

Design Of Smart Grid For Solar/Wind Energy Conversion System

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Abstract: Performance advancement, framework unwavering quality and operational effectiveness are key attributes of shrewd matrix frameworks. In this paper a novel model of brilliant matrix associated PV/WT half and half framework is created. It involves photovoltaic cluster, wind turbine, nonconcurrent (enlistment) generator, controller and converters. The model is executed utilizing MATLAB/SIMULINK programming bundle. Annoy and watch (P&O) calculation is utilized for amplifying the produced control in light of most maximum power point tracker (MPPT) usage. The dynamic conduct of the proposed display is inspected under various working conditions. Sun powered irradiance, temperature and wind speed information is assembled from a framework associated, 28.8kW sun based power framework situated in focal Manchester. Ongoing estimated parameters are utilized as contributions for the created framework. The proposed model and its control methodology offer an appropriate device for brilliant matrix execution advancement.

I. INTRODUCTION

The impediments of worldwide assets of fossil and atomic fuel, has required a critical look for elective wellsprings of vitality. In this way, another route must be found to adjust the free market activity without turning to coal and gas fuelled generators. Shrewd matrix is a framework that would empower the combination of sustainable power sources and move from dependence on petroleum derivatives, while keeping up the harmony amongst free market activity. The key attributes of savvy framework incorporate [1]:

Grid enhancement: framework unwavering quality and operational proficiency.

Distributed age: customary expansive power stations, as well as individual PV boards, smaller scale wind, and so on

Advanced metering foundation (AMI): brilliant meters.

Grid-scale stockpiling.

Demand reaction.

Plug-in half breed electric vehicles (PHEVs) and vehicle to lattice (V2G). This paper centers for the most part around the keen framework combination of PV/WT half breed framework (network advancement and dissemination generation).In this examination, a point by point dynamic model, control and reproduction of a shrewd matrix associated PV/WT cross breed control age framework is proposed. Displaying and reenactment are executed utilizing MATLAB/SIMULINK and Sims Power Systems programming bundles to confirm the viability of the proposed

framework. In this paper board commitment, the displaying of twist turbines in control frameworks flow reproductions is talked about. In the first place the three most essential real breeze turbine ideas are portrayed. At that point, different classes of wind turbine models are presented and it will be talked about which demonstrate sort can be coordinated in control framework progression reenactment programming. To close, it will be contended that it is conceivable to display different sorts of variable speed twist turbines with just a single model in control framework progression reproductions. In this examination, wind turbine generators, photovoltaic boards, and capacity batteries are utilized to fabricate a matrix connected age framework which is ideal as far as different criteria including cost, dependability, and outflows. Multidisciplinary configuration encourages the leader to make more reasonable assessments. An arrangement of exchange off arrangements can be acquired utilizing the multidisciplinary approach, which offers numerous plan contrasting options to the leader. A modified molecule swarm advancement calculation is created to determine these non-commanded arrangements. A network connected crossover control framework is composed in light of the proposed approach. In the present examination in this manner, a breeze control age framework (WPGS), PV age framework (PVGs), and BESS half breed control age framework (Fig. 1) were considered. At that point, a fluffy rationale and wavelet change based smoothing control system was proposed for prompt WP and

PV control ages smoothing by on-line direction of battery yield control. This paper is composed as takes after. Segment II displays the demonstrating of each power source. Reenactment comes about are talked about in Section III. Area IV is the conclusions.

II. SYSTEM DESCRIPTION AND MODELING

Keen matrix is a framework comprises of three layers: the physical power layer, the control layer and the application layer. Furthermore, as indicated by, Katherine Hamilton [1], brilliant network must be dynamic and have steady two-path correspondence, as appeared in Fig.1. Along these lines, for instance, with PV boards on the rooftops, insightful building framework will creates, store and utilize their own vitality. Henceforth, as dynamic structures they turn out to be a piece of the keen framework. This could spare vitality and increment unwavering quality and straightforwardness.

