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Mitigation of Reactive Power Control of Renewable Wind Energy Source Using Reactive Power Control Device

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ABSTRACT

In this theory we propose the outline and control calculation to enhance the force solidness for Wind Energy System. Among the different framework, we have considered the transmission framework, which is a completely submerged framework. For taking care of the concerned issues in vitality ,it is important to examine the force change event. The static synchronous compensator (STATCOM) which depends on the adaptable transmission frameworks (FACTS) can possibly keep up those troubles. So as to outline a practical hearty controller, the nonlinear frameworks are changed over to the frameworks, which are utilized as an essential casing work to blend the fluffy controller. Reenactment results for concerned framework are shown to envision theplausibility of the proposed technique. The framework is demonstrated and mimicked utilizing MATLAB/SIMULINK. This paper displays there enacted framework for the receptive force change of wind vitality utilizing STATCOM.

Key words: Wind Energy, Power Quality, Statcom, Reactive power

1. INTRODUCTION

Background

Wind energy has been used for thousands of years for milling grain, pumping water and other mechanical power applications. Wind power is not a new concept. The fist accepted establishment of the use of windmills was in the tenth century in Persia [1]. Today, there are several hundred thousand windmills in operation around the world. Modern windmills tend to be called wind turbines partly because of their functional similarity to the steam and gas turbines and partly to distinguish them from their traditional forbears [2]. Wind energy was the fastest growing energy technology in the 1990s, in terms of percentage of yearly growth of installed capacity per technology source. The growth of wind energy, however, is not evenly distributed around the world. By the end of 1999, around 69% of the worldwide wind energy capacity was installed in Europe, a further 19% in North America and 10% in Asia and the Pacific [3]. Wind energy is expected to play an increasingly important role in the future national energy scene [4, 5]. Wind turbines convert the kinetic energy of the wind to electrical energy by rotating the blades. Greenpeace states that about 10% of electricity can be supplied by the wind by the year 2020 [6]. Cost of wind turbines In the 1990s, the cost for manufacturing wind turbines declined by about 20% every time the number of manufactured wind turbines doubled. Currently, the production of large-scale, grid- connected wind turbines doubles almost every 3 years. A similar cost reduction was achieved during the first years of oil exploitation about 100 years ago. The Danish Energy Agency predicts that a further cost reduction of 50% can be achieved until 2020, and the EU Commission estimates in its White Book that energy cost from wind power will be reduced by at least 30% between 1998 and 2010 [8].

2. REACTIVE POWER SUPPORT FROM STATCOM

The measure of receptive force supplied by any repaying gadget relies on upon the voltage drop at the transport and its abilities. For instance, a STATCOM can supply its most extreme evaluated remunerating current even at lower voltages. The rating of the STATCOM additionally chooses the greatest receptive force that can be supplied, yet typically they have some additional ability called the transient capacity which is accessible to the framework for a brief timeframe. The receptive force supplied is likewise reliant on the prompt responsive force sources in the framework. The extent of the wind turbine and the synchronous machine likewise impacts on the responsive force capacity.

3. INTRODUCTION TO SIMPOWER SYSTEMS & IMPLEMENTATION:

Sim Power Systems and different results of the Physical Modeling item family cooperate with Simulink to demonstrate electrical, mechanical, and control frameworks Sim Power Systems works in the Simulink environment. Power frameworks are mixes of electrical circuits and electromechanical gadgets like engines and generators. Engineers working in this order are continually enhancing the execution of the frameworks. Necessities for definitely expanded productivity have constrained force framework fashioners to utilize power electronic gadgets and refined control framework ideas that assessment customary examination apparatuses and procedures. Further confusing the investigator's part is the way that the framework is frequently so nonlinear that the best way to comprehend it is through reenactment. Land-based force era from hydroelectric, steam, or different gadgets is by all account not the only utilization of force frameworks. A typical characteristic of these frameworks is their utilization of force gadgets and control frameworks to accomplish their execution destinations Sim Power Systems is an advanced configuration instrument that permits researchers and specialists to quickly and effectively assemble models that mimic force frameworks. Sim Power Systems utilizes the Simulink environment, permitting you to construct a model utilizing basic snap and drag techniques. Not just would you be able to draw the circuit topology quickly, yet your investigation of the associations with mechanical, warm, control, and different orders. This is conceivable in light of the fact that all the electrical parts of the recreation cooperate with the broad Simulink demonstrating library. Sim Power Systems and Sim Mechanics share an exceptional Physical Modeling square and association line interface.

