

Integration of Renewable Energy Source to Power Grid

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Abstract

In current scenario, the use of renewable energy sources are rapidly increases due to technology development and effectiveness. Day by day rise in price of petroleum products, problems in transportation of petroleum products and due to its limited availability demand of renewable energy sources like solar energy, wind energy, geothermal energy increases day by day. The evaluation of technology in solar panel and its conversion help in increasing the efficiency of solar power plant resulting in fulfilling the increased demand. The higher energy demand in day time is more than night. This demand can be fulfil by solar power plant. In this thesis paper, PV solar system connected with electrical grid has been performed. The electrical energy generated from the solar system is directly connected to power grid without adding battery backup, It is performed and validated that the overall cost of the proposed system reduced and become economical. The Simulink model of the proposed validated to justify the proposed work.

Keywords: Photovoltaic, Grid Inverter, Solar Energy, Simulink Model

I. INTRODUCTION

A 'grid-connected electrical phenomenon grid- is AN electricity generating star PV power system that's connected to the utility grid. A grid-connected PV system consists of star panels, one or many inverters, an influence acquisition unit and grid affiliation instrumentality. They vary from tiny residential and business upside systems to giant utility-scale solar energy stations. not like complete power systems, a grid-connected system seldom includes AN integrated battery resolution, as they're still terribly valuable. Once conditions square measure right, the grid-connected PV system provides the surplus power, on the far side consumption by the connected load, to the utility grid.

- Provide a bi-directional flow of energy; that's top-down (from generators to users) and bottom-up (with end-users causative the electricity supply) aimed toward guaranteeing grid stability once putting in distributed generation;
- Improve the interconnection of grids at the regional, national and international level, aimed toward increasing grid reconciliation capabilities, responsibility and stability;

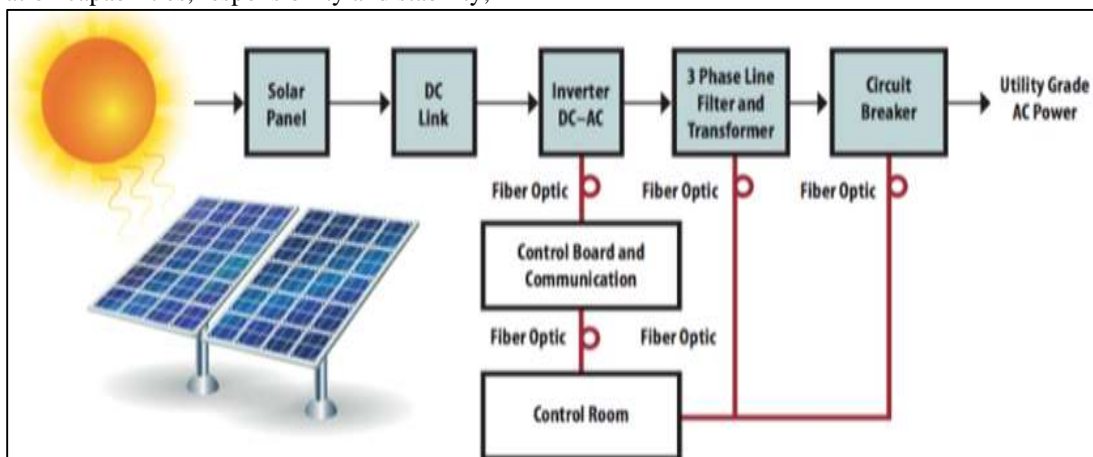


Fig. 1: Block diagram of the proposed System

In Jan 2015, the Indian government swollen its star plans, targeting US\$100 billion of investment and a hundred GW of star capability, together with forty GW's directly from top side star, by 2022. India quadrupled its alternative energy generation capability from a pair of 650 MW on twenty six could 2014 to 10,000 MW on ten March 2017.

