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Control of Grid Interfaced wind and solar Energy Sources Used to Ameliorate power quality

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ABSTRACT
To surmount the constraints in power distribution engendering system, which are been compensating by utilizing contrivances like, series/shunt compensating. This puissance quality quandary should be addressed so incidentally provide congruous quality power at the same time integrating hybrid renewable energy sources. In this project, the design of amalgamated operation of solar and wind array proposed. The proposed system is composed of series shunt controller, wind and PV array connected to DC link by boost converter, which is able to compensate the voltage sag, swell, voltage interruption harmonics and reactive in is landing and interconnecting modes. The renewable energy source hand me down here is photovoltaic (PV) and Wind system. This project presents renewable energy source interfacing mutually the grid that compensates power quality quandaries by a grid interfacing UPQC control. The grid interfacing UPQC gate pulse is engendered by a hysteresis current control method and it has the potency to (1) minimize the harmonic current (2) ameliorate power factor (3) compensate reactive power (4) supply active power to the load in DG. This work is modelled and simulated in MATLAB/Simulink
Index Terms- Renewable Energy, Distribution Generation, Power Quality, photovoltaic, Solar, shunt active filters, series active filter

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I. INTRODUCTION

The potency quality issues can be viewed with veneration to the Solar wind generation, Transmission and distribution network, such as voltage sag, swells, flickers, harmonics etc. However, the wind & Pv engenderer introduces perturbances into the distribution network. The simple method used to run the wind & pv engendering system is to utilize the induction engenderer connected directly to the grid system. The induction engenderer has intrinsically advantages of cost is less and more efficacy and robustness. However, induction engenderers require reactive power for magnetization. Shunt and series active filters predicated on current controlled voltage source inverter are acclimated to interface the intermittent hybrid renewable energy source in distributed system. (1) minimize harmonics current (2)improve power factor (3)compensate reactive power (4) supply active power to the load in DG.

II. SYSTEM CONFIGURATION

The grid interfaced to wind energy source and solar PV array. for sustainable energy dependency, this system is connected to a three-phase grid. The DC motor is Emulated as the Wind source. The solar PV array with Boost Converter, is Connected at the DC link voltage is maintained at constant by GVSC.

The three phase Nonlinear Load is realized amalgamation of uncontrolled rectifier in parallel to the RL Load. Ripple filter out the Switching harmonics, whereas, the repudiation of current harmonics is obtained by the interfacing inductors linked in series with the utility grid. The control algorithms implemented for switching the VSCs provide enhanced perturbance repudiation in integration to which amended system amended system performance is visually examined under solar insolation change, wind speed variations and load disruption.

III. CONTROL METHODOLOGY

The control algorithm for proposed Wind – Solar integrated AC micro grid, are aimed for abnegating the internal and external perturbances and their sceptical effects on the system. Maximum power point tracking (MPPT) is a technique used photovoltaic (PV) solar systems to maximize power extraction. They are a coalescence of STATCOM and SSSC such that both are amalgamated utilizing a prevalent dc source and provide both active and reactive power line emolument. It controls all the parameters of the AC power transmission system. In shunt emolument, are connected in parallel with the puissance system transmission line. It works as a controllable current source. A reactive current is injected int with the following equation.

Iph = (Iscr +ki* (TK- Tref))*(λ/1000) (1)

Where Iph is the light-engendered current, Ki is the short-circuit current, TK and Tref are temperature coefficient, respectively, λ is the irradiation on the contrivance surface (W/m2). 2)Module Saturation Current I0 the module saturation current I0 varies with the cell temperature and is given by

Irs=Irr*(T/Tr)3*exp(q*Eg/(k*A)*((1/Tr)(1/T) (2)

Where Eg is the band gap energy of the Semiconductor 2) Module Output Current IPV the fundamental equation for current output of PV module can be modified as

