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Power quality improvement by solar fed cascaded multilevel invereter with fuzzy logic based controller

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Abstract: *The power quality of solar photovoltaic (PV) energy conversion systems is harmed by harmonics. This research studies the elimination of harmonics in a solar-fed cascaded fifteen-level inverters using Proportional Integral (PI), Artificial Neural Network (ANN) and Fuzzy Logic (FL) based controllers to tackle this issue. In contrast to current methodologies, the FLC-based solution helps to reduce harmonic distortions in order to enhance power quality. Besides increasing power quality, this research also recommends offering output voltage control to keep voltage and frequency at the inverter output end compliance with grid connection regulations. An inverter with a 15-level cascade of PI, ANN, and FL controllers is modelled using the MATLAB/Simulink platform. A 3 kWp solar plant coupled to a multilayer inverter is created and presented to demonstrate the technology that is being proposed. All three solutions are put to the test via the use of output voltage control and measures for power* quality.

Key words:*Fuzzy logic, Cascaded Multilevel Inverter, Power Quality, and Photovoltaic (PV)*
(FL)

I. INTRODUCTION

In order to enhance living circumstances, many developing nations must provide electricity to rural regions [1]-[4]. Students nowadays should be forced to learn about themes such as energy efficiency, electricity supply, and long-term sustainability, among other things. A country's economic progress and human and industrial development depend on a stable supply of energy. More effective techniques of producing and dispersing energy are needed because of the increasing dependence on unstable nations' natural resources and diminishing petroleum reserves, as well as environmental concerns. There are advantages and disadvantages to using more traditional power producing methods like thermal and nuclear. Research into non-fossil fuels has increased as a result of the increasing focus on lowering CO2 emissions. It follows that all sectors, from residential to transportation to industry to agricultural, have an urgent need for a more ecologically friendly source of energy. As a consequence of the unexpected growth in demand and environmental hazard, energy producers have been forced to go farther and more effectively. Recently, a wider range of energy policy and investment alternatives have been available throughout the world [5]. [6]. Renewable and sustainable energy may be generated from natural resources forever. The sun, wind, water, and geothermal heat are all examples of renewable energy sources. Biomass, wind, and solar power may be found all over the globe, unlike traditional energy sources like coal and oil, which are confined to certain geographic regions. Energy security and environmental effect will improve if renewable energy is implemented quickly.

Improved healthcare and lower infant mortality might save governments tens of millions of dollars in healthcare costs [6]-[8]. Power production, water heating, transportation, and other energy services are frequently provided by renewable energy sources in rural locations (off grid). As a result, it is reasonable to predict that renewable energy assets will improve the supply of power to rural residents [9]. There is a chance. to harness the sun's energy using a variety of technologies, including solar heating, focused photovoltaics and concentrated solar power (CSP) (CPV). Active or passive, based on their present state, they might be characterized as In order to generate electricity, photovoltaic (PV) systems make use of the photoelectric effect. PV systems use a series of silicon semiconductors to turn light into electricity. DC to AC conversion is accomplished by the use of converters. It is necessary to use a special MPPT system since the sun has so much power. In most cases, solartracking PVs are employed for this. For maximum power generation and stable voltage, sun-tracking PVs monitor variations in solar insolation all around the world. They can. For PV systems, the efficiency of a solar panel may be assessed by how effectively it can convert sunlight into power. PV solar panels may be employed as a major source of electricity because of its reliability as a renewable energy source. Another difficulty with the solar energy system is that photovoltaics don't provide enough power to meet demand. PV's inconsistent generation bears the most of the blame for this failure. The capacity to regulate voltages is one of the new issues that arises as a result of this. Reactive and active powers have long been used in transmission and distribution to maintain voltage levels In order to maintain voltage control, a voltage drop must be maintained when the system travels from transmission to distribution. [10] Under load, STATCOMs and SVCs work together to guarantee that the voltage across is maintained in acceptable limits. When operating under heavy loads, impedance may cause either an overvoltage or a voltage drop below the normal range, causing voltage management issues. Using a power electronic interface is recommended when the voltage is imbalanced between the power source and the load. With this interface, you can control voltage output and improve electrical quality. This is the first time that multilayer inverters have been employed in a way that provides a twofold benefit. It is from the word "tri-level level converter" that we get the term "multi-level" High output voltages are achieved by combining a large number of DC sources in the switching semiconductors. When it comes to power quality, Single-level inverters can't compete with the advantages of multilayer inverters in terms of electromagnetic compatibility losses and voltage capacity. This kind of inverter includes cascaded MLI, neutral-point clamped MLI, and flying capacitor MLI.. Cascaded Multi-Level Inverters are used in this investigation (CMLI). Regardless of whether your CMLI is powered by batteries or solar cells, you must have the correct voltage available. DC voltages are same between the CMLI's two sides. PV panels need asymmetrical inverters because of the variable voltage they produce. Asymmetrical inverters have DC link voltages adjusted in opposite directions. In comparison to other multi-level inverters, CMLI has the fewest components. Converting DC power to AC necessitates the use of CMLIs DC power sources. For example, solar PV might assist offset this drawback. It is possible that these conditions will enhance and simplify the regulation of the voltage regulator in a solar power circuit. Covered in Section 2 are techniques for manipulating voltage levels. Finally, the results are presented.

