

## **Title: Semidefinite Optimization Approaches for Reactive Optimal Power Flow Problems**

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**Abstract:** The Reactive Optimal Power Flow (ROPF) problem consists in computing an optimal power generation dispatch for an alternating current transmission network that respects power flow equations and operational constraints. Some means of voltage control are modelled in ROPF such as the possible activation of shunts, and these controls are modelled using discrete variables. The ROPF problem is thus a nonconvex mixed integer optimization problem. We present recent research work on ROPF, in collaboration with Hydro-Quebec and RTE, that considers semidefinite optimization approaches for solving ROPF and their integration into a branch-and-bound algorithm. We present results on benchmark instances and we show that this method can frequently attain global optimality. On instances not solved to optimality, we are able to find better solutions than the known rounding algorithms in the literature. We also demonstrate that applying an appropriate clique merging algorithm can significantly speed up the resolution of semidefinite relaxations of large ROPF instances.

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