Background and objectives

70% of Iceland’s electricity is produced by hydroelectric power plants. Iceland is the world’s largest electricity producer per capita. In cooperation with the Icelandic energy production consulting company, Verkís, a complete dynamic model is to be designed based on a reference power station, Fossárvirkjun, located in the northwest of Iceland. The objective of developing such model is to study the dynamic characteristics of the plant, such as overall performance during disturbances, worst-case scenario of full stop and start of the plant and subsequently the effect on the power grid.

In addition a MIMO predictive controller will be studied and implemented for optimal system performance, in consideration to boundary constraints. The benefit of these controllers are manifold, where an example could be to minimize oscillations in gate control signals to reduce wear, while optimizing performance in regards to speed and power.

To build the model and simulate these different scenarios along with implementation of predictive controller the object-oriented based modelling language, Modelica®, will be used to model the complex, physical power system.