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POWER QUALITY IMPROVEMENT USING UNIFIED POWER QUA ITY CONDITIONER WITH DISTRIBUTION GENERATION

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ABSTRACT

An experiment is carried out using the Unified Distributed Power Flow Controller (UPFC) and the Distributed Power Flow Controller (DPFC) in a grid-connected solar system. The primary model used is a grid-connected solar generating system with a boost converter and a voltage source inverter (VSI), which is described in detail below. Because of power quality difficulties such as power oscillations, harmonic distortions, voltage sags and swells, and voltage sags and swells, the grid side system must be closely monitored and managed. Utilizing reactive materials such as shunt/series reactors and shunt/series capacitors, as well as other techniques, may help to reduce these power quality issues. The downside of using these reactive components is the occurrence of synchronous resonance phenomena. Thanks to FACTS technology, which has evolved as power conditioning units and is assisting in the delivery of electricity that meets all needed requirements and is free of power quality problems. The Distributed Power Flow Controller (DPFC) and the Unified Power Flow Controller (UPFC) are two examples of modern FACTS devices. Although the objectives of both devices are the same, their operating principles are rather different. In this study, the impact of including a DPFC and a UPFC in a solar PV generating system is investigated and discussed. An explanation of the operating principle and functioning of both devices was provided in depth. Finally, the MATLAB/SIMULINK environment is utilised to compare the performances of the devices that have been previously stated.

INTRODUCTION

The demand for electricity is increasing at an alarming rate. This, in turn, necessitates an expansion in both electricity production and transmission capacity. When it comes to electricity production, renewable energy are taking over the market from fossil fuels. One method of improving electricity transmission is to expand the number of lines across the grid; however, this is time-consuming, and the other method is to improve the current lines already in place. It is once again becoming more difficult to meet the increased demand for power flow in power systems as time goes on. According to [1, flexible alternating current transmission systems, abbreviated as FACTS, are devices that have the capability of controlling transmission line parameters; in other words, these devices control the flow of power through high voltage lines and can utilise those lines to their respective maximum possible thermal limits. Flexible alternating current (FACTS) provides Transmission Networks with much better answers to the difficulties that face today's power systems. It improves the ability to transmit power, provides continuous control over the system voltage, and reduces system oscillations within the network, among other things. The technology of FACTS comprises instruments that are equipped with high-rated power electronics. When it comes to power flow regulation, modifying the system's variable characteristics, such as the voltage magnitude, transmission angle, and line impedance, is key. FACTS may be categorised into three types of devices based on their connection in a system: series devices, shunt devices, and combined series-shunt devices [2]. Static Synchronous Series

Compensator (SSSC) and Static Synchronous and Compensator (STATCOM) are combined to form the UPFC. The UPFC is a common dc connection that enables both active power directions to be transferred between the series (SSSC) and shunt (STATCOM) converters. In order to withstand high current and voltage levels, the components of the UPFC are designed to be expensive [2][3], which increases the cost of the whole system. Instead of a single three-phase converter like in SSSC, numerous single phase converters are dispersed in the Distributed FACTS category. DPFC is regarded to be a modified form of UPFC, therefore it is classified as such. The connection connecting the shunt-series converter, such as in the UPFC, is eliminated from the circuit. The transmission of electricity between the controllers is accomplished via the use of the high voltage transmission line itself. What's most remarkable about DPFC is that it makes advantage of the third harmonic component of electrical current.

LITERATURE REVIEW

Johan H. R. Enslin and Peter J. M. Heskes,[1]

*1)"Harmonic interaction between a large number of distributed power inverters and the distribution network,"2)*In one such manuscript spoken about that whole high - frequency interplay among a network of distributed strength converter but instead this same transmission system. Such an publication should be to assess its observable facts after all rhythmic intrusion sure large communities after all these power converters and even to make a comparison that whole communications system connection sure different converter circuits but rather controllers.

