Evaluation of the Performance of a Distributed Generation By Optimization Technique Along with Reliability Analysis

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Abstract:
In recent years, fuel cell technology has markedly increased its presence in stationary power production. A plethora of pilot projects are operating worldwide, continually increasing operational hours either as standalone units or as elements of gas turbine combined cycles. A vital tool for the efficient and dynamic assessment of such systems is a software model that enables the user to explore several alternatives in a short timeframe. Conversely, the use of artificial neural networks has broadened to include other domains, including medicine, finance, and, as anticipated, engineering (fault detection in equipment). The network inputs denote parameters critical to fuel cell performance, whilst the outputs illustrate the effects of changes in one or more fuel cell design variables on its performance. Crucial criteria for the cell are the geometric configuration and the operating circumstances. This discourse examines several design factors of the neural network, including network size, training procedures, activation functions, and their influence on the effectiveness of performance modelling. The results of the analysis and the limitations of the approach are provided and scrutinised.

Keywords: Fuel cell, Micro grid, Distributed network, Optimization

Introduction

Compressor, heat exchanger, burner, and turbine components are miniature replicas of high-performance gas turbines. Microturbines exist in two distinct kinds. One is a single-shaft, high-momentum apparatus with the electrical alternators positioned on a shaft separate from the compressor and turbine. A distinct kind of micro-turbine is the split-shaft design, which links a conventional generator via a gearbox to a power turbine operating at 3600 rpm [15-17].
We develop a split shaft model including a 3600 rpm power turbine. The model comprises a split shaft power turbine, an induction generator, power electronics, a heat exchanger, and a control panel [16–17].The single shaft and split-shaft concepts are shown in Fig. 1 and Fig. 2, augmenting the resilience and reliability of contemporary power systems [6]. This research advocates for the incorporation of storage systems into multi-objective distribution network design to enhance the reliability index. MAIFI [7]. The incorporation of renewable energy sources significantly impacts the system's reliability and stability [8]. The strategic positioning of distribution generation units is essential for minimising power loss and improving overall system performance in deregulated power networks by regulating fluctuations. Identifying vulnerabilities in a deregulated energy sector

[a] Schematic diagram of a Micro Turbine