Journal of **N**onlinear **A**nalysis and **O**ptimization
Vol. 11, Issue. 2 : 2020
ISSN : **1906-9685**

CHANGES IN DISTRIBUTION LOSS ASSIGNING DGS IN RADIAL SYSTEMS: A COMPREHENSIVE GUIDE

[#1]Mr.PURELLA SRAVAN KUMAR, ***Assistant. Professor,***
[#2] Mr.BUSANAVENA LAXMAN, ***Assistant. Professor,***
Department of Electrical and Electronics Engineering,
SREE CHAITANYA INSTITUTE OF TECHNOLOGICAL SCIENCES, KARIMNAGAR, TS.

ABSTRACT: Following the deregulation of the energy market and the adoption of distributed generation (DG), the role of distribution loss allocation (LA) has become more prominent. In the context of the activities of the LA (Local Authority), this study proposes a novel strategy for the distribution of power in radial networks. The method that has been suggested, which makes use of power flow analysis and takes into consideration both the active and the reactive power flows of the lines in Los Angeles (LA), is comprised of three different components. The calculation of the power loss begins with each node, beginning with source nodes, which are defined as nodes whose generation is more than their load. After then, the amount of power loss is apportioned to the loads that are connected to each node. After that, the total amount of power loss is divided up among all of the nodes in order to calculate the amount of power loss that will be allotted to the Distributed Generators (DGs) based on the results that were acquired in the previous phase. In contrast to the phase that came before it, this one entails assigning power losses to nodes that are connected to sink nodes while the load is greater than the generation. The very last step is called normalization. The proposed method is shown on two distribution feeders, and its findings are compared to those obtained by other methods currently in circulation.

Index Terms**:** Distributed generation, loss allocation, radial distribution systems.

1. INTRODUCTION:

The implementation of distributed generation, often known as DG, as well as the transition of distribution loads from the customer mode to the prosumer mode have resulted in the transformation of distribution networks from the passive mode to the active mode. As a direct consequence of this, several issues that were previously affecting the transmission network have now been moved to the distribution systems. Loss allocation, often known as LA, is a method that is used to establish the precise percentage of total distribution loss that may be assigned to each load or distributed generation (DG) source. LA is an abbreviation for the term "loss allocation." In light of the comprehensive investigation, this procedure is regarded as a barrier or an obstacle.

Distribution line approach is still a relatively new subject, and the majority of distribution system administrators do not have a standardized strategy in place. While the literature discusses a wide variety of approaches for approaching transmission lines, distribution line approach is still in its infancy. The vast majority of the methods that are currently utilized for the purpose of disseminating LA were originally proposed for the purpose of transmitting LA. The marginal method that is listed is the one that is used to calculate the marginal loss coefficients, which are used to indicate the changes in total loss that are produced by a change in active/reactive node injection. The findings of the power flow are utilized to derive these coefficients, which are then used in order to determine the percentage of distributed generators (DGs) and loads that contribute to the total loss. However, in order to account for any instances of overestimation, the results of this method will need to be modified. The results of the Newton-Raphson power flow are relied on by both the method that was mentioned and the method that was marginal. As a consequence of this, they are both subject to the constraints that are associated with making use of this power flow strategy in distribution systems that have a significant number of nodes, lines that have a small resistance in comparison to their reactance, or lines that are either extremely long or excessively short.

2. EXISTING SYSTEM:

Because the shunt admittance of these lines is so low, distribution systems that only use overhead lines require a special kind of matrix called a Y-bus matrix. As a direct consequence of this, the Z-bus strategy cannot be implemented.

A modified admittance matrix for buses is the foundation of this strategy.

Car ini and colleagues claim that the straightforward approach to LA, which takes into account both active and reactive processes, is unable to produce accurate results when applied to particular situations. When computing the loss at each node, BCDM takes into account the current that is flowing through the node's upper branches.

3. PROPOSED SYSTEM:

A Local Authority (LA) technique for radial medium voltage distribution networks that incorporate Distributed Generators (DGs) is presented in this study. At the start of the procedure, a specified group of nodes is given a power loss value of zero. This is done so that the procedure can begin. After that, the amount of power loss that can be credited to the other nodes is calculated by taking into account the amount of power loss that can be attributed to the connections that link the nodes that have been assigned zero power to the other nodes. At this point, normalization is carried out in order to compensate for the excessive recovery of total loss that was brought about by this process. The way forward is reliant on the results of the power flow.

