ISSN: 2096-3246
Volume 54, Issue 02, April, 2022

Intelligent Grid Connected Hybrid Multi Renewable Sources With Cascaded H Bridge Inverter Increase Efficiency

M. Kalyan[1], Dr. S. Padma[2] and Dr. S. Chandrashekar Reddy[3]
Research Scholar, Department of Electrical Engineering, Annamalai University, Annamalai Nagar, Tamilnadu, India[1]
Associate Professor, Department of Electrical Engineering, Annamalai University, Annamalai Nagar, Tamilnadu, India[2]
Professor, Department of Electrical Engineering, Christu Jyothi Institute of Technology & Scince,Jangaon,Warangal, Telangana.[3]

Keywords:
THD, Wind and solar panel, inverter, converter, grid.

ABSTRACT

The sun and wind primarily based time are well thoroughly taken into consideration to be alternative source of environment-pleasant electricity period that could alleviate the power demand concerns. This paper provides a standalone hybrid power technology device together with sun and permanent magnet synchronous generator (PMSG) wind electricity resources as well as an a/c loads. A managerial manage tool, made to put into effect Maximum power point tracking (MPPT), is delivered to make nice use of the simultaneous electricity harvesting from fashionable electricity generation beneath various climate situations. This paper offers an evaluation of demanding situations and opportunities/ options of hybrid solar PV and also wind power assimilation systems. Voltage in addition to frequency exchange, in addition to harmonics is predominant electricity high-quality concerns for each grid-related as well as stand-alone structure with bigger effect in case of weak grid. This can be dealt with to a massive degree with the aid of having appropriate layout, superior short feedback manipulate facilities, and terrific optimization of the hybrid systems. These renewable useful resource assets are top rate options to satisfy the world electricity ask for, nevertheless unforeseen as a result of natural troubles. Using the crossbreed solar at the side of wind green beneficial useful resource tool along with can be one of the handiest selections for the use the ones without difficulty provided assets. The objective of this researches paper is to test out the sum of elements of Hybrid sun in addition to wind machine. The application in addition to particular standards connected to the increase of crossbreed similarly talked about on this paper. In this paper, simulation version of crossbreed sun at the facet of wind power device connected to grid is carried out. For this evaluation is carried out on alternative layout to pick out Harmonics, interruptions in resource voltage, supply contemporary, in addition to similarly section of THD.

1. INTRODUCTION

We require electricity for running mostly all the home equipment we make use of in our each day lifestyles. So it has end up an important part of our life. Currently there are 2 strategies to provide strength first by way of utilising non-renewable resources of electricity and second via sustainable assets of strength. With increase in populace and additionally development of innovation, usage of electrical power is also growing significantly. All at once, we have to improve the producing of electrical strength likewise so as to meet the wishes of growing populace. The best downside with using conventional assets is that their utilization reasons air pollutants as a result of the manufacturing of various pollutants like ash in case of a coal energy plant, smoke in case of diesel nuclear strength plant, radioactive fabric in case of nuclear power plant. Keeping these pollutants isn't always an easy job and it additionally wishes a number of cash. So we need to discover some different techniques to create energy. The only viable approach is through utilizing non-traditional resources of strength. Out of all the feasible choices provided in non-traditional sources of power, solar in addition to wind are the best techniques. As tidal power may be applied handiest on the sea beaches, sea thermal electricity can used within the centre of the ocean and its setup is likewise very difficult. While sun and wind are supplied in all the regions of the globe as well as putting in their nuclear strength plant is moreover now not a cumbersome job. The accessibility of sun energy is a primary problem, as it's miles to be had for round eight hrs in an afternoon; on the other hand wind is effectively available nearly for 24-hour. Yet we are able to do something to offset that trouble via integrating those collectively. Throughout foul weather one among them may be utilized whilst in the course of normal climate each may be run collectively. So on this paper we can be explaining a sun-wind crossbreed strength system.

