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"An Authentic control of Voltage Profile Using PMU through GPS System "

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Abstract—

Nowadays the increase of power electronic devices at the distributed side, which has ability to provide power factor correction and reactive power control at the same end. The device connect to distributed side are resonant converter, satic-Var compensator, power buffer, solar panels, and pluggable hybrid electric vehicles (PHEVs),Such equipment are not presently utilized by the power system to fulfill the reactive power for unity voltage profile. The integration of these end-user RCD are done to support the grid via a secure communications infrastructure.The real time data of bus system measured by PMU and transfer to control center through GPS system. PMU and SCADA measurement data can be displayed in the same line monitoring and displaying on power substations. Ttraditionally the un-authentic communication network has used via fiber-based networks, cellular network, Wi-Fi and Wi-Max networks as well as more ad-hoc radio and wireless mesh networks.in this paper the new communication network with authentic signature is suggested and also the optimal placement of PMUs Due high cost.

Keywords—PHEV(Pluggable Hybrid Electric Vehicle), Intelligence Control System (ICS), Wide Area Measurement System (WAMS),Reactive Control Device (RCD),Phasor Measurement Units(PMU),Electrical Measurement Units(EMS)

I. INTRODUCTION

In present days the increase of power electronic devices at the residential consumer ends, which has ability to provide power factor correction and reactive power control form the same end. Device which connect to consumer side are resonant converter, static-Var compensator, power buffer, solar panels, and pluggable hybrid electric vehicles (PHEVs) [8].Such equipment are not presently utilized by the power system to fulfill the reactive power for unity voltage profile.

Power system operation is currently contingency constrained, which often by low-voltage violations. A contingency is scenario by which estimation of operational reliability for the power system. Utilities regularly run a series of contingencies in a process known as contingency analysis. Under normal conditions, the system is operated so that it can withstand the loss of any contingency [3].

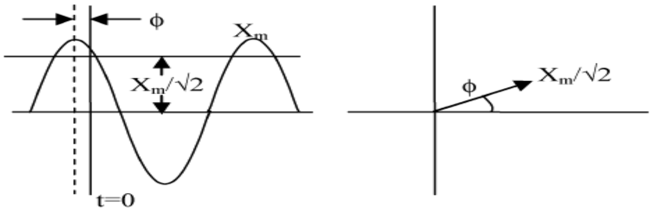
Residential-level devices can be called upon to correct voltage violations in their local area, using secure, authenticated messaging to coordinate the control. This vision put forward for comprehensive form of reactive power control that goes all the way from the transmission system level to the end user. Each transmission system bus is a member of what is defined as a reactive support group. When a problem is detected in the system, the particular low-voltage buses are identified and targeted for control then, the reactive support groups for the low-voltage buses are instructed to provide a certain net amount of reactive power support in order to restore system voltages to some appropriate level.[9]

For secure communication the intermediate network node between transmission and receiving may be wired/wireless routers or other devices and controllers that offer message-relaying capabilities. These include traditional fiber-based networks, cellular network, Wi-Fi and Wi-Max networks as well as more ad-hoc radio and wireless mesh networks[9]. The study about state estimation based on the integrated measurement has obtained preliminary results. Other research work about using PMU data such as fast transient stability assessment, power quality dynamic assessment, FACTS control, preventive control and incident handling has been carried out With the development of smart grid and the construction of SGOSS[8].

This paper is organized as follow section II reviews the basic concept of phasor representation of power system voltage and current under normal condition [1].Section III discus the objective of this paper. Section IV discus the methodology for increasing voltage profile using PMUs through GPS system. Section V provide the conclusion

II. PASHOR MEASUREMENT UNITS

A pure sinusoidal waveform can be represented by a unique Complex number known as a phasor. Consider a sinusoidal Signal [1].



(a) (b)

Fig 1. Phasor representation of a sinusoidal signal (Sinosoidal. (b phasor representation))

$$X(t) = Xm\ Cos(wt + \Phi) \quad (1)$$

Where:
X (t) = Instantaneous Value of Phasor quantity.
Xm = Maximum Value of Phasor quantity.

Synchrophasor is a term used to describe a phasor which has been estimated at an instant known as the time tag of the synchrophasor.In order to obtain simultaneous measurement of phasors across a wide area of the power system, it is necessary to synchronize these time tags, so that all phasor measurements belonging to the same time tag are truly simultaneous. The PMU must then provide the phasor given by (1) using the sampled data of the input signal. Note that there are antialiasing filters present in the input to the PMU, which produce a phase delay depending upon the filter characteristic. Furthermore, this delay will be a function of the signal frequency. The task of the PMU is to compensate for this delay because the sampled data are taken after the antialiasing delay is introduced by the filter. This is illustrated in Fig. 2.

