Offshore Wind Farms and HVDC Grids Modeling as a Feedback Control System for Stability Analysis - DTU Orbit (13/12/2018)

Offshore Wind Farms and HVDC Grids Modeling as a Feedback Control System for Stability Analysis

The low impedance characteristics of DC transmission lines cause the voltage source converter (VSC) in HVDC networks to become electrically closer together and increase the risk of severe interactions between the converters. Such interactions, in turn, intensify the implementation of the grid control schemes and may lead the entire system to instability. Assessing the stability and adopting complex coordinated control schemes in an HVDC grid and wind farm turbines are challenging and require a precise model of the HVDC grid, wind farm, and the controllers. In this paper, a linear multivariable feedback control system (FCS) model is proposed to represent the dynamic characteristics of HVDC grids and their controllers. The FCS model can be used for different dynamic analyses in time and frequency domains. Moreover, using the FCS model the system stability is analyzed in both open- and closed-loop forms. The standard eigenanalysis identifies the modes of only the closed-loop system and detects the pertaining state variables. The open-loop model, in the frequency domain, is a complementary tool that helps to have more intuitive insight into the system stability. A four terminal HVDC grid with two OWPPs and two AC grids is used for simulations and verification of the proposed FCS model.

General information
State: Published
Organisations: Department of Wind Energy, Integration & Planning
Contributors: Bidadfar, A., Saborío-Romano, O., Altin, M., Göksu, Ö., Cutululis, N. A., Sørensen, P. E.
Number of pages: 5
Publication date: 2017
Peer-reviewed: Yes
Event: Paper presented at 16th International Workshop on Large-Scale Integration of Wind Power into Power Systems as well as on Transmission Networks for Offshore Wind Power Plants, Berlin, Germany.
Electronic versions:
Offshore_Wind_Farms_and_HVDC_Grids_Modeling_as_a_Feedback_Control_System_for_Stability_Analysis.pdf
Source: PublicationPreSubmission
Source-ID: 134900630
Research output: Research - peer-review > Paper – Annual report year: 2017