Solar in addition to wind energy, despite the fact that, have one fundamental hassle that daunts purchasers: the periodic attributes. Both sun (PV) cells and also wind turbines (WT) convert herbal deposits into electric powered electricity, but their outputs are very dependent on the actual availability of resources. (Is addiction severely impacts the integrity of the renewable power system (RES). To minimize and additionally put off the end result fluctuation of the RES, energy garage units are typically used as summarized by Khare et al. In [2] (Assimilation of electricity storage area proper into RES, lamentably, results in a boost of the device. (Capability of the garage machine is set up primarily based upon the peak lots need, and it involves be extensively bigger for a standalone RES thinking about that numerous margin hours are required. (Ere fore, it is hard to enhance the components of the RES to meet the weight needs with minimum fee and additionally excessive integrity.

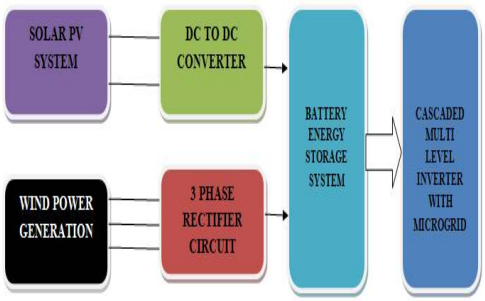


Fig.1.1. Model block diagram.

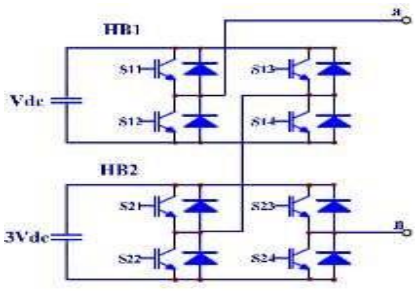


Fig.2. CMLI inverter module with switches.

ISSN: 2096-3246
Volume 54, Issue 02, April, 2022

About Paper

Introduction about the Hybrid energy storage system with external energy storage system. Section 1 explain about introduction of solar and wind power generation system. Section 2 explain of survey of the paper with different authors, section 3 explain about Proposed method with expected block diagram, section 4 give simulation results with respective of time & the conclusion with draw backs.

2. LITERATURE SURVEY

Amr Ahmed A. Radwan [1] 2020, Explain introduces a brand-new geography, yet easy in addition to dependable, for a grid-related wind-solar cogeneration gadget. An irreversible magnet concurrent generator-based main wind generator is interconnected to the utility-grid by means of lower back-to-again voltage-source converters (VSCs). The dc-link capacitor has in reality been used to at once interface a photovoltaic sun generator. No dc/dc conversion levels are wanted, and for that reason, the hybrid device is simple and also effective. Additionally, the proposed topology includes an impartial maximum electricity point tracking for both the wind in addition to the sun mills to maximise the extraction of the renewable energy.

Bhupender Sharma, Ratna Dahiya, Jayaram Nakka, [2] 2019, Clarify an advanced cascaded H-Bridge multilevel inverter (CHBMLI) primarily based grid related crossbreed wind-sun strength conversion device with the required of power nice. The wind electricity conversion system (WECS) and additionally solar energy conversion device (SECS) are linked independently to a separated dc-links of the CHBMLI through their corresponding DC/DC converters based superior power factor tracking gadget. The CHB geography whilst advocated as PWM rectifier preserve with the capacitor unbalancing issues among the dc links feeding distinct dc plenty and the very same develop when piloted in regenerative procedure with exceptional resources standing out uneven strength into every mobile. The recommended HWSECS gadget suffers the similar unbalance voltages as 2 distinctive resources (WECS as well as SECS) are augmented amongst separated dc-hyperlinks.

