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Joint beamforming and network topology optimization of green cloud radio access networks

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Cloud radio access networks (C-RAN) are a promising technology to enable the ambitious vision of the fifth-generation (5G) communication networks. In spite of the potential benefits of C-RAN, the operational costs are still a challenging issue, mainly due to the centralized processing scheme and the large number of operating remote radio head (RRH) connecting to the cloud. In this work we consider a setup in which a C-RAN is powered partially with a set of renewable energy sources (RESs), our aim is to minimize the processing/backhauling costs at the cloud center as well as the transmission power at the RRHs, while satisfying some user quality of service (QoS). This problem is first formulated as a mixed integer non linear program (MINLP) with a large number of optimization variables. The underlying NLP is non-convex, though we address this issue through reformulating the problem using the mean squared error (MSE)-rate relation. To account to the large-scale of the problem, we introduce slack variables to decompose the reformulated (MINLP) and enable the application of a distributed optimization framework by using the alternating direction method of multipliers (ADMM) algorithm.

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