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Power Flow in Bipolar DC Distribution Networks Considering Current Limits
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Abstract
Power electronics converters are equipped with current controls that protect the converter from over-currents. This protection introduces non-differentiable equations into the power flow problem. The conventional Newton's method is not suitable in that conditions. This letter proposes a fixed-point iteration to overcome this difficulty. The technique is derivative-free, and hence, it can naturally include the saturation given by the converters' current protection. Exact conditions for convergence and uniqueness of the solution are demonstrated using Banach's fixed point theorem. Numerical experiments in Matlab complement the analysis.

Index Keywords
Convergence of numerical methods, Electric current control, Electric inverters, Electric load flow, Fixed point arithmetic, Matrix converters, Power control, Power electronics, Renewable energy resources; Condition, Convergence, Current limits, DC distribution network, DC grid, Newton's methods, Power flows, Power-electronics, Renewable energy source; Newton-Raphson method

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