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Performance Enhancement of a Grid Connected DFIG system Based on STATCOM and PID Controller

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Abstract: In this paper, the relation of electricity production to electricity will affect the quality and reliability of the system. The effects of wind turbines on the quality of electricity in the system are high power, active power, volume change, flicker, harmonics, and power consumption in rotation, which all are measured in accordance with national and international standards. The findings of this paper prove the problem of electrical quality resulting from the installation of a turbine with a power supply. Through MATLAB / SIMULINK, control measures have been proposed to alleviate the problem of electrical quality based on the corners that are connected to STATCOM and PID controller

Key Words–PID, DFIG, statcom, DFIG,controller ,bidirectional inverter

I INTRODUCTION

Increasing concerns over the limited oil reserves and reducing carbon emissions have stimulated the development of renewable energy industries. Especially in recent years, thanks to clean energy and economies, the energy sector has experienced a huge surge. For example, in the European group, about 23.85GW of electricity in 2008 came from a turbine (WTG) generator. Because induction generators are the main source of energy, they are connected to the turbine to produce electricity, so in order to maintain a stable voltage, the reactive power must be compensated. It is not easy to integrate energy into a power system on such a large scale. Power systems and functions are related to conventional power plants. In traditional plants, the generator is directly assembled into a container. Wind power plants have different characteristics than conventional power plants. Therefore, due to its inherent inefficiencies, it has an impact on power generation and stability. Therefore, the transmission system operator (TSO) is forced to set new requirements for the turbine generator interaction in the corner. In this way, the TSO attempts to integrate renewable energy into the system, and all the measures necessary to maintain stability can still be applied to satisfactory levels. On the other hand, some tools such as FACTS have been developed to control the heart and improve energy efficiency. Resistance is an important part of integrating FACTS tools. Therefore, one of the current concerns is the use of FACTS tools to improve the operation of farms and livestock and electricity.

Static Synchronous Compensator (Statcom):

STATCOM is a related reactive power compensation device. Manufacturers can generate and / or receive reactive power, and their output can be modified to control specific markers of the power system. Generally, it is a solid transmitter that can generate or criticize the independent, active energy at the end when it is supplied from a power source or energy storage device in the access territory. STATCOM is a leading source of liquid money. When fed from DC supply channels, there will be a series of three-phase AC output with associated AC system volumes. 'that. By a small amount of emotion (provided by the extraction of a good interface coil or an amplifier). The DC power supply is supplied by the power supply voltage regulator. STATCOM can improve the operation of the power system, such as motion control of the transmission system and distribution, power supply control of the transmission system, volume control. -something permanent, etc. It is required not only

to control the DC power supply, but also the moving power and (if necessary) the power in the connection line. In addition, the functionality of STATCOM is as follows: there is little time as it replaces the components of a pacemaker with compact electronic converters, it provides manufacturing equipment for manufacturing companies, and this reduces the labor market scary places and times; 3. Use the built-in electronic transformers to reduce their environmental impact. statcom is similar to a compatible motorcycle and produces three sinusoidal cables that can be matched to the base frequency, and the cables and cables can be controlled. This ideal motor is unstable, almost instantaneous, does not make any changes to existing systems, and can produce reactive (capacitive and inductive) power within it.

Wind Energy Generating: The principle of operation of a wind turbine system involves the following conversion: the rotor absorbs kinetic energy from the wind, causing the production of electricity, which converts to electrical energy and feeds into the tank. There are currently three types of turbines. They are a breeder of farm equipment

- Doubly fed induction generator
- Direct-drive synchronous generator.

The first is the simplest and oldest system, consisting of traditional direct-drive boxes with an inverter-induction chassis manufacturer. The distance between the lamp and the speed of the rotor produced varies with the amount of electricity produced. The speed of the rotor varies slightly, around 1% to 2%, so a regular turbine is often called. The other two energy systems are the speed system. In the dual feed induction generator, the back-to-back power supply feeds the three-step rotor pump, thus breaking down the mechanical rotor frequency and speed. electric rotor, and the reduction of the stateral voltage and the speed of the rotor can be compared to the mechanical speed of the rotor. In the direct communication manufacturer, because one transmitter is connected to the stator amplifier and the other transmitter is connected to the aluminum, the generator is completely separated by electronic. Therefore, the total wind power is transmitted through the HVDC link.

DOUBLY-FED induction generator (DFIG):

With many advantages, it is the most common wind turbine today. One of the benefits is that it is more efficient than a direct-drive electric system with a full power converter because only 20% of the power goes through the power converter, and the rest goes on a stator without an electric current. Another advantage of the double air force is the ability to develop active and dynamic forces to achieve better integration [1]. However, through direct coupling of stator reinforcement to the refrigerator, DFIG air is sensitive to storage failure. In addition, energy consumption is a constant type of energy, which means that due to the constant nature of the wind, the output of OWF varies in some areas. Therefore, when the wind forces combine with the electrical system, the operating system's position will change from time to time. A number of published papers discuss how to reduce the negative impact of electrical energy on DFIG-based wind farms [2] - [6]. In [2], a DFIG-based OWF is proposed, which is connected to the line by means of a high-voltage direct current (HVDC) commutation via a hydraulic conductor HVDC link adjusters, giving damping sufficient power for storage. The OWF is subject to air speeds and various interference conditions. However, this control strategy can be applied to systems with long distances from the OWF to the marine light bulbs. In [3], a modified conversion converter (VFT) is designed to soften the output power produced by the OWF sent to the database and to improve the transmission of the OWF. However, these papers are more likely to run out of power supply than the actual electricity.

