ENHANCING POWER QUALITY IN HYBRID AC/DC MICROGRID WITH IRPT CONTROL STRATIGY FOR DSTATCOM

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Abstract - *Energy is the most basic prerequisite for the social exercises on our reality, for example, creation, transportation, homegrown life and different fields. Then again, energy age is the greatest emergency to people, since as of now the significant wellspring of energy creation around the globe wide. Due to increasing the demand for power, we need to find different source of power for fulfilling the consumers demand but tradition power generation unit totally based on coal based power plant, which effect environment so due this we shifting to the concept of renewable energy side. This paper mainly focuses the study of microgrid (which consist mainly renewable source of power ex-solar power pv array ,wind energy fuel cell etc) to fulfill power demand in parallel with traditional power system to minimize the burden on it, But implementation of microgrid concept not easy task due to non linear load, non linear load generating harmonics to the main system so in this paper we using Dstatcom with IRPT-Based control algorithm for minimizing the harmonics at different load condition, simulations are done using MATLAB.*

Keywords: Micro grid, photovoltaic array system(pV system),Instantaneous reactive theory based algorithm (IRPT-Based control algorithm)

INTRODUCTION

Now in present era the global power demand has been rapidly increased caused by growth of population, innovation in technology and growth of economic. They to this reason there is various individual that have no access to electricity. The power grid architecture and design itself follow matching electric power generation to given energy consumption continually. Grid having itself system complex with slow and fast dynamic. In grid infrastructure component are use at end of its operational use, which is not to much efficient as innovation in technology in field of power management. In the grid electricity loss in transmission and distribution 5 percent of total energy T&D. which is very less but now due to rapid changes in electrical engineering technology, the grid can be found with new electronic devices which is more capable than the old technology. Which is very efficient due to this we are focusing for new source of energy rather than reducing loss of T&D. Series of application which is introduce in generating and consumed? The micro grid is the group of localized available sources control protection and management system, that normally operates connected to and synchronous with traditionally wide area system grid (macro grid), But can also disconnect to island mode and function autonomously as physically economic condition. Increase in penetration of distribution generation and development with electrical proximity to one have supported concept of the micro grid

The purpose of this work is to join the two thoughts of inverters and D-STATCOMs into an indicated DSTATCOM inverter remembering the ultimate objective to like the benefits of an inverter with DSTATCOM limit with no additional expense. Sustainable essentialness structures offer a couple of good conditions over standard imperativeness sources, for instance, basic gas or coal. They are ideal wellsprings of imperativeness that can be found in numerous regions without emanating any nursery gasses. Sustainable essentialness is rich and free, and all around not impacted by political flimsiness. The major bother of inexhaustible essentialness sources is that they are generally arranged in far off reaches and a long way from significant weights. Additionally, the use of inexhaustible essentialness sources is confined by how they are not by and large available. Force electronic-based versatile AC transmission System (FACTS) contraptions have been delivered with a particular ultimate objective to give more data and control on power structures. Generally, capacitor banks have been used to control the responsive power on a power system, yet with course of action of power equipment in power structures, STATCOMs were imagined and got more thought in the midst of late years. The purpose of this work is to join the two thoughts of inverters and DSTATCOMs into an alleged D-STATCOM inverter remembering the ultimate objective to like the upsides of an inverter with DSTATCOM limit with no additional expense. A staggered D-STATCOM inverter is a power electronic contraption that is put between a sustainable imperativeness source and a scattering system to give dynamic power, just as to control responsive power on the structure. Staggered converters have a couple of inclinations stood out from the standard two level converters. They have the capacity to perform at a lower trading repeat, they have lower total consonant winding (THD), and they have less dv/dt across over switches and consequently less voltage weight on the devices. The proposed DSTATCOM inverter in this paper could substitute existing inverters used for sustainable

imperativeness structures, especially for little to medium estimated wind applications.

OBJECTIVE OF PROJECT WORK
- Energy from hybrid system is extracted.
- The extracted energy will be stored in battery and given to the bidirectional dc to dc converter coupled with inverter.
- Load will be drawn from it.