The procedure can be broken down into the following three steps.

Calculating the loss allocated to the loads:

Loss due to active flows:

The process of identifying active source nodes involves locating nodes at which the amount of active generation exceeds the amount of active demand. The active loss of active source nodes is set to zero; the loss that is incurred by nodes that are not source nodes as a result of active flows is computed; and the active loss that is allocated to loads as a result of active flows is determined.

Loss due to reactive flows:

- During this step of the process, you will search for nodes that have an excessive amount of reactive generation in comparison to the amount of reactive demand they have. You will then designate these nodes as reactive source nodes and give them zero loss. The following step is to compute the losses that were sustained by other nodes as a consequence of reactive flows, as well as the losses that were sustained by loads as a consequence of reactive flows.
- The total loss is determined by adding up all of the individual losses that are linked with the loads that are brought on by the various active and reactive flows.

Calculating the loss allocated to the DGs:

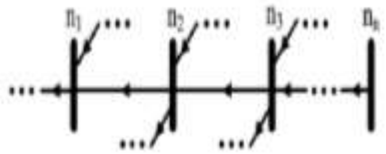

Fig .1.Part of a sample distribution feeder

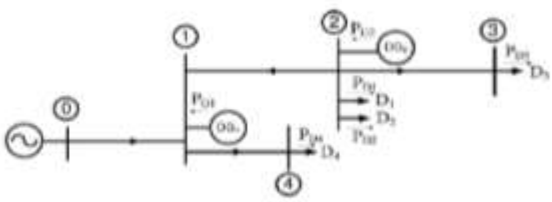

Fig.4. Sample distribution feeder

CASE STUDY

As can be seen in Figure 6, the Local Area (LA) technique that has been proposed has been put into practice on an example of a rural distribution system. 17 nodes, 12 loads, three distributed generators (DGs), and 16 distribution lines are all part of the system. The results of the power transmission are presented in Table I, together with the resistance of the distribution lines. The active fluxes cause each node to suffer a loss that is equal to the sum of the values of two terms, and this loss is calculated as follows:

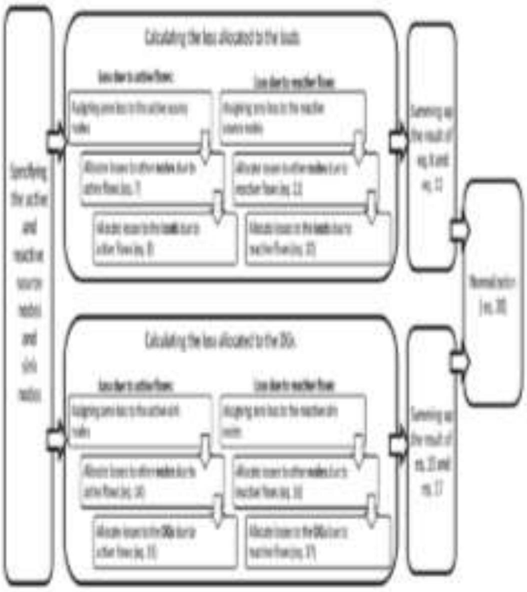

Fig.3.Steps of the proposed LA method

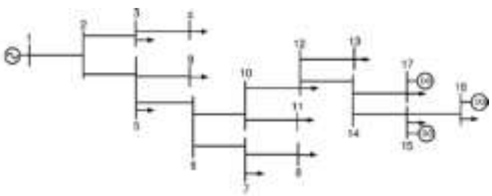

Fig.4. Test distribution feeder

The disruption of the node's electrical connections with the power sources that supply it with electricity.

Therefore, it is reasonable to assume that loads positioned at the extremities of lengthy feeders often result in considerable losses being dispersed. This is because of the nature of the situation. This may be shown by looking at Table II, which shows that the load that is connected to node 11 is responsible for significant losses. Loads that are located in close proximity to powerful generation sites, such as node 5, are given loss percentages that are on the lower end of the spectrum. One of the advantages of implementing the technique that was presented is that it takes into account the system topology in Los Angeles. As a result of taking consumers' locations into consideration, this approach is more equitable than the pro rata system that was previously in use.

