31761 - Renewables in Electricity Markets

Assignment 1: Expectations

General considerations

Assignment 1 concentrates on day-ahead electricity market design and operations, using some realistic data as input, also considering the regulatory framework, since premium and feed-in tariffs eventually affect offering strategies, market clearing and revenues. At the time of distributing the assignment, it was explained that the aim was to evaluate

- your understanding of day-ahead electricity markets,
- your ability to model the day-ahead market mechanism,
- your ability to use real-world data as input,
- your critical analysis of the results generated.

I should add that the aim is additionally to evaluate your ability to master the concepts of the course and to use those to develop new insights into the workings of day-ahead electricity markets through an application to a realistic test case. In parallel, the aim is also to have you develop your ability to deliver and discuss the outcome of your work in a synthetic manner. The constraint of 10 pages on the report is there to force you to prioritize the material and sorting what is most important and what can be placed in Appendices (or simply skipped).

In addition, my main objective with this first assignment is to get you into the topic and to understand the way I would like us to work over the 13-week period. In principle, this is the easiest assignment... but at the same time, since this may be the first you work on such a type of assignment, in a group, combining base knowledge, programming, data handling, etc. it may actually end up feeling quite challenging. It somehow reflects the type of skills we would like you to develop to become skilled and talented engineers working with renewable energy and electricity markets!

What makes the grade?

In terms of the assignment grading itself, the philosophy is to grade between 0 and 100 (you could think of percentage of success), where the minimum passing percentage is somewhere around 40%. I keep it as an adjusting parameter based on the performance of the class overall that year. This is in line with the Danish way of grading where nearly all grades are a pass (i.e., 0 is a fail, but {2,4,7,10,12} are passing grades). Eventually, the grades for quizzes and assignments will be taken all together, and a final grade in the Danish grading scale will be generated.

Grading blocks for this assignment

The various topics graded in Assignment 1 include (with the number of points assigned for each part between parentheses):

Problem formulation (15 points): the students should be able to describe what the market clearing problem is and how it is formulated mathematically, as well as how the various market players participate in the market

Revenue calculation (15 points): the students should be able to tell how the revenues are calculated, based on market clearing, quantities scheduled, as well as regulatory support

Clearing example (20 points): the students should be able to illustrate how the market clearing works (based on supply and demand curves, equilibrium point, etc.), as well as the impact of renewables and transmission effects

Overview of revenues (15 points): this is the way we can see if the ideas have been implemented correctly and whether the students can be critical with their own results (are those plausible or not? what price do those suppliers really get in practice, etc.)

Analysis of market outcomes (20 points): the students should be able to go beyond the technical aspects of programming and plugging data in their machinery to develop some key insights about what is going on in their market e.g., wind effect, transmission effect, price dynamics, etc.

Code (5 points): there the code that is used to produced the results is verified to ensure that is reflects the formulation proposed, and can plausibly produce those results

Report quality (10 points): the students should be able to prioritize the material to be presented in the report, make proper use of the English language, make right choices of illustrations, etc.

The total number of points is hence 100.