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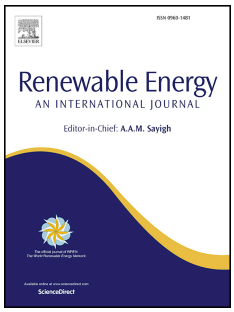

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A real time pricing strategy for remote micro-grid with economic emission dispatch and stochastic renewable energy sources

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Abstract

Micro-grid is a complete energy solution for remote areas facing energy crisis however, energy cost from fuel based sources in a micro-grid is higher than conventional sources. So price-signal based control strategy for the benefit of utility and customers by virtue of renewable integration is analysed. Renewable energy has become less costiler than fuel based sources in a micro-grid. Stochastic power generated from wind turbine (WT) and photo voltaic (PV) along with economic generation from micro-turbine (MT) and fuel cell (FC) is optimised. Anti-predatory particle swarm optimisation (APSO) for non-linear dynamic economic emission dispatch of micro-grid for 24 hours with and without renewable energy sources (RESs) is analysed. APSO method with RESs is identified to give better fuel-cost-minimum. Power-to-cost index is proposed as a simple real time pricing (RTP) strategy. The strategy is identified to have the potential to bring down power demand and peak reduction followed by additional reduction in emission and fuel cost in any micro-grid.

Keywords: Renewable energy sources, micro-grid, real time pricing, dynamic economic emission dispatch, anti-predatory particle swarm optimisation

1. Introduction

Technology is advancing at a higher rate, weather forecast is much accurate than before. Years of acquired wind and solar data has brought prediction closer to real time events. Hence the advancement in technology ensure that, installation of renewable energy sources (RESs) are a risk free investment. The rate of installation of RESs, such as wind turbine (WT) and PV has increased. In India, when comparing to official reports from [1] and [2], a 30% capacity increment of renewable energy is observed for a span of less than a year. PV and WT can be installed in areas with consistent irradiation and wind velocity profile. Remote areas without grid connectivity is benefited with RESs. However,

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