Flexible modeling of electrical power systems – the Modelica PowerSystems library

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New trends such as renewable power, virtual power plants, electric mobility and smart grids raise the importance of electrical power systems. The systems are manifold, including e.g. DC, single- and multi-phase AC with fixed and variable frequency. Often times such systems cover other physical domains as well, such as rotational mechanics and thermo-fluid. Required system models range from simple flow calculations of active power to detailed transient and asymmetric studies of three-phase systems. Transformed modal coordinates play an important role for the treatment of three-phase AC systems.

The paper introduces the new Modelica PowerSystems library. It covers arbitrary phase systems in one modeling framework. Besides simple generic models that are valid with all phase systems, also large sets of detailed component models for DC and three-phase AC are included. The detailed component models have been ported from the former Spot library to PowerSystems.

The applications of one and the same PowerSystems library range from detailed transient drive train models up to online optimization models for the balancing of accounting grids.