International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume: 3 | Issue: 3 | Mar-Apr 2019 Available Online: www.ijtsrd.com e-ISSN: 2456 - 6470

Study on Loss Allocation of Power Distribution Network with Distributed Generation

Udit Kumar[1], Dr. Himani Goyal[2]

[1]Student, [2]Professor

[1,2]Department of Electrical Engineering, Poornima College of Engineering, Jaipur, Rajasthan, India

How to cite this paper: Udit Kumar | Dr. Himani Goyal "Study on Loss Allocation of Power Distribution Network with Distributed Generation" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-3 | Issue-3, April 2019, pp.674-676, URL: http://www.ijtsrd.com/papers/ijtsrd22958.pdf

IJTSRD22958

ABSTRACT

The introduction of the power distribution network with distributed generation is vast and losses and faults have been occurred so new challenges also been introduced. Loss allocation problem is one of them, it comes during operation of power distribution network with distributed generation. In the distribution of electricity loss allocation also vary and sudden changes will occur, to reduce this type of problem bus radial network will be used according to the distribution and generation of electrical power by loss allocation scheme. In the loss allocation scheme, different types of algorithms and calculation will be used.

KEYWORDS: *Loss allocation, Radial distribution system, load flow, Active and reactive power flows, Distributed generation, operating costs, renewable energy sources*

1. Literature Review

Today electricity becomes a necessity to the world, most works are done by electrical power for example machinery works, households, etc. Generation and distribution of electrical power from energy sources to the consumers by generation and distribution networks so it becomes so complicated, losses and faults will have occurred.

In the loss allocation the current real and imaginary parts will be taken by each network. The two phase have been choosen for loss allocation of distribution with distribute generators allocation of the electrical consumers or suppliers. The second phase has been taken of the loss changes of network which has been arised from generators by allocated to each distributed generator. Different types of methods for loss allocation is been used.

2. Allocation based on current injections

In the current injection based loss method slack bus is been used. This is used because of it usable functions and its application in the distributed system and the generation system, by infeeded of the buses in the transmission system.

3. Mathematical Formulation

The mathematical formulation by standard system of matrix impedance, networks are been divided in three types; Fixed current buses, buses without sources, fixed voltage buses. Fixed voltage buses and fixed current buses is the relation between the current and voltage.

4. Loss Allocation without Distributed Generators

In the loss allocation without distributed generators have been allocated to electrical power users; reactive power and active power flow by each networks and branch.

$$I_i^{1} = I_i^{1p} + jI_i^{1q} \quad (1)$$

Therefore, the loss of branch i can be expressed as:

$$P_{lossi} = R_i\left[\left(\sum_{j=1}^{N} I_{ji}^{1p}\right)^2 + \left(\sum_{j=1}^{N} I_{ji}^{1q}\right)^2\right]$$

Where R_i is resistance of branch I, N is the total number of that load

loss which is allocated by load j by branch I can be expressed as:

$$P^j_{lossi} = R_i\left[\left(\sum_{k=1}^{N} I^{1p}_{ki}\right) I^{1p}_{ji} + \left(\sum_{k=1}^{N} I^{1q}_{ki}\right) I^{1q}_{ji}\right] \quad (3)$$

$$P^j_{ipss} = \sum^{N} P^j_{lossi} \quad (4)$$

In Equation(4),T is total number of branch.

Overall equation for loss allocation;

$$P^g_{Gloss} = \sum_{i=1}^{T} P^g_{Glossi}$$

5. Allocation based on linear regression

In situations where extensive arrangements of estimation information are accessible, in any case, the system parameters are not actually displayed, relapse techniques can be utilized to isolate the reasons for the dynamic and receptive power misfortunes from one another and to envision future misfortunes dependent on guesses. In the reasons for the Reactive power trade between a dispersion framework and a transmission framework have been assigned to the breeze turbines, CHPs and purchasers utilizing a straight relapse examination. This methodology has likewise been utilized in to decide the effect of wind turbines on the receptive power misfortunes in the dissemination transformers of a framework. [15;16] propose a bunch savvy direct relapse a technique dependent on fluffy rationale to envision and assign dynamic control misfortunes in a dissemination framework. The possibility of the direct relapse examination is to speak to the misfortunes as a direct mix of various info factors. For the most part, the straight relapse issue can be determined. $\hat{y}$ is a section vector with one example of the evaluated amount per section, X is a network with a line for every perception and a section for each information parameter, B is a segment vector with one coefficient for each info parameter, and1 is a character section vector with a similar size as $\hat{y}$.

6. Loss allocation

The losses of the framework have been broken down as per the strategies portrayed in beneath. The point of the investigations is twofold. Right off the bat, they should give a diagram of the misfortunes in the appropriation framework. The accompanying inquiries ought to be considered.

How large are the total losses compared to the load and production?

- Where in the system are the losses dissipated?
- What are the losses caused by the integration of DG?
- What are the losses caused by the transfer of reactive power?
- What are the potential savings in losses if the simultaneity between load and production is Increased?

Also, the investigations will fill in as an approval of the misfortune portion techniques introduced . The examinations depend on estimations got in the period April sixth, 2006 to February sixth, 2007. Amid the period, a couple of long periods of information are absent because of correspondence issues in the SCADA framework. The assessed mean qualities of misfortunes and so on have not been remedied for the distinction in burden and generation design between the missing two months also, the remainder of the year. Demonstrates an outline of the mean dynamic power misfortunes, isolated into the parts causing the misfortunes. The aggregate mean-misfortunes make around 1.27 MW, from which 72 % is dispersed at 10 kV dimension and beneath. It ought to be noted that the genuine framework additionally involves an expansive number of 0.4 kV lines which have not been demonstrated. The shunt misfortunes of the transformers which are basically autonomous of the stacking, make 49 % of the complete dynamic power misfortunes. The mean burden subordinate misfortunes of the 150/60 kV transformers just add up to 5 kW.