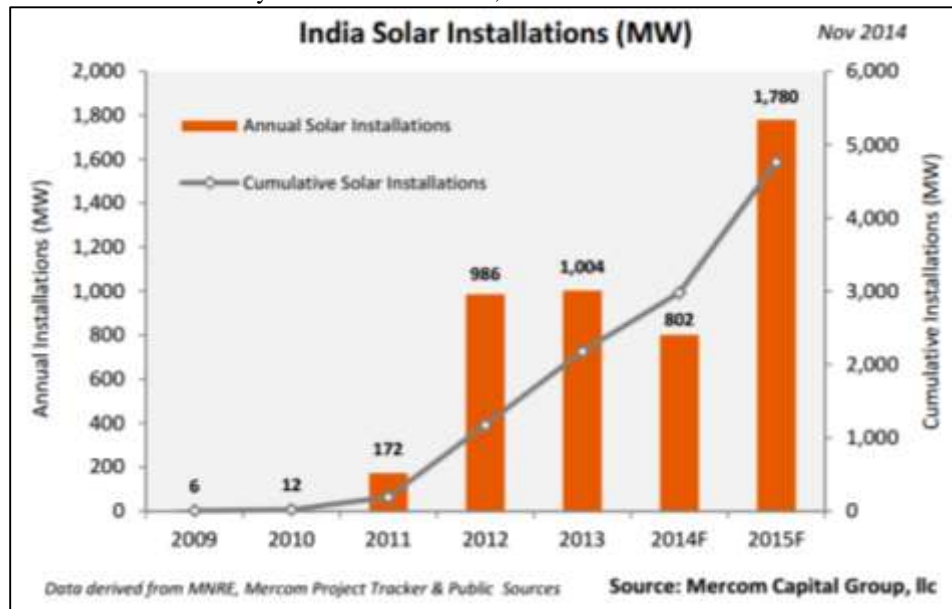


Fig. 2: Solar Installed capacity in India

II. RECENT SOLAR DEVELOPMENT IN INDIA

Solar power in Bharat could be a aggressive business. As of 31 Dec 2016, the country's star grid had a accumulative capability of 9,012.66 megawatts (MW) or 9.01giga watts (GW). In January 2015, the Indian government enlarged its star plans, targeting US\$100 billion of investment and a hundred GW of star capability, as well as forty GW's directly from top side star, by 2022. Bharat quadrupled its solar energy generation capability from a pair of 650 MW on twenty six might 2014 to 10,000 MW on 10 March 2017. The country else four GW of solar energy capability in 2016, the very best of any year.

In addition to the large-scale grid connected star PV initiative, Bharat is continuous to develop the employment of off-grid solar energy for localized energy wants. Bharat features a poor electrification rate in rural areas.

Table - 1
Cumulative solar capacity in India

Sr. No.	Year	Cumulative capacity (in MW)
1	2010	161
2	2011	461
3	2012	1,205
4	2013	2,319
5	2014	2,632
6	2015	3,744
7	2016	6,763

In 2015, solely fifty fifth of all rural households had access to electricity, and eighty fifth of rural households trusted solid fuel for change of state. star merchandise have more and more helped to satisfy rural wants, and by the tip of 2015, a accumulative total of just below one million star lanterns had been sold-out within the country, reducing the requirement for high-priced lamp oil. Additionally, a accumulative total of 30,256 star supercharged water pumps for agriculture and water had been put in. throughout 2015 alone, 118,700 star home lighting systems were put in, and 46,655 star street lighting installations were provided underneath a national program. a similar year saw simply over 1.4 million star cookers distributed or sold-out in Bharat.

III. PROPOSED MODEL AND SIMULATION RESULTS

In this Model Solar energy gathered by electrical phenomenon star panels, supposed for delivery to an influence grid, should be conditioned, or processed to be used, by a grid-connected electrical converter. Essentially, AN electrical converter changes the DC input voltage from the PV to AC voltage for the grid. This electrical converter sits between the electrical device and also the grid, attracts energy from every, and should be an outsized complete unit or is also a group of little inverters, every physically connected to individual star panels. See AC Module. The electrical converter should monitor grid voltage, waveform, and frequency.

