Coordinated Voltage Control Scheme for VSC-HVDC Connected Wind Power Plants - DTU Orbit (01/01/2019)

Coordinated Voltage Control Scheme for VSC-HVDC Connected Wind Power Plants

This paper proposes a coordinated voltage control scheme based on model predictive control (MPC) for voltage source converter-based high voltage direct current (VSC-HVDC) connected wind power plants (WPPs). In the proposed scheme, voltage regulation capabilities of VSC and WTGs are fully utilized and optimally coordinated. Two control modes, namely operation optimization mode and corrective mode, are designed to coordinate voltage control and economic operation of the system. In the first mode, the control objective includes the bus voltages, power losses and dynamic Var reserves of wind turbine generators (WTGs). Only the terminal voltages of WTGs are taken into account in the second mode. The predictive model of the system including VSC and WTGs is developed firstly. The calculation of sensitivity coefficients is done by an analytical method to improve the computational efficiency. Simulation results are presented to demonstrate the effectiveness of the proposed controller and the control performance is compared with conventional optimal control and loss minimization control. Besides, the robustness of the proposed controller to communication time delay and measurement errors is investigated in the last.

General information
State: Published
Organisations: Department of Electrical Engineering, Center for Electric Power and Energy, Electric Power Systems, Shandong University
Contributors: Guo, Y., Gao, H., Wu, Q., Zhao, H., Østergaard, J.
Pages: 198 - 206
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: I E T Renewable Power Generation
Volume: 12
Issue number: 2
ISSN (Print): 1752-1416
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 4.18 SJR 0.979 SNIP 1.453
Web of Science (2017): Impact factor 3.488
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.55 SJR 0.878 SNIP 1.434
Web of Science (2016): Impact factor 2.635
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 3.13 SJR 0.976 SNIP 1.555
Web of Science (2015): Impact factor 1.562
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 3.56 SJR 1.229 SNIP 2.282
Web of Science (2014): Impact factor 1.904
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 4.96 SJR 1.601 SNIP 2.799
Web of Science (2013): Impact factor 2.28
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 4.64 SJR 1.353 SNIP 2.787
Web of Science (2012): Impact factor 1.718
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1