iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** V **Month of publication:** May 2019

DOI: https://doi.org/10.22214/ijraset.2019.5672

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue V, May 2019- Available at www.ijraset.com

A Review on Protection of Transmission Line Using Reverse Power Flow Evaluation

Prof. Surbhi Shrivastava[1], Mr. Kartik Sinha[2]
[1]Asst. Professor, [2]Sr. Project Manager
[1]Electrical Engineering Department, Jhulelal Institute of Technology, Nagpur
[2]Electrical Engineering Department, Reliance Power Plant, Butibori, Nagpur

Abstract: ***This project aims at securing personnel from effects of reverse power by designing protection system. Reverse power flow occurs when power in any circuit flows from receiving end to sending end i.e. in reverse direction. This condition can be dangerous for the working personnel in transmission line because he is assuming that the power is flowing in regular direction i.e. from sending to receiving end. This project consists of protection circuit including dc motor with their motor drives, control unit, limit switches, RF transmitter and receiver, indicating unit. Using this system, isolators placed near the generating station, the transformer (substation) and the consumer (industries) can be opened and closed simultaneously so as to prevent the flow of reverse power. This system will help in reducing the deaths caused by accidental power flow. This project employs the use of FM transmission and reception; hence this system can be used for long range operation. Any isolator on the line can be operated by RF signals. In this way reverse power can be prevented and lives can be saved.***

Keywords: Reverse power flow, Transmission line, Transmission and Reception, Substation & Industries

I. INTRODUCTION

Reverse power is the power which flows from the receiving end to the generating end. During maintenance, the power to the industry or institution at the receiving end is cut off and they start up their own generators to meet their requirement. If the isolators placed on the transmission line are not opened, the receiving end becomes the generating end and the generating end becomes the receiving end. This phenomenon is known as Reverse Power flow. Basically, the power flows from input terminal to the output terminal. However, in the case of reverse power, the power flows from in the reverse direction that is from the output terminal to the input terminal which may have adverse effects. In an incident which has recently taken place at Mansar in Maharashtra where a personnel working in the site of distribution transformer faced dire consequences due to the flow of reverse power.

Consider load as a factory which is having its own alternator as auxiliary power source and maintenance work is to be carried out on a transformer in factory premises. For that the isolators should be kept open. Now if by mistake of operator, one of the isolator is failed to open and as the alternator is working, the power from alternator will flow in system and the person working on transformer as he is unaware of this reverse power flow can suffer a shock, which can be fatal. There may be multiple isolators on a single line – One at the generating end, one or two at the substation and one at the receiving end. One personnel at each of these locations is tasked with the job of operating the isolator when needed. These personnel communicate with each other to synchronize the operation. But even after communicating and synchronizing the opening and closing, there exists the element of human error. Someone might accidentally pull the lever close the isolator, thus endangering the lives of all the people that are working on the transmission line or the transformer. The existing system has a lot of drawbacks, such as -

Time delay

Human error

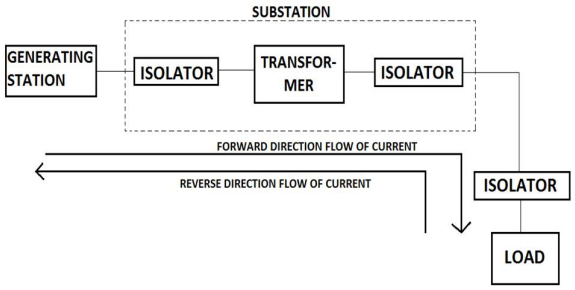


Fig.1: Power Flow Diagram

II. LITERATURE REVIEW

IEEE, "Performance of a fast forward power control using power control bits for the reverse power control as power measurement". *Published in: Vehicular Technology Conference, 1998. VTC 98. 48th IEEE (Volume:2):* In this paper, we propose a fast forward power control in which the power control bits in the forward link used for the reverse link power control are utilized to measure the estimate of forward power. In a DS-CDMA system, there is generally power control bits transmitted in the forward link for fast reverse power control and they are transmitted usually with a fixed rate. Even if they have polarity, the SNR of a power control bit is equivalent to that of a pilot bit. This means that they can play an equivalent role to the pilot symbols in the sense of power measurement. In some systems, the position of a power control bit in a power control group is usually randomized to average out the interference. Then the power measurement by power control bits is performed quasi-periodically while the power measurement by pilot symbols or periodic power control bits can be made periodically. Computer simulation shows that the performance degradation by this quasi-periodicity is small to validate the proposed fast forward power control scheme

IEEE, "Study of energy management for decreasing reverse power flow from photovoltaic power systems". *Published in: 2009 IEEE PES/IAS Conference on Sustainable Alternative Energy (SAE):* When the volume of distributed generation (DG), including photovoltaic (PV) power systems, is increased, reverse power flow from DG may cause problems. To reduce the reverse power flow from PV power systems, energy management by use of storage batteries is expected to be a solution. In addition, the combination with load control is expected to reduce the storage capacity. In this study, energy management methods by use of the Supply and Demand Interface (SDI), which is a device to control DG, batteries and loads, are proposed and the effectiveness of the methods are evaluated by simulation analyses. The simulation results show that the amount of reverse power flow from PV power systems is reduced by the proposed energy management methods, and the load control is effective in reducing the reverse power flow. The required storage capacity to prevent the reverse power flow from the distribution line to the transmission line is also shown.

