Hybrid solar wind power generation system

Hybrid solar wind power generation system

Thank you for visiting nature . You are using a browser version with limited support for CSS. To obtain the best experience, we recommend you use a more up to date browser (or turn off compatibility mode in Internet Explorer). In the meantime, to ensure continued support, we are displaying the site without styles and JavaScript.

A hybrid renewable energy power system comprising wind and solar energy can compensate for the energy deficit of many nations and it remains a pragmatic step to exploit these renewable sources and ensure their integration for a grid-connected and or stand-alone application4. Hybridization of renewable sources of power with the actual battery capacity is vital in addressing the problem of intermittency of power output and over-dependence on the nation"s power grid5.

Wind and solar power systems are accepted universal renewable options for producing electricity and tackling climate change. These sources are readily available at no cost and have low environmental threats. In power generation for rustic and industrial applications, their integration remains advantageous both technically and economically6,7.

In practice, hybrid system under-sizing usually affects the smooth operation of all the industrial-electric appliances, and over-sizing the hybrid system may become an economic liability. Therefore, technical and economic simulation of the hybrid renewable power system can assist in cutting costs and guarantee power solidity8.

The transition from these fossil fuels to clean energy depends on the renewable energy generation and technologies which are active drivers of the transition6. Over the past two decades, green energies were coated to have a high cost of production making it impossible to be connected to a network or have a single appliance, and their use for commercial purposes was also limited12. Recently, the prices of most of the equipment for renewables have been reduced in many nations given the opportunities to afford new ones for renewable energy production13.

Hybridization or integration of renewable energy sources and power storage is a bold step toward achieving a reliable, affordable, and well-planned renewable energy power system14,15. Furthermore, accessing these technologies at affordable prices, and the confidence of having the needed skills to carry out the installations has been boosted recently, linking solar photovoltaic and wind power increase rapidly worldwide10.

Samy16 conducted a techno-economic assessment of hybrid renewable energy systems in the Monshaet Taher area of Egypt. He highlighted the potential of applying the renewable energy-hydrogen concept for the electrification of villages by studying five different hybrid power system configurations using the HOMERTM

software.

Mulumba and Farzaneh14 carried out a dynamic techno-economic simulation and analysis of a hybrid renewable energy power system in the remote areas of Kenya using a multiple objective optimization modeling technique and the epsilon (?) approach. They reported that the optimal size of the hybrid renewable energy system was feasible at 330 W for 26 photovoltaic panels and 3 (1kw) wind turbines sufficient for 37.94 MWh annual loads.

Eze et al.17 assessed the technical and economic feasibility of a hybrid renewable energy system in the Institutional Buildings of Kenya. They calculated the 25-year current cost to determine the lowest energy cost for the Diesel/Photovoltaic/Grid sources to realize the optimized design system.

Sharma et al.18 compare simulation software for hybrid energy systems with evaluation approaches. The creation of specialist tools like Homer Pro, Energy Pro, iHOGA, and TRNSYS to study these systems stands out in the previous decade. The study thoroughly analyzes these various instruments in terms of economic and environmental assessment and found that only one considers techno-economic effects.

Ayua et al.20 reported that The Gambia has a surplus of agricultural products such as fruit juice, confectionery nuts, chicken feeds, and fish which are inadequately utilized because of the unavailability of the desired processing industries. Investment in the industries that process these products will reduce the nation"s overdependence on imports and increase its exports.