

TERMS OF REFERENCE

CONSULTANCY SERVICES FOR RENEWABLE ENERGY INTERN

1. Introduction

The Caribbean Institute for Meteorology and Hydrology (CIMH) is an Institution of the Caribbean Community (CARICOM) and the technical Organ of the Caribbean Meteorological Organization (CMO). The mandate of the CIMH is “to assist in improving and developing the Meteorological and Hydrological Services as well as providing the awareness of the benefits of Meteorology and Hydrology for the economic well-being of the CIMH member states. This is achieved through training, research, investigations, and the provision of related specialized services and advice”.

In achieving its mandate, the CIMH in 1973 established an affiliation with the University of the West Indies in which its primary responsibility is the delivery of the B.Sc. programme in Meteorology in the Faculty of Pure and Applied Sciences. The CIMH is recognized regionally and globally as:

- The World Meteorological Organization (WMO) Regional Training Centre for the Caribbean;
- A centre for applied research and development in meteorology, hydrology/water resources, climatology and related areas including disaster risk reduction and impacts forecasting;
- The WMO Regional Instrument Centre for the Caribbean;
- A WMO Centre of Excellence for Training in Satellite Meteorology;
- The WMO Regional Climate Centre (RCC) for the Caribbean;
- The Caribbean Centre for Climate and Environmental Simulations;
- The Climate Data Archive for CMO Member States;
- The Pan American Centre for the WMO Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS);

The CIMH has strong collaborations with other Regional Institutions, national organizations in CMO Member States and the international community. Since 2006, the CIMH has been providing internships opportunities to graduate and undergraduate students registered at regional and international universities. While the majority of internships have supported research and development in Earth and Atmospheric Sciences, in recent years the areas of focus have been expanded to include Social Sciences, Computer Science and Information Technology. Internships commonly range from 3-months to 1-year with the potential for an increase to two years. Many interns have converted their projects to publications and conference presentations as well as M.Sc. and PhD graduate research programmes.

Recognising the importance of building critical mass in weather, climate and hydro-meteorological professionals to the region's resilience to climate change, increasing climate variability and extreme weather, the CIMH initiated a young professionals programme in 2006 focused on students in the B.Sc. Programme in Meteorology at the University of the West Indies Cave Hill Campus. The programme subsequently expanded to include individuals from different disciplines including civil engineering, water resources management, climate science and remote sensing - all closely linked to the core programmes of the CIMH. In recent years, the programme has been further expanded to include individuals from the social sciences in recognition of the fact that engaging persons in these disciplines is critical to building professional relationships that are essential for understanding and better defining sectoral needs for

applications of weather, climate and hydro-meteorological information. Currently, the programme caters to young professionals in undergraduate and graduate programmes.

Attachments of 1–2 years are usually undertaken by recent graduates seeking to extend their skillsets before either seeking employment or entering graduate programmes. These attachments focus on building prototypes of either new products or services. A good example is the implementation of the Wavewatch-3 software to build an operational high-resolution marine significant wave height forecasting platform for the Caribbean Sea and adjacent oceans (<http://ww3.cimh.edu.bb>). The young professionals support their supervisors by conducting a significant portion of the basic work required to complete and operationalise the project. Several young professionals in recent years have supported investigations into boundary problems related to climate and (a) tourism, (b) energy and (c) agriculture.

2. Renewable Energy Intern Position

2.1. Background

The Renewable Energy Intern will support the establishment of up-to-date wind and solar energy resource maps and predict future performance of wind energy systems for Barbados.

The Barbados Government through the Ministry of Energy and Water Resources is involved in a number of solar energy projects. However, there are plans to advance the development of wind projects by identifying and testing sites that may be suitable for wind energy.

Wind energy is location specific and requires long term wind measurements in order to verify the power in the wind energy. Since the power of the wind is related to the cube of the wind speed it is important to secure good accuracy and predictability of the wind speeds over the operations of any wind energy facility.