II RELATED WORK

Due to the limitations of conventional energy sources, wind energy continues to grow in the field of research as one of the renewable energy sources. However, optimizing the energy flow rate has

become a major issue. Different methods are used to alleviate this situation. In this study, the accuracy of grid-based farms was improved by reducing the volume reduction and using a static signal amplifier (STATCOM). in order to obtain practical results. A control panel with a PID controller was used to control STATCOM. Pulse block method (PWM) was used as a STATCOM strategy. During the change in wind speed, different methods were developed (i.e., wind farms with capacitor banks and STATCOM or using STATCOM with proportional interest rate interchange (PID) intermediaries).) for various studies on the stability of wind farms. Comparison of the results shows that STATCOM with PID inhibitors has good performance and high stability. In power systems, even if all the faults are cleared, they cause some oscillation. These oscillations are called low frequency oscillations (LFOs). In this regard, the design of the damping controller is essential for a series or similar series. When properly designed, they can significantly improve the stability of the power system [6-8]. For that matter. The literature [6] proposed a Var statistical compensator (SVC) control system to improve the voltage drop of faults within a single power system connected to an infinite drive. due to the presence of wind farms. The method used for the construction of SVC control is based on adaptive fuzzy network networks. In a similar vein, the findings in 7 [8, 8] have shaped the STATCOM monitoring of single-engine and multi-machine systems. It should be noted that the manufacturer is intended for FACTS equipment only, and there are no controllers that are configured for the air sector transformers. In order to achieve a reliable output in the power system, in addition to using FACTS devices, you need to configure the control of the grid-side (GSC) and rotor-side (RSC). One of the techniques used to reduce LFO in DFIG is to restore the power of the converter and reactive power. The integration of this control is called the power stabilizer (PSS), which is the power of the transmission line [9]. The key point of this work is to apply PSS to induction manufacturers and use a fuzzy system to adjust their appearance. In [10], an extensive damping design is applied to reduce the LFO. As a result of the use of these control strategies not considered in the above study, it is also possible that the firing of the turbine and the unsteady operation of the wind turbine pump system may also occur. Renewable energy is used in energy distribution systems to improve power outages.

III LITERATURE REVIEW

ArashAsrariet.al. to reduce the issue of electrical quality related to power distribution systems, a Pareto-based metaheuristic approach was developed. The application of multiple-purpose applications has been tested on bus systems 69. In the resulting section, substantial improvements have been made to reduce circulation and reduce system under observation.

Chandan Kumar et. al The limitations of current monitoring and monitoring of the statutory compensation bill are discussed. It has been tested and determined that the current control method is not suitable for increasing the volume of the wire. Instead, the volume control method was developed as a DSTATCOM monitoring mechanism, and the operation was validated. Simulation analysis results show that section statistical responders reduce leakage to the compressor and power supply.

Sabha Raj Arya et.al. A new control method for the regenerator with biogas / biomass diesel engine has been released. The statistical compensator allocated to the neural network is used to reduce the load sensing of the output current without controlling the volume. The current sowing that is measured by the proposed method is considered as a manipulation of the subject matter. The simulation results show that the overall result is much improved. Consistent tools and equipment are the cause of quality issues in power systems,

analysed bySrinivas et.al.The zonal statistics compensator is used as a compensation tool, and the lowest terms in the square and the lowest

squares in the control algorithm are combined. The Matlab-based Sim Power System box is used to produce the current transport with high power and reactive power. The algorithm controls the compensation mechanism by minimizing the error detection. The release of the system has been found to be satisfactory and the current supply of electricity has decreased. Statistical compensators designed for battery storage have been used to improve the quality of wind power systems [33]. DSTATCOM investigated and adjusted the load and uncertainty of the load. In theory 34, a revised design of a quality pilot with a variety of modifiers was proposed to alleviate the quality issues caused by the four-phase cable distribution system with two shepherds. The three-bulb headlight connected to the power distribution system is used to solve the volcanic volume and the linear and non-linear damage problems. Fuzzy logic technology is a technology to improve the response of DC bus pilots. The results analysis proves the effectiveness of the proposed technology.

F.H. Zadeh and M.R. Naseh et al. There is a significant decline in development for the three-wire system. Due to non-linear loads, the energy sector is affected. The distribution of electricity and the production of coal in the industry of wind turbine systems are responsible for generating harm. Therefore, the use of UPQC improves the implementation of negative reduction. R.A.J. Amalorpavaraj et al. He proposed the development of a systematic study to improve sensitivity and quality. [36]. Due to the changes in the volume of the rms, the inertia of the wind can result in a reduction in wind speed and extension. The active flow regulator regulates the flow volume at the end of the wind. Here, the payment of the injection volume is achieved through the PWM-based signal processing.

IV PROPOSED SYSTEM

Electricity generation, power transfer, and the latest distribution of electricity meters are some of the steps taken in the electricity industry. Energy quality is an important factor that reflects the power situation. Due to changes in the behavior of electricity generation in the air system, serious quality issues may arise. In this paper, the control strategy is used to design and analyze the volume control, damage disassembly, and power efficiency by providing static amplification for propagation. In some unforeseen circumstances, the supply is provided by additional equipment (such as a power distribution system integrated into a power system). In recent years, non-stationary energy sources such as solar energy and solar systems have been integrated into power systems. With these resources, the demand for energy efficiency systems in the world is increasing. One of the reasons for the increased efficiency is to satisfy renewable energy systems is to reduce the use of fossil fuels, reduce costs and reduce greenhouse gas emissions [37]. The energy system is integrated into the power distribution system for continuous electricity. Similarly, one of the power distribution systems is the power supply system. While the introduction of wind power systems improves electricity supply, it also brings with it new problems, namely lower quality. Likewise, due to the wind blowing, the energy column also escaped. Results of Modification and Discussion The proposed control plan was developed using SIMULINK in the system modules. The table gives the system mark for the given system. The implementation of the proposed system architecture under dynamic conditions is also provided. The three stages that STATCOM calls into the tank will eliminate the disruption caused by off-line loads and wind turbines. The three-step inverter based on the IGBT is connected to the grid via a converter. The demand curve of the pipeline transfer pipeline was calculated in the hysteresis unit of 0.08. The choice of the enhanced hysteresis band transducer in the system can improve the currentquality and provide a control signal for the corresponding reduction in their operating unit.

