(1)

Improvement of Voltage Sag and Dynamic Stability For Different Load arrangements by Using Multi-Pulse STATCOM

Ali M. Yousef ,Ahmed A. Hafez

Abstract:

A power system is frequently exposed to overloading. This may introduces a number of unavoidable consequences as voltage sag, voltage dip and or power instability. This article advises remedy for such problems in a power system which is loaded by heavy static and dynamic loading levels. A multi-pulse D-STATCOM is to be incorporated in the power system under concern. The STATCOM generally enjoys the merits of fast response and reduced volumetric dimension. Moreover, it was investigated for boosting power system stability under different disturbance scenarios. However, a less is reported regarding stability under heavy loading condition. This article investigates design and analysis of application of multi-pulse D-STATCOM for improving voltage sag and power system stability under different loading types/levels. A simple and robust controller is advised for fulfilling the operation requirements. PSCAD software is used as platform for investigating the dynamic behavior of the system under concern. Comprehensive analysis and results are provided to validate the applicability and functionality of the D-STATCOM . The simulation results prove the capability of the D-STATCOM in mitigating voltage sag and enhancing power system stability while improving power quality of the distribution system.

Keywords:

Voltage sag; power stability; D-STATCOM; PSCAD; Dynamic performance; Static/Dynamic Load levels.

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(2)

Ant lion optimizer versus particle swarm and artificial immune system for economical and eco‐friendly power system operation

Ahmed Y. Hatata Ahmed A. Hafez

Abstract:

Economic load dispatch (ELD) became recently a mandatory tool for reliable and economic power system operation. ELD improves the security of the power supply while minimizing the generation costs. Daily load curve imposes conflicting requirements on ELD scheme, such as fulfilling demand during peak periods while limiting the cost. Demand response (DR) is an intelligent approach that ensures load demand fulfillment without introducing additional costs. DR allows shifting the electricity consumption to the non‐peak periods. Therefore, DR could be considered as a virtual power plant. ELD is usually solved as nonlinear constraint optimization problem. Three simple, fertile, and robust meta‐heuristic optimizations are competing in this article for solving ELD incorporating DR as virtual power plant. These are ant lion optimizer (ALO), particle swarm optimization (PSO), and artificial immune system (AIS). The objectives are minimizing the overall cost, system losses, and emission levels. Variety of distinctive study systems are considered to test the functionality and feasibility of the proposed algorithms; they are 6‐bus, 30‐bus, and 118‐bus IEEE systems. MATLAB environment is used for coding ALO, PSO, AIS, and the systems under concern. The comprehensive results show that incorporating DR in ELD reduces the costs/losses/emissions without affecting the power system security and reliability. The comparative results verify the robustness and reliability of ALO in minimizing the overall operating cost and emission levels of the power systems under concern while confining with the constraints. Moreover, they show that ALO has the highest accuracy and convergence efficiency while enjoying the reduced computation storage and execution time.

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(3)

STATCOM versus SSSC for power system stabilization

Ahmed A. A. Hafez

Abstract:

lexible alternating current transmission systems (FACTS) are gaining more attention in power utilities because of their advantages of controllability, reliability, and operation over a wide range. Static synchronous compensator (STATCOM) and static series synchronous compensator (SSSC) are prominent FACTS topologies; they have the ability to instantaneously regulate active/reactive powers and stabilize the power system following severe disturbances. In this paper, STATCOM and SSSC are compared with regard to their damping action on power system oscillations. The comparison is extended to the controller design strategies. Two distinct meta□heuristic optimization approaches, namely chaos (CO) and simulated annealing (SA), are recommended for the optimal design of the SSSC and STATCOM damping controller. To assess the promising FACTS topology, a single□machine infinite bus system is subjected to several disturbances while operating at different loading levels. MATLAB/Simulink is used as a platform to investigate the dynamic performance of the system under consideration with STATCOM and SSSC. Simulation results reveal the superiority of SSSC in damping power system oscillations in terms of response speed and stability margin. Moreover, the CO optimization scheme seems to outperform the SA algorithm in terms of computation requirements and global optimal convergence.

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(4)

-Machine Topology for Integral Starter-Generator in More Electric Aircraft

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Abstract:

This paper highlights the basic concepts and advantages of More/All Electric Aircraft (MEA/AEA) in the area of aircraft industry. MEA is anticipated to optimize the aircraft performance, reduce the total cost and increase safety, reliability and robustness. The Combined Starter/Generator (CS/G) system is advised as a key technology to enable MEA/AEA. A detailed analysis for the performance requirements of CS/G system is carried out. A comparative study for different machine candidates for CS/G is proposed, while focusing on Fault-tolerance, reliability and robustness.

Keywords:

more-electric aircraft; combined starter/generator; fault-tolerant; permanent magnet; switched reluctance; induction generator, homopolar.

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(5)

Optimal sizing of hybrid renewable energy system via artificial immune system under frequency stability constraints

Hafez, Ahmed A.; Hatata, A.Y.; Aldl, M.M.

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(6)

Ant lion optimizer versus particle swarm and artificial immune system for economical and eco-friendly power system operation

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