fuel by exploring technologically advanced and new generation solutions, capable of creating the so-called “Plastic to Fuel and Waste to Power” model.

The biofuel produced by the Integrated Refinery through Transesterification Reactions is biodegradable and non-toxic.

Furthermore, the integrated biorefinery is capable of making use of a greater number of biomass components, thus reducing waste generation and carbon dioxide emissions.

Therefore, the Integrated Biorefinery product also responds to the need to decarbonize the environment in the field of transport.

2. NATIONAL AGENCY FOR OIL, GAS AND BIOFUELS

Study Of The Production Of Electrical Energy And Biofuels From Solid Waste In Angola

This research is placed in the context of stimulus and use of alternative and clean sources for the production of electric energy and biofuels. The study is justified by the need for development based on the participation of renewable electric energy; for the diversification of the energy matrix; the complementary to the hydraulic source in the seasons by adding value to the waste. The main objective of this study is to analyse which factors have implied obstacles to the exploration of the electricity and biofuel production from agriculture and waste in Angola, based on economic, environmental, and regulatory aspects.

Biofuels are energy sources considered alternative, as they are renewable in nature and have low levels of pollutant emissions into the atmosphere. In general, these energy sources are usually produced from different raw materials, including plastic.

The main types of biofuels currently used are ethanol and biodiesel; These are usually used both for moving vehicles and for generating energy.

In fact, the energy transition in Angola is an irreversible trend and it is necessary to join forces with the aim of supporting Angola to become a leader among West African countries in the decarbonisation process.

This will also enable the energy transition, through the production of sustainable biofuels derived from raw materials such as plastic.

This biofuel from plastic has a strong connection with biofuel produced with green hydrogen.

This confirms the important role that biofuels, both derived from plastic and green hydrogen, play within the energy transition, not only for their ease of use, but also as an absolute innovation in the management of the transport system today more than never indispensable to provide optimal solutions

to have, through biofuels, in a sustainable and non-polluting way, all the alternative energy necessary to modernize the country and start decarbonisation.

Workplan

ACTIVITY	FIRST YEAR				SECOND YEAR				THIRD YEAR				FOURTH YEAR			
	Quarters				Quarters				Quarters				Quarters			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Civil Works and Accessories	■															
Staff Training	■	■														
200 KW Photovoltaic Plant	■	■														
Electrolyzer and Compressor		■														
Storage Tank and Hydrogen Bottles		■														
Workstations - Management Software		■														
Green Hydrogen Production			■	■	■	■	■	■	■	■	■	■	■	■	■	■
Transportation from UCAN to International Airport			■	■	■	■	■	■	■	■	■	■	■	■	■	■

<table>
<tr><td>Work Package: 1</td><td>Name of Work Package</td><td colspan="2">Budget: €</td></tr>
<tr><td>Name of responsible authority:
Catholic University of Angola
High Institute of Mineral Resources, Environment and Technologies</td><td>Civil Works and Accessories</td><td colspan="2">126.224,00</td></tr>
<tr><td colspan="4">Aim of the work package:
• Warehouse for the allocation of the Compressor, the Tank and the cylinders for the storage and transport of hydrogen.
• Water well.</td></tr>
<tr><td colspan="4">Activities:
Construction of the warehouse for the allocation of the Compressor, the Tank and the cylinders for the storage and transport of hydrogen. Drilling of the well for the supply of water to be sent to the electrolyser under the control of coordinators and researchers.</td></tr>
<tr><td>Results:
Warehouse and water well for green hydrogen storage and production</td><td colspan="2">Milestones:</td><td></td></tr>
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<table>
<tr><td>Work Package: 2</td><td>Name of Work Package</td><td colspan="2">Budget: €</td></tr>
<tr><td>Name of responsible authority:
Catholic University of Angola
High Institute of Mineral Resources, Environment and Technologies</td><td>Staff Training</td><td colspan="2">126.224,00</td></tr>
<tr><td colspan="4">Aim of the work package:
Advanced training of the technicians making up the staff under the guidance of technicians from an organization with proven experience in the sector under the control of coordinators and researchers</td></tr>
<tr><td colspan="4">Activities:
Training on maintenance techniques and IT control of equipment dedicated to the production of green hydrogen and the efficiency of the water well.</td></tr>
<tr><td>Results:
Technical and research staff excellently trained for maintenance and production activities.</td><td colspan="2">Milestones:</td><td></td></tr>
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<tr><td>Work Package: 3</td><td>Name of Work Package</td><td colspan="2">Budget: €</td></tr>
<tr><td>Name of responsible authority:

Catholic University of Angola

High Institute of Mineral Resources, Environment and Technologies</td><td>200 KW Photovoltaic Plant

Buses for Airport and cars for transport of Staff and Green Hydrogen</td><td colspan="2">1.620.000,00</td></tr>
<tr><td colspan="4">Aim of the work package:

Installation of the photovoltaic plant to supply energy to the production system.

Purchase of two buses with hydrogen cell engine and two vehicles for the transport of the staff of coordinators, researchers, technicians and workers and for the transport of hydrogen containers.</td></tr>
<tr><td colspan="4">Activities:

Purchase and installation of the 200 KW photovoltaic plant.

Purchase of two buses with green hydrogen cell engine

Purchase one car to transport the technical staff and one pick up to transport the hydrogen cylinders to the international airport.</td></tr>
<tr><td>Results:

Production of energy from renewable sources necessary for production.