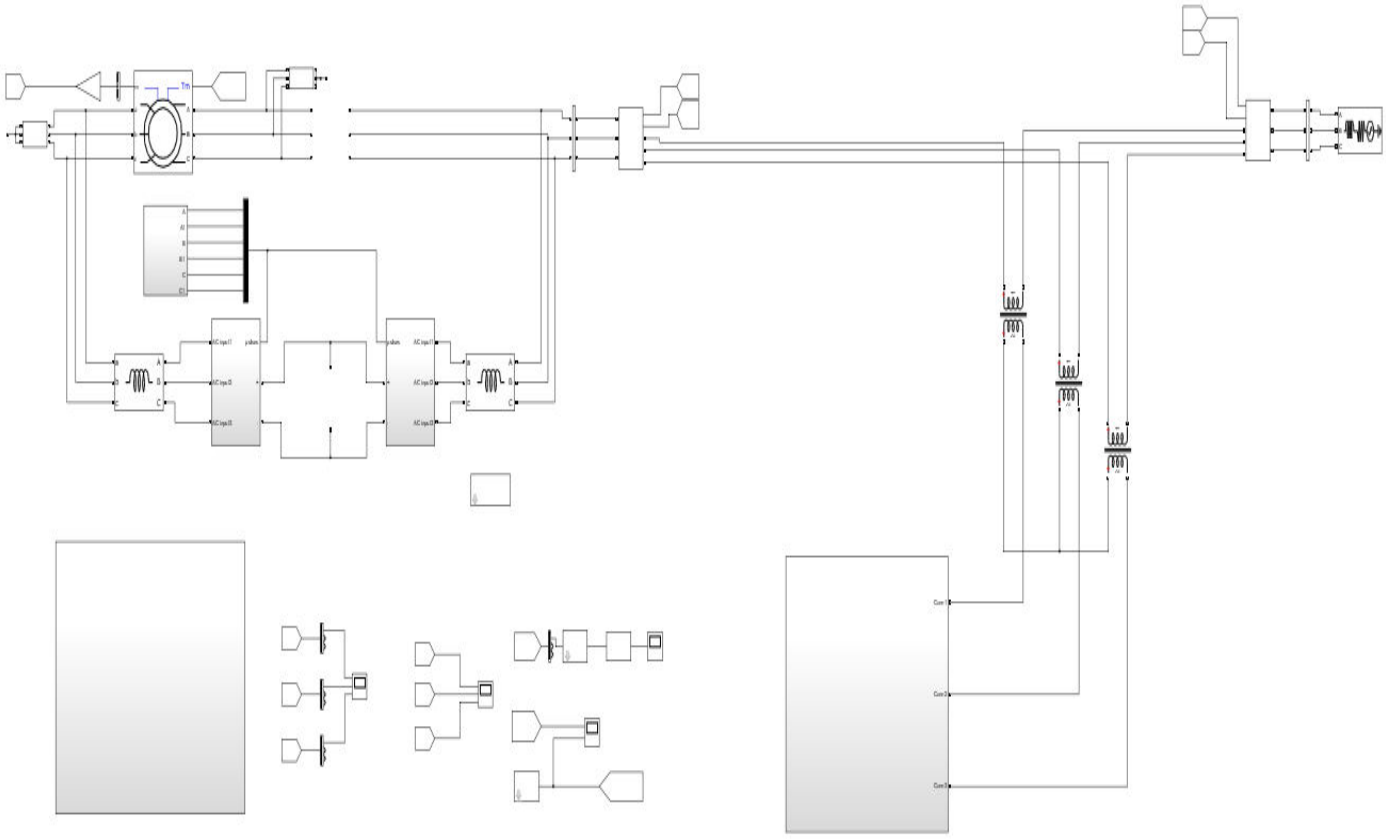

Fig. 1 Proposed system model

In this paper, the bill control system can be used for PID manufacturers and other non-PID control systems. Without the control of the PID, there will be a reduction in the bill and the system will be unstable. But using a PID controller, the volume reduction is small and the output required can be adjusted. This can provide better performance and strengthen the system.