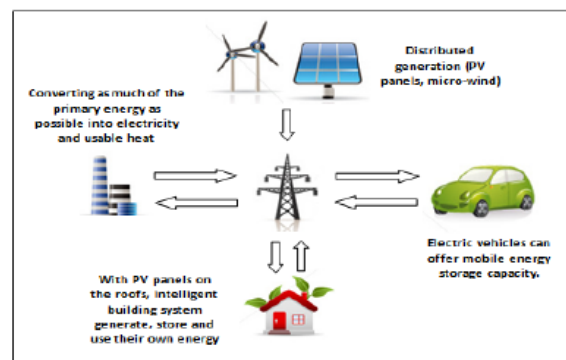


Fig. 1. General layout of the smart grid

In this segment, the dynamic recreation demonstrate is depicted for photovoltaic/wind turbine mixture age framework. The created framework comprises of a photovoltaic cluster, dc/dc

converter with a disengaged transformer, intended for accomplishing the MPP with a present reference control (I_{ref}) created by P&O calculation, wind turbine, non concurrent acceptance generator, and air conditioning/dc thyristor controlled double bridge rectifier.

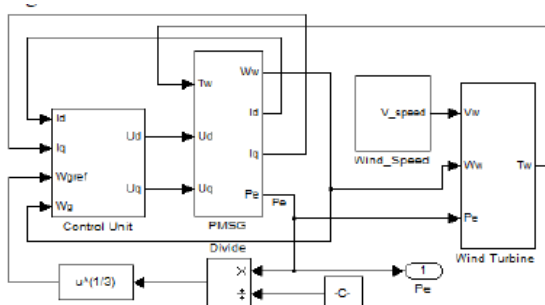


Fig. 2 Model of WPGS using MATLAB/SIMULINK

A. Modelling and Design of a Photovoltaic Mod

The general numerical model for the sun oriented cell has been contemplated in the course of recent decades [12]. The circuit of the sun powered cell display, which comprises of a photocurrent, diode, parallel resistor (spillage current) and an arrangement resistor; is appeared in Fig. 3. As per both the PV cell circuit appeared in Fig. 3 and Kirchhoff's circuit laws, the photovoltaic current can be introduced as takes after [13]:

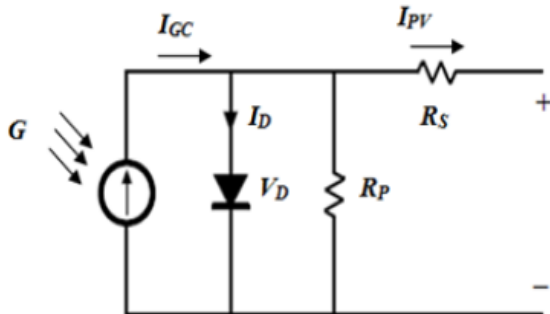


Fig. 3. Single diode PV cell equivalent circuit

In this investigation, a general PV display is assembled and actualized utilizing

MATLAB/SIMULINK to check the nonlinear yield qualities for the PV module. The proposed show is executed, as appeared in Fig. 4. In this model, while the inputs are the sunlight based illumination and cell temperature, the yields are the photovoltaic voltage and current. The PV models parameters are typically extricated from the fabricates information sheet.