SYSTEM DATA

I visited wind mill Dewas situated at Jamgodrani Hills Under & Installed by Geotz Financial Service Pvt Ltd, NewDelhi. All the data Parameter provided by the Wind Mill Jamgodrani hills Deaws M.P. India.

Generating Power 11kv
System nominal voltage and frequencyVrms L-L, f(Hz)[33e3, 50]
Converter rating (VA): 3e6
Nominal wind turbine mechanical outputpower : 2*1.5e6+1.5MW+1.25MW
Base wind speed (m/s): 3
Maximum power at base wind speed (puof nominal mechanical power) =1
Baserotational speed (pu ofbasegenerator speed) = 1
Maximum pitch angle (deg) =25 Maximum rate of change of pitch angle(deg/s):=2
Nom. power, L-L volt. And freq.: [Pn (VA),Vn (Vrms), fn (Hz)] [2*1.5e6/0.9 11kv 50]
Stator [Rs,Lls] (pu): [0.005325 0.2316]
Rotor [Rr',Llr'] (p.u.):[0.003312 0.2211]
inertia constant, friction factor, andpairs of poles: [H(s) F(pu) p] [6.00 0.01 3]
Statcom Control : 3.606 Mvar
Line section length (km):11, Wind LineDistance 3Km
Transformer5MVA11kv/33kv,33kv,0.020/30, 0.020 & 11kv 0.020/30,0.020

