Contribution ID: **59** Type: **Apresentação regular**

An effective hybrid decomposition approach to solve the network-constrained stochastic unit commitment problem in large-scale power systems

We propose an effective hybrid decomposition method to solve network-constrained stochastic unit commitment (SNCUC) problems. We address large-scale SNUC cases involving renewable generation units, hundreds of thermal generation units, thousands of transmission lines and nodes, and uncertain renewable generation and demand. The problem is formulated as a two-stage stochastic program with continuous and binary variables in the first stage and only continuous variables in the second stage. We developed a hybrid Benders decomposition that recasts the original SNCUC problem into a novel master problem and subproblems. The proposed master problem encompasses unit commitment decisions and dispatch decisions across all scenarios, resulting in an extended master problem with first- and second-stage variables and constraints. At each iteration, a new column-and-constraint generation step adds selected transmission variables and constraints per scenario to the master problem. Detailed computational results compare the proposed hybrid decomposition performance with the extensive formulation via branch-and-cut and multiple Benders decomposition implementations. The results show that the hybrid decomposition achieves bounds of superior quality and finds solutions for instances where other Benders decompositions fail.

Authors: PINTO DE LIMA, Ricardo (King Abdullah University of Science and Technology); Prof. CONEJO, Antonio (The Ohio State University); Dr CONSTANTE-FLORES, Gonzalo (Purdue University); Prof. KNIO, Omar (King Abdullah University of Science and Technology)

Presenter: PINTO DE LIMA, Ricardo (King Abdullah University of Science and Technology)

Session Classification: Session 1.2 - OR in Energy 1