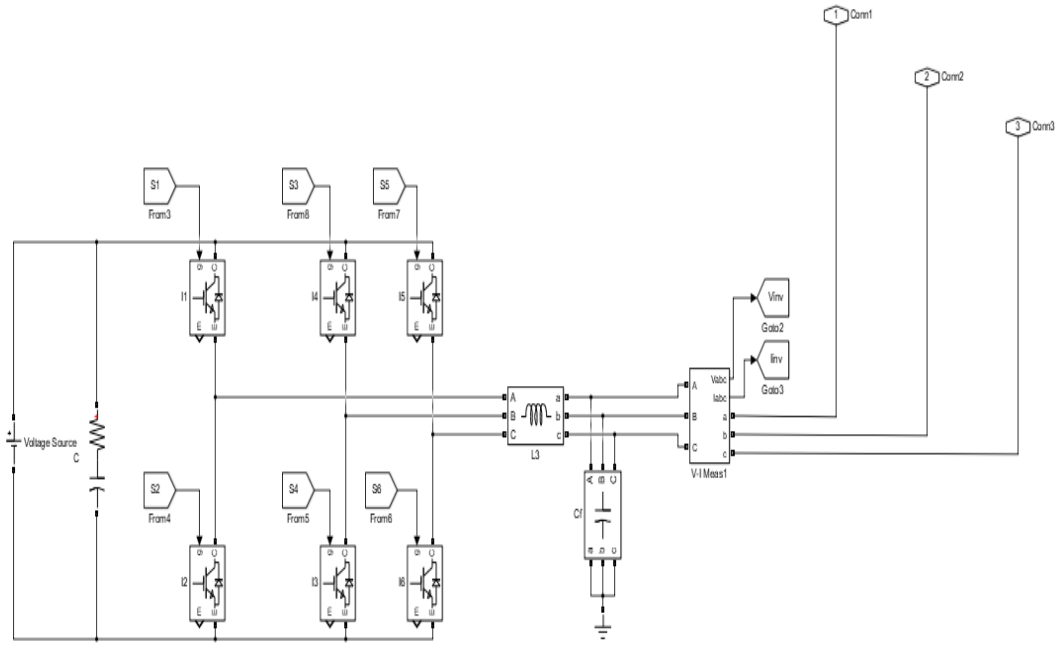

Fig. 4. Proposed control scheme with STATCOM

The DC bus current and current through the capacitor are shown in Figure 6. Current power cable and PCC are shown in Figure 5. Current source, current supply, engineer engine inverter and wind turbine production are shown in Figure 5.

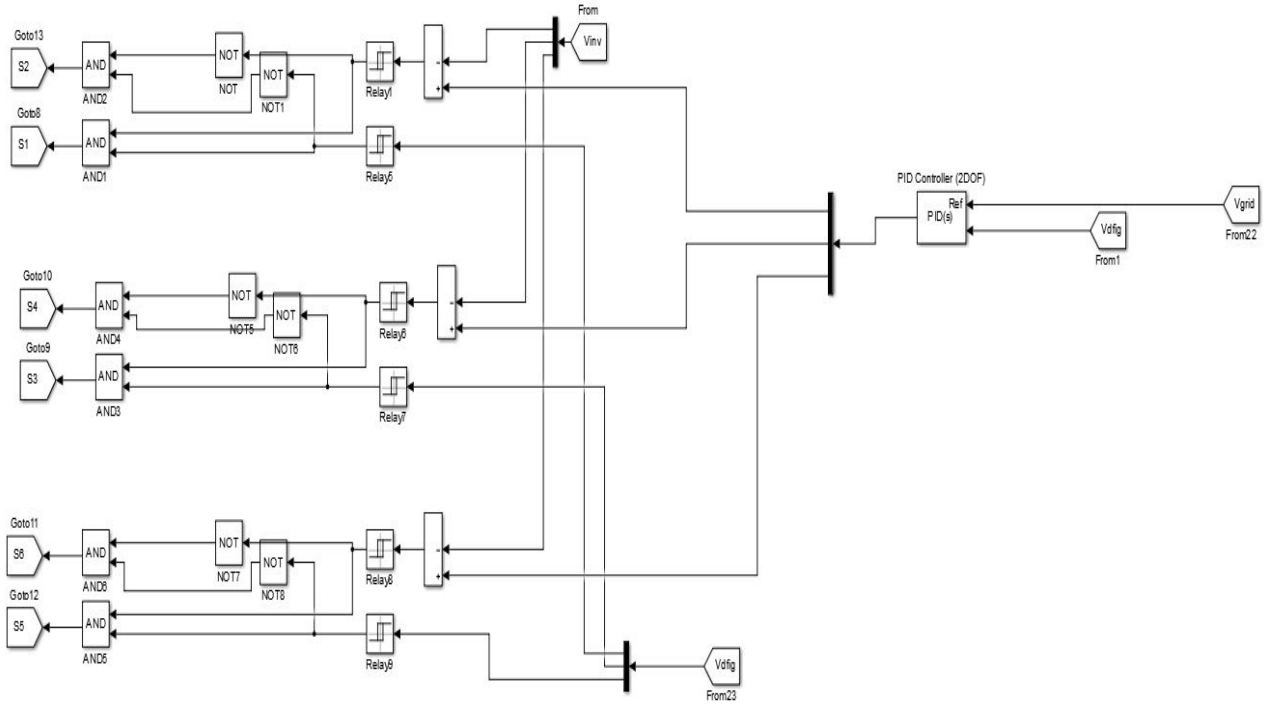

Fig. 5 control scheme

Proportional-integral-derivative controller (PID controller) is a system-based control system designed primarily for industrial purposes. And a permanent change control system.