In the 1980s the wind energy in Barbados was studied based on the approach of carrying out 2-6 weeks wind data collection and correlating it with long term data being collected at the airport in Barbados and CMIH. Studies at the University of the West Indies (UWI) suggest that although there is not much spatial and temporal variability in the solar energy throughout the small area of Barbados there is enough variation to impact the production of solar energy and by extension the selection of sites for solar systems. Before any significant investment, it is important to establish if the wind resource 30 years ago remains similar to that at present day and whether present day characteristics will persist for a further 30 years - the expected life cycle of any significant investment. Hence, it is important to establish whether the data collected 30 years ago can lead to the identification of sites to carry out wind development in 2019.

The Government of Barbados (GOB) recently purchased a portable 10 meter high weather station that is capable of measuring wind speeds, solar insolation, rainfall, barometric pressure etc. In addition, the GOB has several solar projects which have included solar insolation measurements (e.g., gymnasium, Bridgetown, etc). There are also several solar systems that are remotely monitored.

2.2. Objective

To establish and up-to-date wind and solar energy resource maps for Barbados and verify the predicted performance of GOB solar energy projects and predict future performance of wind energy systems at selected sites.

2.3. Scope of Work

The specific duties and responsibilities of the intern will include:

- Review wind energy estimates determined from wind speeds measured by the CMIH in the wind energy resource assessment of Barbados (40 sites). The sites were measured at 10 M for 4-6 days at specific Julian days;
- For the 40 sites carry out daytime measurement using the portable weather station and correlate to the day time value at the airport and CMIH to determine if there is any suggested relationship between the value for the wind measured 30 years ago and that measured for the limited time in 2019.
- Collect data on wind energy at other wind measurement locations including GOB solar energy project locations.
- Acquire the solar insolation data at the solar energy sites in Barbados (e.g., Bridgetown Sewerage Plant, Bowmanston pumping station, Barbados Gymnasium, CMIH etc) and determine the specific power output of the systems as it relates to the performance of the solar systems
- Review the performance of the GOB solar projects that have remote sensing via the internet to determine their specific performance. Report on the performance of these systems on a monthly basis in terms of total KWh of electricity produce and KWh/KWp of installed solar using the existing computer link to their online performance.
- Prepare an interim solar energy resource map for Barbados both in terms of solar intensity and predicted performance of solar systems at various locations in KWh/KWp.

6. Qualifications

Candidates applying for the position should have as a minimum, a BSc degree in Meteorology along with experience and/or training in wind and solar energy is an asset. Persons with degrees in other areas of science and engineering and experience collecting and processing solar and wind data will be considered for the internship.

Given the regional and interdisciplinary nature of CIMH's work, the successful intern should also possess:

Core Competencies:

- Proven strong academic track record.
- Knowledge, experience and understanding in using wind measuring and weather measuring devices.
- Experience in doing data gathering, research and analysis is essential.
- Experience in collecting data and using online search tools to recover data on the internet is required.
- Strong written and oral communication skills.
- High level of computer literacy (Excel, Word, Python, Matlab and Octave along with core competencies in GIS).
- Previous work experience is advantageous.

- Proven analytical and report writing skills are advantageous.

Behavioral Competencies:

- Highly organized and self-motivated;
- Demonstrated ability to do research;
- Creativity, flexibility and ability to work within deadlines;
- Maturity, initiative, tact and high sense of responsibility;
- Demonstrated ability to work in a team.

7. Duration

The assignment is for 12 months. While the internship will be with the CIMH the intern will split time at the Ministry of Energy and Water Resources where the intern will be part of a team consisting of persons from the Ministry of Energy and Water Resources, Barbados Water Authority, The Barbados National Petroleum Corporation and the Barbados National Oil Company Limited and may also include other GOB agencies with their own solar or wind energy projects.

The Principal of the CIMH retains primary supervision of the intern, however, it is expected that the Chief Energy Conservation Officer in the Energy Conservation and Renewable Energy Unit will contribute significantly to the supervision of the intern.

8. Reporting

The successful candidate will be required to submit bi-monthly progress reports and a final report within one month following the completion of the assignment detailing the activities performed under the internship.