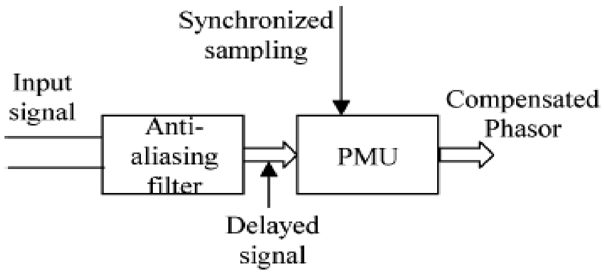


Fig. 2. Compensating for signal delay introduced by the anti-aliasing

The synchronization is achieved by using a sampling clockWhich is phase-locked to the one-pulse-per-second signal provided by a GPS receiver. The receiver may be built in the PMU, or may be installed in the substation and the synchronizing pulse distributed to the PMU and to any other device which requires it. The time tags are at intervals that are multiples of a period of the nominal power system frequency.
It should also be noted that the normal output of the PMU is the positive sequence voltage and current phasors. In many instances the PMUs are also able to provide phasors for individual phase voltages and currents [1].

The application of PMUs are in Power System Monitoring, State estimation , Power system satiability, Voltage Satiability

III. OBJECTIVE OF WORK

To develop controlling technique realms and layers., To identify the bus for control reactive power and fulfillment of the same through local /consumer end connected converter to fulfill the requirement of reactive power ,To develop authentic signature system for controlling the reactive power to particular converter end ,To minimize the effort for controlling the reactive power from user end, To make algorithm for reactive power control using PMU through GSP,To make proposed model for three bus system,To find integrate the algorithm and proposed model to field

IV. METHEDOLOGY

In this article the methodology are presented for proposed research are presented. on authentic control of voltage profile using PMU through GPS.

A. *Intelligent Control Frame Work :*

Members of a chain of command structure such as the Incident Command System (ICS) follow a line of authority and responsibility. The ICS is a “systematic tool used for the

command, control, and ordination of an emergency response” This system is used by firefighters and other emergency personnel for efficiently handling the emergency scenarios they face daily. From the widespread successful uses of this system, it has proven to be effective for dealing with emergencies and with large numbers of responders who may not all work together normally but have the same goals for the incident. Interestingly, a similar framework is needed for the intelligent control of reactive power control devices to respond efficiently when the power system is in crisis. In the ICS, each individual reports to only one supervisor. The individuals work in groups and the group members report to a particular supervisor or officer who in turn reports to another specific officer. The functional unit with the highest authority is called command. Below command may be different sections, branches, functional groups, and geographical divisions . The resources which actually perform the task are at the lowest level in the chain of command [8].

B. *System Block Diagram*

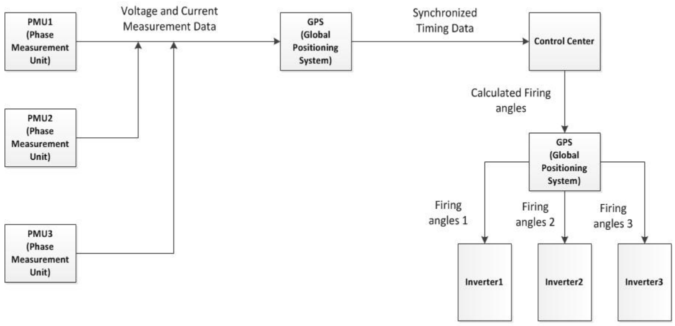


Fig..2 . System Block Diagram

The data of voltage and phase angle measured by PMUs are transfer to control centre via GPS system, these data are going to used by system to calculate the firing for voltage source inverter which is required to control the reactive power.

C. *Methods for Voltage Control*

The buses at the transmission system level which supervise loads whose MVAr (Q) output we are attempting to control are denoted as Q-controlled (Q-C) buses. Effective placement and control of Q-C buses are determined based on the sensitivities of voltage magnitude to reactive power injection (3). Classification of loads can further help in selecting the Q-C buses that are the most controllable and in accounting for the reactive power capabilities of the

$$f1 = \sum_{i=1}^{M}[Vi - Vspeci]^2 = \sum_{i=1}^{M} \qquad (2)$$

and the power flow equations and notation used in this paper are given in the Appendix. The objective function" f1" should be minimized subject to power flow constraints and limits on equipment. The goal of solving this problem is to determine the required total reactive power injections at the Q-C buses such that the voltage profile V of the system equals the specified voltage profile V spec. within some tolerance [8].

