Alireza Arastou, Pouria Ahmadi, and Mehdi Karrari, 2021, Modeling and parameter estimation of a steam power plant including condenser back-pressure uncertainty using operational data, *IEEE Systems Journal,* Nov 2021.

Abstract This article copes with a challenging issue about modeling and parameter estimation of the steam power plants. To this end, a thorough model for steam units is obtained, where the turbine-boiler control strategy is also considered in the modeling procedure. The number of integrated model inputs is optimal, making it appropriate for automatic generation control purposes. This model can work accurately in nominal conditions without abnormal events. Thus, the gathered data from an identification test in a 325 MW steam unit in nominal situations is employed to estimate the proposed model's unkn0own parameters using a genetic algorithm. Additionally, the condenser back-pressure (CBP) effect in the steam unit generation is elaborated. Regarding the CBP dependency on environmental conditions, like the wind speed, this effect is treated as an uncertainty in the article. Consequently, a novel turbine model considering the CBP effect is introduced. Determining the CBP uncertainty bounds is another problem addressed in the article using an efficacious information gap decision theory method on the recorded data in abnormal conditions. Finally, the derived model and parameters in both nominal and abnormal conditions are validated using the operational data, and the results are discussed.

Keywords Boiler, condenser back-pressure, genetic algorithm, governor, information gap decision theory (IGDT), steam power plant, uncertainty.