International Journal of Advance Research in Science and Engineering
Volume No. 12, Issue No. 06, June 2023
www.ijarse.com
IJARSE
ISSN 2319 - 8354

An AI Based Hybrid power System

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Abstract

Energy supply and related environmental problems, especially global warming could be successfully addressed just by switching from the conventional fossil fuel and nuclear energy to purportedly environmentally friendly and sustainable renewable sources. But this credence is proved to be a fallacy as RE sources could not meet the demand of energy that is growing globally without posing certain associated problems to human and the environment. RE supply from domestic wind, hydroelectric dam, solar energy, ground-source heat, and biomass waste was proven to be incapable of meeting energy demand.

Keywords — **Artificial intelligence, Electric multiple units, Battery energy storage, Power grid, Renewable energy sources**

I. INTRODUCTION

Today, smart grid is considered as an attractive technology for monitoring and management of grid connected renewable energy plants due to its flexibility, network architecture and communication between providers and consumers. Smart grid has been deployed with renewable energy resources to be securely connected to the grid. Indeed, this technology aims to complement the demand for power generation and distributed storage. For this reason, a system powered by a photovoltaic (PV) has been chosen as an interesting solution due to its competitive cost and technical structure. To achieve this goal, a realistic smart grid configuration design is presented and evaluated using a radial infrastructure.

The economic problem of PV integration is the high installation cost due to lower PV penetration rate of these decentralized power stations. Indeed, electricity grids are stable systems contrarily to renewable energy plants (PV and Wind) which are decentralized, unpredictable and their connection to the grid could lead to instability while coupling them.

These phenomena limit the integration of renewable energies into conventional grids and harm their sustainability. In general, they discuss smart grid concept and applications, design, sizing and optimal placement of the energy mix, small scale test- bed implementations in order to choose the best strategy to its

implementation, voltage stability, overall system integration rate, global losses and many other factors which help economical and technical decision-making.

It implicitly promotes the reliability and sustainability of the power supply and lowering the peak demand. They presented a survey of potentials and benefits when enabling technologies such as energy controllers, smart meters and communication systems with reference to real industrial studies courses.

The current and typical solution of smoothing renewable power generation fluctuations in power system. A BES based SOLAR power systems had suitable control strategy that can effectively utilize the maximum power (MPPT) output from the DC-to-DC converter.

As like split battery the output Inverter also classified in to TWO ratings that is called as load response inverter

II. LITRATURE REVIEW

Xi Fang, Satya Jayant Misra, Guoliang Xue, Dejun Yang, ―The New and Improved Power Grid: A Survey‖, IEEE Communications Surveys & Tutorials, Vol. 14, No. 4, pp. 944-980, 2012[1]. Waded Medjroubia, Ulf Philipp Müllerb, Malte Scharfb, Carsten Matkea, David Kleinhansa, ―Open Data in Power Grid Modelling: New Approaches Towards Transparent Grid Models‖, Elsevier Energy Reports, Vol.3, pp. 14-21, November 2017[2]. Hany E. Farag, E.F. El-Saadany, Ramadan El Shatshat, Aboelsood Zidan, ―A generalized power flow analysis for distributed systems with high penetration of distributed generation‖, Elseiver, Electric Power Systems Research, Volume 81, Issue 7, pp.1499-1506, July 2011[3]. Abbas Azarpour, Suardi Suhaimi, Gholamreza Zahed, Alireza Bahadori, ―A Review on the Drawbacks of Renewable Energy as a Promising Energy Source of the Future‖, IEEE power & energy magazine, Vol. 38, Issue 2, pp 317–328, February 2013[4].

III. SIGNIFICANCE OF STUDY

A hybrid energy system combines multiple types of energy generation and or storage or uses two or more kinds of fuel to power a generator. A hybrid energy system is a valuable method in the transition away from foissil fuel-based economics. Artificial intelligence (AI) is the basis for mimicking human intelligence processes through the creation and application of algorithms built into a dynamic computing environment. Stated simply, AI is trying to make computers think and act like humans.

IV. SCOPE OF STUDY

Artificial intelligence (AI) has the potential to cut energy waste, lower costs, and accelerate the use of clean renewable energy sources in power grids globally, along with improving the operation, maintenance, control, planning and plan execution of power systems.AI technologies are able to identify areas of energy leakage as well as examine the health of devices. For example, AI-powered predictive analysis collects data from wind turbine sensors, monitoring the infrastructure for wear and tear and alerting the operator when maintenance is needed.

V. OBJECTIVE

- Major contribution of our proposed work is to increase the power efficiency.
- Load requirement-based inverter power sharing.
- Renewable energy interfacing.
- Alternative option charger with EB.

VI. PROPOSED METHODOLOGY

A hybrid system consists of conventional and nonconventional energy systems for the achievement of reliable operation to keep the balance between energy supply and load demand. Various methods have been employed for planning and sizing of the hybrid energy system to get optimal location.

