International Journal on Recent and Innovation Trends in Computing and Communication
Volume: 3 Issue: 10
ISSN: 2321-8169
5842 - 5844

Review: - Phasor Measurement Unit in Smart Grid for Minimum Elapsed Time

Anita Rawat[1], S.N.Joshi[2],
[1]M.Tech Scholar, Govt. Women Engg. college, Ajmer, Rajasthan, India
[2] Assistant Professor, E.E.E Deptt., Govt. Women Engg. college, Ajmer, Rajasthan, India

Abstract: - The latest technology sensors are ployed in a small grid with a two way mode for communication & also to access the data to mutate it to a self heating grid which is dynamic in nature, optimizes the transference intelligent & distributing. The need of sensitive grids are response & identification in real time. In order to compute occurrences like stability of system, throughput of an equipment, demand, response & outages by making use of intellectual communication, open standards & constituted in IP systems are required by a smart grid. Synchrophasor measurement technology is accurate and real-time monitoring with high resolution of actual system conditions in wide area . The proposed idea has been verified for matlab software is comprised of procured speed, time, observabance of buses in overall system for placement in optimization of Phasor Measurement unit abbreviated as PMU.

Keywords: *Smart grid control center, Wide area measurement and control and synchronized phasor measurement unit, optimal placement of Phasor measurement unit.*

*****

I. INTRODUCTION

Variegated smart appliances, meters, resources of energy which are renewable & efficient are ployed in a grid which is smart. The main goal of a smart grid is regulation of distribution, production & conditioning of power grid.

The usual component applicable to almost each of the statement in field of communications & processing digitally by a smart grid, which makes the structuring of information & flow of data to the center level. Such abilities support to integrate the power grid with digital techniques. This integration is also the main component of the problems that arises. For this purpose there are three classes are formulated by the electric utilities described as: enhancement in infrastructure termed as a strengthen grid in China with summing up an extra layer which describes a smart grid to a better extent; transmutation in the terminologies of business where it is mandatory to capitalize the investments in a smart technology. The inclusion of general terminology of a smart grid is done in the advancement of grid in terms of distribution & substation automation.

The load applied to grid can fluctuate with respect to time. Though the aggregated load is considered by summing up the individual load from clients, the load is not saturated. If a famous show starts, load will increase and hence more current will be drawn.

In response to the raise in need of power, some extra generators are also installed in addition to the startup generator on a standby mode. The customer gets the warning about the reducing load by a smart grid. Some mathematical computations can determine the number of standby generators needed to be installed to cope up with the failure ratio. The rate of failure can be minimized by applying more number of generators for standby. But the deduction in load by consumers can also relieve this issue in smart grids.

PHASOR MEASUREMENT UNITS

To track the electric system's situation PMUs are the sensors are dispensed via transmission network. The PMU performs computations at a speed which is almost 30 times that of present SCADA methods. The phase & magnitude of an AC voltage is determined by the Phasors. It was observed in 1980s that GPS could furnish exact signals of time, which permitted them to compute difference in phase angle of voltage over a region. As per the scientists, the automatic systems may transfigure the power management with the help of extensive PMUs that can collate the phase angle of voltage on grid by giving a rapid response to condition of system in a dynamic trend.

The WMAS is a system applied for surveillance in the real time in PMUs on an extensive scale. It is believed that the blackout happened in 2003 could be limited to a small region if a phasor at a wide area would have been installed.

FUNDAMENTALS OF PMUS

The technique of PMU furnishes the information about phasor in actual time. The superiority the phase angle possesses at a reference time on a global scale is to capture an image of a wide power system. This application held to confine blackouts & observe working of power grid in actual time. As the technology enhances, the instruments like DFRs constituted on the microprocessor invade the PMU with other operations to extend the list of the features.

A pure sinusoidal waveform can be represented by a unique complex number known as a phasor. Consider a sinusoidal signal

$$x(t) = Xm \cos(wt+\phi) \quad (1)$$

The phasor representation of this sinusoidal is given by

$$x(t) = \frac{X_m}{\sqrt{2}} e^{j\phi} = \frac{X_m}{\sqrt{2}} (\cos\phi + j\sin\phi) \quad (2)$$

Note that the signal frequency w is not explicitly stated in the phasor representation. The magnitude of the phasor is the RMS value of the sinusoid $\frac{X_m}{\sqrt{2}}$ and its phase angle is φ , the phase angle of the signal .

II. PHASOR MEASUREMENT CONCEPTS

Although a constant phasor implies a stationary sinusoidal waveform, in practice it is necessary to deal with phasor measurements which consider the input signal over a finite data window. In many PMUs the data window in use is one period of the fundamental frequency of the input signal. If the power system frequency is not equal to its nominal value (it is seldom), the PMU uses a frequency-tracking step and thus estimates the period of the fundamental frequency component before the phasor is estimated. It is clear that the input signal may have harmonic or non harmonic components. The task of the PMU is to separate the fundamental frequency component and find its phasor representation. The most common technique for determining the phasor representation of an input signal is to use data samples taken from the waveform, and apply the Discrete Fourier Transform (DFT) to compute the phasor. Since sampled data are used to represent the input signal, it is essential that ant aliasing filters be applied to the signal before data samples are taken. The antialiasing filters are analog devices which limit the bandwidth of the pass band to less than half the data sampling frequency (Nyquist criterion).