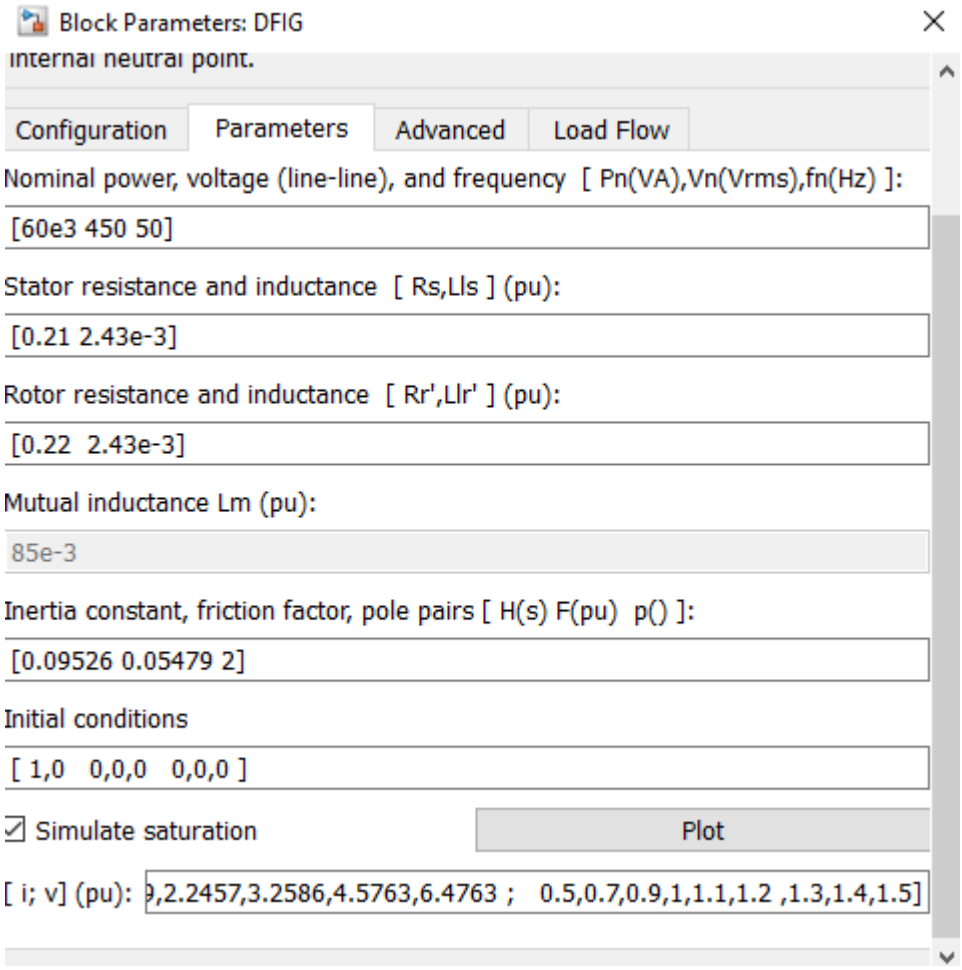

Fig. 6 DFIG parameters

Control Strategies of STATCOM: The strategy of STATCOM depends on the principle of vector control . It is connected to a three-phase process. When generating a power source converter for a DC voltage regulator, to reduce losses, the DC bus voltage can be controlled by adjusting the output voltage of the transformer cable. . The flow rate can be controlled by the current quadrature distribution of the transformer to coordinate the propagation of reactive power from STATCOM to the grid . As for the average power of the airway to the point of contact, the most severe condition depends on the operation conditions .This article discusses two control strategies. One is a volume control system via PID control; the other is a width control.

