ELEC97083/ELEC97084 - Sustainable Electrical Systems (DH201910): Coursework 2

Submission deadline: 4 pm on 14 March 2025

Operation of balancing market with variable wind generation

One of the design characteristics of balancing market is the intention to punish generators that do not honour their advance commitments. If a generator has a shortfall in generation, then it must pay for that shortfall at the System Buy Price (SBP). If on the other hand the generator produces more energy than contracted, then it should pay for this excess at the System Sell Price (SSP).

As Intermittent Renewable Sources are intrinsically difficult to forecast, the effect of these penalty costs is that the value of intermittent energy is reduced. This part of the exercise is design to examine this effect. In the sheet "BM Prices and Wind" you are given a half hourly profile of a group of wind farms for 15 days together with half hourly profiles SSPs and SBPs.

Complete the folowong tasks[1]:

- Plot wind output profile, SBP and SSP profiles (3 marks)
- Plot the forecast error of wind output assuming that the persistence forecast technique is used to predict wind output at gate closure; perform this calculation for 3.5 hours and 1 hour gate closure (4 marks)
- Calculate and plot half hourly imbalance income / charges from participating in Balancing Mechanism (4 marks)
- Calculate the overall income of the wind farms from the energy sales in the forward market and total penalties during the period under consideration (4 marks)
- Discuss your results and elaborate on alternative trading strategies that the group of the wind farms could adopt to increase the value of its generation (7 marks)
- Write a summary of your work with appropriate observations made (8 marks)

Submit the Coursework report (up to 6 pages in total) as a PDF file (named as your 'Firstname_Surname_CW2.pdf') on Blackboard before 4 pm on 14 March 2024.

[1] Make appropriate assumptions to compensate for lack of data, as appropriate