



Maintaining stability of standalone Micro-Grid by employing electrical and mechanical fault ride through techniques upon fixed speed wind generation systems

Rashad M. Kamel

Abstract:

This study presents two different Fault Ride Through (FRT) techniques to keep and restore stability of Fixed Speed Wind Generation system (FSWGs) installed in standalone Micro-Grid (MG). The first technique is an electrical FRT and is implemented by inserting a series resistance with the terminals of FSWGs during fault to maintain reasonable value of terminal voltage and consequently help stability restoration. The second controller is a mechanical FRT controller and is performed by change the gear ratio of wind generation systems to spill part of extracted mechanical power and consequently improving stability issue. Obtained results proved that each controller able to maintain the stability of FSWGs under the most severe disturbance conditions (400 ms three phase fault at FSWGs terminals). The first controller is faster than the second controller in restoring FSWGs stability. Superior results and performances are obtained when the two FRT techniques are employed simultaneously. Without employing any one of the two FRT techniques, FSWGs is not able to maintain or restore its stability after fault clearing. Consequently, MG will lose one of its micro-sources and cannot keep its stability during the standalone mode, unless load shedding strategy is activated. The two proposed controllers are simple, effective, and economical attractive.

Keywords:

Micro-Grid Standalone mode Fixed speed wind generation system Fault ride through Series dynamic braking resistance Variable ratio gearbox

Published In:

Energy Conversion and Management , Vol. 74 , pp. 149- 161