Status of ClaRaCCS: Modelling and Simulation of Coal-Fired Power Plants with CO$_2$ Capture

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Within the DYNCAP project, the Modelica library `ClaRaCCS` is developed. The goal of the library is to provide models for the analysis of complex power plants with CO$_2$ capture in both static and dynamic operation mode. After completion of the DYNCAP project, the library will be freely available under the Modelica license. This paper gives an introduction to `ClaRaCCS` and presents the current status of development.The technical fundamentals of conventional steam power plants as well as carbon capture processes modelled in the library are outlined. General features of the library are introduced: Starting from the general library structure the guiding principles, that underlie the models in `ClaRaCCS`, are explained. The treatment of media data as well as validation of models is described. These properties are illustrated by a concrete modelling example, where the model of a furnace is described. The current status of `ClaRaCCS` is demonstrated by an example of use: the model of a coal-fired power plant with attached post combustion carbon capture unit is presented. The results of a simulation scenario are shown, where throttling of the carbon capture unit is used in order to meet the demand for a short term increase of the power plant's generator power. Future steps of development are outlined.
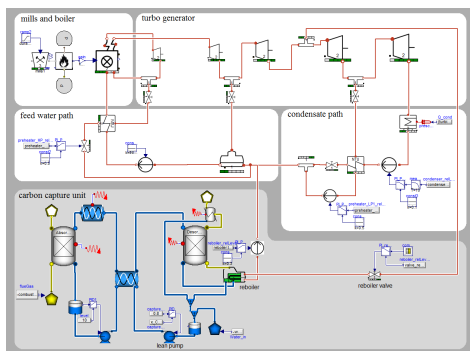
Model of a coal-fired power unit with attached CO$_2$ post combustion capture unit.
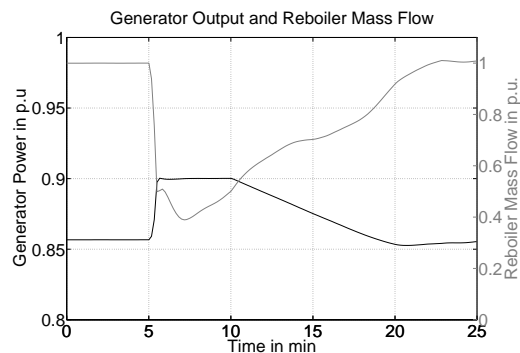
Power output during reduction of the steam tapping used for the CO$_2$ capture unit.

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