Hamid Marafia [3] studied the expediency of photovoltaic or pv innovation for energy generation and provided comparative economic evaluation of electricity generation with a trendy gasoline wind turbine. The consequences advocate that the sun photovoltaic structures aren't low cost in comparison to a trendy fuel turbine. Nonetheless, it became ended that PV structures would possibly turn out to be fee-powerful when the system fee minimizes to under $2.50 according to top Watt with conversion overall performance over 20%.

Mohanlal Kolhe et alia [4] has analyzed the economic feasibility of a standalone solar photovoltaic device with the maximum probably general distinct gadget i.e. A diesel powered machine for strength call for thru degree of sensitivity evaluation of existence cycle value computation. The evaluation has been carried out for the electricity demand for diverse critical standards, which include cut price charge, diesel gas charge, diesel system lifetime; gasoline upward thrust charge, solar isolation, PV selection price as well as integrity. The end result found out that the PV powered systems may be a cost-effective desire at a each day power need as much as 15 kWh even below unfavourable economic conditions.

Usha Bajpai et al [5] created a version to optimize the dimension of PV panel and additionally battery in

a standalone solar powered system. Optimization of PV gadget changed into finished based upon the mobile place, performance, and also mobile power and also array inclination. Thus this kind of standalone PV strength gadget can be more truthful, sensible and suitable. Comparable process changed into likewise executed via Philip (2013) on the studies of machine layout, instalment and performance of a standalone wind-diesel strength supply structures for faraway applications. The result suggests that the machine efficiency turned into fine.

V. K. Gajbhiye et al. (2017) Power is important for the financial growth and also social improvement of any united states. The globe managing the issue of energy era. The fossil power sources are constrained as well as wanted to make use of efficaciously. This electricity generated complements the greenhouse impact. The used of the consolidated sun and wind power system can be greater blessings on the way to make beneficial throughout 12 months. In this presented studies the review is completed on the various types of solar in addition to wind linked hybrid system for developing the counselled research observe.
Yazhini.B et al. (2017) on this paper, it assesses a few interaction present day technology provided for grid assimilation of renewable resource assets. Considering that many renewable useful resource sources are recurring in nature, it is an important venture to combine a good sized a part of renewable resource resources proper into the electricity grid infrastructure in general the electric strength drift occurs in a single course from the principal flora to customers. When compared to large strength flora, a renewable resource plant is having tons much less functionality. Yet as bobbing up sources renewable resource have to be taken into consideration.

In the proposed paper details study has been carried out for grid interconnection system using hybrid solar and wind power generation for improving power quality. The software simulation circuit of the proposed project is simulated on MATLAB using simulink the power system under study for simulation circuit. It can be concluded that:

1. The non sinusoidal source voltage, source current and load voltage became sinusoidal with the use of controller.
2. The controller reduces the reactive power delivered by PV source thus improving THD of the proposed power system.

The magnitude of voltage sag and swell of line RMS voltage at PCC due to sudden change of load were also observed for the simulated power system, under study. We are trying to reduce the THD as show in below Compare to existing methods. The THD value should be less than 5%.

3. RESEARCH METHODOLOGY

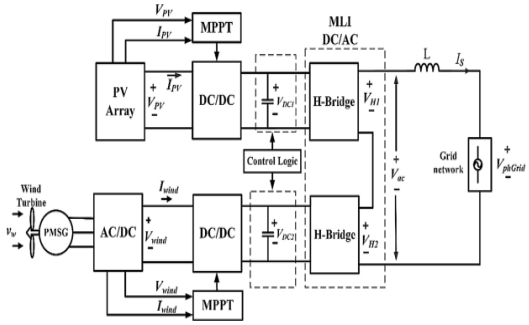


Fig.3. Expected simulation block diagram with microgrid.

