**Programming Competition Problem Statement**

Global concern over climate change due to greenhouse gas emissions is increasing. Mounting evidence suggests that continued release of greenhouse gasses at present levels will lead to possibly irreversible changes on a global scale, threatening the livelihood of millions of people, and countless other species.

Electricity production is a large contributor of greenhouse gasses, with many generating facilities using hydrocarbon or coal combustion to produce steam for turbine rotation. Significant environmental benefit could be gained by a national effort to transition from these forms of electricity generation to renewable energy systems, which produce electricity using a variety of methods that do not release greenhouse gasses. It can be challenging for companies, government agencies, and private citizens to determine what form of renewable energy system to install. Renewable resource availability can vary significantly from one location to another, and throughout the year. Collecting and evaluating the information required to analyze resource availability in a given area, in order to determine the most economically feasible renewable energy system design is a significant challenge.

Being able to assess renewable resource availability is a core factor in the engineering design process for a new renewable energy system. Several open access databases exist that can provide the data needed to assess renewable resource availability, but accessing each database manually can make a comprehensive analysis of renewable energy potential in a region highly challenging and time consuming. Those unfamiliar with database access, and data analysis techniques face significant barriers in renewable energy system development.

Your goal is to develop a tool that will help automate this process, and simplify the assessment of renewable energy resource availability for the purpose of renewable energy system development in Canada. Your software must meet a set of technical requirements in the areas of: input, data access and processing, and output.

**Input Requirements**

At minimum the software must accept an input for a rectangular geographic region, defined by two latitude, longitude pairs. One pair will define the top left corner of the region, the other will define the bottom right corner of the region. If desired, more complex geometry input may be implemented. The specifics of the input interface may be chosen by the team.

For the purposes of this competition, the software you develop may treat latitude and longitude as a grid scale on a flat x-y plane. However, you are not restricted from compensating for/representing the spherical nature of latitude and longitude coordinates if you desire.

**Data Access and Processing**

There are a large variety of renewable resources that can be used to produce electricity. The software you are being tasked with developing will focus on a subset of these resources: solar and wind. A selection of databases have been chosen that contain data relevant to estimating resource availability of these kinds in Canada. At minimum, the software you produce is expected to use at least one database for wind data and one database for solar data. It is encouraged that multiple data sources be used, time permitting.

Solar:

1. NASA Atmospheric Science Data Center: Global Data Sets – SOLAR RADIATION. Available: <https://eosweb.larc.nasa.gov/cgi-bin/sse/global.cgi>
2. European Commission Photovoltaic Geographical Information System. Available: <http://re.jrc.ec.europa.eu/pvg_static/web_service.html#MR>

Wind:

1. NASA Atmospheric Science Data Center: Global Data Sets – WIND SPEEDS. Available: <https://eosweb.larc.nasa.gov/cgi-bin/sse/global.cgi>
2. Government of Canada, Canadian Wind Energy Atlas – Data Files. Available: <http://www.windatlas.ca/download-en.php>

For the purpose of this competition, no specific focus is being placed on what values/units of solar and wind availability are being presented. The chosen quantities that are being presented should be clearly shown, however. It is expected that you provide a summary of the resource availability throughout the year, and not simply an annual average. Interpolation of data within the given region is acceptable, but the implementation specifics should be documented and justified.

**Output Requirements**

The goal of the output of your software should be to provide an easy to understand overview of the renewable resource availability in the given region, throughout the year. There are no specific requirements for the implementation of the produced output. Several considerations for the output/ output interface are listed below:

* Some intended users of the system may not have a strong technical background in software use or data analysis.
* The user may desire a way to save the output for later review.
* The user my desire access to some or all of the numerical values of the renewable resource summary for use in calculations.
* It should not take a long amount of time to gain an understanding of the resource availability in the region.