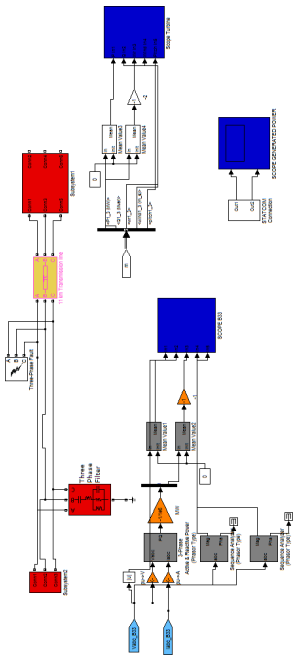


Fig.1 Wind System Without Use Statcom

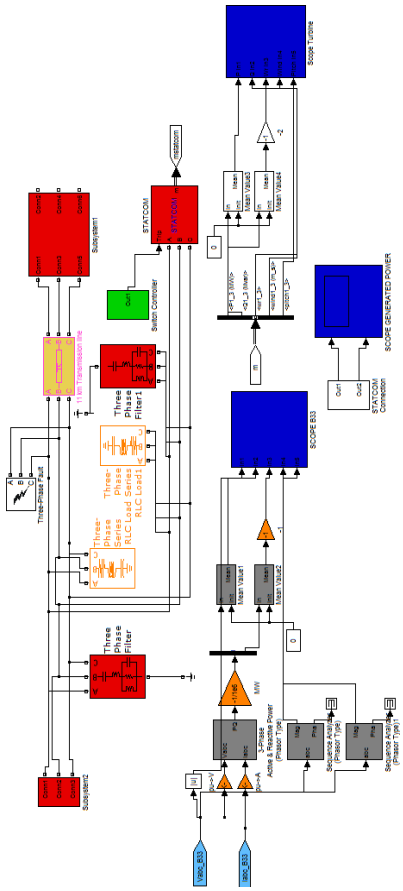


Fig.2 Wind System With Use Statcom

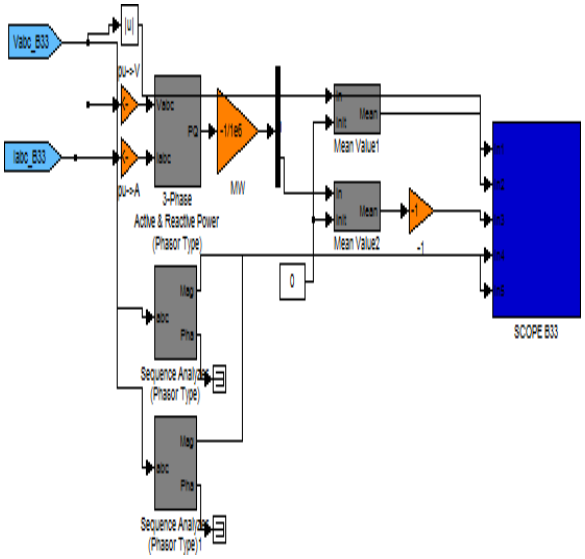


FIG 3.BUS 33 TRANSMISSION OUTPUT

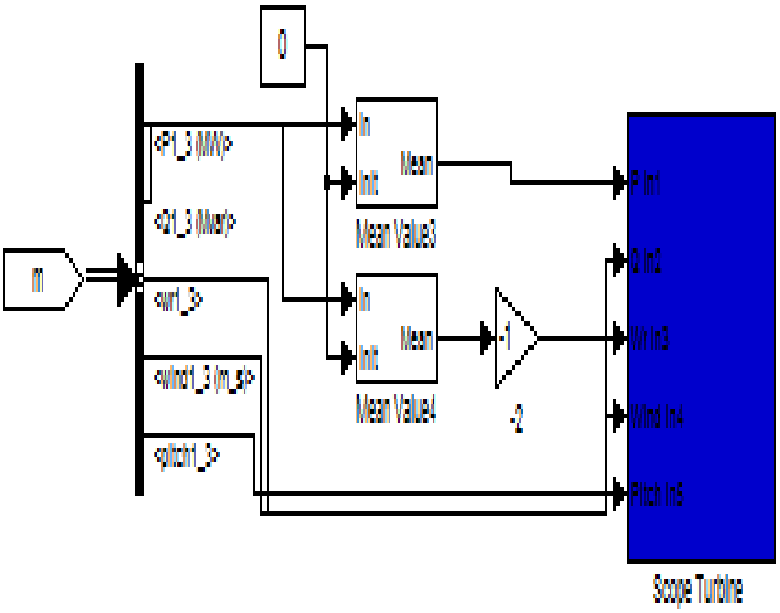


FIG 4.WIND TURBINE OUTPUT

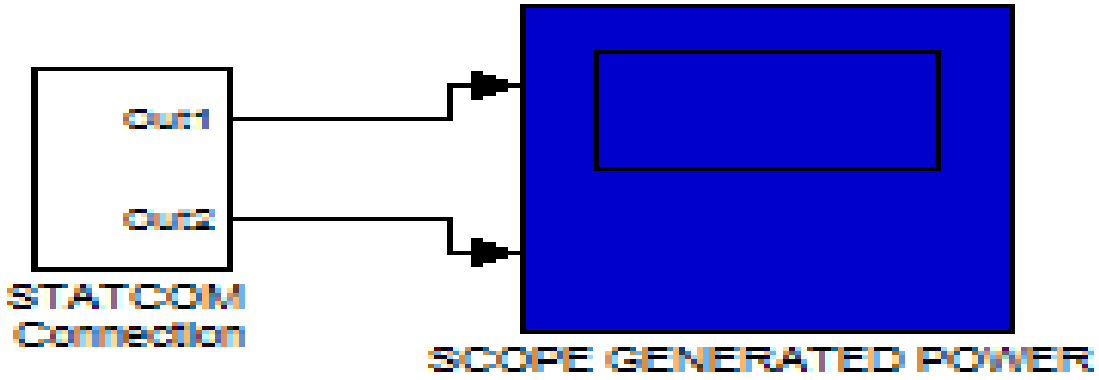


FIG 5. FACTS DEVICE INCORPORATED OUTPUT

4.SIMULATIONS AND RESULT

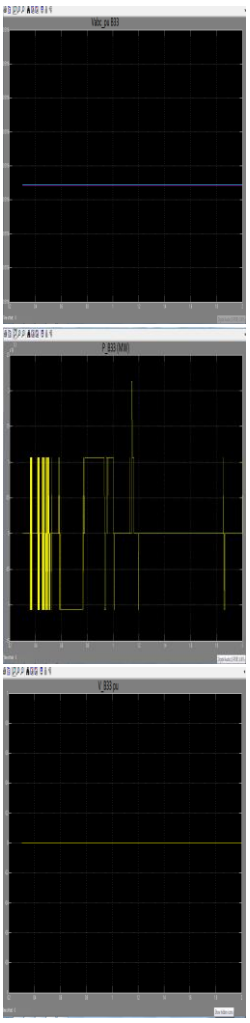
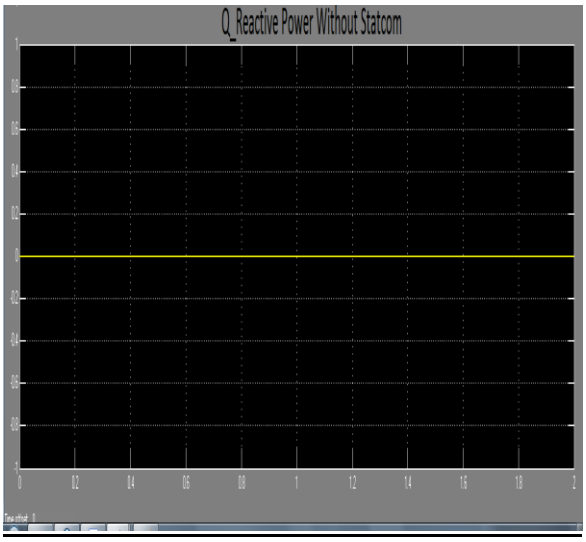


