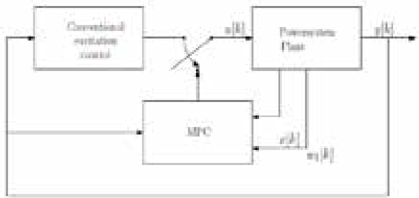
Background and objectives

The Norwegian Network Code FIKS from the Norwegian Transmission System Operator (TSO) Statnett, states that synchronous generators ≥ 1 MVA must connect to the grid with a cos ≤0.85 capacitive and ≤ 0.95 inductive. Reactive power can be used to compensate for voltage drops in a power system, but must be provided closer to the demands than real power needs due to transportation limitations of reactive power through the grid.

Flexible power factor control on large synchronous generators located close to points of high demand could enhance the voltage stability of a power system.

Model Predictive Control for voltage control through field excitation of hydroelectric generating units is investigated.

Typical objective criterion:

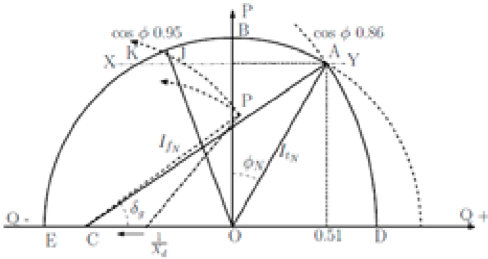


Structure of plant and controller. Here, MPC is a Single Input, Multiple Output (SIMO) controller

An attractive feature of MPC is its capability to handle Multiple Input, Multiple Output (MIMO) systems and nonlinear systems taking constraints into account.

With increased provision of reactive power, the generating unit will be more mechanically stressed. Due to these stresses an investigation of thermal performance of the generating unit by varying the ratio of active/reactive power provision will be done

An optimal utilization of thermal capacity and cooling mechanisms of hydroelectric synchronous generators should be found and compared with design and standards. Thanks to Statkraft for funding the study.



Capabillity diagram of a synchronous generator

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Improved functionality of power systems using model predictive control

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PHD THESIS