
Support in assessment of the projects proposals which involve installation of photovoltaic panels, within the Call for Proposals for existing MSMEs

**Project number/
cost centre:
20.9057.9-001.00**

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1. List of abbreviations

AI	Artificial Intelligence
CV	Curriculum Vitae
ML	Machine Learning
IT	Information Technology
IoT	Internet of Things

General information

a. Brief information on the project

Hoyo Home is an innovative smart home system specifically designed to seamlessly integrate IoT devices from various vendors. With the aim of providing a unified and user-friendly experience, Hoyo Home brings together diverse IoT devices under a single platform, eliminating the need for multiple apps and interfaces.

The core functionality of Hoyo Home revolves around its ability to connect and control IoT devices from different manufacturers. By establishing compatibility and standardization across various devices, Hoyo Home process for homeowners, making the smart home experience more accessible and convenient.

Through its intelligent integration capabilities, Hoyo Home enables users to control and automate a wide range of smart devices within their homes. This includes but is not limited to lighting systems, thermostats, security cameras, door locks, entertainment systems, and kitchen appliances. The system provides users with centralized control, allowing them to monitor and manage all their devices from a single interface.

Hoyo Home utilizes cutting-edge technologies to ensure seamless communication and interoperability among the integrated IoT devices. It leverages wireless protocols such as Wi-Fi, Bluetooth, Zigbee, and Z-Wave to establish connections and enable real-time data exchange between devices. This allows for synchronized operations and coordinated automation scenarios, enhancing the overall functionality and performance of the smart home system.

To provide enhanced control and accessibility, Hoyo Home supports various modes of operation. Users can interact with the system through voice commands, allowing for hands-free control of their smart devices. Furthermore, a user-friendly mobile application provides remote access, allowing users to monitor and manage their smart home system from anywhere with an internet connection.

By providing a unified platform, seamless device compatibility, and intelligent automation capabilities, Hoyo Home aims to simplify and enhance the smart home experience for users, offering convenience, customization, and control at their fingertips.

b. Context

The assignment will contribute to achievement of the Hoyo AI module of the project. The Hoyo AI module will be the brain of an intelligent system that drives the autonomy of the smart home. With its ability to make custom decisions and learn from users' behavior, Hoyo AI enhances the smart home experience by creating a personalized and optimized environment. By providing a unified platform and leveraging advanced AI algorithms, Hoyo Home simplifies device management and promotes convenience, energy efficiency, and security.

For this project the Hoyo AI module will be aimed at optimizing the heating, cooling, and power consumption in a smart home environment. The project will leverage data collected from Hoyo Home's IoT devices and create an algorithm that will provide automated user decisions to optimize power consumption and power production from Photovoltaic Panels.

Hoyo Home provides the following data:

- Live data from each IoT device about the current power consumption
- Live data about the current temperature
- Live data about the current humidity
- State of each IoT device (On/Off)
- Possible States for Each IoT Device
- User set preferences
- Motion sensor data
- Room luminescence data
- Live data for overall power consumption in the Office/Apartment
- Live data about the energy production from photovoltaics

The algorithm should be able to sort, categorize, store and analyze the data to provide analysis and automated decisions for the IoT devices.

The main goal of this algorithm is to optimize power consumption and power production. Meaning the algorithm should be able to optimize the IoT devices (including heating/cooling systems) to maximize their effort while the solar power production is highest and with that lower the overall power consumption when the solar power production is lowest.

Because AI and ML model training is a scientific area, Hoyo Tech is looking in engaging a local short term consultants (LSTCs) that will develop the Hoyo AI module that later on will be integrated into the Hoyo Home system.

The project will require the following resources:

- a) AI and ML experts for algorithm development and data analysis.
- b) Software developers for system development and integration.
- c) Testing environment and equipment.
- d) Project management and documentation resources.

The budget will be allocated based on resource requirements, project timeline, and any additional costs incurred during the project's execution.

- c. **Hoyo Tech** shall hire the contractors for the anticipated contract term, from **15 August 2023 until 15 October 2023**
- d. **The contractors shall provide the following service:**