II. LITERATURE SURVEY

[1]. 'Is a PV-led renewable energy plan the proper way for supplying modern electricity to the rural poor of Sub-Saharan Africa?' S. Karekezi and W. Kithyoma, Energy Policy, vol. 30, pp. 1071-1086, September 2002.

For the time being, the great majority of Africans reside in rural areas. The value of modern power in rural places cannot be overstated. Solar photovoltaic (PV) projects for rural electrification have been implemented in practically all countries in this area, but rural Africa's access to modern electricity is still woefully inadequate despite these efforts by governments and donors. Rural residents cannot afford to utilize solar PV to power lowvoltage devices like light bulbs. Overreliance on solar photovoltaic (PV) systems in rural Africa's energy sector is examined in this article. This article provides more solutions for rural renewable energy development .'s Biomass fuels will continue to be the fuel of choice for the vast majority of rural dwellers for the foreseeable future. The implementation of effective biomass technologies will enable the efficient use of limited biomass resources and lessen the negative health effects of biomass consumption on women and children's health. Solar thermal, wind pumps, micro/pico hydropower, and cleaner fuels like kerosene and LPG have received minimal attention. Rural businesses may see a considerable boost in output from these energy sources. Rural poor are less likely to benefit from simply solar PV initiatives, according to this report, which focuses on more diverse forms of renewable energy and rural activities that provide money.

[2] "A novel generic architecture for cascaded multilevel inverters with a decreased number of components based on the H bridge," IEEE Transactions on Industrial Electronics, vol. 61, no. 8, pp. 3932–3939, 2014.

This study proposes a new kind of cascaded multilevel inverter that uses freshly built H-bridges. The proposed design has fewer dc voltage sources and power switches, which reduces the inverter's complexity and total cost. In order to develop these abilities, we compared the proposed topology against the standard topologies from the aforementioned viewpoints. The authors also provide an innovative approach that may be used to estimate the size of dc voltage sources.

[3]. An evaluation of microgrids in Senegal's renewable decentralization initiative is presented in Renewable Energy, 35, no. 8 (August 2010).

There is a growing need for energy in these oilimporting Sahelian countries. An imbalance in payments results in an increase in debt and an exhaustion of budgetary resources, yet renewable resources are readily available. This is how it looks. An off-grid stand-alone renewable energy producing system for remote rural areas in a Sahelian country is the focus of this article's feasibility research.. After performing a study in 2006 as part of the Microgrids Project, researchers were able to assess demand in rural Senegal's Thies, Kaolack, and Fatick areas of the country. As a starting point, renewable energy sources including solar panels, wind turbines, and hydropower are chosen. When life-cycle expenses and environmental externalities costs are included in, PV technology's levelized power prices are less costly than the cost of expanding the system. As a consequence, installing decentralized PV systems rather than building new power lines in remote rural areas saves money in the long run. There must be no more than 7:47 KWh/year of demand for Thies, and no more than 7:884 KWh/year of demand for Kaolack and Fatick. Aside from that, the proposed method offers for the environmental valuation of energy obtained from non-renewable resources.