FIG 6. OUTPUT VOLTAGE OF BUS BAR WHIT OUT STATCOM IN WIND SYSTEM



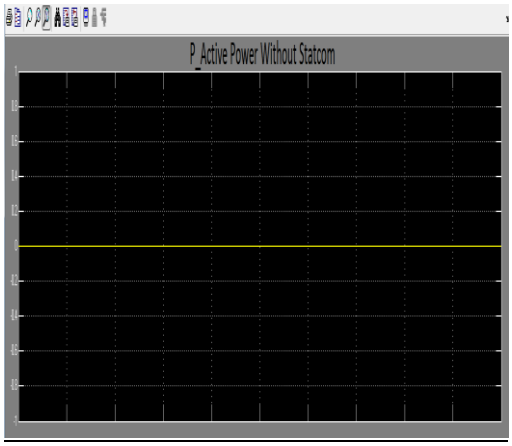


FIG 7. OUTPUT POWER WITHOUT STATCOM IN WIND SYSTEM (ACTIVE AND REACTIVE POWER)

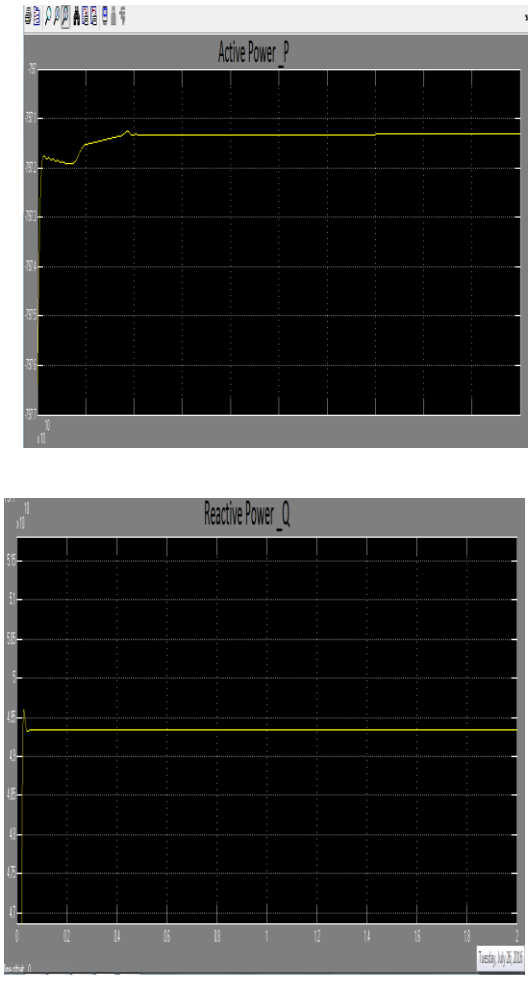


FIG 8 OUTPUT POWER WITH STATCOM IN WIND SYSTEM (ACTIVE AND REACTIVE POWER)