ISSN: 2096-3246
Volume 54, Issue 02, April, 2022

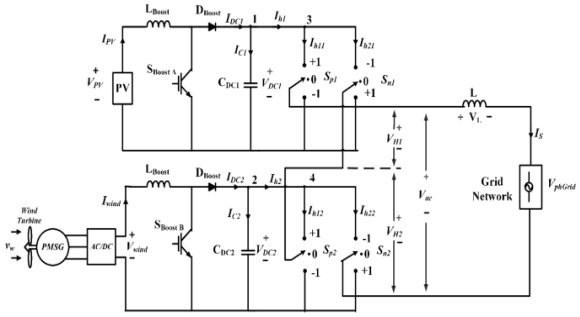


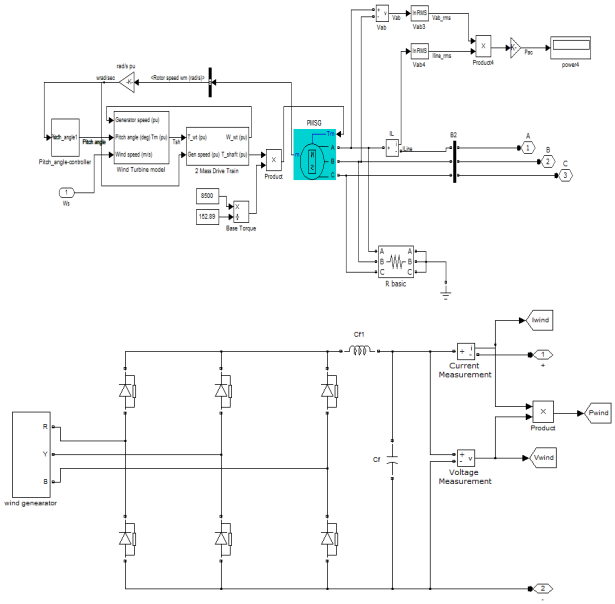
Fig.4. Equivalent circuit grid connected CHBMLI.

Maximum power generation:

Renewable useful resource sources are substantially used because of limited use widespread energy sources. The crossbreed strength system comprises most important assets but on the whole used sources are wind as well as solar. These power assets are of variable nature. The wind velocity and solar mild aren't continuous all through the day, it transforms all the time. So there is a difficulty in elimination of most strength from these sources. For drawing out finest electricity from wind and solar, we use maximum energy radar. As a result of this the electrical electricity outcome of crossbreed device is raised. The MPPT made use of in sun strength gives the control sign to the dc to dc converter and those managed results is obtainable to the grid or to the lots. Similarly for wind strength moreover most efficient power factor tracking is used for obtaining most power by controlling wind fee. The MPPT makes first-rate use of the effectiveness of the system. There are plenty of algorithms which assist in tracing the most electricity aspect of the PV module. The converter reaches its regular state voltage result in 10 ms. However for MPPT manner, voltage, and also current values with respective of time. Based upon the simulation as well as test outcomes, every canter of the proposed PSO operation must manage no extra than four PV modules to be able to have the most effective tracking accuracy and additionally minimal total tracking time. Tracking for the global maximum energy factor of a disbursed PV device beneath numerous partial shading issues may be done inside 1.3 sec.

Wind Power Generation:

The inputs to the controller are voltage, gift and additionally velocity of PMSG. Making use of the price and voltage samples the recommendation modern-day is decided. It is in comparison with the prevailing decided and additionally the mistake is made use of to calculate the responsibility cycle. Of the electricity digital button in growth converter which controls the procedure of wind electricity generation at MPP. It may be truly located that the MPPT controller plays an essential responsibility inside the hybrid power machine. In order to reduce the losses as well as to improve the effectiveness and overall performance of the crossbreed system a quicker MPPT controller is referred to as for.



