Guaranteeing a Physically Realizable Battery Dispatch Without Charge-Discharge Complementarity Constraints

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The non-convex complementarity constraints present a fundamental computational challenge in energy constrained optimization problems. In this work, we present a new, linear, and robust battery optimization formulation that sidesteps the need for battery complementarity constraints and integers and prove analytically that the formulation guarantees that all energy constraints are satisfied which ensures that the optimized battery dispatch is physically realizable. In addition, we bound the worst-case model mismatch and discuss conservativeness. Simulation results further illustrate the effectiveness of this approach.