

Modelling a Lignite Power Plant in Modelica to Evaluate the Effects of Dynamic Operation and Offering Grid Services

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Offering services to stabilize the electrical grid is one of the major tasks of fossil power plants and also of significant economical relevance. However the effects on the power plants regarding the additional wear of components is uncertain. Usually the effects regarding control reserves, especially primary control occur with high frequencies and small amplitudes, which makes investigations based on measurement data impossible since the effects are masked by the noise of normal operation. In order to investigate this issue, a detailed model of a lignite power plant has been used, which was developed in Modelica for simulating and comparing scenarios with and without offering primary control reserves. The model comprises the entire water-steam cycle including turbines, preheaters and pumps, as well as a very detailed boiler model including the air supply, coal mills, a combustion chamber, heating surfaces and piping. Furthermore the power plants control system has been implemented in a very precise way. In addition the study involves an investigation on the input signals (grid frequency) and a calculation of lifetime consumption for specific components to evaluate the effects.

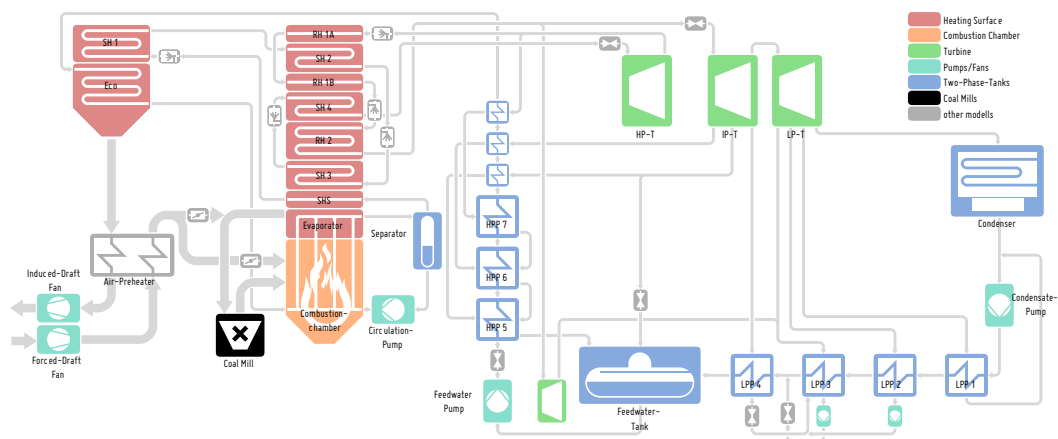


Figure 1: Implemented components of reference power plant