

DEPLOYMENT OF SYSTEM PARAMETERS IN THE CONTROL OF GRID-SIDE CONVERTER FOR FAST DYNAMIC RESPONSE

C. A. Nwosu¹, and ²U. C. Uchenna

¹Department of Electrical Engineering, University of Nigeria, Nsukka Nigeria

²Department of Electrical/Electronic Engineering, Ambrose Alli University, Ekpoma, Nigeria

cajethan.nwosu@unn.edu.ng, uchennafamily@ieee.org

ABSTRACT

Direct deployment of system components e.g. resistors, capacitors and inductors, in the determination of PI controller gains and integration times through internal model control (IMC) method has been applied to the control of grid-side converter. The effects of adding delay time of conversions, data processing, and dead-time in the forward path of current controller, and damping in the feedback path of the minor loop of the voltage controller have been investigated. The addition of delay time improves the transient response of the current controller to a step change in current demand; it also increases the open loop phase margin of the voltage controller to improve its stability. The dynamic response of the voltage controller to a step change in voltage demand is well enhanced with the addition of damping in the feedback path of the minor loop and further increases the stability of the controller by actively damping the 35% overshoot to a mere 2% and also phase margin from 49.5° to 77.1°.

KEYWORDS: Time delay, active conductance, overshoot, dynamic response.