"Power plants monitoring for reverse power flow evaluation". *Department of Electronics and Automation, Celal Bayar University, Turgutlu-Manisa, Turkey:* Power plant generators are important components of an electrical energy system. They should be constantly monitored and protected in order to maintain the quality and reliability of the power supply. Otherwise, generators may occur in case of faults or incorrect operation. One of them is reverse power condition. Reverse power flow can be cause important problems if it is not considered in the protection system design. The objective of this study is to investigate of the reverse power condition of the power plants generators. For this purpose, reverse power data are collected from a cogeneration power plant generators protection relays. The relays are able to detect disturbances and when these occur, all digital and analogical signals are stored in its memory, including the pre-fault, fault and post-fault intervals. Hence, the reverse power data, which are collected during the transition case from abnormal condition of the generators to motoring mode, present current, voltage, active and reactive power data as well as frequency variations, are analyzed for two generators.

"A Monitoring Technique for Reversed Power Flow Detection with High PV Penetration Level". *Article in IEEE transactions on smart grid · February 2015:* The integration of renewable energy resources (RESs) in power systems poses many research challenges. Research shows that the RES output may exceed the consumed power during the day. Consequently, the direction of the power flow on distribution lines can be reversed during some periods. As the voltage regulator is normally designed for unidirectional power flow, this may cause voltage violations on the distribution feeder. Therefore, most utilities try to set a penetration level (PL) limit for safe operation. On the other hand, time varying and unbalanced loading are the main characteristics of distribution systems. Moreover installation of intermittent and non dispatch able photovoltaic (PV) devices increases the control problems of distribution system. This paper presents an impedance-based monitoring method for detection of distribution system current behavior. It will be shown that by utilizing this monitoring technique, not only the small variation of PV PL can be easily detected, but also some fast transients such as the effect of cloud movement on PV system can be monitored. This monitoring technique employs only local measurements of bus voltages and line current to measure the apparent impedance seen at the installation point. The practical application of measured impedance as a monitoring technique shows its effectiveness for distribution system monitoring in presence of various PV PL.

A. Problem Solution

What we propose to remedy this problem is simultaneous operation of all isolators in the line. All the isolator will be commanded from the substation. The worker or electrician should flip on the switch before going to work on the transformer; this would ensure that all the isolator in the line will be opened despite their location or vicinity to the substation. We propose the use of Radio Frequency to communicate between the substation and the isolator located at the industry side. It would be wise to invest more money on safety equipment for the workers as well.

III. CIRCUIT DIAGRAM AND WORKING

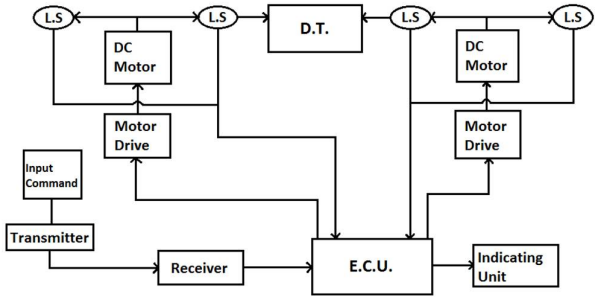


Fig2: Circuit Diagram

The above diagram shows the constructional features of circuit diagram of reverse power flow protection system. It consists of different blocks including limit switches, transmitter receiver, dc motor drive and control unit. Each block performs a different operation. All these components are used to control the operation of isolator. By controlling the operation of isolators the reverse power flow from load to source can be prevented, hence safeguarding the personnel and equipment. The power given to the circuit is from ac source. The isolators are placed either side of the transformer, which is to be operated through the radio frequency transmitter and receiver. The E.C.U. comprises of relay including S.P.D.T. and D.P.D.T.