Power quality issue

Intermittent strength from sun and additionally wind has a full-size effect on hundreds protection due to the fact the ones plenty have no link with grid. So, any shortage in energy technology from those assets can also go away the related hundreds without power supply. Voltage trade, frequency fluctuation as well as harmonics are primary strength excessive excellent worries. The voltage fluctuation because of irradiation modifications can make the PV gadget unstable with a view to have a power on the general reliability of the hybrid stand-on my own solar PV as well as wind gadget. The genuine identical point is relevant with areas to versions in wind velocity which affects the performance of the wind system and also subsequently the general crossbreed device. Exact projecting in addition to organizing systems can lessen the affects. The regularity balance of a generator should be notion about based on lots needs and whether or not the generator is connected to air conditioner loads with important energy frequency requirements or now not. High frequency adjustments can be suppressed with the aid of making use of garage gadgets consisting of electrolytic double layer capacitor.

Operation:

A PSO MPPT formulation is made use of for optimum energy removal and also the grid aspect manipulate of MLI to put off the most appropriate modern-day from HRES with common dc-link advocated in [7] DC bus intermediate voltage balancing through utilizing space vector modulation (SVM) for grid incorporated three level voltage aid in advised in [8], but it is made complex as contrasted to traditional PI controller based totally plans as well as also called for clear out creating in suitable style. In [9] a control approach and PWM gadget for modular multilevel converters (MMC) to mitigate the converter flowing existing for a grid integrated RES is supplied, but also for practical execution that is located extra difficult in framework.

ISSN: 2096-3246
Volume 54, Issue 02, April, 2022

PARAMETERS	Values in Simulation	Values in Experimentation
DC capacitance (C_{DC1}, C_{DC2})	3000 µF	3000 µF
Single phase grid voltage(rms) (V_{phGrid})	230 V	230 V
Grid line voltage (rms) (V_{grid})	415 V	415 V
Source inductance (L)	12 mH	12.5 mH
Source inductor internal resistance (R_s)	0 Ω	0.4 Ω
Reference DC link voltage (V_{DC}^*)	400 V	400 V
Switching frequency (f_{cr})	2.5 kHz	2.5 kHz
Grid frequency (f)	50 Hz	50 Hz

In this section MLI topology having self-voltage harmonizing functionality with lower switching count number and Unity Power Factor (UPF) became recommended, they saved UPF necessities however just advanced and also described to paintings on low grid voltage. Amongst all simple MLI geographies, "cascaded H-bridge inverter (CHBI)" is usually used for grid-connected HWSECS due to its modular layout, excessive resolution and additionally utilising reduced voltage rated semi-conductor switches for undertaking medium or excessive strength degrees. The foremost gain of embraced CHBMLI topology having the separated dc-links plays the well-known role to authentic in attaching two precise varieties of assets with absolute power at any aspect of time. On pinnacle of that, this MLI assistance to join average voltage assets from HWSECS to feed the complete electricity generated proper into the high voltage grid without any transformers yet at the same time the device accomplishes the higher synchronization together with calibrated and controlled energy glide.

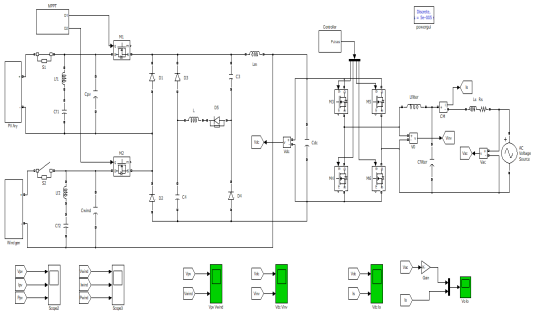


Fig.5. Simulation model with Hybrid circuit.

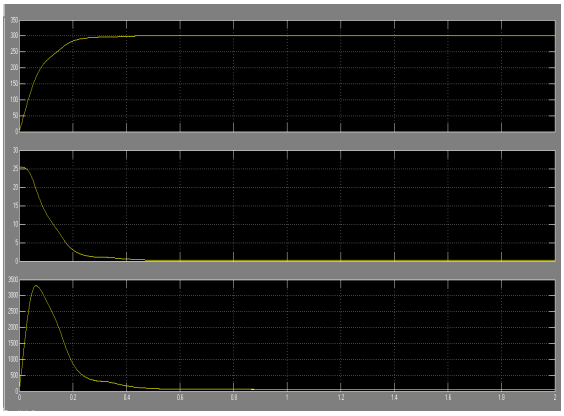


Fig.6 .Output voltage with Multi input (PV & Wind).