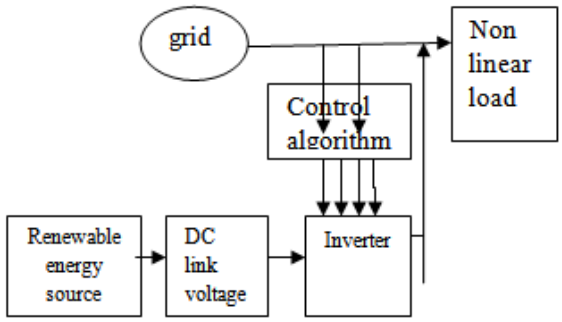
ID=np*Iphnp*I0*(exp(q*(Vpv+IpvRs/(k*T*A*ns) (3)

Where NP is number of parallel connections of cells in the given photovoltaic module, RS is the Equipollent series resistance of the module.

B. Control Algorithm of Grid Interfaced Inverter

From the source voltage (Vabcs), the source voltage amplitude Vt is calculated. The active power transfer in between grid and Solar will be carried by constant Vdc voltage across the capacitor. The authentic voltage (Vdc) is compared with

BLOCK DIAGRAM



(1) Block diagram of existing system

Reference voltage (Vdcref) and the error engendered is passed through a PI controller, which results as a current Ismd. This Ismd is multiplied with unit vector component of (Ua, Ub, Uc), which engenders in phase reference current (Isad, Isbd, Iscd).The amplitude voltage (Vt) is compared with reference voltage (Vtref) and the error engendered is passed through a second PI controller, which results as a current Ismq. This Ismq will be multiplied by unit vectors are (Wa, Wb&Wc) to engender the quadrature reference current (Isaq, Isbq, Iscq). Further the reference currents Iaref, Ibref and Icref are engendered by the integration of Isabcd&Isabcq of source currents. With the avail of reference current, the authentic source current is compared with the reference current and the error given to hysteresis current controller. If the genuine current exceeds the given current a certain range, it can transmute the switching state of the inverter to control the vicissitude of the genuine current signal in order to track the given current signal. HCC engenders switching pulses for grid interfacing inverter.

IV. PROPOSED SYSTEM

In this project, the design of cumulated operation of UPQC (Cumulated Power Quality Conditioner) and wind & PV array is proposed. The proposed system is composed of series and shunt controller, wind & PV array connected to DC link by boost converter which is able to compensate the voltage sag, voltage swell, voltage interruption, harmonics and reactive power in both islanding and interconnected modes.The proposed system is able to inject the active power to grid in additament to its faculty in amelioration of puissance quality in prevalence coupling point of UPQC method. Additionally, it can provide a component of sensitive load power during sag,swell, voltage interruption.

A.Modelingof Photovoltaic Module

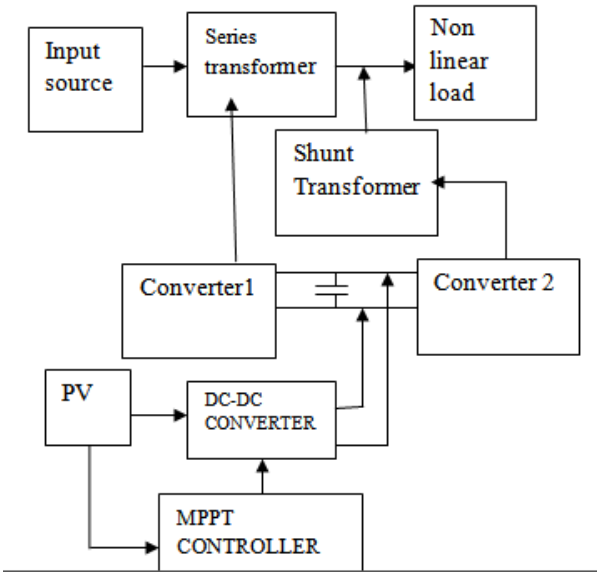
Modeling this PV module approximately needs taking weather information of irradiance and temperature as input variables. The output can be verified by the current, voltage, potency, that are habituated to trace the characteristics of IV or PV curve. if Any modification within the input instantly implicatively insinuates transmutations in outputs. That' s for what purport, it' s obligatory to utilize a precise model for the PV module. if culled model is the single diode model with series and parallel resistors for more preponderant precision.