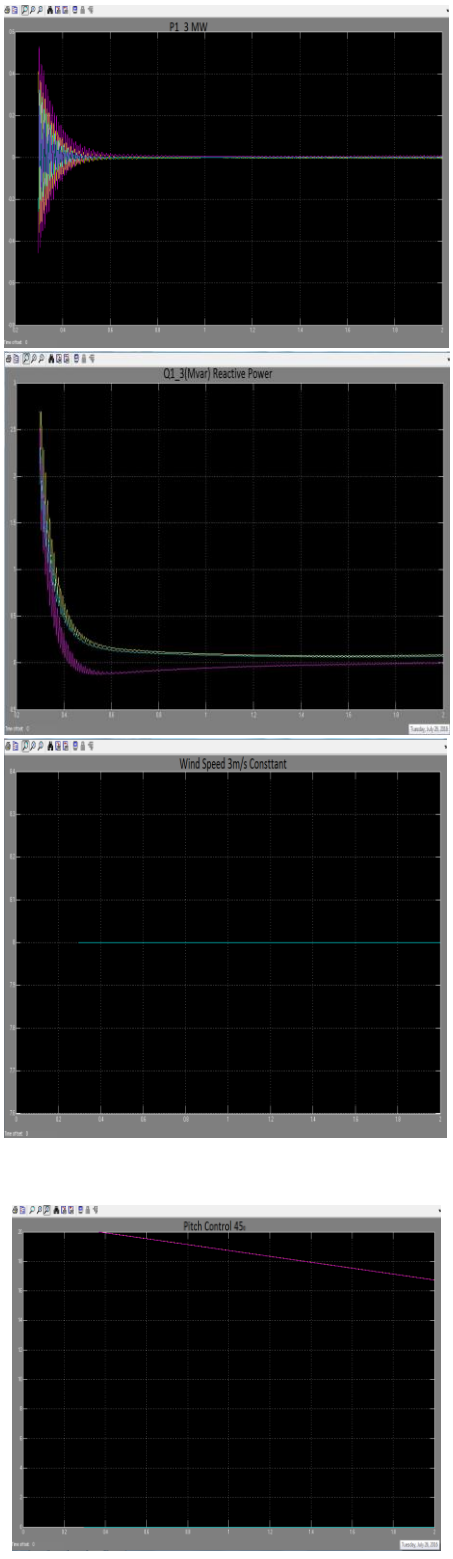


FIG 9. OUTPUT POWER WITH STATCOM IN WIND SYSTEM

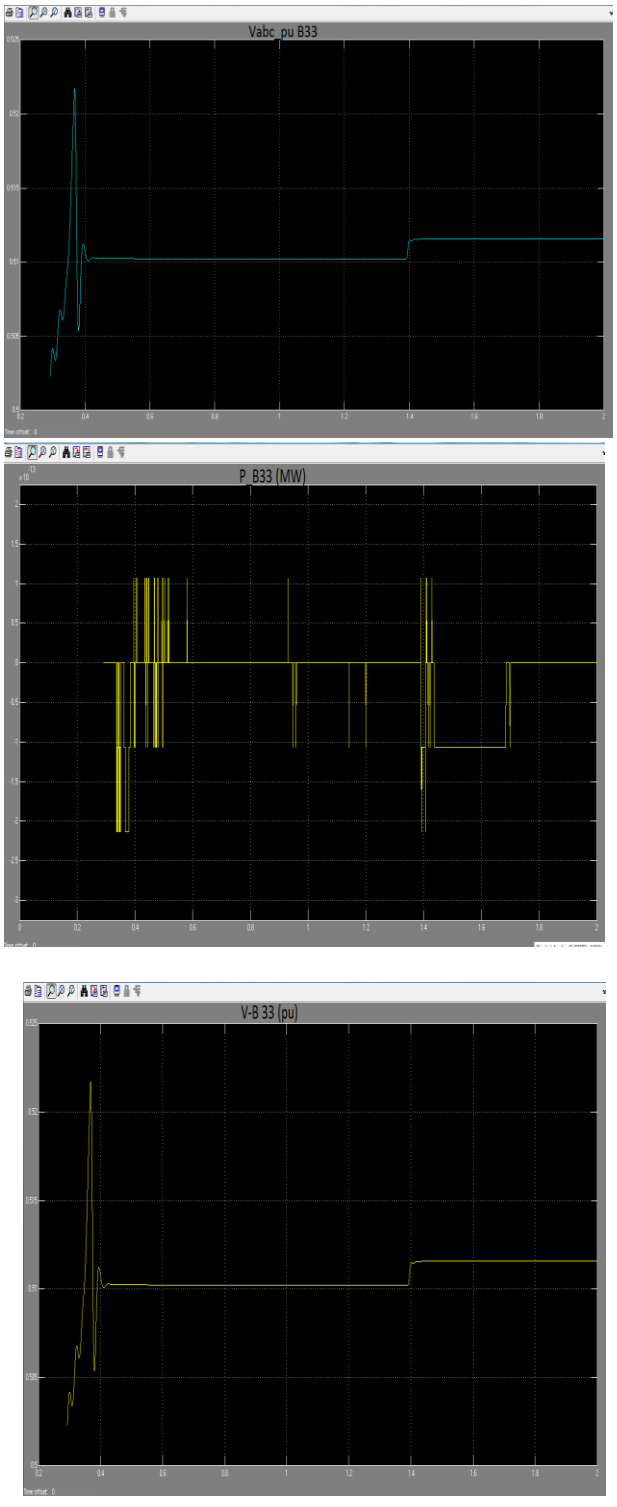


FIG 10. OUTPUT POWER BUS BAR WHIT STATCOM IN WIND SYSTEM

The STATCOM supplies variable responsive power and backings voltage at the heap transport in this manner lessening the motions in the heap voltage. Likewise, the heap has some wide power motions in the framework without the STATCOM that can be diminished with the assistance of a STATCOM.

5. CONCLUSION AND FUTURE WORK

In the past segment, we have indicated results for various conditions in first condition we have demonstrated figure 6 and 7 which are the uncompensated yield results here the low power and high responsive force. These are uncompensated yields (whit out use STATCOM) by examination of fig (8,

9) and (10) plainly control variable enhance and receptive force repaid and wind framework execution change use STATCOM (utilizing STATCOM)
A squeezing interest for more electric force combined with the exhausting regular assets have prompted an expanded requirement for vitality generation from renewable sources, for example, wind and sun oriented vitality. The electrical yield power produced from these wellsprings of vitality is variable in nature and thus, proficient force control is required for these vitality sources. Wind power has seen expanded infiltration in the later past and certainstringent lattice interconnection necessities have been produced. Wind turbines must have the capacity to ride through an issue without separating from the lattice. At the point when a wind ranch is associated with a feeble force framework, it is important to give effective force control amid typical working conditions and improved backing amid and after deficiencies. Voltage flimsiness issues happen in a force framework that is not ready to take care of the receptive force demand amid flaws and substantial stacking conditions. Dynamic pay of receptive force is a compelling measure of protecting force quality and voltage steadiness. At the point when numerous wind turbines are added to the framework, the network gets to be weaker as these sorts of generators require extra control gear since they don't have any self recuperation capacity like the routine ynchronous generators. This requires an intensive investigation of the typical and element execution of the wind turbines amid and after an unsettling influence. This theory investigates the likelihood of interfacing a STATCOM to the wind power framework keeping in mind the end goal to