We propose a binding of Modelica models to CIM, allowing to comply with the EC regulation while assuring unambiguous modeling and simulation of power system dynamics.

The mapping allows to automatically transform the CIM UML representation of each component, to a well defined mathematical representation using the equation-based Modelica language.

Workflow:
1. Mapping of CIM classes with Modelica classes / models
2. Automatic conversion from CIM to Modelica using the mapping
3. Provision of ‘start values’ to the Modelica model (from power flow solution) – State Variable Profile in CIM
4. Use Modelica model for time domain simulations

Modelica models:
- Modelica is an object-oriented equation-based programming and modeling language, which allows the representation of cyber-physical systems using a strict mathematical representation.
- Initial values of variables: initial equation construct or by setting the (fixed=falase, start=x0) attribute of the instance variables.
- Initial value of parameters: setting its attribute to be (fixed=false, start=x0), the initial value is implicitly computed during initialization and keep its value throughout the simulation.
- To keep a balance between the same number of unknowns and equations, for each unknowns, an extra equation should be provided under the initialization section.

Conclusion:
- Proposal for mapping CIM and Modelica for unambiguous model information exchange and simulation.
- Mapping offers a solution for assigning start values to continuous (differential), discrete and algebraic state variables from a power flow solution stored in a CIM data model, and to generate the corresponding Modelica classes.
- First step into extending the CIM (or CGMES) to include a strict mathematical model representation of power system dynamic models.
- Implementation of the mapping will allow executing time-domain simulations of cyber-physical power system models, using Modelica compiler directly from their CIM definition.

References: