AIMLAC Coding Challenge 2021 – Request for Proposals

You are invited to submit a proposal for a software solution to manage renewable energy systems for the new offices of the Centre for Doctoral Training in Artificial Intelligence, Machine Learning and Advanced Computing.

The location

The offices are to be located 2.5km west of Llanwrtyd Wells railway station in Mid Wales at coordinates 52.1051, -3.6680. This is approximately the central point of the five partner universities which make up the CDT. The location is approximately 470 metres above sea level and 220 metres above Llanwrtyd Wells in a former forestry site on top of a mountain.

Electrical systems

The building is 50m x 50m with shared and individual office space for up to 90 people. A solar panel array consisting of 1400 LG 335 W Mono Neon2 A5 panels is located on south facing 45 degree sloped brackets on the roof. These provide a combined output of up to 470 kW in ideal conditions. Two Endurance E3120 50 kW wind turbines are located a few hundred metres from the main building at 52.1030, -3.6690 and 52.1040, -3.6685.

The building is electrically heated with a system using up to 120 kW. On site data centre equipment and computers use up to 200 kW, personal computers and office equipment a further 10 kW and lighting and other equipment up to 20 kW. The building will typically only be occupied between 9am and 5:30pm Monday to Friday and not during bank holidays.

The site is connected to the national grid through a cable capable of carrying 50 amps/11,000 volts (550 kW). The on site generation equipment is able to both supply the site and export electricity. Excess power which cannot be exported is lost by disconnecting the solar array or wind turbine. Note that it is only possible to disconnect the entire solar array, a single wind turbine or both wind turbines. Individual solar panels cannot be disconnected. There is currently no energy storage on site.

Your Task

- Predict on site power generation at 30 minute intervals for at least the next 24 hours. The National Grid charges a penalty fee for any power generator who over estimates their power output and is unable to deliver.

- Automatically decide upon a price to sell any excess electricity to the National Grid. The price must be as profitable as possible while still being competitive with the general wholesale market. This must be specified at 30 minute intervals.

- Produce a regular report for management stating:
  - Revenue from selling electricity
  - Cost of imported electricity
  - Cost savings compared to buying from the National Grid at a rate of 15 pence per kilowatt hour.
  - Carbon dioxide savings compared to buying from the National Grid. Note that the carbon intensity of the grid varies.

Your Proposal

Deadline: 5pm on Friday February 26th 2021
Submit proposals to: coding-challenge@cdt-aimlac.org

State a summary of your proposed solution on no more than two pages of A4.

Proposed implementation

Describe or explain how your solution will:

- Predict the output of the solar panels and wind turbines
- Predict demand for the office building itself
- Decide upon your bid price
- Mitigate the risk of your model making incorrect predictions

Team description

- Who is going to deliver this project. Include a brief description of each member's expertise.
- Describe what each team member will contribute to the project.

Costings

- State the full economic cost of your proposal by:
  - Assigning a pay grade and spine point for each team member and working out how many hours they will contribute. We will only consider staffing costs up to spine point 43. Cheaper proposals will be preferred.
  - Use your university's full economic costing spreadsheet to calculate the cost of each team member.
  - Note this is a student project, you won't really get paid this money.

You will be informed if your proposal has been accepted along with any reviewer comments by 5pm on March 5th 2021. Accepted proposals will be required to present their ideas via video conference on the week commencing March 8th. You will have until June 2021 to produce a working solution. Multiple proposals will be accepted.