give productive control. In this theory, the wind turbine displayed is a DFIG that is an impelling machine which requires receptive force pay amid matrix side unsettling influences. A fittingly measured STATCOM can give the important receptive force remuneration when associated with a powerless lattice. Likewise, a higher rating STATCOM can be utilized for effective voltage control and enhanced dependability in network associated wind cultivate yet financial aspects confine its rating. Reproduction contemplates have demonstrated that the extra voltage/var support gave by an outer gadget, for example, a STATCOM can fundamentally enhance the wind turbines flaw recuperation by all the more rapidly reestablishing voltage attributes. The degree to which a STATCOM can give support relies on upon its rating. The higher the rating, the more bolster gave. The interconnection of wind homesteads to powerless frameworks likewise impacts the wellbeing of wind turbine generators. A portion of the difficulties confronted by wind turbines associated with frail frameworks are an expanded number and recurrence of deficiencies, lattice variations from the norm, and voltage and recurrence changes that can trip transfers and cause generator warming.
The dynamic execution of wind homesteads in a force matrix is enhanced by the utilization of a STATCOM. The STATCOM gives better voltage qualities amid extreme flaws like three stage impedance cut off also. The reaction of a wind ranch to sudden burden changes is enhanced by the utilization of a STATCOM in the framework.

FUTURE WORK

In this postulation, recreation considers demonstrate that the dynamic execution of wind ranches is enhanced with the utilization of a STATCOM. Future work can include examining the sounds in the framework and assess strategies to decrease the framework music. A multilevel STATCOM can be displayed to diminish lower request sounds. Three stage high impedance cut off have been concentrated on in this theory that can be stretched out to watch the reaction of the framework to different sorts of deficiencies. The wind turbines here are demonstrated as individual turbines, which could be stretched out to speak to a wind ranch by displaying them as a solitary proportionate wind turbine. The study has been founded on the execution for IG that could be further reached out to different sorts of wind turbines. This study can be reached out to a bigger framework to assess the backing gave by the utilization of a STATCOM.

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