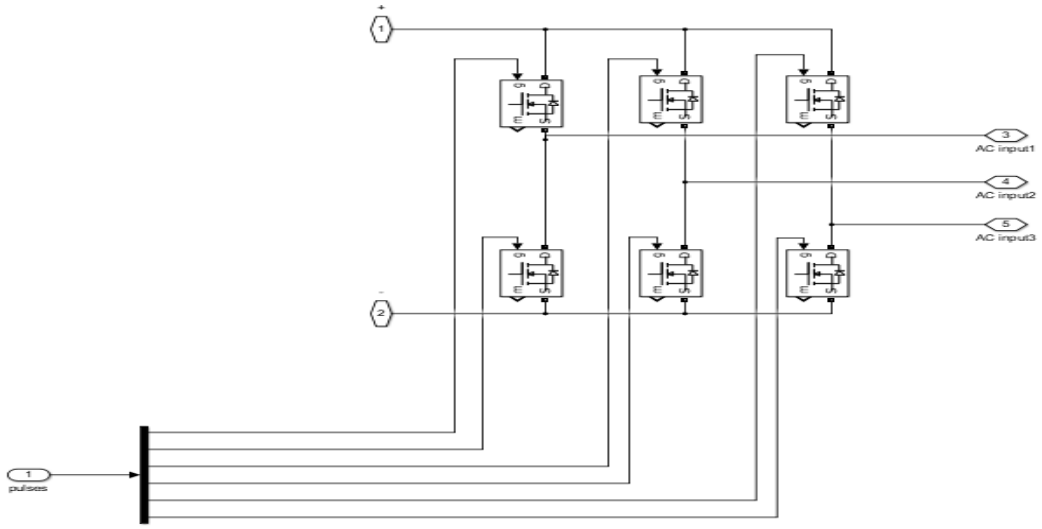

Fig 7 bidectional inverter

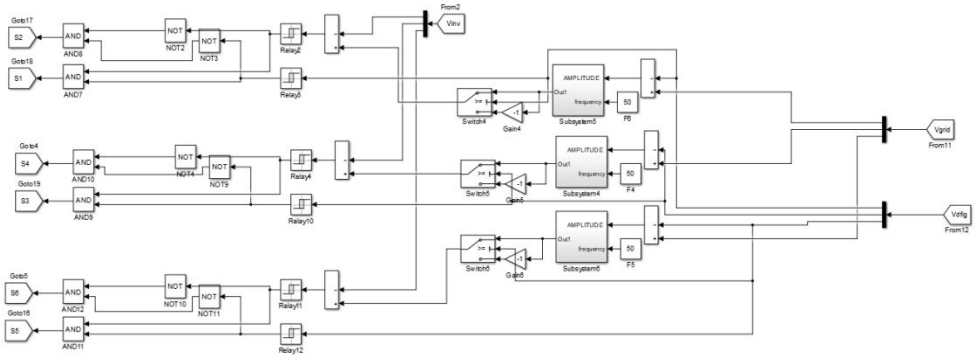

Fig.8 without PID control scheme

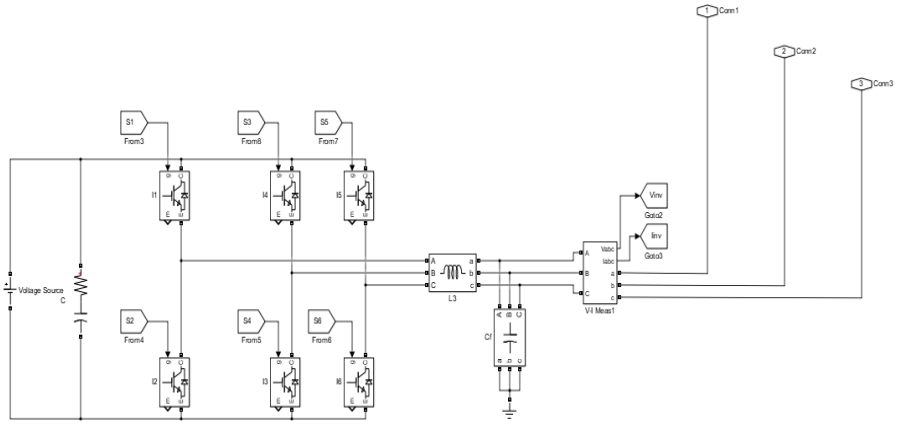

Fig 9 statcom without PID CONTROLLER

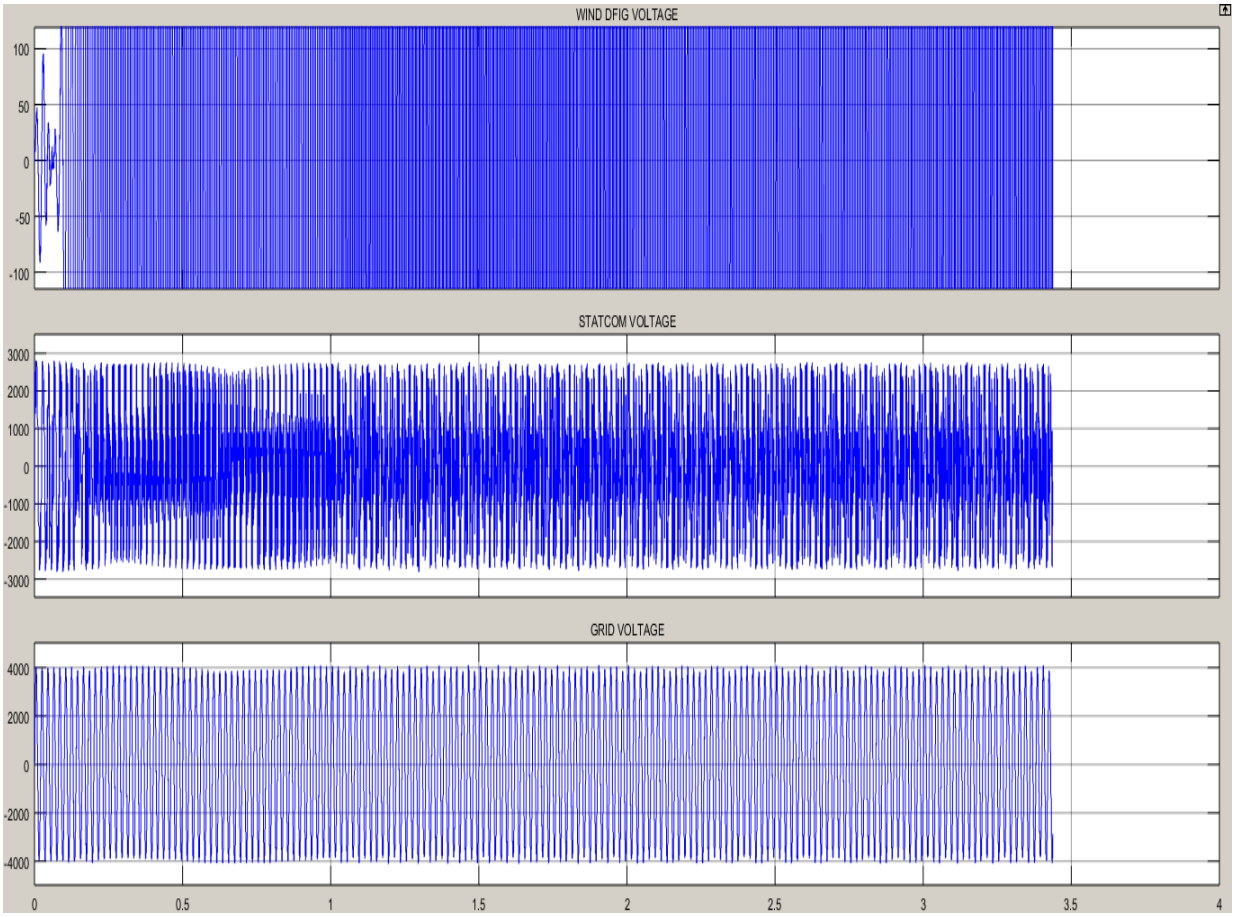

Fig 10 Wind voltage and grid voltage and STATCOM voltage without PID

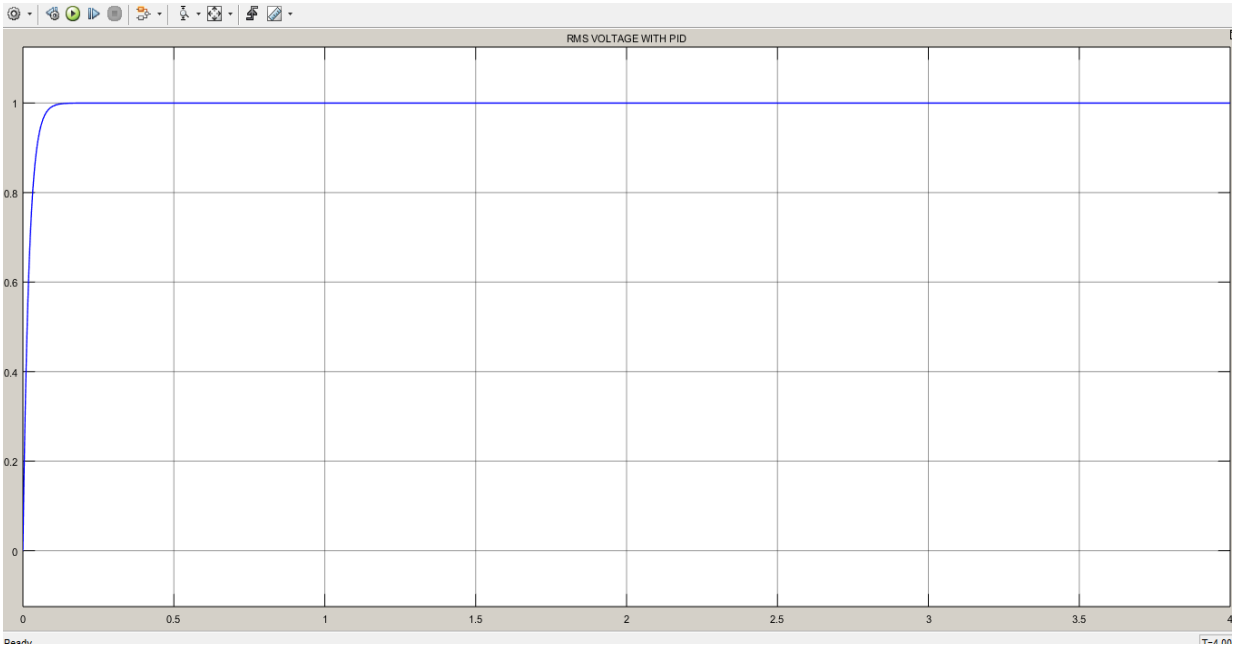

Fig.11 RMS voltage with PID

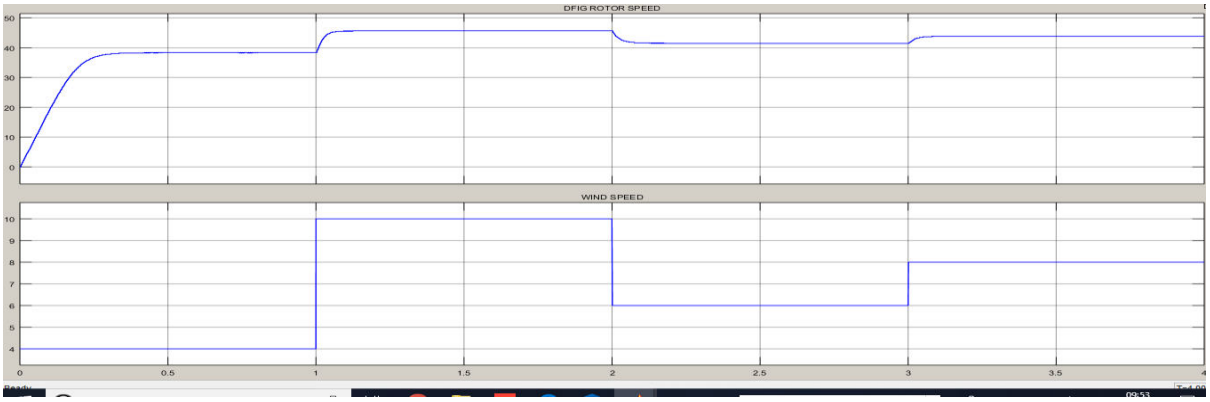

Fig .12 Wind Speed AND DFIG speed with PID

Fig 13 TERMINAL VOLTAGE

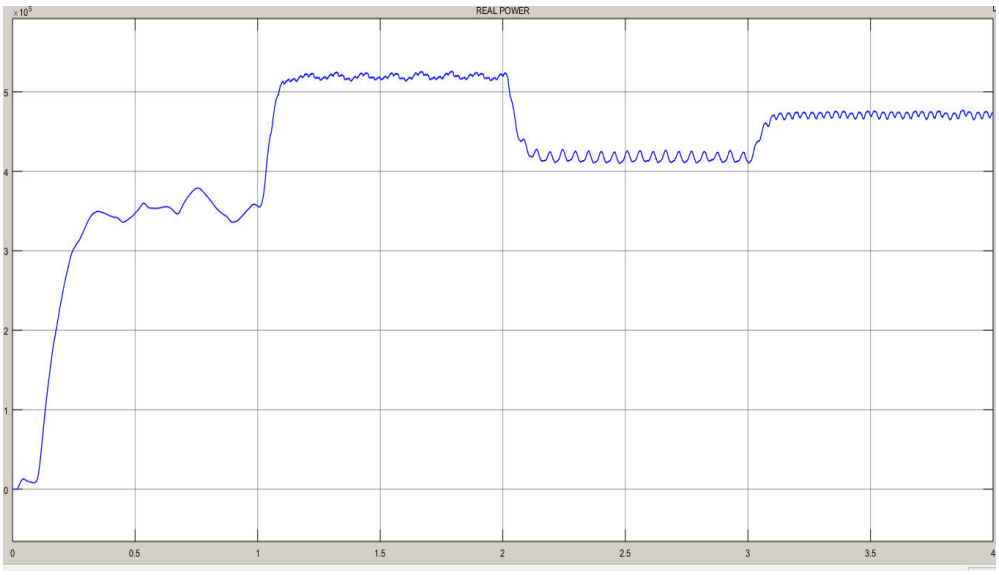

Fig.14 Real Power