MODELLING OF HYBRID MICROGRIDE

Half and half framework can be accomplished utilizing at least two distinctive fuel sources. There are numerous instances of half breed energy frameworks which were developed from wind/sun based, wind/diesel, sun oriented/diesel, wind/sunlight based/diesel and different arrangements. It is regularly conceivable to accomplish better generally speaking inventory design by incorporating at least two sources in light of the fact that the stockpile example of various sustainable power sources discontinuity yet with various examples irregularity. Consolidating inexhaustible mixture framework with batteries as capacity framework are utilized to build the span of intensity supply, using utilize the ideal utilization of the accessible sustainable power asset and to accomplish higher dependability than singular use [5]. Wind PV cross breed framework is centered around wind and sun powered capability of the area. Subsequently, it very well may be worked during the day utilizing energy from the sun and after the sun set it can use the potential breeze energy or energy put away in batteries to proceed with its capacity. Therefore, wind and nearby planetary group function admirably together in a mixture framework. A square graph of the proposed coordinated mixture wind/PV framework is appeared in figure 3. The overall development appeared in the figure gives an unmistakable thought regarding the proposed model. PV board changes over daylight into power which is associated with DC-DC converter and wind turbine changes over the accessible energy in wind into AC electrical force which can be changed over to DC power.

Solar Energy: Solar energy is that energy which is gets by the radiation of the sun. Sun powered energy is available on the earth constantly and in bountiful way. Sun powered energy is unreservedly accessible. It doesn't create any gases that mean it is without contamination. It is moderate in expense. It has low support cost. Just issue with close planetary system it can't deliver energy in awful climate condition. In any case, it has more noteworthy productivity than other fuel sources. It just needs beginning speculation. It has long life expectancy and has lower outflow.

Wind Energy: Wind energy is the energy which is extricated from wind. For extraction we use wind plant. Ii is sustainable power sources. The breeze energy needs less expense for age of power. Upkeep cost is additionally less for wind energy framework. Wind energy is available very

nearly 24 hours of the day. It has less discharge. Starting expense is likewise less of the framework. Age of power from wind is reliant upon the speed of wind stream.
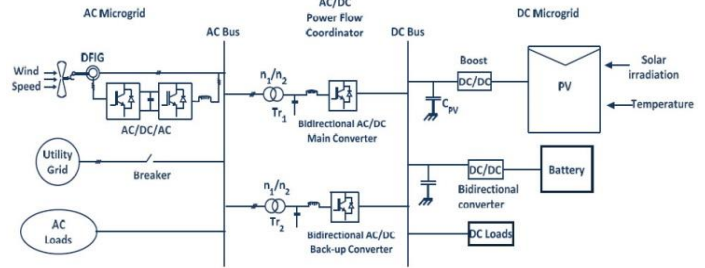

Fig-Hybrid AC/DC microgrid

IRPT BASED CONTROL ALGORITHM DSTATCOMS

Three phase load currents and pcc voltage are sensed used to calculate the instantaneous active and reactive powers. Three phase PCC voltages are sensed and process through BPFs before their transformation to eliminate their ripple contests and denoted as ($V_{sa}V_{sb}V_{sc}$). A first- order Butterworth filter is used as a BPF.

Three phase filtered load voltages are transformed into two phase α-β orthogonal coordinate ($v_\alpha v_\beta$) as

$$\begin{pmatrix} v_\alpha \\ v_\beta \end{pmatrix} = \sqrt{\frac{2}{3}} \begin{pmatrix} 1 & -\frac{1}{2} & -\frac{1}{2} \\ 0 & \frac{\sqrt{3}}{2} & -\frac{\sqrt{3}}{2} \end{pmatrix} \begin{pmatrix} v_{sa} \\ v_{sb} \\ v_{sc} \end{pmatrix}$$

Similarly, three phase load current ($i_{La}i_{Lb}i_{Lc}$), are transformed into 2-phase α-β orthogonal coordinate as