VII. BLOCK DIAGRAM

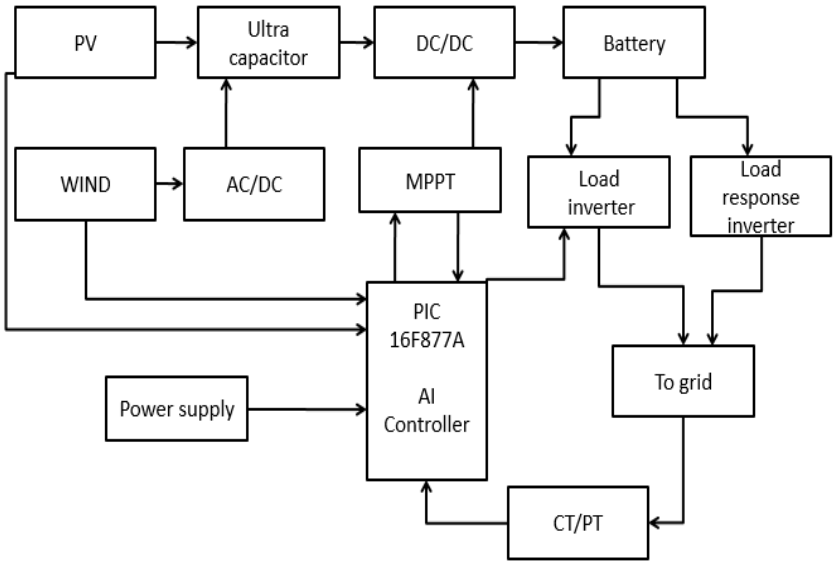

Figure 1 – Block Diagram

VIII. BLOCK DIAGRAM DESCRIPTION

- In power applications and system design, modelling and simulation are essential to optimize control and enhance system operations.
- The dynamic simulation model is described for a hybrid power system comprises PV panels, wind turbine, fuel cells, battery bank, converters and controllers.
- The main controller will have developed to ensure the continuous power supply or the load demand.
- The following subsections present the implementation of the PV/wind turbine /PEMFC/Li-Ion battery system model.

- Modelling and simulation are implemented using MATLAB / Simulink and Sim Power System software packages.
- A model of PV panel with moderate complexity which includes the series resistance, the saturation current of the diode, and the temperature independence of the photocurrent source is considered based on the Shockley diode equation.
- The cell ideal factor (F) is dependent on the cell technology. The inputs for the proposed PV model are solar irradiation, cell temperature and PV manufacturing data sheet information.

IX. WORKING PRINCIPLE

- Traditional power systems consist of a network of three components, each with a different role to play.
- DER systems, which are a variety of small-scale power production and storage technologies, are becoming more common in today's smart power grid as a way of supplementing or replacing the old electric power system.
- Connected to a local distribution system or to a host facility inside the local distribution system, distributed energy resources (DERs) generate power or regulated loads. There are various DERs, such as solar panels, CHP plants, energy storage, and power transformers, and the size of these resources is often less than that of more conventional power plants.
- The smart grid will deliver better power quality less economic efficiency, and allow users to participate more actively in their energy management. A key component of a renewable production system is storing the generated power, and it is possible to use energy storage as a backup for intermittent renewable energy sources.

X. FEATURES

- The world is consuming large amounts of energy in various forms like electric energy and mechanical eenergy.
- Since the electrical energy is an important factor for the development of the world, many body heat to electric converter and solar panel are utilized and connected to the power storage circuit for generation of electrical energy.
- Two different Artificial Intelligence (AI) models such as Artificial Neural Network (ANN), Adaptive Network based Fuzzy Inference System (ANFIS) are utilized for the total power generated from renewable energy resources researchers tried to generate electricity from renewable energy sources collected by sensors in order to overcome the shortage of electrical energy for household appliances and industrial areas.
- In this paper, we develop Internet-of-Things (IoT) based system to generate electrical energy from multiple sensors for household appliances and industrial areas.
- Validation is done through the statistical parameters such as Root Mean Square Error (RMSE) and R2 coefficient of correlation. Result outcome from the models shows that ANN performance is better than ANFIS.

IJARSE
ISSN 2319 - 8354

XI. ADVANTAGES

- Speed processing.
- They do not need any appropriate knowledge of the system model.
- They have the ability to handle situations of incomplete data and information corrupt data.
- Fuel saving (up to 50%).
- Lower atmospheric contamination. Savings in maintenance. Silent system.

XII. CONCLUSION

We presented a hybrid AI method for the optimal management of RECs. We proposed a method that provides an end-to-end approach: the predictions of a neural network concerning the aggregated load, the PV generation, and common services of a REC are passed as input to an optimization MPC algorithm to maximize the income. The method alidated on publicly-available data. The results of the proposed method are compared to those of several competitors.

The proposed method generates the largest REC income. However, the present study has some limitations. The method is validated on data of a single REC, and thus, future studies must be directed towards further validation of the presented method on different public and private datasets. Also, it would be interesting to take into account more inputs such as the weather forecast for the prediction of future energy features, in order to achieve even better performance.

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