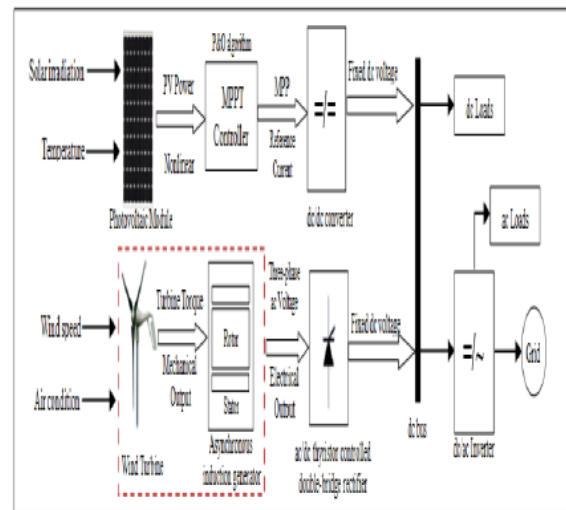


Fig. 4. Block diagram of the proposed system

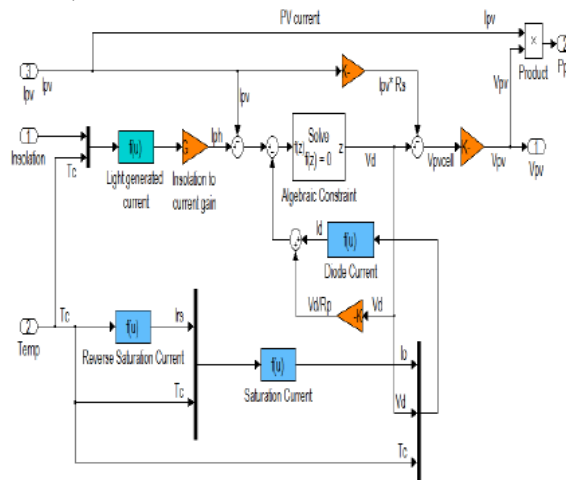


Fig.5 Subsystem implementation of the PV model

B. Modeling and Design of a WT and Induction Generator

A few examinations have been accounted for in regards to WT and wind generators [14]. In this examination, the proposed WT show depends on the breeze speed versus

WT yield control qualities. The yield energy of the breeze turbine is given by [15]:

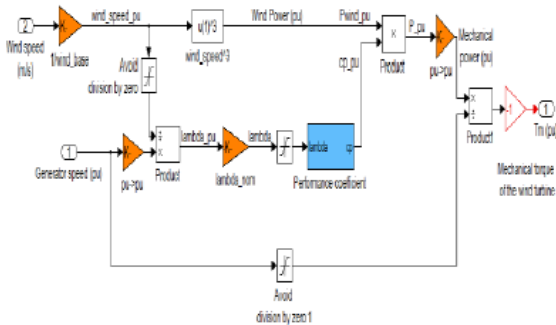


Fig.6. Subsystem implementation of the WT model

The wind turbine induction generator (WTIG) display is designed utilizing the inherent Sims Power System library. The rotor shaft is driven by the WT which delivers the mechanical torque as indicated by the generator and wind speed values. The electrical power yield of the generator (stator winding) is associated with the brilliant lattice. That may be conceivable later on, in light of the fact that PV is anticipated to proceed with its current cost decreases for the following decades and have the capacity to contend with non-renewable energy source. Some prominent research organizations suggest that India ought to receive an arrangement of creating sun oriented power as a predominant segment of the sustainable power source blend, since being a thickly populated in the radiant tropical belt, the subcontinent has the perfect blend of both high sun based insolation and subsequently a major potential shopper base thickness. In one of the investigated situations, India can make sustainable assets, for example, sunlight based the foundation of its economy by 2050, getting control over its long haul carbon outflows without bargaining its financial development potential. The

independent sunlight based photovoltaic vitality framework can't give

dependable power amid non-radiant days. The independent breeze framework can't meet the steady load requests due to critical variances in the size of wind speeds consistently. Accordingly, vitality stockpiling frameworks will be required for every one of these frameworks with a specific end goal to fulfill the control requests. Generally capacity System is costly and the measure must be lessened to a base feasible for the sustainable power source framework to be savvy. Mixture control frameworks can likewise be utilized to decrease vitality stockpiling necessities. By incorporating and enhancing the sun powered photovoltaic and wind frameworks, the dependability of the frameworks can be enhanced and the unit cost of energy can be limited. In India the Solar-Wind Hybrid power plants are in fact endorsed by the Ministry of New and Renewable Vitality (MNRE). These Solar/Wind Hybrid power plants produce power and can be a substitute hotspot for the exorbitant diesel generators which are keep running amid the power cuts and furthermore in areas where persistent EB supply isn't accessible. The Returns on Investment (ROI) of these tasks are less and furthermore with the Central Financial Assistance given by the legislatures it is considerably speedier. With these frameworks we can produce, store and utilize the power as and whenever required and furthermore for provincial jolt.