III. APPLICATIONS OF PMUS IN POWER SYSTEMS

The synchronized phasor measurement technology is relatively new, and consequently several research groups around the world are actively developing applications of this technology. It seems clear that many of these applications can be conveniently grouped as follows:

- Power System Real Time Monitoring
- Advanced network protection
- Advanced control schemes

IV. PMU IMPLEMENTATION

Phasor measurement units are predicted to become a very vital part of power systems state estimation. As such the measurements from PMUs are proven to increase the observability of power systems by strategic placement of a minimal number of phasor.

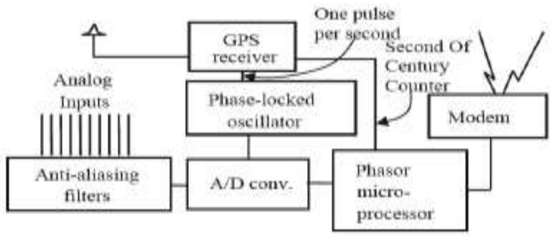

Figure 1:- Major elements of the modern PMU.

As in many relay designs one may use a high sampling rate called oversampling with corresponding high cut-off frequency of the analog anti-aliasing filters. This step is then followed by a digital decimation filter which converts the sampled data to a lower sampling rate thus providing a digital anti-aliasing filter concatenated with the analog anti-aliasing filters. The advantage of such a scheme is that the effective anti-aliasing filters made up of an analog front end and a digital decimation filter are far more stable as far as aging and temperature variations are concerned. This ensures that all the analog signals have the same phase shift and attenuation thus assuring that the phase angle differences and relative magnitudes of the different signals are unchanged. As an added benefit of the oversampling technique if there is a possibility of storing raw data from samples of the analog signals they can be of great utility as high bandwidth digital fault recorders. The sampling clock is phase locked with the GPS clock pulse. Even higher sampling rates are certainly likely in the future leading to more accurate phasor estimates since higher sampling rates do lead to improved estimation accuracy.

V. PROPOSED METHODLOGY

PMU placement by making use of spanning trees incorporated in graph of power systems is a proposed methodology for reduce the elapsed time. An imitated terminology has been introduced to put limitations on the algorithm of PMU. To assess the methods of PMU IEEE 14 model of bus is applied via MATLAB. The report gives allowance of flow of power via different variables & methodologies, total P,Q & theta plots, voltage, frequency magnitude are computed for IEEE 14 bus. In this method the price acquainted to install a PMU is the main goal to minimize it with the limitation of its surveillance. A matrix that accumulates 0 & 1 explains the observance. If the PMU is absent, value 0 is defined for it & if

PMU is present it will designate 1. The time taken by it can be confined by placing the PMU in different places.

VI. CONCLUSION

The report permits the flow of power via various variables of state P,Q & angle plots, frequency, voltage magnitude are calculated for IEEE 14 bus system. The placement of PMU minimizes the number of PMUs installed which also dissipates the cost. By ploying a PMU in a smart grid enhances system stability. Thus the observance of power system is convenient by PMU. Changing in the position of the PMU elapsed time get reduce for the system .

REFERENCES

[1] Towards intelligent smart grid devices with IEC 61850 Interoperability open control architecture, IEEE conference on transmission and distribution new Orleans April2010 .
[2] Management and control of domestic smart grid technology Albert molderink, IEEE transaction smart grid Vol-1 Sept 2010.
[3] Internet based phasor measurement system for phase control of synchronous islands David M Laverty IEEE.
[4] Wide – area frequency monitoring network Architecture and Applications IEEE Transactions on smart grid Vol. 1.NO.2. Sept 2010.
[5] Next generation monitoring, analysis and control for the future smart control centre IEEE Transactions on SMART GRID, Vol. 1.NO.2. Sept 2010.
[6] A hybrid smart AC to DC power system IEEE Transactions on SMART GRID ,Vol. 1.NO.2. Sept 2010.
[7] Management and control of domestic smart grid technology IEEE Transactions on SMART GRID, Vol. 1.NO.2. Sept 2010.
[8] R. F. Nuqui, A. G, Phadke, ―Phasor Measurement Unit Placement Techniques for Complete and Incomplete Observability,‖ IEEE Transaction on Power Delivery, Vol. 20, No. 4, 2381 – 2388, October 2005.
[9] Synchronized Phasor Measurement sand Their Applications, A.G. Phadke • J.S. Thorp
[10]]Practical Considerations for Implementing Wide Area Monitoring, Protection and Control , Elmo Price, ABB Inc., 2006 IEEE 59th Annual Conference for Protective Relay Engineers.
[11] Qiao Li, Student Member, IEEE, Rohit Negi, Member, IEEE, and Marija,‖ Phasor Measurement Units Placement for Power System State Estimation: A GreedyApproach‖, IEEE .