

AIMLAC Coding Challenge 2020/21

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Overview

- Why are we doing this?
- What are we doing?
- How we will be working
- Meet your teams
- Your First Task

Why are we doing this?

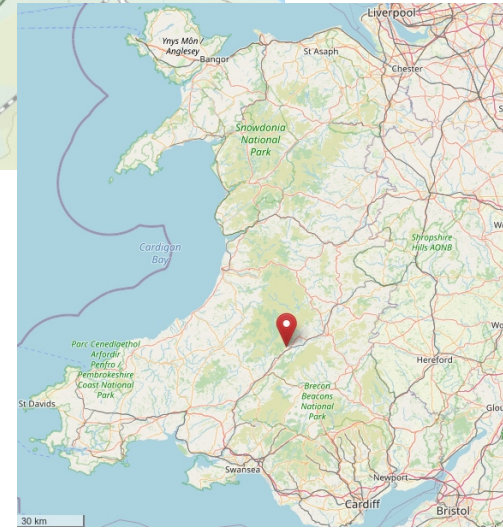
- Improve your skills in:
 - Team Working
 - Software Development
 - Data Analysis
 - Applying machine learning techniques to a real problem
 - Remote Working
 - Using collaborative software development tools

What are we doing?

- Building a renewable energy “auto bidder”
 - How much energy the site can sell to the grid in the next 24 hours?
 - What is the most profitable price that this can be sold for?
 - (hint: find out the wholesale price of electricity)
 - Produce a regular report on:
 - Amount of electricity generated and exported/imported
 - Profitability
 - Money saved vs just using it from the grid
 - CO2 saved vs using the grid

The new (fictitious) AIMLAC HQ

- 2.5km west of Llanwrtyd Wells railway station in Mid Wales
- Mountain top location, 470m above sea level, 200m above the valley floor
- Approximate centre point of the 5 universities



Renewable Energy at AIMLAC HQ

- 2x Endurance E3120 50 kW wind turbines
- 1400x LG 335 W Mono Neon2 A5 solar panels
 - Tilted at 45 degrees
 - South facing
- 50 amp/11,000 volt (550 kW) grid connection
- No battery storage



On-site Electricity Usage

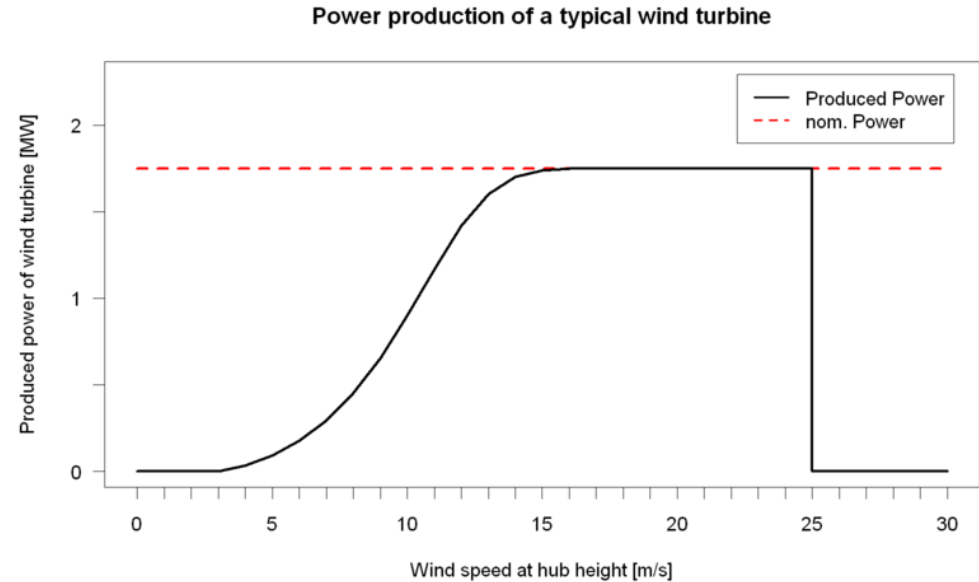
- Heating – up to 120kW
 - 0 kW on warm days (>15C outside)
 - 30 kW at 10C
 - 60 kW at 5C
 - 90 kW at 0C
 - 120 kW at -5C
- Computers in data centre – 200 kW
- PCs and office equipment – 10 kW
- Lighting + Misc – 20kW
- Building typically occupied 9:00am to 5:30pm, Monday to Friday
 - excluding bank holidays and December 21st-31st.

