On the Existence of the Power Flow Solution in DC Grids With CPLs Through a Graph-Based Method

Publisher: IEEE

Cite This

PDF

Oscar Danilo Montoya All Authors

Abstract:
This brief explores the formulation of the power flow problem in DC grids with a classical incidence matrix through a graph-based formulation. This corresponds to a compact representation of the conventional backward/forward sweep methods, which is applicable to radial and mesh networks with a unique voltage controlled source. To guarantee the existence and uniqueness of the power flow solution in the DC network under well-defined operative conditions, the Banach fixed-point theorem is employed. Simulation results confirm that the solution of the proposed method is numerically comparable with classical approaches, such as Gauss-Seidel, Newton-Raphson, successive approximations and Taylor-based methods. All the simulations are conducted in MATLAB software.

Published in: IEEE Transactions on Circuits and Systems II: Express Briefs (Volume: 67, Issue: 8, Aug. 2020)

Page(s): 1434 - 1438

INSPEC Accession Number: 19950707

Date of Publication: 27 August 2019

DOI: 10.1109/TCSII.2019.2937564

ISSN Information:

Publisher: IEEE

Funding Agency:

I. Introduction

DC networks are electrical systems that work in the direct current paradigm, which are impulsed by the advances in power electronics, renewable generation and energy storage systems [1], with high efficiency in terms of power transference, power loss and voltage profile [2], [3]. These grids can be operated from high-voltage to low-voltage