1. Develop a module to sort data gathered from IoT devices
 - This module should gather data from all streams that Hoyo Home provides, categorize, sort and store it on device for further analysis. For memory limitations we store data up to 1 year on the device and up to 10 years on the cloud.
2. Develop an AI module to analyze the data
 - *The purpose of this module would be to analyze the data previously gathered and sorted and provide real time feedback for the Hoyo Home system. The output should be actions that the IoT devices need to do in order to satisfy the pre set user preferences while preserving energy consumption.*
3. Understand user habits and preferences regarding heating, cooling, and power consumption.
 - *This module should be able to constantly monitor user habits and preferences, gather data and feed it into the AI module. This data will later on be needed for the auto adaptation part of the AI module.*
4. Gather data from online service that predicts outside weather conditions and weather forecast.
 - *Data gathered from online weather forecast services will help make better decisions about the heating and cooling systems.*
5. Automate the control of heating, cooling, and power systems based on learned user habits and preferences.
 - *With the data gathered from the previous modules, the AI engine should be able to make autonomous decisions, predict user behavior and based on that generate new user preferences that will better suit the user's needs.*
6. Achieve significant energy savings while maintaining user comfort and productivity.
 - *By optimizing each part of the system the expected results is better overall energy consumption, lower electricity bill and lower the CO2 footprint. Expected result should be in the range from 15% to 35% lower power consumption*

e. The LSTCs shall provide the following deliverables:

D1: An optimized decision-making system that will be integrated into Hoyo Home HAB that adapts heating, cooling, and power systems based on user preferences and energy availability from the PV system.

D2: An automated control system that adjusts environmental conditions and power usage in real-time, integrating with the decision-making system.

D3: An automated control system that adjusts environmental conditions and power usage in real-time, integrating with the decision-making system.

f. Additional Information

The whole process for the AI module is defined in couple of stages:

- a) **Data Collection:** Data needs be sorted and stored in Hoyo Home HUB on temperature, humidity, occupancy, power consumption and power production. External data from online weather forecast services only needs to be temporarily stored until certain decision is made.
- b) **Data Analysis:** Utilize AI and ML techniques to process and analyze the collected data, identifying patterns, trends, and user behavior related to heating, cooling, and power consumption.
- c) **User Profiling:** Develop algorithms to create user profiles based on historical data, considering individual preferences, presence in the office/apartment, working hours, and other relevant factors.
- d) **Energy Optimization:** Implement a decision-making system that integrates the analyzed data and user profiles to optimize the operation of heating, cooling, and power systems. This system should maximize the utilization of PV power production, minimize energy waste, and maintain user comfort.
- e) **Automation:** Design and develop an automated control system that adjusts heating, cooling, and power settings in real-time based on learned user habits, weather conditions, and energy availability from the PV system.
- f) **User Interface:** Create a user-friendly interface that allows users to monitor and control the smart office/apartment system, providing feedback on energy consumption, efficiency, and comfort levels.

Tender requirements

The LSTCs are required to provide proof of evidence for fulfillment of the requirements, on the basis of their CVs

1. Qualifications of proposed staff

1.1 Expert 1:

1.1.1 General qualifications

Education: PhD Computer Science and Engineering with published research on IoT with AI and ML.

Professional experience: At least 8 years of experience in the field of computer science, Big Data, ML and AI.

Specific professional experience:

- (a) At least 6 years of experience in ML and AI including research in this area.

1.1.2 Language skills: business fluency in English language.

1.2 Expert 2:

1.2.1 General qualifications

Education: At least a Bachelor degree in Computer Science and engineering.

Professional experience: At least 4 years of experience in the field of software development.

Specific professional experience:

- (a) At least 6 years of experience Frontend Development.
- (b) At least 4 years of experience in AI and ML projects.

1.2.2 Language skills: business fluency in English language.

1.3 Expert 3:

1.3.1 General qualifications

Education: At least a Bachelor degree in Computer Science and engineering.

Professional experience: At least 4 years of experience in the field of software development.

Specific professional experience:

- (a) At least 4 years of experience in project management in IT.

1.3.2 Language skills: business fluency in English language.

The CV of the LSTCs must be submitted using the EU format and shall not exceed 4 pages. The CV must clearly show the position and job the ISTC held in the reference project and its duration. The CV should be submitted in English language.

2. Specification of inputs

Fee days	Number of experts	Number of days per expert	Comments
• Data Collection and Preparation	1	5	
• Data Analysis and User Profiling	1	15	
• System Development and Integration	1	30	
• Testing and Optimization	1	10	
• Documentation and Deployment	1	5	

*Calculate your financial bid exactly in line with the quantitative requirements of the specification of inputs above. There is no contractual right to use up the full days/travel or workshops or budgets. The number of days/travel/workshops and the budgets will be contractually agreed as **maximum amounts**. The regulations on pricing are contained in the price sheet.*

The working time shall be documented in the respective time sheet.

Note:

If restrictions are introduced to combat coronavirus/COVID-19 (restrictions on air travel and travel in general, entry restrictions, quarantine measures, etc.), Hoyo Tech and the contractor are obliged to make adjustments to their contractual services to reflect the changed circumstances on the basis of good faith; this may involve changes to the service delivery period, the services to be delivered and, if necessary, to the remuneration.