



Three Control Strategies to Improve the Microgrid Transient Dynamic Response During Isolated Mode: A Comparative Study

Rashad M. Kamel, Aymen Chaouachi, Member, IEEE, and Ken Nagasaka, Member, IEEE

Abstract:

The necessity to solve global warming problems by reducing CO₂ emission in the electricity generation field had led to increasing interest in microgrids (MGs), particularly those containing the renewable sources such as solar and wind generation. Wind speed fluctuations cause high variations in the output power of a wind turbine which cause fluctuations in frequency and voltage of the MG during islanding mode and originate stability problems. In this paper, three techniques are proposed for solving and reducing the consequences of this problem. In the first technique, we develop a new fuzzy logic pitch angle controller. In the second technique, we design an energy-storage ultracapacitor which directly smoothes the output power of the wind turbine and enhances the performance of the MG during the islanding mode. In the third technique, storage batteries are used to support the MG in the islanding mode.

Keywords:

Index Terms—Dynamic response, fuzzy pitch controller, islanding, microgrid (MG), storage batteries, ultracapacitor, wind power smoothing.

Published In:

IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, APRIL 2013 , VOL. 60, NO. 4 ,