[4]. An inverter architecture with a self-balancing level doubling network has been proposed by Chattopadhyay and Chakraborty in IEEE Transactions on Industrial Electronics, Volume 61, Issue 9, pp. 4622-4631 in 2014.

Multilayer inverter (MLI) design using a level doubling network is designed (LDN). With its LDN half-bridge inverter, you get two additional voltage outputs. The proposed LDN idea does not include closed-loop control or algorithms, and it does not utilize or supply any power. But the higher level count compensates for the fact that this design makes use of symmetric H-bridge MLIs, thus performance is on par with an asymmetric one. It is possible to achieve symmetric MLI by ensuring that each cell is filled evenly. Only a three-arm Hbridge (two switches per phase) is used to enhance the number of levels. In terms of quality and cost, the reduction in power quality, switching frequency, and filter size and cost are considerable.

[5]. Schröder and Smith, "Distant future of the Sun and Earth," (Vol. 386(1), 2008) (Monthly Notices of the Royal Astronomical Society. doi:10.1111/j.1365-2966 2008.13022.x)

A highly-validated evolution algorithm generates stellar models of the Sun and the Solar System in the far future. An in-depth investigation is conducted into mass loss in the solar giant stages owing to a cold wind (not one produced by dust). The mass loss of the Sun (0.332 M Sun, 7.59 Gy from now) may give the Earth with a significant orbital expansion, inversely proportional to the remaining solar mass, according to the innovative and well-calibrated mass loss formula of Schroder and Cuntz. (2005, 2007). At this point in solar growth, the Earth's closest encounter with a big, cool photosphere is expected. This crucial time in Earth's evolution is marked by a loss of orbital angular momentum caused by the Sun's immense gravitational pull and the chromosphere's dynamic drag. Although the reduction of solar mass has had a positive effect, we have learned that our planet will be devoured. A planet's current minimum orbital radius of 1.15 AU is required to make it through the solar tip-RGB phase. In addition, our detailed models of mass loss show that the tip-AGB giant will be smaller than the tip-RGB giant. As a result of the Sun's RGB phase, which has already lost a significant amount of material, this phenomenon has arisen. AGB brightness will not create a superwind that is dustdriven and will not produce a solar planetary nebula on an annual basis (PN). Even with one more thermal pulse, a circumstellar shell similar to but smaller than the PN IC 2149 might be created, with an estimated total mass of the CS shell of less than onehundredth the mass of our sun.

III. PROPOSED SYSTEM

Figure 1 depicts a 15-level MLI solar-powered system, which has been proposed. Here's a schematic of how the system works: an inverter with 15 layers of cascaded H-bridges and a solar PV array PWM pulses may be generated using several controllers such as the Pi, Fuzzy and ANN.

IV. CONTROLLING MODELLING

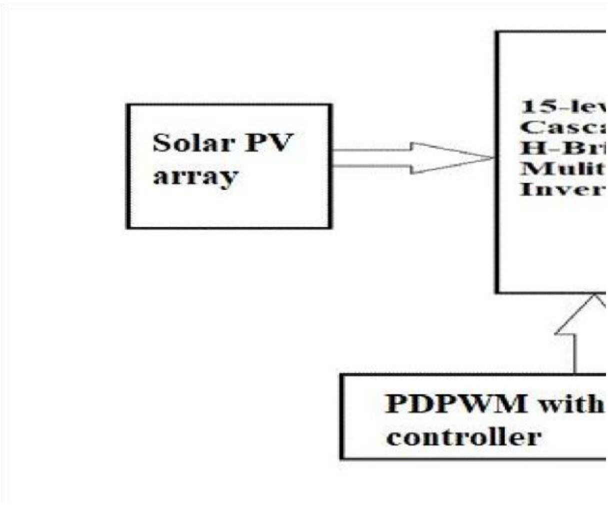

Fig 1 Proposed Solar PV fed 15 level-MLI system

Solar PV systems, for example, are connected to the DSI grid in the same way a generator or synchronous machine would be on an electrical grid (Distribution System). As much as 20% of a solar panel's daily output power might fluctuate due to irradiation absorption. In order to keep the PV voltage constant, power electronics may be necessary. Once the DC voltage has stabilized, inverting the voltage for grid transmission may begin. An inverter variation of 1% is advised for a 48V, 7A solar panel with a 20% variability in power.