B.Modeling of wind

When wind rhymes with "grinned," it refers to moving air, as in a breeze, or what fills the sails of a boat. When wind rhymes with "kind," it

signifies to turn, as in winding one's watch. There are all kinds of ways to wind: You can wind a ball of yarn, wind up to take a swing, or wind your way home.The equation for wind power(P) is given by P= 0.5 x ρ x A x Cp x V3 x Ng x Nb where, ρ = Air density in kg/m3, A = Rotor swept area (m2). Cp = Coefficient of performance V = wind velocity (m/s) Ng = engenderer efficiency Nb = gear box bearing efficiency.

BLOCK DIAGRAM



(2) Block diagram of proposed system

The positive sequence component at grid frequency is first extracted from the distorted terminal voltage for voltage-sourced inverter (VSI) synchronization. One of the many solutions is the utilization of a amalgamated system of shunt filters and active series filters like amalgamated power quality conditioner (UPQC) .This contrivance cumulates a shunt active filter together with a series active filter in a back to back configuration of amalgamated power quality control, to simultaneously compensate the supply voltage and the load current or to mitigate any type of voltage sag, swell and current fluctuations and power factor rectification in a puissance distribution network

V. RESULT AND FILTER

A.system without filter

In FFT analysis, Total Harmonics Distortion of source and load current without filter Yaxis taken by voltage ratings and X axis taken by the time in ms

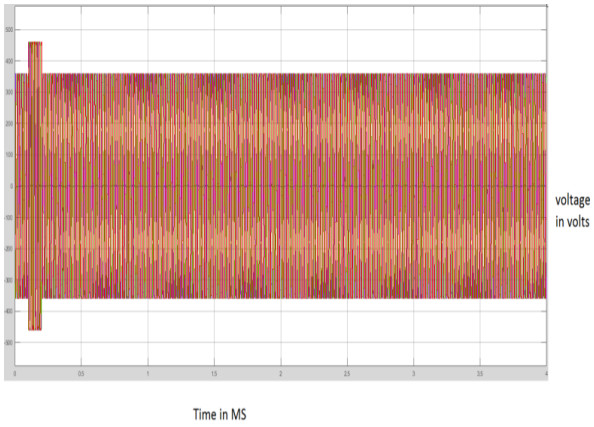


Fig5.1 represent the voltage sag in three phase system here taken by time and voltage.

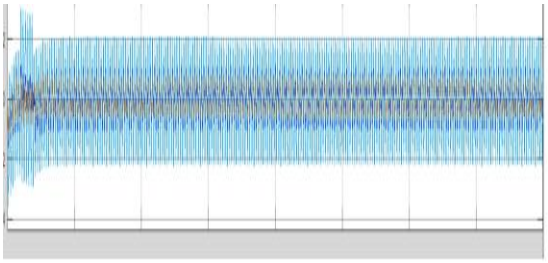
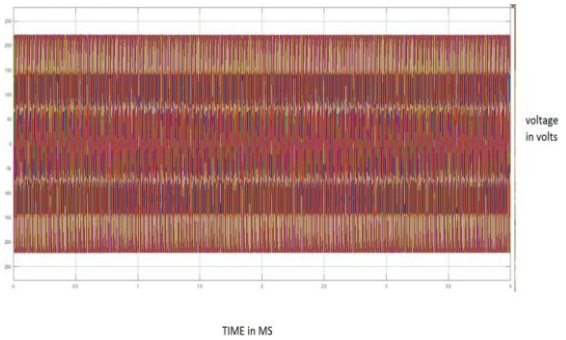


Fig 5.2 represent the voltage swell and here taken by time and voltage of three phase system

