

## Power Systems Laboratory Student Project Agreement

This signed form must be completed before beginning a semester or master thesis. By signing this agreement, the student agrees to complete the project in the specified time frame and acknowledges that they will not receive a grade until they have (a) presented their research to the project supervisor(s) and tutor and (b) submitted their final report to their supervisor(s), along with a declaration of originality confirming that the student is the sole author of the work. The supervisor will provide the student with (a) university citation guidelines and (b) the rubric used to compute their grade. Upon completion of the project, the student permits the institute to make further use of their models, software, and results, and to upload the project report to the institute's website.

### Project Title

Achieving a 100% Renewable Swiss Federal Railway System

### Project Tasks

- Literature review using the proposed documentation and other on generation expansion planning models and acquire basic knowledge of the railway system (especially SBB). The external supervisors will give an introduction on the traction power supply system of the SBB, including a visit of the respective control center.
- Find and process wind and sun radiation data for the model (specific data of the railway power supply system will be delivered by the SBB).
- Set up the mathematical formulation of a generation expansion model using an energy balance approach. The modelling is to be done in Matlab computing environment.
- Design different possible scenarios and analyze the results of the proposed framework using SBB input data and provide recommendations on how to realize the 100% renewable target.
- Based on the results propose a proper dimensioning of the new renewables (in terms of installed capacity, number of plants, their emplacement, need for batteries, etc) for achieving a 100% renewable power supply for the SBB.
- Optional (time permitting): build a generation expansion model by means of stochastic programming and compare it with those of the proposed methodology.
- Take part in 2 to 3 follow up meetings, either at the SBB or at the ETH.
- Write the corresponding report and present the work at both ETH and SBB

### Project Type

Semester

### Project Start

18.02.2019

### Project Finish

31.05.2019

### External

Yes

Jeiziner Annik

Student

Signature

Date

Xuejiao Han

Primary Supervisor

Signature

Date

Dr. Josep M. Aniceto (SBB AG)

Secondary Supervisor

Signature

Date

Dr. Julius Bosch (SBB AG)

External Supervisor and Affiliation

Signature

Date

Prof. Dr. Gabriela Hug

Tutor

Signature

Date