FUZZY LOGIC CONTROLLER

It was Lofti A. Zadeh, rather than Boolean algebra, who coined the term fuzzy logic. There are just two possible states for values in fuzzy logic: 1 (ON) and 0 (OFF) (OFF). To the contrary of Boolean reasoning, fuzzy reasoning admits more than only the binary options true or false. Boolean logic, on the other hand, permits just true or false. Data that is ambiguous, foggy, and imprecise may be used to derive definite conclusions via the use of "fuzzy logic" With a cascaded H bridge multilevel inverter, the Fuzzy Logic Controller (FLC) may be used to run virtual reality applications (VR). An inverter output voltage (Vo) of fifteen levels and the reference voltage (Vref), which is the ideal voltage for an inverter to obtain in accordance with grid standards, are contrasted. e = Vref Vo and de/dt are

According to this comparison, the fuzzy logic controller has a lower THD percentage.

inputs to the FLC that determines the error and its rate of change. For the most part, the FLC is made up of five blocks. You can locate them in a fuzzifier/defuzzer/inference/rule/database form. Fluffy membership functions rely on user input data to determine participation levels. Modulating (or control) signal (Ms) for PWM creation is contrasted with Vef after getting the FLC command (or control) signal (Cs).

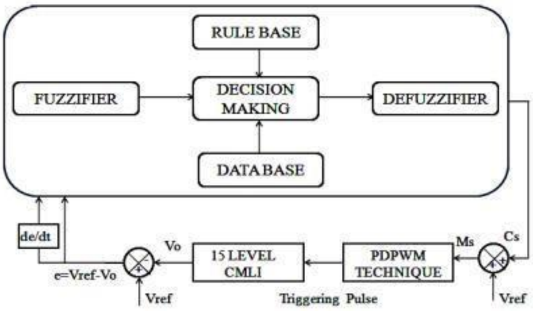

Fig .2 Fuzzy logic Control Structure

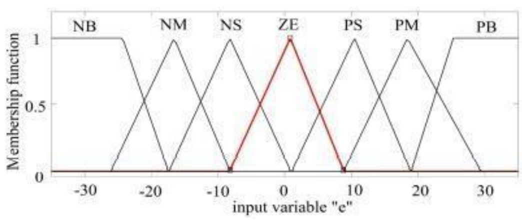

Fig 3. Membership function for error signal

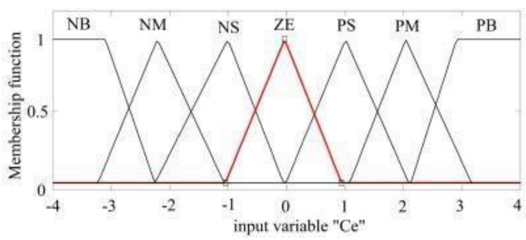

Fig 4. MF for the change in an error signal

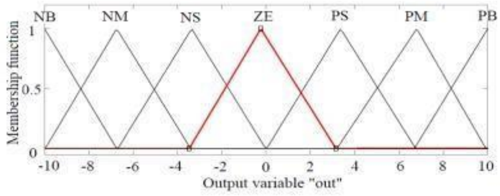

Fig 5. MF for the reference output

TABLE II

FLC RULE MATRIX

Ce \ e	NB	NS	NM	ZE	PB	PS	PM
NB	PB	PB	PB	PB	ZE	PM	PS
NS	PB	PM	PB	PS	NM	ZE	NS
NM	PB	PB	PB	PM	NS	PS	ZE
ZE	PB	PS	PM	ZE	NB	NS	NM
PB	ZE	NM	NS	NB	NB	NB	NB
PS	PM	ZE	PS	NS	NB	NM	NB
PM	PS	NS	ZE	NM	NB	NB	NB