B.System with filter

In order to verify the proposed control approach of Grid Interfaced Renewable Energy Source (Solar) with Hysteresis Current Controller are summarized, the simulation study is carried out using MATLAB/Simulink software. The referd and the compensating



5.3 The figure represent the time and voltage

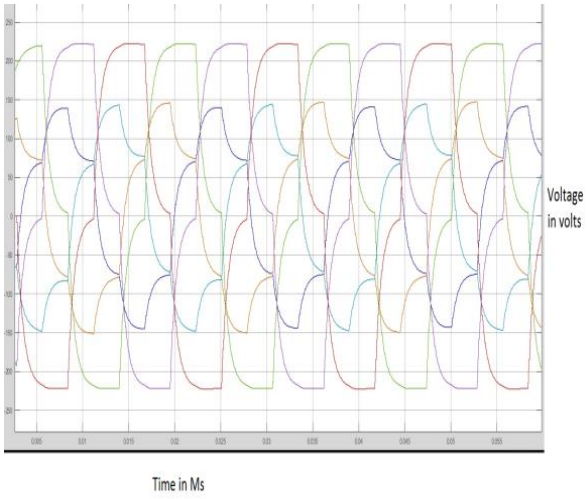
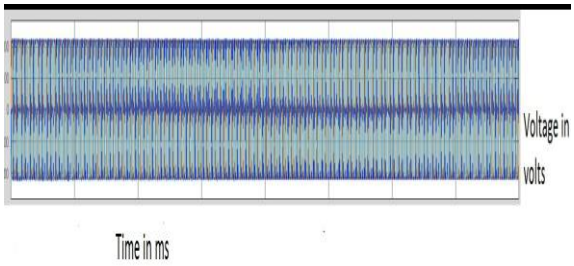
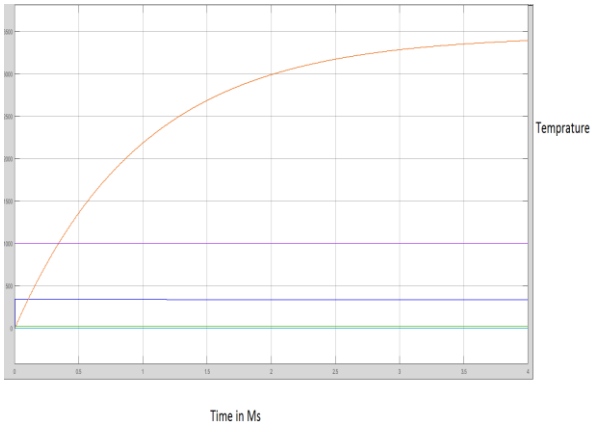


Fig 5.4 represents the time in ms and voltage in volts here shown by pure voltage of three phase system



5.5 figure represent the time and voltage and current.



5.6In order to verify the proposed control approach of Grid Interfaced Renewable Energy Source (Solar) with Hysteresis Current Controller aresummarized, the simulation study is carried out utilizing MATLAB/Simulink software. The referred and the compensating. The solar cell consists of energy engendered by 5700 term for 4ms.

VI. CONCLUSION

The distorted source current waveform is turned into a sinusoidal current with amplitude of 10 A is shown in figure 10. In FFT analysis, the THD of source current is truncated from 29.87% to 2.02%. The THD value of system with and without.During dynamic condition, when the perturbance incurred into the system is astronomically immense, then the associated control parameters are coerced to amplify in order to increment the open loop gain. This results into expedited dynamic performance. Moreover, when the contrary situation arises i.e. a diminutive perturbance is propagated into the system, then the control parameters abbreviate their values and as a result open loop gain decrease. With its better filtering performance is optically canvassed. NADRC-PLL provides enhanced perturbance suppression and amended dynamic replication with same range of open loop gain. High bandwidth is introduced in order to amend the transition period when the perturbance is immensely colossal. When the perturbance is minute, during the steady state, the nonlinear control strategy of is realized.

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