

Validation of equivalent dynamic model of active distribution network cell

Abstract

Paper presents an equivalent model of an active distribution network cell (ADNC) with distributed generation for transmission system stability studies. The equivalent model of ADNC comprises a converter-connected generator and a composite load model in parallel. The gray-box approach was chosen as it enables inclusion of prior knowledge about the ADNC structure into the model development, hence making the model more physically relevant and intuitive than a black-box or white-box model. The dynamic equivalent model is presented in a seventh-order nonlinear quasi state space format, developed from the algebraic and differential equations describing assumed typical components of the ADNC. The developed equivalent model of ADNC was validated through small and large disturbance studies using the modified IEEE nine-bus transmission system model.

Keywords

Active distribution networks; Distribution network cell; Dynamic equivalent; Nonlinear least-square optimization