Renewable Energy 101 – Units

- Amps = number of electrons moving per second
- Volts = electrical “Pressure” moving electrons
- Watts = amps * volts
 - Instantaneous measure of power
- Kilowatt Hours
 - 1 kW/h = 1000 watts sustained for 1 hour
 - Electricity is bought and sold in kilowatt hours.

Renewable Energy 101 – Wind Turbines

- Wind turbines generate electricity proportionally to wind speed.
 - Cuts off at maximum speed
 - Might even drop off slightly
 - Really strong winds might require stopping the turbine
- Find the data sheet of the wind turbine for exact relationship.



Renewable Energy 101 – Solar Power

- Generate electricity in proportion to the amount of sunlight hitting them.
- Power output reduced when sun isn't directly pointed at the panel
 - Forms a sine curve across the day
- Cloudy days have much lower output.
 - 10-25% of sunny output

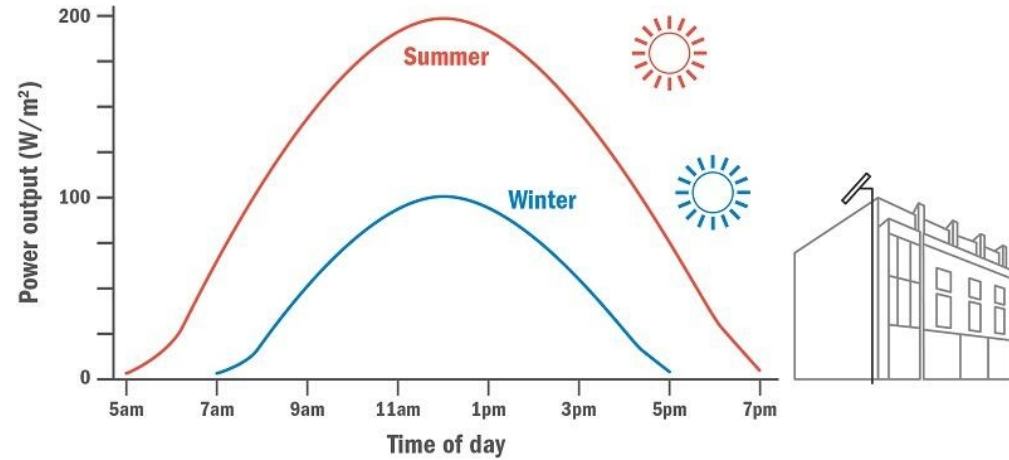


Image from:

<https://www.iop.org/explore-physics/sustainable-building-design/solar-panels>

How we will be working

- Teams of 5-6 people
 - We will allocate you
- Monthly customer meeting
 - One RSE acting as the customer, it might change who
 - Agree a work plan for the following month
 - Customer might have new requirements as things go along
- Technical support
 - Other RSEs providing technical support
 - Recommendations on software development process

Team Allocation

- We're trying to even out skills across the teams
- "Have you worked in a collaborative software development team before?"
 - In industry and academia
 - Only in industry
 - Only in academia
 - No

Teams Icebreaker

- Join your team in a breakout room
- Go round the group and introduce yourselves
 - Name, University, PhD topics
- State what programming languages you have knowledge of
- Suggest a name for your group

Your first task

- Think about how you might build a solution
 - What data do you need? Where will you get it from?
 - What models do you need to make?
 - What AI/ML/Modelling techniques will you use?
 - What programming languages?

Deliverables

- Produce a two page project proposal by February 26th.
 - See document for more details
 - Include costings for your team (note: we aren't really paying you!)
 - Reviewers comments returned by Friday March 5th.
- Present it to the “customer” week beginning March 8th

Setup your teams

- Choose somebody to lead the first task
- Responsibilities will include:
 - Arranging and chairing meetings
 - Submitting the proposal document
- Setup some co-working resources:
 - Slack
 - Make a private channel/workspace for yourselves and a channel for customer interaction
 - Trello
 - Github
 - Anything else you think you might need

Questions?