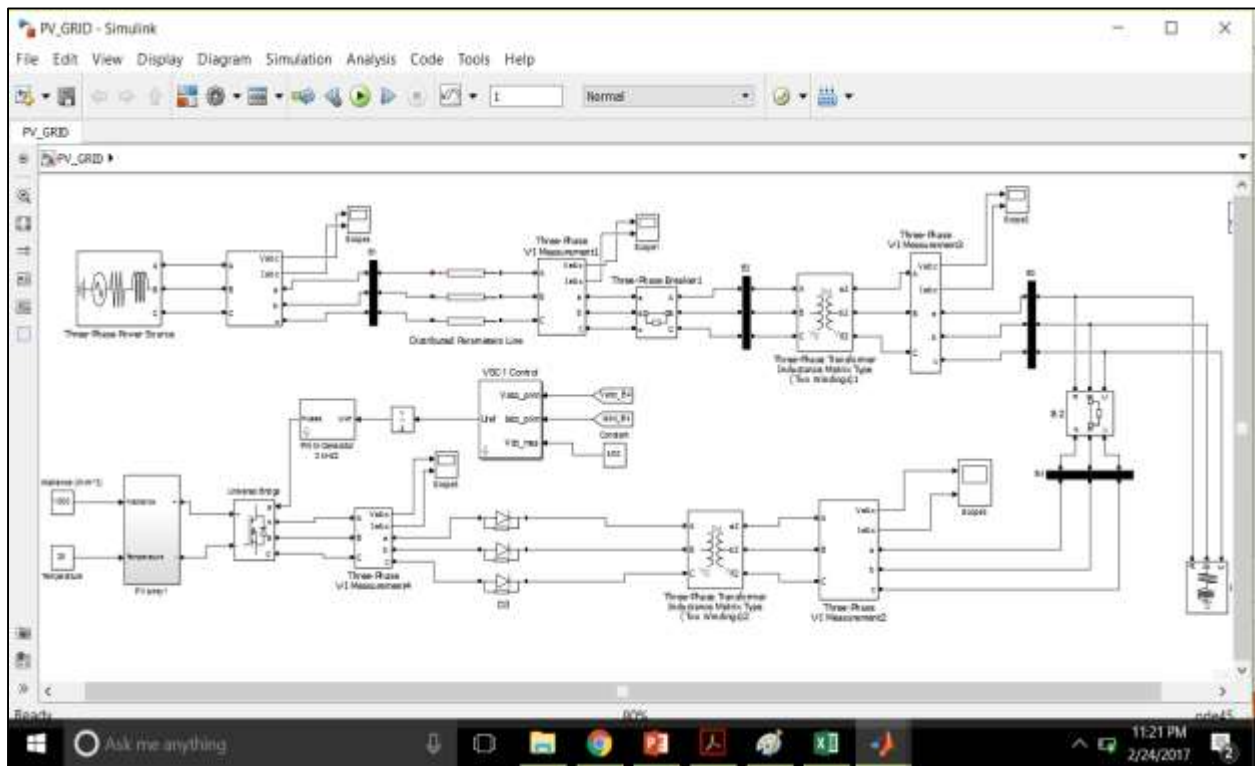


Fig. 3: Proposed Simulink model

One reason for observance is that if the grid is dead or strays too way out of its nominal specifications, the electrical converter should not pass on any alternative energy. AN electrical converter connected to a dead line can mechanically disconnect in accordance with safety rules, for instance UL1741, that vary by jurisdiction. another excuse for the electrical converter observance the grid is as a result of for traditional operation the electrical converter should synchronize with the grid wave shape, and turn out a voltage slightly over the grid itself, so as for energy to swimmingly flow outward from the electrical device.

A. PV Voltage

These are the three phase outputvoltage waveform of grid tie inverter which take input from photovoltaic arrays. PV voltage shown blow in the Fig. 4.

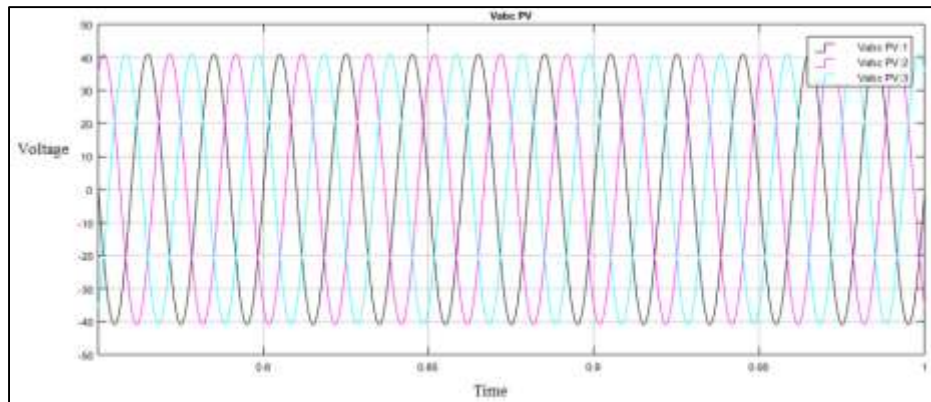


Fig. 4: PV Voltage

B. PV Current

These are the three phase output current waveform of grid tie inverter which takes input from photovoltaic arrays gives output power transformer for matching the voltage to grid voltage.

