KTH Electrical Engineering

Master Thesis Proposal

Trajectory Sensitivity Analysis of the Nordic Power System

–Appropriate Placement of Series Compensators to Improve Transient and Small Signal Stability in the Nordic Power System

Introduction

Rotor angle stability is the ability of a power system to remain in synchronism after being subjected to a disturbance. It can be divided to two categories named transient stability (rotor angle stability in the presence of large disturbances) and small signal stability (rotor angle stability in the presence of small disturbances).

The main goal of this project is to find the best locations for installing series compensators to improve both the transient and small signal stability in the Nordic power system. Due to the non-linear nature of dynamic behaviour of power systems, rotor angle stability inspection can be an extremely massive calculation, especially, when the goal is to check the stability margin in each iteration of an algorithm which intends to improve the rotor angle stability. Trajectory Sensitivity Analysis (TSA) can be used as an efficient and powerful tool to analyze the effect of series compensators on both transient and small signal stability of power system. In this project, TSA is going to be applied to the Nordic power system to find the best locations for installing series compensators.

Preliminary work plan

The following steps should be accomplished in this project

1. Literature study and understanding of TSA.
2. Implementation of TSA in MATLAB for the Nordic power system. TSA codes are available for the general case.
3. Dynamic analysis of the Nordic system and identification of critical disturbances etc.

4. TSA should be applied to the Nordic system when there is no disturbance for small signal stability improvement study.
5. TSA should be applied to the Nordic system considering all the probable and severe faults for transient stability improvement study.
6. Identification of the best locations for installing series compensators for both transient and small signal stability improvement.
7. Verifications of the obtained results.
8. Further development and analysis if time is available.

Simpow and/or PowerFactory will be used as simulation tool and some programming will be performed in Matlab.

General information

The master thesis project will be performed at the division of Electric Power Systems at KTH. For the project a payment of about **37 500 SEK** is foreseen after successful and in time delivery of a report.

Prerequisites

1. Power system analysis Part 2 EG2031 or equivalent
2. FACTS and HVDC EG2070 or equivalent

Send your application, including your CV, transcript and a short introduction of yourself to: **robert.eriksson@ee.kth.se**

June 2012