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Optimal solutions for fixed head short-term hydrothermal system scheduling problem

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ABSTRACT

In this paper, optimal short-term hydrothermal operation (STHTO) problem is determined by a proposed high-performance particle swarm optimization (HPPSO). Control variables of the problem are regarded as an optimal solution including reservoir volumes of hydropower plants (HdPs) and power generation of thermal power plants (ThPs) with respect to scheduled time periods. This problem focuses on reduction of electric power generation cost (EPGC) of ThPs and exact satisfactory of all constraints of HdPs, ThPs and power system. The proposed method is compared to earlier methods and other implemented methods such as particle swarm optimization (PSO), constriction factor (CF) and inertia weight factor (IWF)-based PSO (FCIW-PSO), two time-varying acceleration coefficient (TTVACs)-based PSO (TVAC-PSO), salp swarm algorithm (SSA), and Harris hawk algorithm (HHA). By comparing EPGC from 100 trial runs, speed of search and simulation time, the suggested HPPSO method sees it is more robust than other ones. Thus, HPPSO is recommended for applying to the considered and other problems in power systems.

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Nomenclature

$Vol_{h,i}$	Volume of the *hth* HdP in the *ith* period
$Inf_{h,i}$	Inflow of the *hth* HdP in the *ith* period
$Dis_{h,i}$	Discharge of the *hth* HdP in the *ith* period
$Vol_{h,\min}, Vol_{h,\max}$	Minimum and maximum volume of the *hth* HdP
$Dis_{h,\min}, Dis_{h,\max}$	Minimum and maximum discharge of the *hth* HdP
x_h, y_h, z_h	Given coefficients in generation function of the hth HdP
$P_{h,\min}, P_{h,\max}$	Minimum and maximum power generation of the *hth* HdP
$P_{h,i}$	Generation of the *hth* HdP in the *ith* period