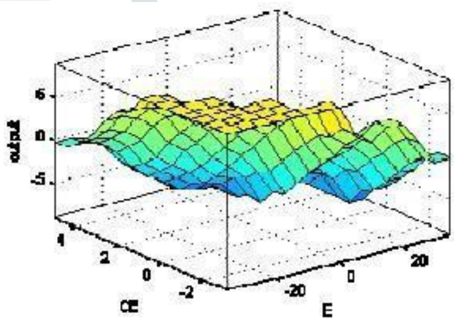

Fig 6. 3 D visualization of Fuzzy rules PIBASED CONTROLLER

Similar to FLCs, proportional integral (PI) controllers maintain an inverter's output voltage at a fixed value dependent on grid demand. Figure 6 shows how common the PID controller is in feedback systems. It is vital to pay more attention to controller gains while using PI-based controllers than when using FLCs since the rules and MF parameterization are more complicated. This controller's gain is adjusted to accommodate for irradiance faults that might change with time. Due to solar PV oscillation, the PI controller generates several error signals.

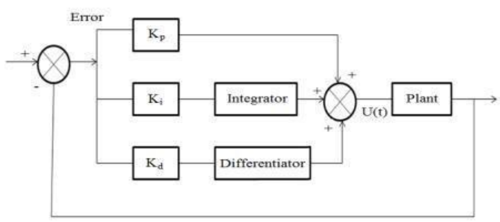

Fig 7 Structure of PID Controller

When setting the PI controller gain, solar radiation variations are taken into consideration. The PI controller generates reference signals for the plethora of error signals generated by the solar PV's fluctuating output..

ARTIFICIAL NEURAL NETWORK BASED CONTROLLER

Neuronal networks, rather of assigning specific subtasks to each unit, execute functions collectively and in parallel by the units. The neural networksbased controller regulates voltage depending on the input-output information.. The discrepancy between a reference value and the actual value is what we mean by an error. ANNs are trained using these mistakes. The ANN can give the inverter circuit with the best switching angles to maintain a constant output voltage for the proper error signal levels. In order to train an artificial neural network, the following stages must first be completed: Compose the data needed to run the model and then update the weights based on the fresh or amended input data that you've collected. For example, a neural network that analyzes error signals is trained on a variety of samples at different times.

V. MATHEMETICAL MODELLING Solar cell modelling

PV (Photovoltaic) cells are shown schematically in the following illustrations. With the diode and the current source in series, the solar cell is given the attention it requires.

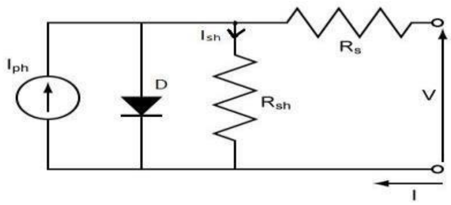

Fig.8 Solar PV module equivalent circuit

For the above circuit, apply KCL (Kirchoff's Current Law) we have [1]

$I_{ph} = I_d + I_{sh} + I$ (3.1)

$I = I_{ph} – (I_{sh} + I)$ (3.2)

We have the following equation for the Solar cell current

$I = h −([(+ I.R_s)/V_T) – 1] – (V + R_s)/R_{sh}$
(3.3)

where Iph denotes isolation current I represent cell current I_o denotes reverse saturation current
V represents the cell voltage
R_s denotes Series Resistance
R_{sh} is Shunt Resistance
V_T represents Terminal Voltage

CASCADED H BRIDGE MLI MODELLING

Multilevel inverters cascaded together provide output at five stages, seven stages, twelve stages, nine stages, sixteen stages, and eleven stages with twenty switches, making use of the numerous levels of the multilevel inverter. 13 levels and 24 switches spiral down to 15 levels and 28 switches, and so on. pattern.