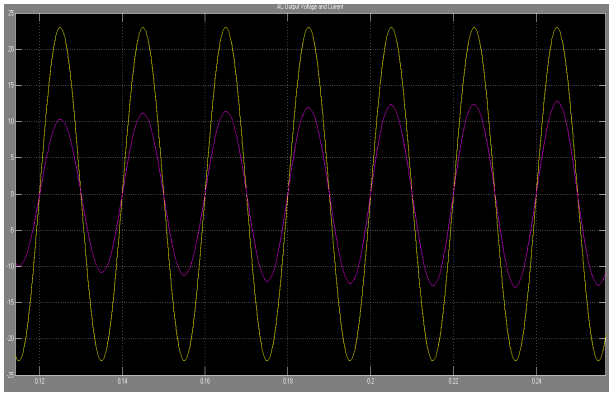


Fig.7. AC Voltage Output.

Wind Power Supply Applied

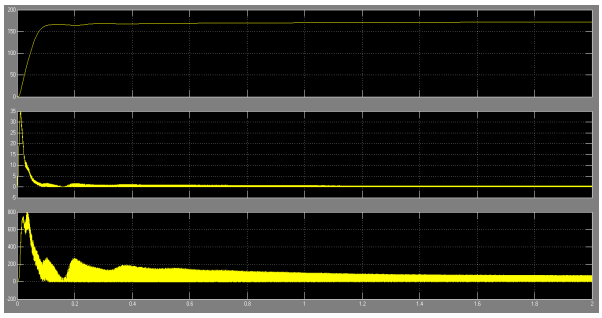


Fig.8. Only Wind power supply applied

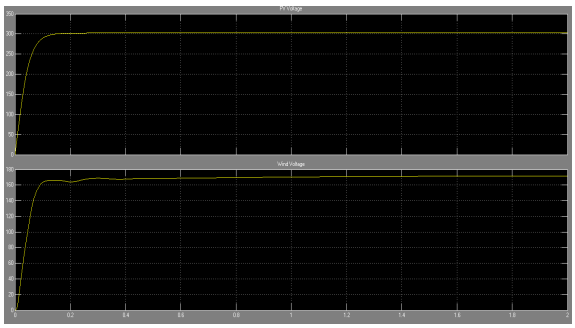


Fig.9. Voltage and power Across the INPUT.

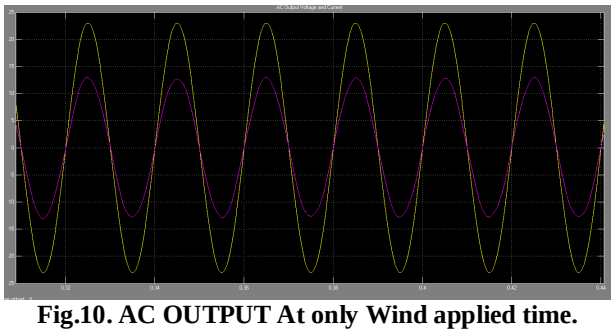


Fig.10. AC OUTPUT At only Wind applied time.

ISSN: 2096-3246
Volume 54, Issue 02, April, 2022

PV Wind Applied

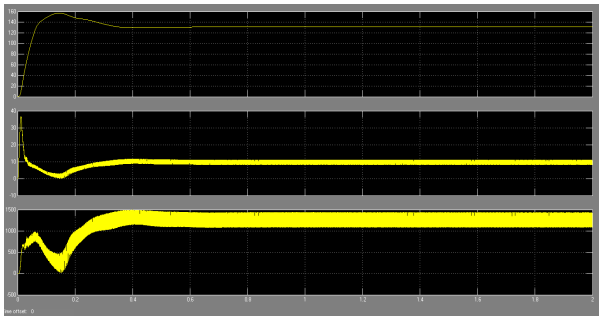


Fig.11. Only Wind source applied.