The outcomes of applying the suggested strategy are not only impacted by the geographical factors at play, but also by the demand or generation of the clients. This is seen by the significant amount of loss that may be traced to node 8. The Jacobian matmust be computed in order to use the marginal strategy, which places an additional computational burden on the linear algebra method. In a similar fashion, the Z-bus technique is dependent on the computation of the Z-bus matrix, which can be a time-consuming process for broad distribution networks. On the other hand, the solution that was recommended only requires power flow measurements and does not require any further computations.

Some of the transmission methods that were first developed for LA, such as Z-bus and concise, attribute a portion of the total loss to the bus that is not being used. Because it is essential that the loss assigned to the slack bus in distribution LA be zero, the outcomes of these methods need to be modified in order to distribute the loss assigned to the slack bus across other nodes. This is because it is required that the loss allocated to the slack bus in distribution LA be zero. The approach that has been offered does not need to have any changes made to it in order to accommodate radial distribution networks, as the original design already included these.

CONCLUSION

This article proposes a novel method for assigning responsibility for losses that occur in radial distribution networks. The loss that is attributed to each node is determined by taking into account both the losses that are attributed to the nodes that are located nearby as well as the losses that are attributed to the connecting lines. The subsequent desirable characteristics of the suggested methodology are investigated in: The method is harmonious with the power flow's final results. Both the amount of energy that loads consume and the amount of energy that distributed generators (DGs) create are directly proportional to the losses that are attributed to them.

The amount of loss that is assigned to each load as well as distributed generation (DG) is affected by the location of those components.

The method may be grasped with little effort, and its application does not call for complex programming or a substantial amount of computing resources. It is required to carry out the method individually for each hour, which requires a significant investment of time, in order to make up for the energy that is lost throughout the course of the day. As a result, the authors are working on developing a stochastic strategy to ascertain equal loads by taking into consideration their volatility over a set duration. This is being done in order to substitute the load value while preserving an identical energy loss impact.

REFERENCES

1. P. M. Sotkiewicz and J. M. Vignolo, "Nodal pricing for distribution networks: Efficient pricing for efficiency enhancing DG," IEEE Trans. Power Syst., vol. 21, no. 2, pp. 1013–1014, May 2006.
2. E. Carpaneto, G. Chicco, and J. S. Akilimali, "Loss partitioning and loss allocation in three-phase radial distribution systems with distributed generation," IEEE Trans. Power Syst., vol. 23, no. 3, pp.1039–1049, Aug.2008.
3. E. Carpaneto, G. Chicco, and J. S. Akilimali, "Computational aspects of the marginal loss allocation methods for distribution systems with distributed generation," in Proc. IEEE Melecon, Benalmádena (Málaga), Spain, 2006, pp. 1028–1031.
4. M. Atanasovski and R. Taleski, "Power summation method for loss allocation in radial distribution networks with DG," IEEE Trans. PowerSyst., vol. 26, no. 4, pp. 2491–2499, Nov. 2011.
5. E. Carpaneto, G. Chicco, and J. S. Akilimali, "Branch current decomposition method for loss allocation in radial distribution systems with distributed generation," IEEE Trans. Power Syst., vol. 21, no. 3, pp.1170–1179, Aug. 2006.
6. R. S. Daniel, R. S. Salgado, and M. R. Irving, "Transmission loss allocation through a modified Ybus," in Proc. Inst. Elect. Eng., Gen.,Transm. Distrib., Mar. 2005, vol. 152, no. 2, pp. 208–214.
7. W. L. Fang and H. W. Ngan, "Succinct method for allocation of network losses," in Proc. Inst. Elect. Eng., Gen., Transm. Distrib., Mar.2002, vol. 149, no. 2, pp. 171–174.
8. C. N. Macqueen and M. R. Irving, "An algorithm for the allocation of distribution system demand and energy losses," IEEE Trans. Power Syst., vol. 11, no. 1,pp. 338–343, Feb. 1996.
9. J. S. Savier and D. Das, "Loss allocation to consumers before and after reconfiguration of radial distribution networks," Int. J. Elect. Power Energy Syst., vol. 33, no. 3, pp. 540–549, Mar. 2011.
10. J. S. Savier and D. Das, "Energy loss allocation inradial distribution systems: A comparison of practical algorithms," IEEE Trans. Power Del., vol. 24, no. 1, pp. 260–267, Jan. 2009.