31761 - Renewables in Electricity Markets

Q&A Assignment 1: Build and operate a realistic day-ahead electricity market

This document is to gather all questions received about Assignment 1 and the answers I gave.
Do not hesitate to ask questions as these are then anonymized.

Q.1: In our preliminary model we have combined the demand from the respective DK1 or DK2 region with the import and/or export demand of that region, to provide an overall demand for each region. For example, if the demand in the DK1 region is 1000 MWh in a given hour, and the export demand is 200 MWh then the overall demand would be 1200 MWh. Therefore generators in the DK region would produce 1200 MWh, neglecting any transmission between DK1 and DK2.

A.1: I can understand the intuition. However, the import and export have to be a consequence of the supply-demand balance in DK1 and DK2. During the lecture, as I explained the basic idea for imprt and export, one first has (i) to look at the supply-demand balance overall, (ii) map the production and demand on both DK1 and DK2 and check how much needs to be exchanged between the 2 areas, (iii) in case the transmission capability is exceeded, one needs to splits the two sides and account for the necessary exchange in determining the supply-demand balance in both DK1 and DK2. It gives and intuition, but it would be cumbersome to do for each and every hour of the month. This is why I gave you the optimization formulation that directly determines schedules, prices on both sides, and usage of transmission capacity. Please use that as it is far more convenient (and elegant).

Q.2: The poinis more about the fixed import/exports for the various neighboring countries mentioned in the assignment description, e.g., fixed imports from Norway to DK1, as well as fixed exports from DK1 to Germany and DK2 to Sweden. Can we simply consider the export from DK1 to Germany, for example, as the equivalent to another consumer on the demand side for DK1?

A.2: Yes it is a the most natural way to do it: mandatory export become a prioritized consumption block, and mandatory import is a prioritized supply block.

Q.3: In point 1, Wind energy suppliers table, what is the difference between none, premium and feed-in tariff? Does it affect the linear program? if so, how? Is 'Support' in the column headers same as price?

A.3: This is is to be discussed in Lecture 3, on 12 Feb. 2018. Please be patient and disregard it for now.

Q.4: The following statement is not clear to us "For the revenue calculation in the assignment, there is no need to consider removing the marginal cost of power generation for these various participants". Please clarify if there is any marginal cost to consider for this assignment.

A.4: I only want you to calculate the revenue of the producers from participation in the day-ahead market, not trying to figure how much it has cost them to produce.

Q.5: In point 2.3 it is being asked to clear 2 markets, one with high and one with low wind penetration (i.e. share of wind power generation to meet consumption.) What does wind penetration refers to? Percentage of the demand being supplied by wind? if not, what does it refers to? How do we decide which time units to use? This could be done in a lot of ways (picked from the list freely, max. and min. combined prognostic supply, Highest and lowest wind penetration, etc.)

A.5: The point here is to give an example where there is no, or nearly no wind power in the system, as well as an example where there is a lot of wind power in the system. Wind power penetration is the percentage of wind power to meet the load. E.g. Penetration of 50% means that half of the load is

supplied by wind power.

Q.6: In point 2.7: What is 'impact of wind power generation' referring to? We are not sure what is the expected analysis for this bullet point. What is 'statistics of wind curtailment' referring to? Which statistics do you want us to show? What is 'load shedding'? is this the same as a black out? What is 'context' referring to? We are not sure what is the expected analysis for this bullet point either.

A.6: impact of wind generation refers to how different level of wind generation yields different price characteristics, schedules of conventional generators, etc. Some typical thing to look at is the average price when wind power penetration is within 0-5%, then 5-10%, then 10-15%, etc. and to make a plot of that. Statistics of wind curtailment refers to how often do we have excess wind (i.e., too much power in the system) hence requiring to stop some of the turbines. This can be a single number (like, 2% of the times) for the whole period, while the analysis may then be a function of the time of day for instance. Load shedding is when it is the consumption that has to be cut, in case there is not enough energy generated to meet the required load. "Context" reflects to explaining in which conditions we experience load shedding, if any.