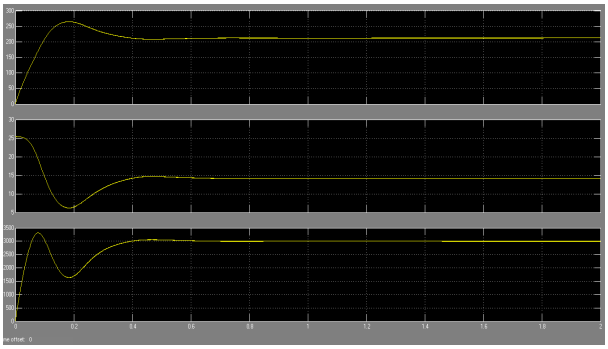


Fig.12. Solar power supply applied.

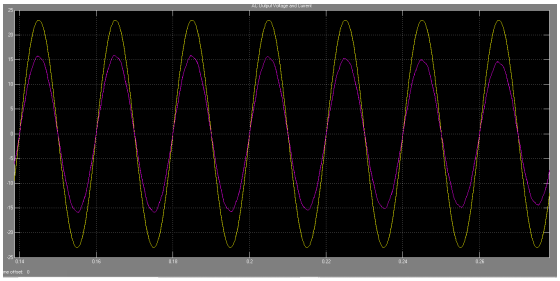


Fig.13. Output voltage and current.

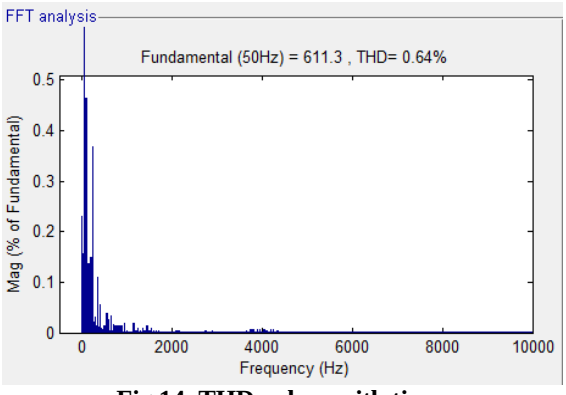


Fig.14. THD values with time.

4. Conclusion

The usage of renewable assets is substantially stressful international. The international encountering the trouble of global scarcity of electrical power and also infection may be quick gotten rid of with renewable resources. The right here and now paper is based totally upon the unique investigates on using the herbal deposits like sun and also wind. The mix of sun and also wind crossbreed system is likewise presented in the paper. In well-known the purpose of the studies observe to used nowadays literary works for creating the proposed research take a look at work. When furnished adjustments in wind as well as solar irradiation, finest electricity extraction with PSO can music the most excellent electricity following those changes. The DC bus voltage may be maintained constant at 450V with inverter manage despite adjustments in wind fee and additionally sun irradiation. Compared to the P&O set of rules, the PSO creates even greater energy and additionally less oscillations to make certain that it has plenty better performance. The hybrid version turned into designed in Matlab/Simulink software application and additionally outcome is demonstrated. The consequences show that sun radiation as well as temperature level affects the final results of the gadget. As the solar irradiance will increase the price of present rises simultaneously the result electricity raises while improve in temperature level reduces the worth of voltage which affects the decrement in energy. The wind fee and additionally path of wind are primary elements influencing the final results and outcomes display that sinusoidal a/c energy is received with moderate versions because of the changes in wind fee. In trendy, the hybrid gadget gives an approximate output of 1.5 MW. Combining these 2 green resources for era of strength to fulfill the needs gives clean electricity final results.

