

The state-of-the-art magnetically linear voltage-behind-reactance (VBR) and phase-domain induction machine models for nodal-analysis-based electromagnetic transients programs (EMTP-type) offer an excellent combination of numerical stability, accuracy, and efficiency. However, incorporation of magnetic saturation in these models renders their interfacing circuits dependent on the operating segment of the piecewise-linear saturation characteristics. Consequently, refactorization of the network's conductance matrix is required during simulations, which reduces the numerical efficiency of the overall solution and limits the models' range of application. This paper presents a new VBR squirrel-cage induction machine model that includes main flux saturation and possesses a saturation-independent constant-parameter interfacing circuit. Case studies in PSCAD/EMTDC demonstrate that the proposed model offers similar numerical stability and accuracy to the state-of-the-art models, while considerably increasing simulation speed for practical multimachine systems.