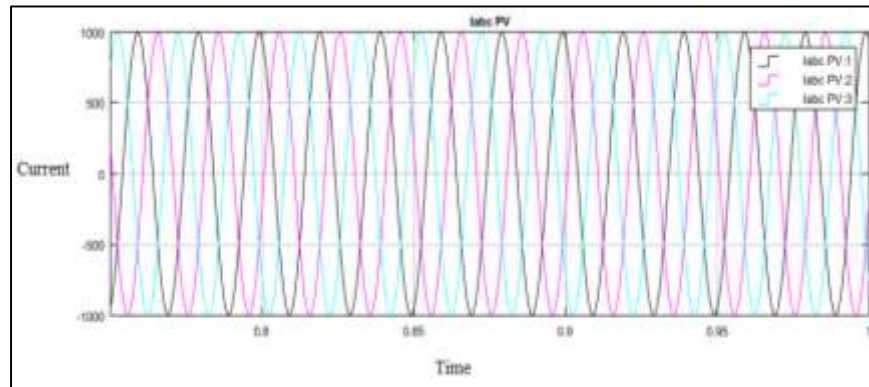


Fig. 5: PV Current

C. Grid Voltage

This waveform illustrate the three phase Voltage of Power grid. Grid Voltage shown blow in the figure.

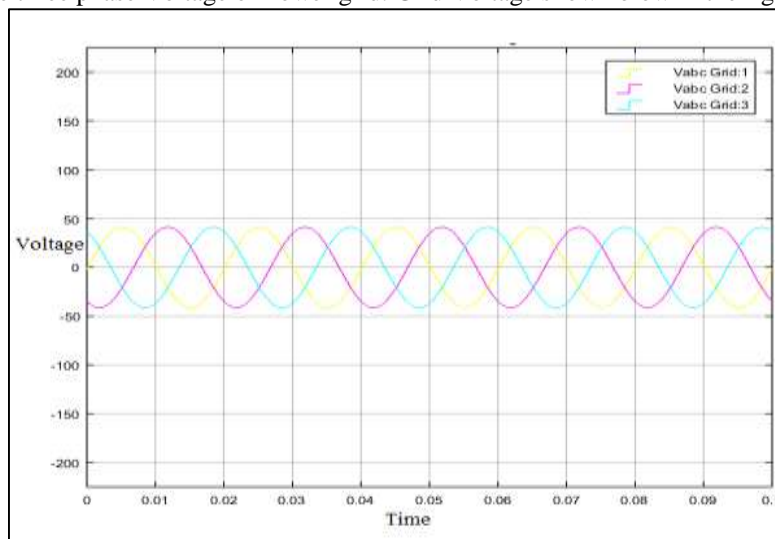


Fig. 6: Grid Voltage

D. Grid Current

This waveform illustrate the three phase grid current. Grid current value basically depend on the grid voltage when power constant.

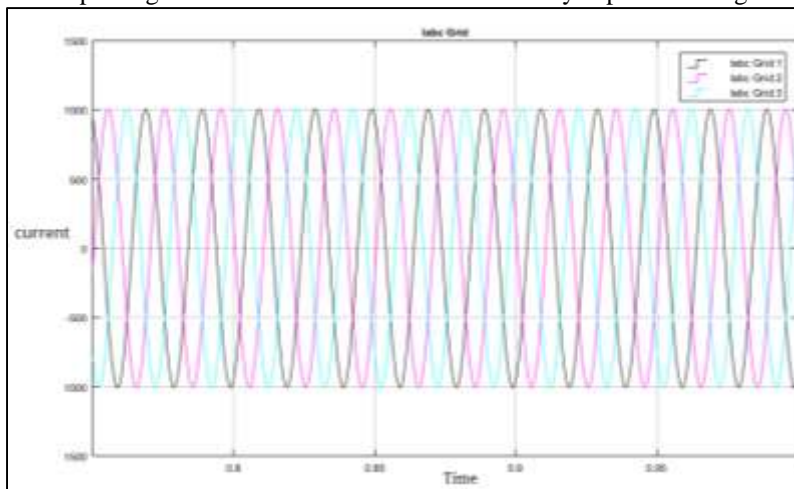


Fig. 7: Grid Current

E. Load Voltage

The voltage which is across the load are called load voltage. Load Voltage waveform shown blow.