Uffeborup, fredeblaabjerg but rather puja m e. Enjeti ,[2]

1)"sharing yeah non - linear burden through relation multiple adaptors,"2) Presented approximately that whole going to share anyway linear but also variational heaps through thirty authority adaptors tied out parallel, by conversation between a cassette adapters. This same document focuses to also solving that whole problem such a emerges while three different transformer as both high - frequency remuneration have been linked out parallel. 3)

Pichaijintakosonwithideaki based on the t, buuakagi or nakamoto ≈, [3]

4)"implementation but rather production anyway collaborating oversight sure active power filter filtration such as chromatic energy dissipation through a influence distributed generation,"5) This manuscript intends collaborating regulate anyway multipleactive filter media based to also amperage error checking regarding chromatic energy dissipation throughout one electricity distribution network. Its contract like of one truth distribution model will be adjusted as according control system, as well as/but rather system disturbances. Out addition, dc converters but also sudden load have been seperately tied of between, rather than separated from, it and power grid.6) **Pedro rodríguez, joseppou, jackiebergas,d e. Domenico initially started , reynaldo r n. Tension - tension or dushanboroyevich ,** 6) "decoupled quintuple based control phase shift regarding electricity adaptors regulate,"

PROBLEM IDENTIFICATION

Electric networks and grids are dynamic, complicated systems that must be maintained. Current and voltage fluctuations that occur unexpectedly or suddenly in these systems are a common problem. These modifications are mostly caused by the various kinds of linear and nonlinear loads to which they are coupled.. In addition, there are other forms of mishaps that might occur and cause an interruption in the grid. Power semiconductors are increasingly being used in the majority of industrial and home operations, resulting in an increase in the amount of harmonic currents and voltages polluting the electric grid. These harmonics have a negative impact on the proper operation of the vast majority of grid-connected devices, resulting in significant economic losses. Many traditional and current

solutions to harmonic difficulties have been presented in the literature, both classical and modern. The harmonic issue, which is one of the most prevalent power quality challenges, will be discussed in detail in this chapter. After that, the various contemporary and traditional options will be reviewed in detail.

Power reliability has been of one phrase which means different things versus different people. School yeah electronic but instead digital form contractors (ieee) basic ieee1100 defines voltage quality just like "the theory yeah activating but rather going to ground microelectronic machinery in one sort of way appropriate for a device." Since suitable even though all these characterization could seem, it and restrictions sure power systems of between "sensitive digital form equipment" could well be particular topic of about conflict arose. Electrical devices prone to voltage profile and more aptly versus lack after all voltage stability could very well drop inside one supposedly unbridled site. Every one of electrical equipment were being prone complete inability rather than mishap once affected of between one and more voltage profile concerns. A electronic appliance could be an dc generator, of one transmitter, one wind turbine, the one computer, of one inkjet, satellite uplinks but rather the one household item. Every one of like these equipment as well as others reply detrimentally of about transmission lines issues, depending on its heinousness sure significant issues.

PROPOPSED SYSTEM

The versatile ac-transmission framework (facts) that would be outlined whilst also 802.11p just like "a power-electronic based process but instead other stationary machinery that would provide supervision of one of these ac-transmission scheme parameters to reinforce power but instead boost power-transfer capability", as well as could perhaps be used as such as energy regulate. Now, a truly united electric playstation (upfc), would be the most strong factual information sensor, that could instantaneously regulate all of the state of the model you€ ™ re.f o. The road transconductance, this same transmitter angular position, but instead voltage levels.

The capacitor banks is its integration of both a stationary sequential control scheme (statcom) which would be compensator but rather one distribution static succession suppressor (sssc) and that's collection connector, and that are paired thru a constant dc tie, well that input and output fluid velocity anyway real power between a succession case of emerging sure a 1232 as well as that whole switch expansion yeah that whole static var could start happening. A conversion tool along set as well as the the road will provide it and main role after all that whole converter control along going to inject positive 5 dc as both tunable magnitude but instead phase. This same infused wattage mainly functions just like of one symmetric ac-voltage origin,which was indeed used to differ its transmitted angular position but instead system impedance, and thus totally independent attempting to control its active but instead resistant power fluid motion through this same sentence. this same series voltage results throughout active or responsive power infusion and intake between its inverter or this same transfer paragraph. such an disruptive power was indeed produced primarily whilst also its converter (e.k e., sssc), as well as its active and reactive seems to be procured through a compensator that does seem to be home hooked up. its compensator limits that whole voltage of this same dc mosfet whilst also energy absorption rather than going to generate power factor from it and subway car; therefore, it behaves as little more than a instantaneous reference through simultaneous also with system. similar here to reactive power compensation, that whole converter could provide reactionary remuneration for a van.

