

Power System Economics 2 –Seminar work

Below you will find a detailed description of your assigned project for the seminar of PSE2. Attached you will also find a base code and the data you will work with and adapt depending on the requirements of your topic. Remember the final paper deadline will be on **July 5th**. Your paper should be no longer than 10 pages! The content of the paper should be structured as: introduction, literature, methodology, model description, results, and conclusions. Furthermore, a pre-submission is required until **June 5th**. It should include an adjusted and working GAMS-code.

For the paper focus on the analysis of results and making compelling scenarios. Your grading will heavily depend on how good you dominate the economic theory behind your results.

Integration of PSP from Alpine Regions

The Central European electricity sector is a complex system involving various markets which are connected with each other. Power markets have country specific characteristics. In particular, the Alpine regions are characterized by a high amount of pump storage capacities. Your task is to adjust and apply an electricity market model to determine the effects that the storage capacities of Switzerland have on the German electricity market.

Consider the theoretical aspects applying to the topic e.g., International electricity exchange, investment decisions, dynamic effects etc. with the knowledge you have gathered, hypothesize about the effects of such connection – what do you expect will happen with the energy prices and the total system costs?

Now that you have reflected on your topic, some specific tasks are:

- Develop a mathematical formulation for pump storage plants and implement it to the model.
 - PSP are restricted by a maximum turbine power (MW) and a maximum storage capacity (reservoir size) (MWh). Apply the given power capacity factors that show the relation between an installed turbine power and the upper lake capacity.
- To run the model, generate the variable production costs by using the given fuel and CO₂ price.
 - Add this information to the file *Input.xlsx*.
- Analyze the situation before and after connecting the two markets (make use of the lecture on international power exchange).
 - How are the pump storages from Switzerland used?
 - What are the effects on both electricity markets?
 - Examine synergies of coupling these markets.
- Develop scenarios and consider future developments on the German electricity sector (e.g., RES deployment, nuclear phase out, CO₂ emissions...).

For the submission:

- For the pre-submission, please send the code with the basic scenario e.g., Connection is made, the reservoir capacity is not limited, RES capacities and fuel costs are as originally given. There is no intermediate grading, either your code works and results in the correct answer or it does not.
TIP: Do the results match the theory? If not, maybe there is a problem with your code.

- For the final submission you do not need to submit the code again, the paper suffices. Take care that all sections are included and that your scenarios are compelling.