Equip Antonio A. Neto International Airport with two buses to decarbonize passenger transport.

Provide staff with means for the personal transport of technicians and researchers and for the transport of hydrogen cylinders to the airport.</td><td colspan="2">Milestones:</td><td></td></tr>
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<tr><td>Work Package: 4</td><td>Name of Work Package</td><td colspan="2">Budget: €</td></tr>
<tr><td>Name of responsible authority:
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High Institute of Mineral Resources, Environment and Technologies</td><td>Electrolyser and Compressor
Storage Tank and Hydrogen Bottles</td><td colspan="2">440.000,00</td></tr>
<tr><td colspan="4">Aim of the work package:
Position and secure the Electrolyser and the two compressor against the action of meteorological processes.
Store the six green hydrogen collection tanks and the twenty cylinders necessary for transport in a safe environment.</td></tr>
<tr><td colspan="4">Activities:
Purchase of an electrolyser for the production of green hydrogen and place it in an appropriate and protected environment.
Purchase of two compressors, 6 tanks and twenty cylinders for the production, conservation and transport activity and subsequent installation and storage in the warehouse built for this need</td></tr>
<tr><td>Results:
Location and start of green hydrogen production activities.
Storage and transport capacity of the hydrogen produced.</td><td colspan="2">Milestones:</td><td></td></tr>
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<tr><td>Work Package: 5</td><td>Name of Work Package</td><td colspan="2">Budget: €</td></tr>
<tr><td>Name of responsible authority:
Catholic University of Angola
High Institute of Mineral Resources, Environment and Technologies</td><td>Workstations - Management Software</td><td colspan="2">275.480,00</td></tr>
<tr><td colspan="4">Aim of the work package:
IT control of the production and conservation processes of green hydrogen through the acquisition of 4 workstations, 1 server and 2 software, one of which is dedicated to production and one to conservation. IT control of the production and conservation processes of green hydrogen through the acquisition of 4 workstations, 1 server and 2 software, one of which is dedicated to production and one to conservation.</td></tr>
<tr><td colspan="4">Activities:
Purchase of IT components, placement of the same in a dedicated laboratory and rapid training of laboratory staff.</td></tr>
<tr><td>Results:
Dedicated Informatic Laboratory for control.</td><td colspan="2">Milestones:</td><td></td></tr>
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<tr><th>Work Package: 6</th><th>Name of Work Package</th><th colspan="2">Budget: €</th></tr>
<tr><td>Name of responsible authority:

Catholic University of Angola

High Institute of Mineral Resources, Environment and Technologies</td><td>Green Hydrogen Production

Transportation from UCAN to International Airport</td><td colspan="2">1.277.048,00</td></tr>
<tr><td colspan="4">Aim of the work package:

Green Hydrogen continuous Production, storage and transport to International Airport Antonio A. Netoe</td></tr>
<tr><td colspan="4">Activities:

Green Hydrogen production and storage activities and after transport to Airport</td></tr>
<tr><td>Results:

Green Hydrogen Production

Transport activities</td><td colspan="2">Milestones:</td><td></td></tr>
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Budget

DESCRIPTION	PERIOD	UNIT	UNIT COST.	TOTAL EURO (€)	%
1. Human Resources					
1.1. 1 Coordinator	Mensal	48	2 000,00	96 000,00	
1,2 1 SubCoordinator	Mensal	48	1 500,00	72 000,00	
1.3. 1 Researchers Coordinator	Mensal	48	1 500,00	72 000,00	
1.3. 4 Researchers	Mensal	192	1 200,00	230 400,00	
1.4. 2 Technicians	Mensal	96	1 000,00	96 000,00	
1.5. 4 Workers	Mensal	192	700,00	134 400,00	
1.6. Staff Training		1	50 000,00	50 000,00	
1.7. Hydrogen Transport (truck rent)	Mensal	42	5 000,00	210 000,00	
Subtotal 1				**960 800,00**	***28,71***
2. Equipment					
2.1. Electrolyzer		1	250 000,00	250 000,00	
2.2. 200 KW photovoltaic plant		1	800 000,00	800 000,00	
2.3. Compressor		2	35 000,00	70 000,00	
2.4. Storage tank		6	15 000,00	90 000,00	
2.5. Hydrogen cylinders 1 kg		20	1 500,00	30 000,00	
2.6. Staff Car		2	35 000,00	70 000,00	
2.7. Bus with Hidrogen fuel cell		2	375 000,00	750 000,00	
Subtotal 2				**2 060 000,00**	***61,56***
3. System Maintenance					
3.1. Cost for civil works and accessories		1	50 000,00	50 000,00	
3.2. Workstations		4	3 000,00	12 000,00	
3.3. Servidores		1	3 500,00	3 500,00	
3.4. Management software		2	10 000,00	20 000,00	
3.5 Consumables	Trimestral	16	15 000,00	240 000,00	
Subtotal 3				**325 500,00**	***9,73***
4. Total share costs (1 - 3)				**3 346 300,00**	***100,00***
5. Administrative costs (10% of point 4)				**334 630,00**	
6. Total acceptable costs (4 + 5)				**3 680 930,00**	
7. Unexpected costs (5% of point 6)				**184 046,50**	
8. TOTAL COST (6 + 7)				**3 864 976,50**	

Appendices

Literature

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