IMPROVED SOLAR WATER HEATER ADAPTIVE TO RWANDAN WEATHER CONDITION

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Specific Aims:

Despite the potential for solar energy in Rwanda in line with the National priority areas according to the National Strategy for Transformation one (NST1), the spread of solar energy technologies such as Solar Water Heaters (SWHs) is considerably low. High cost, lack of awareness, and technical support services are the main challenges that cause the poor diffusion of solar water heaters and solar energy technologies in general. SWHs sold to the Rwandan market are imported. These SWHs are manufactured to be used in different countries with different solar radiation levels. Thus, the materials used to manufacture them are expensive. This led to the high upfront cost of SWHs. In addition, SWHs available in the Rwandan market lack monitoring and control systems. This is a big challenge for healthcare institutions such as hospitals, where hot water needs to be controlled and monitored to meet some activities requirements.

Integrated Polytechnic Regional College (IPRC) Tumba in collaboration with Energy private developers (EPD) and the National Council of Science and Technology (NCST) is confident that will be able to conduct research and innovation that results in a design and fabrication of improved and temperature controlled solar water heater that is adaptive to Rwandan weather condition.

This project aims to increase the diffusion of solar water heaters and develop the green manufacturing industry by designing and fabricating cost-effective SWHs using local materials. The Fabricated SWHs will be integrated with the Internet of Things (IoT) system to control and monitor the water temperature in the tank.

The specific objectives are:

- **i.** To Collect solar radiation data across the country;
- **ii.** To Conduct research on the thermal efficiency of different local materials that can be used to fabricate solar water heaters;
- **iii.** To design and fabricate a cost-effective solar water heater system adapted to Rwanda's solar radiation conditions;
- **iv.** To build IoT system architecture to control and monitor the temperature of water in the tank;
- **v.** To test the functioning and performance of the SWH prototype and
- **vi.** To write and publish the results of the project in a research journal.

The approach of this project will start with data collection and analysis, prototype simulation and design, fabrication, assembling, and testing. Tools such as digital solar energy meters, sensors, TRNSYS, and Polysun will be used in data collection, design & simulation, and testing. And if proven there will be a scale up phase.

The outcomes of this project are **production of new prototypes of High efficiency and Cost-effective SWH system locally made**, Training on fabrication, installation and maintenance of SWHs, Awareness and diffusion of SWHs, Job Creation and International Journal Publication. Total Project Budget is 90.000.000Rwf, **duration of the project is 18 months**.

Additional information

Investigators/Institutions

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Eng. Munyaneza Jean de Dieu; Lecturer in Renewable Energy, with 11years of experience in energy related designs
Eng. NDAYISENGA Gilbert; Assistant Lecturer at IPRC Tumba, expert in Internet of Things (IOT)
Eng. NSHIMYUMUKIZA Théogène; Assistant Lecturer in Renewable Energy at IPRC Tumba
Mrs. NIHIMBAZWE Madeleine; Assistant Lecturer in Renewable Energy Department, Masters in Electrical Engineering with experience in energy sector.
Mrs. UWABYAYE Liliane; Bachelor's degree in ICT with experience in energy sector especially in solar energy and biomass
Mr. UKIZEBARAZA Fabien; Assistant Lecturer in Renewable department, with experience in mechanical engineering
Mrs. BAMPIRE Delphine; Assistant Lecturer in ICT department at IPRC Tumba, with experience in Internet of Things (IOT)
Eng. Bananeza Christophe; Electrical engineer with experience in Renewable energy sector
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