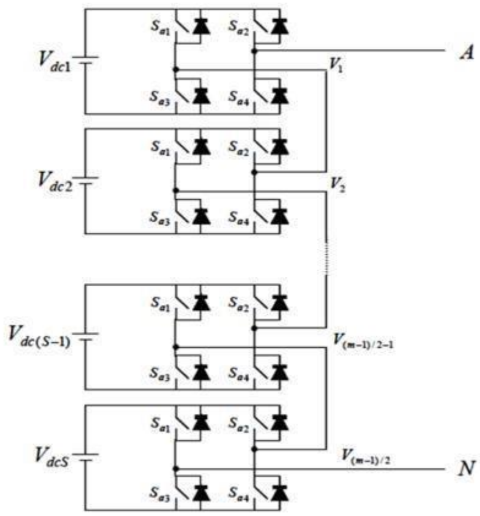

Fig.9: Cascaded n level multilevel inverter

Figure 3.2 shows a cascaded H-Bridge n-level inverter. Each stage has its own dc supply. Each branch of an H-Bridge inverter has its own dc source. How many phases are there in a circuit is outlined in the equation.

$o = 2 \;\; +1(\;\;)$ (3)

If the total number of dc sources is N, then NS

VI. SIMULATION RESULTS

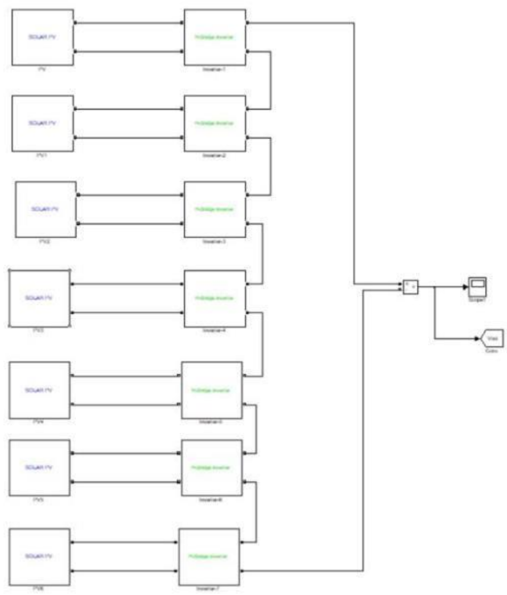

Fig.10 MATLAB/SIMULINK circuit diagram of solar fed 15 level-MLI proposed system

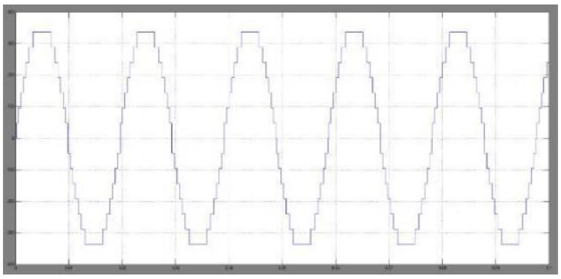

Fig.11 Fifteen level output voltage with PI controller

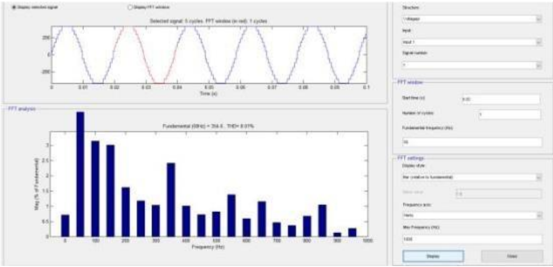

Fig.12 FFT analysis for PI based voltage regulation (8.01%)

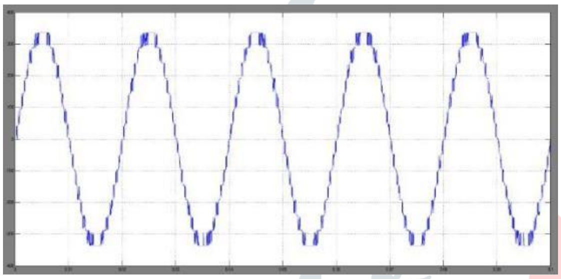

Fig.13 Fifteen level output voltage with FLC controller

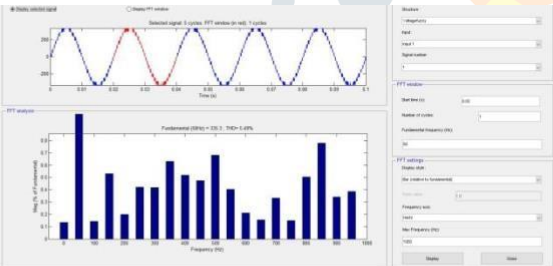

Fig.14 FFT analysis for FLC based voltage regulation (5.49%)