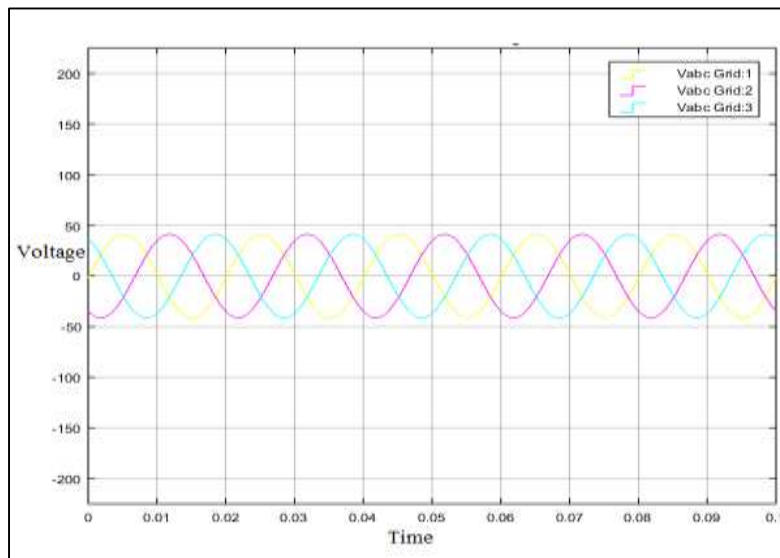


Fig. 8: Load Voltage

F. Load Current

Current flow through the load are called load current. Load current waveform are show in below figures.

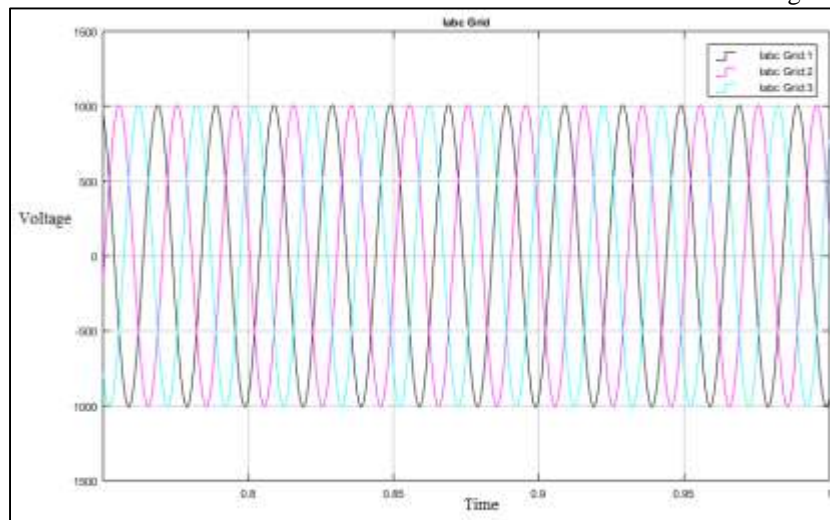


Fig. 9: Load Current

IV. CONCLUSION

In this paper, grid integration and power quality issues of Wind and alternative energy System and their doable solutions offered within the literature are conferred. The causes, affects, mitigation technologies that includes their topologies, highlight the benefits of the grid integrated star and significantly wind generation systems square measure examined. To minimize the fluctuations and intermittent problems power natural philosophy devices square measure the viable choices. Further, energy storage and use of dump load and MPPT could be used for reducing the ability fluctuations in PV systems. Additionally to the same, the up gradation in balance of systems by incorporating the new materials and storage components may scale back the issues associated with grid integration. The cost effective solutions of custom power devices and FACTS devices square measure highlighted to allow associate insight to the scope of analysis in low and medium level voltage network and for one section and three section grids technology.

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