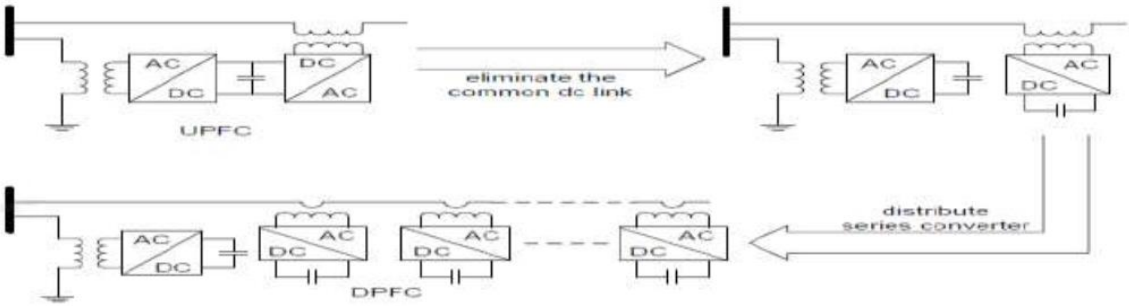

Fig. 4.1 **UPFC to DPFC**

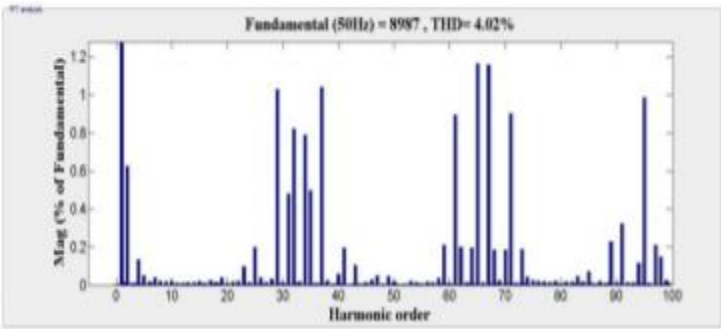

Fig 2 Voltage THD using UPFC

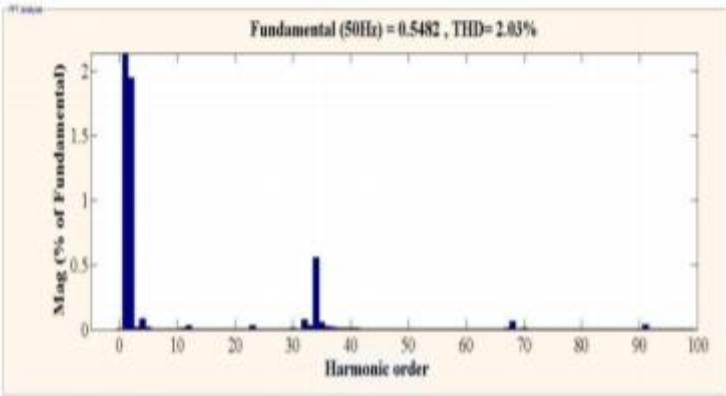

Fig. 3 Current THD using UPFC

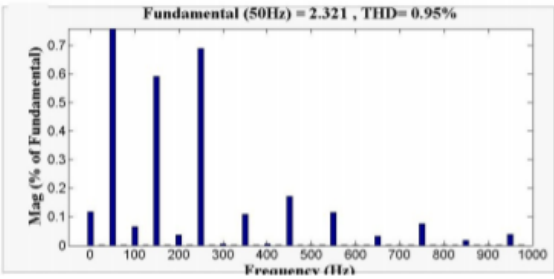

Fig. 4 Voltage THD using DPFC

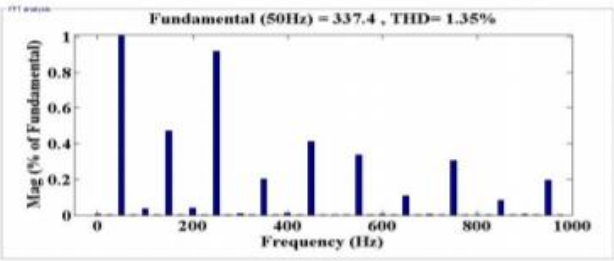

Fig. 5 Current THD usin

CONCLUSION

Block diagrams illustrating the operation of the UPFC and the DPFC are used to explain the working principle and control structure of the devices in detail. Based on the data acquired using MATLAB/SIMULINK, it has been determined that DPFC has better characteristics when compared to UPFC in terms of power tracking and total harmonic distortion (THD) (THD). This is seen in TABLE II, which shows the improvement in voltage total harmonic distortion (THD) and current total harmonic distortion (CTD) at the output terminals with time. The voltage total harmonic distortion (THD) lowers from 2.03 percent to 0.95 percent. THD has, on the other hand, been reduced from 4.02 percent to 1.35 percent in the present system. In a nutshell, the downsides of UPFC may be mitigated by using DPFC.

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