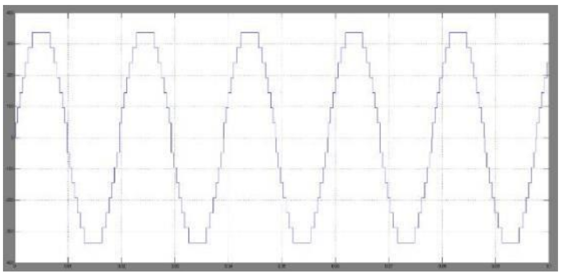

Fig.15 Fifteen level output voltage with ANN controller

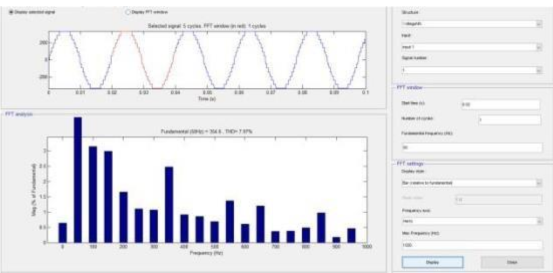

Fig .16 FFT analysis for ANN based voltage regulation (7.97%)

CONCLUSION

The effects of a 15-level inverter on voltage control and power quality are examined using both a simulation and an experimental scenario. Fluctuations in solar PV output and FLC VR performance are linked. Even so, FLC is being investigated for the ninth level, although DC power sources rather than solar panels are being employed in the implementation. All of the other techniques were designed to allow the use of MLI topologies with lower power consumption. The constant output voltage technique proposed by MLI has been tested, and the results reveal that it works effectively. This is a great alternative if you want to improve the quality of your electricity while still depending on the grid.

REFERENCES

[1]. Viswaprakash Babu, K. Shafeeque Ahmed, Y.Mohamed Shuaib, Manikandan M, “Power Quality Enhancement using Dynamic Voltage Restorer(DVR) Based Predictive Space Vector Transformation (PSVT) with Proportional Resonant (PR)-controller”, Published in **IEEE Access (IEEE – SCIE Indexed) (Impact Factor: 4.8, Q1 Journal)** Volume-9, November 2021 (*Digital Object Identifier 10.1109/ACCESS.2021.3129096*).

[2]. Viswaprakash Babu, K. Shafeeque Ahmed, Y.Mohamed Shuaib, Manikandan M, "A Novel Intrinsic Space Vector Transformation based Solar Fed Dynamic Voltage Restorer for Power Quality Improvement in Distribution System", **Journal of Ambient Intelligence and Humanized Computing, (Springer – SCIE Indexed) (Impact Factor: 7.104, Q1 Journal)** (https://doi.org/10.1007/s12652-020-02831-0).

[3].Viswaprakash Babu, S. SathikBasha, Y. Mohamed Shuaib, M. Manikandan , and Syed Enayathali, “An Novel Integration of Solar Fed Dynamic Voltage Restorer for Compensating Sag and Swell Voltage in Distribution System Using Enhanced Space Vector PWM (ESVPWM)”Universal Journal of Electrical and Electronic Engineering Vol.6, Issue.5, 2019.pp. 329 – 350. **(Indexed: SCOPUS, Impact factor: 0.44, Q4 Journal).**

[4].Viswaprakash Babu, K. Shafeeque Ahmed, Y.Mohamed Shuaib, Manikandan M, S.SathikBasha, "Voltage Sag/Swell Compensation Using Solar Photovoltaic Inverter based Dynamic Voltage Restorer (SPVI-DVR)**", Journal of Green Engineering (JGE)**, Volume-10, Issue-9, September 2020, pp. 7102-7114. **(SCOPUS Indexed) (Impact Factor: 1.0) (Impact factor: 0.55, Q3 Journal).**

