CHAPTER 15

ELECTRICAL ENGINEERING

Doctoral Theses

01. PANT (Peeyush)
Investigations on Performance Improvement of Three-Phase Induction Generator in Off-Grid and Grid-Coupled Operations.
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Abstract
(Not Verified)

In this thesis, investigations are made to improve the performance of three-phase IG in both offgridand grid-coupling modes of operation. Investigations on off-grid operation of IG are realisedon the developed decoupled mathematical model of the considered picohydro fed IG systemwhich also includes voltage source converter (VSC), near constant power turbine and electricalloads. Investigations focussing on voltage and frequency regulation, voltage sag recovery amidconstant power/ dynamic loads, issues of de-magnetization/ collapse of IG, embedding faultimmunity and protection are also attended. Theinvestigations address the issues such as fastvoltage recovery during transients, low-voltage ride through control during turbine/ loaddisturbances and adaptive magnetization of IG. The effectiveness of the proposed controlalgorithms is experimentally validated on the same scale laboratory prototype of the system atthe voltage of distribution level. The simulation and experimental results show close conformitypresenting the effectiveness of the proposed investigations.The next phase of investigations deals with grid coupling of smaller capacity IG either solely oras a group of small generation units forming the nanogrid and transacting power to/ from thenanogrid to the utility-grid. Investigations are carried out to enable BTB-VSC configuration toparticipate in bidirectional power transfer and also addressing issues like critical load support,grid-storage, and synchronization/re-synchronization of weak source on the utility grid.The obtained simulated results are experimentally validated on the prototype hardware setupdeveloped in the laboratory at the voltage of distribution level. The simulation and experimentalresults show close proximity and validating the objective of the investigations. In nutshell it isobserved that the proposed investigations establishes IG as a reliable source to generateelectricity even under load and/or source side disturbances in plug and play manner andestablishing the relevancy of the proposed research work.

Contents

generator FED nanogrid coupling grid as storage 11. Main conclusion and suggestions for further scope of work.References.Appendices.List of publications.