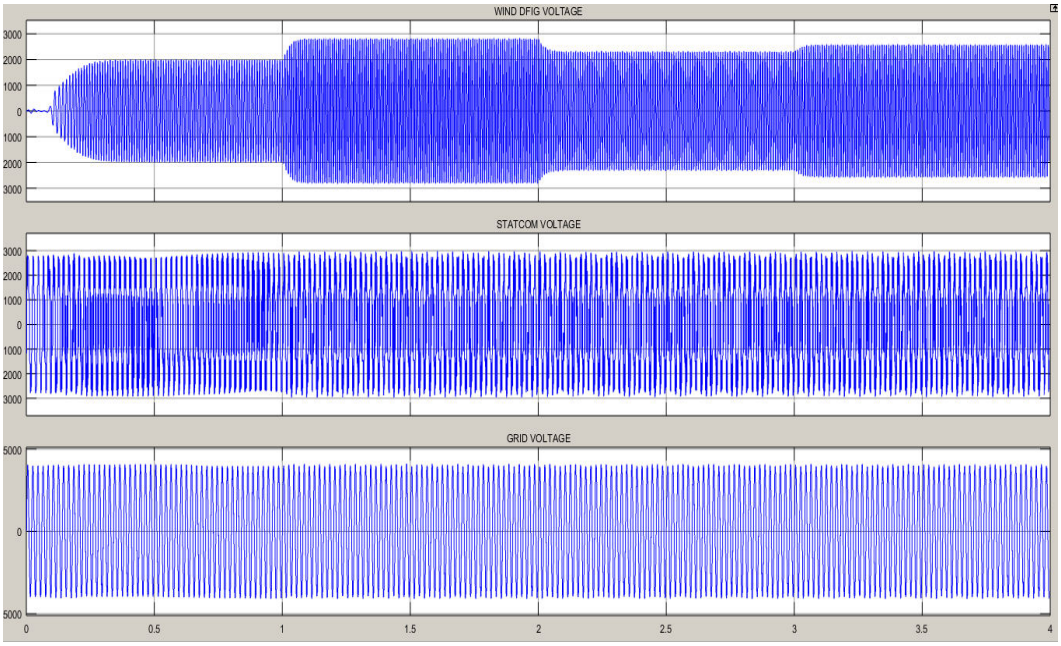

Fig 15 Wind voltage and grid voltage and STATCOM voltage without PID

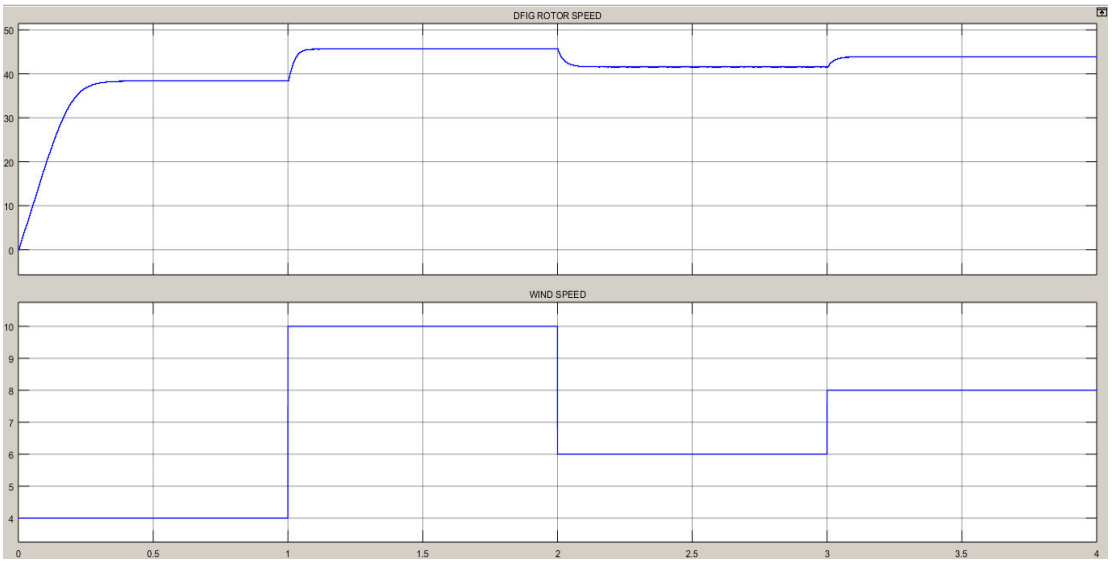

Fig. 16 Wind Speed Without PID

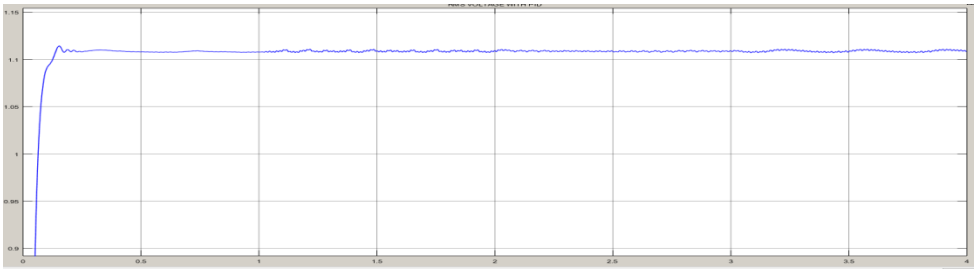

Fig.17 RMS Voltage without PID

V CONCLUSION

This paper investigates the causes of energy conversion quality issues [16], and proposes the implementation of appropriate control strategies for improving the quality of mixed conversion systems. It is capable of maintaining current and current power supply, and provides an opportunity for improved rates. Use of the transmission line. The results show that STATCOM is more efficient in optimizing the RMS voltage and terminal strength of the capacitor bank. STATCOM and PID controller are capable of optimizing the voltage field more efficiently than the capacitor Electricity production is accomplished by providing reactive power to the atmosphere. Therefore, the STATCOM system is more efficient. Finally, through STATCOM and PID monitoring to mitigate traffic volatility and achieve robust results, improved grid-based farms can be improved.

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