5. REFERENCES

[1] Amr Ahmed A. Radwan [1] 2020, “Grid-Connected Wind-Solar Cogeneration Using Back-to-Back Voltage-Source Converters” IEEE TRANSACTIONS ON SUSTAINABLE ENERGY, VOL. 11, NO. 1, JANUARY 2020.

[2] Bhupender Sharma, Ratna Dahiya, Jayaram Nakka, [2] 2019, “Effective grid connected power injection scheme using multilevel inverter based hybrid wind solar energy conversion system” Received 20 August 2018.

[3] Hamid Marafia A. ‘Feasibility study of photovoltaic technology in Qatar’, Renewable Energy, Vol. 24, pp. 565-567.

[4] Mohanlal Kolhe, Sunita Kolhe and Joshi J.C. ‘Economic viability of stand-alone solar photovoltaic system in comparison with dieselpowered system for India’, Energy Economics, Vol.24, pp.155-165.

[5] Usha Bajpai and Suresh C Bajpai ‘Some aspects of array and storage battery sizing in standalone photovoltaic power systems’, Proceedings of the 26th National Renewable Energy Convention of the SESI, pp. 222-227.

[6] V. K. Gajbhiye1, Prof. A. A. Kanaskar2, Prof. S. S. Jawre, “Solar Wind Hybrid System- A Review”, International Journal of Research in Advent Technology, Vol.5, No.5, May 2017.

[7] R.I. Putri, M. Pujiantara, A. Priyadi, M. H. Purnomo, and T. Taufik, “ Optimum Control Strategy of Grid Connected PMSG Wind Turbine Based On Energy Storage System”. International Seminar on Intelligent Technology and Its Application, Mataram, Indonesia, pp. 623-628, 28 – 30 July 2016.

[8] R.I Putri, M. Pujiantara, A. Priyadi, T. Ise, and M.H. Purnomo, “Maximum Power Extraction Improvement Using Sensor less Controller Based On Adaptive Perturb and Observe Algorithm For PMSG Wind Turbine Application,”” IET Electric Power Application, vol. 12, no.4, pp. 455 – 462, 2018.

[9] H. Fathabadi, “Maximum mechanical power extraction from wind turbines using novel proposed high accuracy single-sensor-based maximum power point tracking technique,” Energy, vol. 113, pp. 1219–1230, October 2016.

[10] A.M. Eltamaly, and H.M. Farh, “Maximum Power Extraction From Wind Energy System Based On

Fuzzy Logic Control," Electric Power Systems Research., vol. 97, pp. 144–150, April 2013.

[11] J. Lee, and Y.S. Kim, "Sensorless Fuzzy-LogicBased Maximum Power Point Tracking Control For a Small-Scale Wind Power Generation Systems With a Switched-Mode Rectifier," IET Renewable Power Generation, vol. 10, no. 2, pp. 194–202, 2016.

[12] R.I. Putri, M. Rifa'i, M. Pujiantoro, A. Priyadi, M.H. Purnomo, "Fuzzy MPPT Controller For Small Scale Stand Alone PMSG Wind Turbine", ARPN Journal of Engineering and Applied Sciences. vol. 12, No. 1, pp: 188-193, 2017.

[13] Dr.K.S.Srikanth, T.Krishna Mohan" A Novel Grid-Connected PVFC Hybrid System for Power-Management" International Journal of Research in Advent Technology, Vol.2, No.4, April 2014.

[14]. Giraud and Salameh, "Steady-State Performance of a Grid Connected Rooftop Hybrid Wind–Photovoltaic Power System" IEEE TRANSACTIONS ON ENERGY CONVERSION, VOL. 16, NO. 1, MARCH 2001 1 with Battery Storage.

[15] Djamel and Abdallah, "Power Quality Control Strategy for Grid Connected Renewable Energy Sources using PV Array, Wind Turbine and Battery," Proc. of 2013 Fourth International Conference on Power Engineering, Energy and Electrical Drives(POWERENG), pp. 1671-1675, 2013.