D. *Basic PMU Block Diagram :*

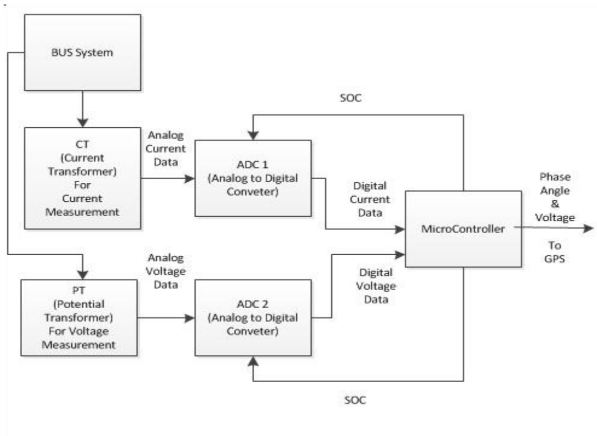


Fig..3 . Block Diagram of PMU

The bus voltage and current are given to controller through CT/PT and ADC , finally the controller measure the voltage and phase angle and given to GPS system for further processr.

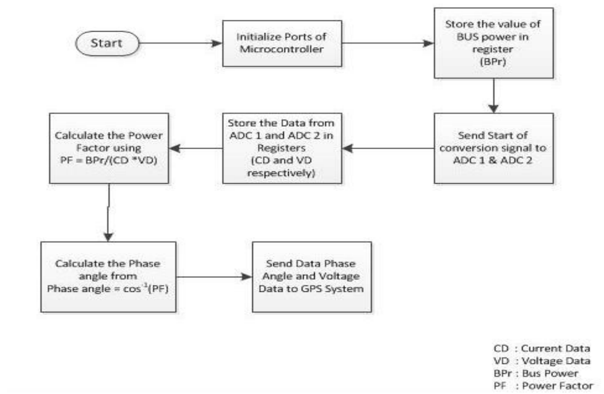


Fig. 4.Flowchart of voltage / phase measurement by PMUs

E. *Sensitivity of Voltage to reactive power*

Sensitivities are linearized relationships which are often used [8] to reveal the impact that a small change of a variable has on the rest of the system. The buses in the system which have loads whose MVAr (Q) output we are attempting to control will be denoted as Q-Controlled (Q-C) buses. The sensitivities of voltages to reactive power injections are fundamental to the analysis of determining locations for and setting reactive power outputs of Q-C buses equations from which the sensitivities are derived are the AC power flow equations for real power P and reactive power Q at a bus *i*

$$Q_{i.calc} = V_i \sum_{j=14}^{n} V_j \left[G_{ij}\sin(\emptyset_i - \emptyset_j) + B_{ij}\cos(\emptyset_i - \emptyset_j)\right]$$

$$P_{i.calc} = V_i \sum_{j=14}^{n} V_j \left[G_{ij}\cos(\emptyset_i - \emptyset_j) + B_{ij}\sin(\emptyset_i - \emptyset_j)\right] \qquad (3)$$

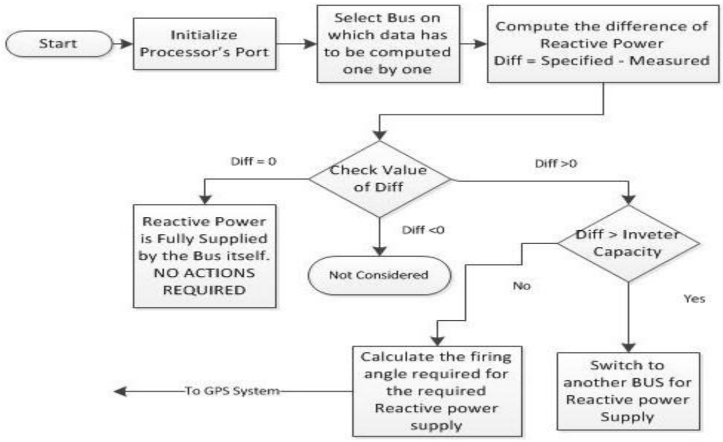


Fig. 5. flow chart of Control center

F. Classification of Load

The controllability of the reactive component of loads can be classified. Since power systems have many load buses, classification can help incorporate knowledge about differing levels of reactive power control capability, and this will improve the selection process for Q-C buses. Let CAT1 be the most controllable category and CATN be the category that is not controllable at all. A load category can be assigned to each load based on prior knowledge perhaps by the manufacturer or by the engineer performing the analysis. Thus, load categories are an additional factor that can be considered when selecting effective locations for Q-C buses. Loads that are highly controllable (lower category number) should be given a higher priority in the selection of Q-C buses. These load classifications are fluid. For example, as a CAT1 load begins to reach the limits of the reactive power it can supply or absorb, it will switch to a higher-numbered category. Future work will investigate non-heuristic ways to do this reclassification.

name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.

V. CONCLUSION

From this paper the understand control of reactive power using converter connected to consumer end.through secure and authentic communication dislike traditional fiber-based networks, cellular network, Wi-Fi and Wi-Max networks as well as more ad-hoc radio and wireless mesh networks.

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