$$\begin{pmatrix} i_\alpha \\ i_\beta \end{pmatrix} = \sqrt{\frac{2}{3}} \begin{pmatrix} 1 & -\frac{1}{2} & -\frac{1}{2} \\ 0 & \frac{\sqrt{3}}{2} & -\frac{\sqrt{3}}{2} \end{pmatrix} \begin{pmatrix} i_{sa} \\ i_{sb} \\ i_{sc} \end{pmatrix}$$
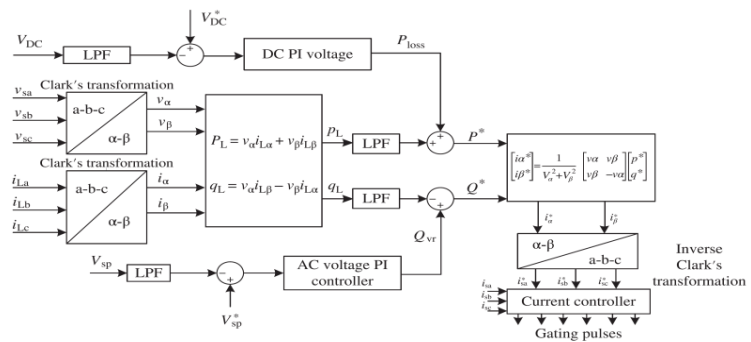

Fig-IRPT based control algorithm of DSTATCOM

From these two set of expression, the instanouse active power reactive power p_L and instannous reactive power q_L, flowing into load side are computed as

$$\begin{pmatrix} p_L \\ q_L \end{pmatrix} = \begin{pmatrix} v_\alpha & v_\beta \\ v_\beta & -v_\alpha \end{pmatrix} \begin{pmatrix} i_{L\alpha} \\ i_{L\beta} \end{pmatrix}$$

Let $\overline{p_L}$ and $\overline{q_L}$ are DC component and AC component of p_L, respective are DC and AC component of p_L respectively and $\overline{q_L}$ there of these may express as

$$q_L = \overline{q_L} + \overline{q_L}$$

$$p_L = \overline{p_L} + \overline{p_L}$$

In these expression fundamental load power is transformed to DC components and the distortion or negative sequence is transformed to AC components and .Then DC components of active and reactive power are extracted by using LPF's reference three phase supply current and are estimated as

$$\begin{pmatrix} i_{sa}^* \\ i_{sb}^* \\ i_{sc}^* \end{pmatrix} = \sqrt{\frac{2}{3}} \begin{pmatrix} 1 & 0 \\ -\frac{1}{2} & \frac{\sqrt{3}}{2} \\ -\frac{1}{2} & -\frac{\sqrt{3}}{2} \end{pmatrix} \begin{pmatrix} v_\alpha & v_\beta \\ -v_\beta & v_\alpha \end{pmatrix}^{-1} \begin{pmatrix} p^* \\ q^* \end{pmatrix}$$

This IRPT-based algorithm may varied and modified for control on supply current for indirect current control ,in this case pf correction mode of operation of DSTATCOM $p^* = \overline{p_L} + p_{loss}$ and $q^* = \overline{q_L} - q_{vr} = 0$ after transformation from two frame to three frame ,three phase transformed are the reference supply current and these must be compared sensed supply currents in PWM current as shown on fig for indirect current control of DSTATCOM .The p_{loss} is an instantaneous active power necessary to adjust the voltage of DC capacitor of the VSC used as DSTATCOM to its reference value. In addition to the instantaneous reactive power necessary to adjust the PCC voltage to its reference values

CONCLUSION AND DISCUSSION

Hybrid power age framework is acceptable and viable answer for power age than traditional energy assets. It has more prominent productivity. It can give too far off spots where government can't reach. So the force can be use where it created so it will diminish the transmission misfortunes and cost. Cost decrease should be possible by expanding the creation of the hardware. Individuals ought to inspire to utilize the non-ordinary energy assets. It is exceptionally alright for the climate as it doesn't deliver any discharge and destructive by product like ordinary energy assets. It is financially save answer for age. It just need beginning venture. It has additionally long life expectancy. By and large it is acceptable, dependable and reasonable answer for power age. Staggered inverters are finding expanded application in mechanical climate with more noteworthy interest for high voltage high force handling strategies with improved productivity. The fundamental bit of way of staggered inverters is the

improvement in the yield voltage signal quality utilizing gadgets of low voltage rating with lesser exchanging recurrence, accordingly expanding the general proficiency of the framework. Staggered inverters can be applied to utility interface frameworks and engine drives. These converters offer a low yield voltage THD, and a high effectiveness. A staggered inverter can decrease the music delivered by the inverter and better THD is acquired when the inverter worked at higher regulation file.

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