[5]Viswaprakash Babu, K. Shafeeque Ahmed, Y.Mohamed Shuaib, Manikandan M, S.SathikBasha, "Cascaded Fuzzy Logic Control of PV Fed DVR for Power Distribution Systems**", Design Engineering** , Volume2021, Issue-8, November 2021, pp. 8890-8900. **(SCOPUS Indexed) (Impact Factor: 1.4, Q3 Journal).**

[6]. D. Carrington, "Date set for desert Earth," BBC News, 21 Feb 2000.

[7]. K. P. Schröder, R. C. Smith, "Distant future of the Sun and Earth," Revisited (Vol. 386(1)), 2008. (Monthly Notices of the Royal Astronomical Society. doi:10.1111/j.1365-2966.2008.13022.x.)

[8]. J. Palmer, "Hope dims that Earth will survive Sun's death. New Scientist", 2008.

[9]. A. S. Maiga, G. M. Chen, Q. Wang, J. Y. Xu, "Renewable energy options for a Sahel country: Mali. Renewable and Sustainable Energy Reviews", vol. 12, no. 2, pp. 564-574, Feb. 2008.

[10]. E. Demirok, D. Sera, P. Rodriguez, "Enhanced local grid voltage support method for high penetration of distributed generators", Proceedings of the 37th annual conference on IEEE Industrial Electronics Society (IECON'11), pp. 2481- 2485, Melbourne: IEEE, 2011.

[11]. P. Hammond, "USA Patent No. U.S. Patent 5 625 545," 1997.

[12]. A. Nabe, I. Takahashi, H. Akagi, "A new neutral point clamped PWM inverter", IEEE Industry Applications Socieyt Conference, pp. 761-76, 1980.

[13]. K. A. Corzine, M. W. Wielebski, F. Z. Peng, J. Wang, "Control of cascaded multilevel inverters", IEEE Transactions on Power Electronics, vol. 19, no. 3, pp. 732738, 2004.

[14]. F. Blaabjerg, R. Teodorescu, M. Liserre, A.V. Timbus, "Overview of control and grid synchronisation for distributed power generation systems", IEEE Transactions on Industrial Electronics, pp. 53, no. 5, pp. 1398-1409, 2006.

[15]. J. M. Carrasco, L. G. Franquelo, J. T. Bialasiewicz, E. Galvan, R. C. P. Guisado, M. A. M. Prats, J. I. Leo´n, N. M. Alfonso, "Power electronic systems for the grid integration of renewable energy sources: A survey", IEEE Transactions on Industrial Electronics, vol. 53, no. 4, pp. 1002-1016, 2006.

[16]. S. A. Dahidah, V. G. Agelidis, "Selective harmonics elimination PWM control for cascaded multilevel voltage source converters: A generalised formula", IEEE Transactions on Power Electronics, vol. 23, no. 4, pp. 1620-1630, 2008.

[17]. S. Mekhilef, N. Mohamad, A. Kadir, "Voltage control of threestage hybrid multilevel inverter using vector transformation", IEEE Transactions on Power Electronics, vol. 25, no. 10, pp. 2599-2606, 2010.

[18]. E. Babaei, "A cascade multilevel converter topology with a reduced number of switches:, IEEE Transactions on Power Electronics, vol. 23, no. 6, pp. 2657-2664, 2008.

[19]. S. Daher, J. Schmid, F. Antunes, "Multilevel inverter topologies for standalone PV systems", IEEE Transactions on Industrial Electronics, vol. 55, no. 7, pp. 2703-2712, 2008.

[20]. H. Abu-Rub, J. Holtz, J. Rodriguez, G. Baoming, "Medium-voltage multilevel converter - state of the art, challenges, and requirements in industrial applications", IEEE Transactions on Industrial Electronics, vol. 57, no. 8, pp. 2581-2596, 2010.

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