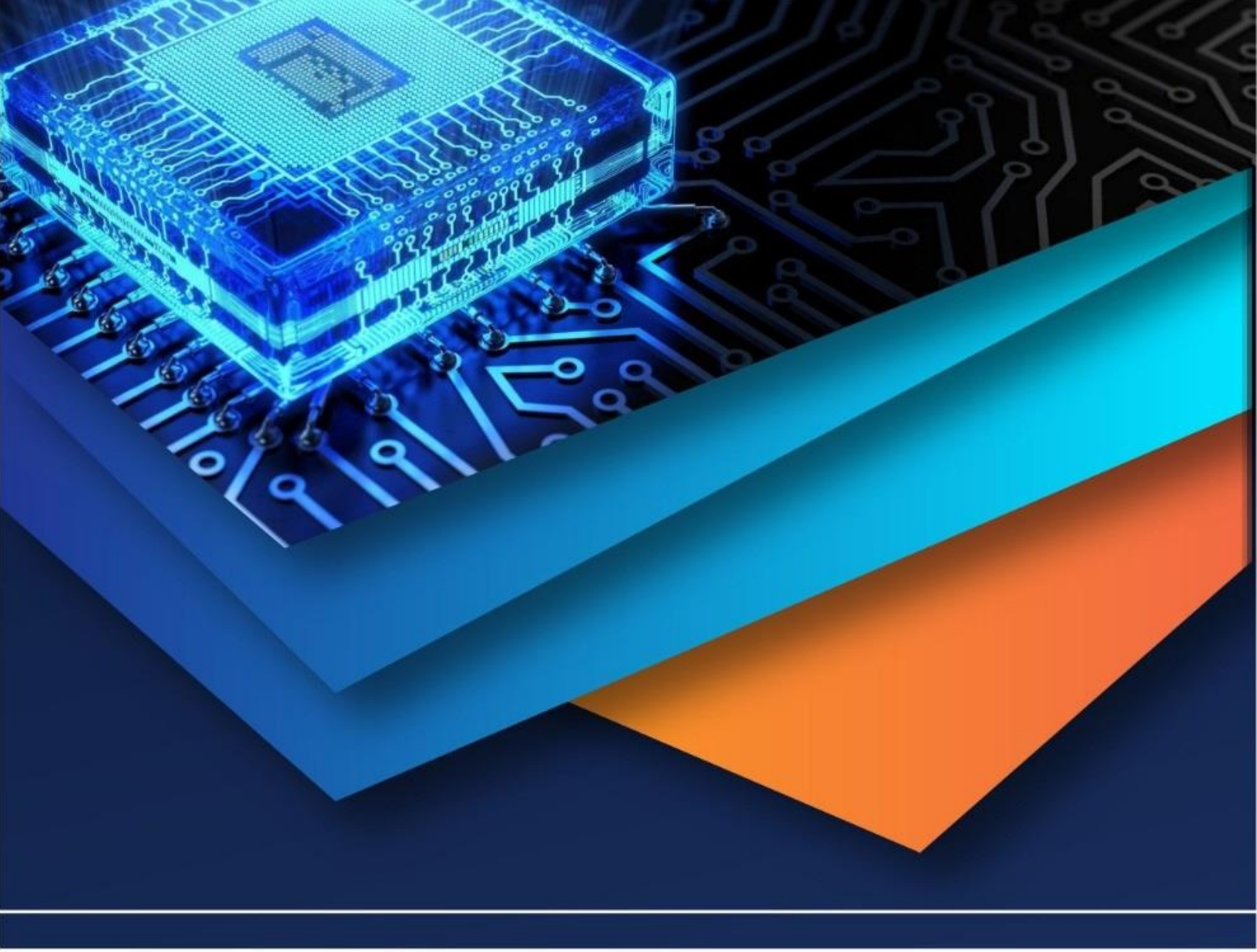
Our main function is to design a protection circuit which will prevent the accidents caused due to the flow of reverse power. In this project we plan to develop such a system which will monitor the occurrence of reverse power using various equipment viz. distribution transformer, DC motor with motor drives, ECU (Electronic Control Unit) containing transmitter and receiver, limit switches and relays.The signal to the ECU is given through the RF signal and is received by the receiver from transmitter by RF module using RF waves. The signal from ECU is then given to motor drive and it will operate the motor drive according to signal. The shaft of motor will operate the limit switch which gives feedback to the ECU and indicated by indicating unit.

IV. CONCLUSION

Our main objective of detecting the reverse power and preventing its adverse effects is achieved. At the end, we can derive the flow of reverse power is detected and accidents due to the reverse power are prevented. The circuit arrangement can be used in sub-station. This system works automatically. This arrangement can be used in switching stations.

REFERENCES

[1] Sezai TASKIN, “Power plants monitoring for reverse power flow evaluation”, Department of Electronics and Automation, Celal Bayar University, Turgutlu-Manisa, Turkey.
[2] Hashem Mortazavi, M. Saad “A Monitoring Technique for Reversed Power Flow Detection With High PV Penetration Level”, 1949-3053 _c 2015 IEEE, article in IEEE transactions on smart grid · February 2015.
[3] IEEE, “Performance of a fast forward power control using power control bits for the reverse power control as power measurement”, Vehicular Technology Conference, 1998. VTC 98. 48th IEEE (Volume:2)
[4] IEEE, “Study of energy management for decreasing reverse power flow from photovoltaic power systems”, 2009 IEEE PES/IAS Conference on Sustainable Alternative Energy (SAE).
[5] IEEE, “Variable reverse power flow-Part I: A-R-OPF with reactive power of wind stations”, Environment and Electrical Engineering (EEEIC), 2015 IEEE 15th International Conference on Rome.
[6] IEEE, “Cooperative control of distribution system with customer equipment’s to reduce reverse power flow from distributed generation”, Power and Energy Society General Meeting, 2010 IEEE.
[7] IET, “Investigation of the reverse power flow requirements of high penetrations of small-scale embedded generation”, IET Renewable Power Generation (Volume: 1, Issue: 3).



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY