Optimal Design of a New Configuration of the Distributed Generation Units using Grey Wolf and Dragonfly Optimizers

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Abstract

Distributed generation units are used to share the loads with the conventional power plants or may be used to supply the power to the loads individually. Wind turbine (WT), photovoltaic (PV), storage battery (SB), fuel cell (FC), gas turbine (GT), and micro-turbine (MT) are considered the most distinctive distributed generation units, which are used in this type of applications. There are much combinations or configurations of these power sources, where the WT may be combined only with the PV. This combination might be combined with the SB. Or WT, PV, and SB are connected with the FC to form another HPGS. This paper introduces a new configuration of these distributed generation units, where WT, PV, SB, and GT are combined to form a new power generation system, known as hybrid power generation system (HPGS). This configuration is classified as a stand-alone HPGS. On the other hand, if this configuration is connected to the utility, it is called as a utility connected HPGS. In this paper, for the first time, the natural gas distribution network is used to deliver the required fuel for the GT of the HPGS, where all operational conditions of this network are considered. New meta-heuristic optimization techniques are also presented for the first time for the HPGS designing. The applied techniques are; the grey wolf optimizer (GWO) and the dragonfly optimizer (DO).

MASK International Journal of Science and Technology 2017, January