III. SIMULATION RESULTS AND DISCUSSION

The square chart of the incorporated photovoltaic/wind turbine framework, and the power controllers are appeared in Fig. 2. The noteworthy contributions for the proposed PV show were sun powered light, PV board temperature and PV fabricating information sheet information's. The I-V and P-V yield qualities for the PV display are appeared in Fig. 6. The yield control and current of PV module rely upon the sunlight based irradiance and temperature, and cell's terminal working voltage too. It was found from Fig. 6(a) and 6(b) that with expanded sun based irradiance there is an expansion in both the most extreme power yield and the short out current. Then again, we see from Fig. 6(c) and 6(d) that with an expansion in the cell temperature, the greatest power yield diminishes while the short out current

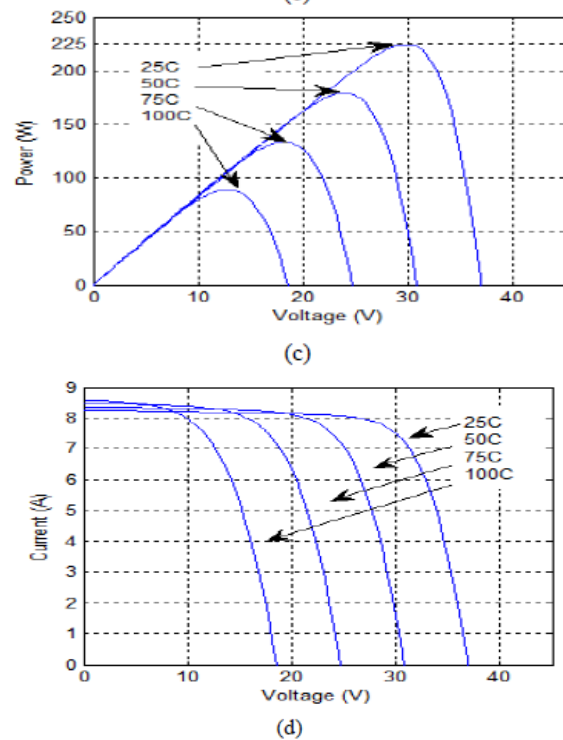
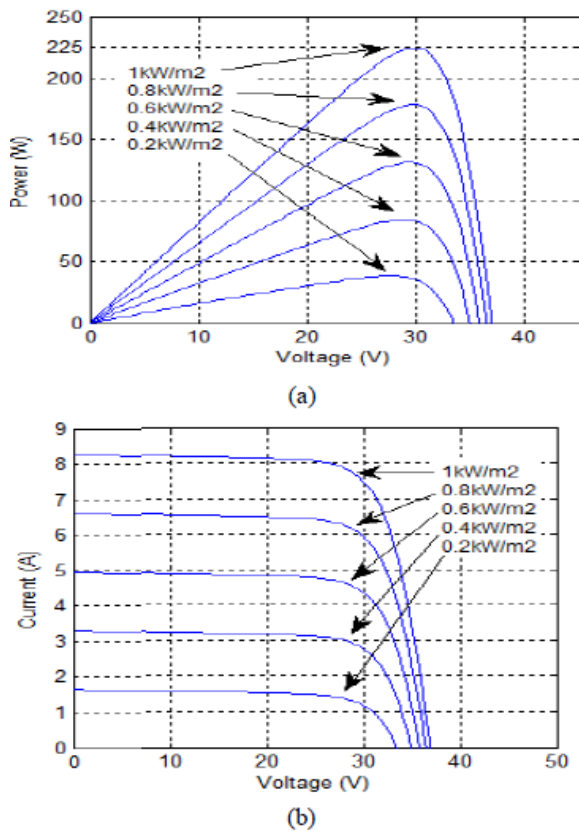


Fig. 6. I-V and P-V output characteristics (a - b) with different G (c - d) with Different T_c

IV. CONCLUSIONS

In this paper, a novel PV/WT half and half power framework is planned and demonstrated for brilliant network applications. The created calculation includes framework parts and a suitable power stream controller. The model has been actualized utilizing the MATLAB/SIMULINK programming bundle, and composed with a discourse confine like those utilized the SIMULINK square libraries. The accessible power from the PV framework is very subject to sunlight based radiation. To defeat this insufficiency of the PV framework, the PV module was incorporated with the breeze turbine framework. The dynamic conduct of the proposed demonstrate is inspected under various working conditions. Sun based irradiance, temperature and wind speed information is accumulated from a 28.8kW

lattice associated sunlight based power framework situated in focal Manchester. The created framework and its control technique show fantastic execution for the reproduction of a total day. The proposed show offers an appropriate instrument for brilliant framework execution streamlining.

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