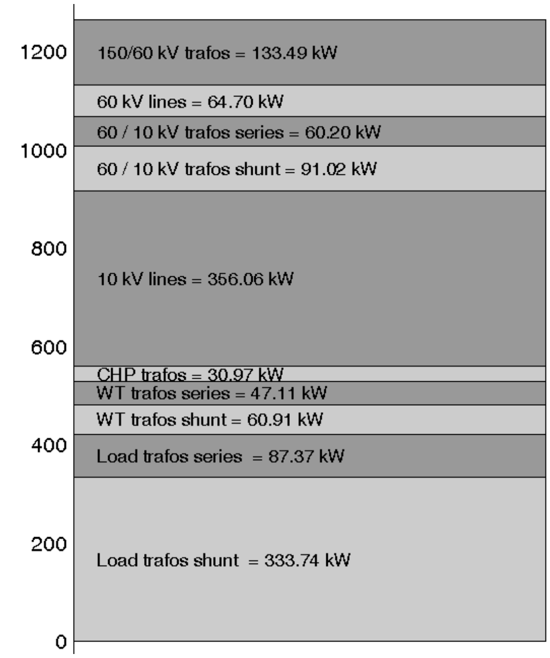

Fig. 1 Mean active power losses

The system involves ten 60/10 kV stations. Three of the stations involve two transformers which are not worked in parallel. Table 1 demonstrates the mean burden and creation from CHPs and wind turbines of the feeders under each of the transformers.The system includes ten 60/10 kV stations. Three of the stations include two transformers which are not worked in parallel. Table 1 demonstrates the mean burden and creation from CHPs and wind turbines of the feeders under each of the transformers think about the effect of the conveyed age, an allotment of the framework misfortunes is executed as depicted. The accompanying blend of the techniques has been utilized: Right off the bat, the misfortunes of the 60 kV system, the 150/60 kV transformers and the 60/10 kV transformers are distributed to the individual feeders, in view of the impedance framework of that some portion of the system. For examination, the assignment is made both utilizing the minor misfortune assignment technique and the a factual technique dependent on current infusions. Besides, the misfortunes at 10 kV dimension and beneath for each the feeder is dispensed to the four classifications; loads, wind turbines, CHPs and shunt misfortunes. The distribution is performed utilizing the relapse technique utilizing the obvious power as input and dismissing the cross-impacts. At last, the misfortunes at 60 kV or more are allotted to the loads, wind turbines, CHPs and shunt misfortunes of the person feeders. The methodology is that the heap or age of each classless the low voltage misfortunes allotted to the explicit class are changed over to a comparable current infusion on the 10 kV side of the 60/10 kV transformers, also, a similar methodology as in stage one is utilized. Table 2 demonstrates the distribution of the misfortunes at 60 kV dimension or more, including the 60/10 kV transformers to the singular feeders. Segment A contains the commitment from the mean power streams of the feeders. Segment B demonstrates.

7. CONCLUSION

The paper has portrayed, how the misfortunes in a dispersion a framework can be allotted to stack and dispersed age units. The negligible misfortune portion technique and the current infusion technique has been utilized for the situation concentrate to allot the misfortunes. For the 60 kV framework, the outcomes from the current infusion strategy have been contrasted with results from the affectability investigation and the two calculations show indistinguishable results. The upsides of the affectability investigation are right off the bat that the calculation is a piece of most power framework recreation devices. In Power factory the figuring of misfortune sensitivities, nonetheless, requires a conjuring of the affectability apparatus for each transport under thought.

This can be mechanized, however, it expands the all-out recreation time. Besides, the elucidation is appropriate for example impetus creating value signals, since it straightforwardly gives the cost of a little change underway/ utilization. The benefits of the present infusion technique are right off the bat that it depends on the decreased impedance lattice, which contains the short out impedance. It is conceivable to make a harsh gauge of the expense of exchanging power from one spot to another equitable by taking a gander at the diminished impedance network. Like the affectability investigation, the calculation requires a heap stream computation for every estimation test to decide the current feeds. PowerFactorydoes not legitimately bolster the fare of the impedance framework. It is, in any case, conceivable that it could get actualized in a future adaptation of the apparatus. The straight relapse technique is a basic method for getting an review of the misfortunes at 10 kV and beneath. It is, notwithstanding, impractical to isolate the misfortunes identified with segments in a similar feeder with comparable burden or generation time profiles because of the multidisciplinary issue.

Framework, it is presumed that the cross impacts between a burden furthermore, generation make a generally little piece of the aggregate framework misfortunes, in light of the fact that the bigger breeze ranches and CHPs are associated with the 60/10 kV stations through their own radials. In light of the relapse investigation of feeders with as it were a couple of little breeze turbines and CHPs, it is, be that as it may, reasoned that a portion of the little units do add to bringing down the misfortunes. The receptive power exchange through the 60/10 kV transformers or more just produces 5 % of the load subordinate misfortunes.

8. References

[1] Costa, P. M. and Matos, M. A., "Loss allocation in distribution networks with embedded generation," IEEE Transactions on Power Systems, vol. 19, no. 1, pp. 384-389, 2004.

[2] Cardell, J. B. Improved Marginal Loss Calculations During Hour of Transmission Congestion. 2005. 38th Annual Hawaii International Conference on System Sciences.

[3] Herter, K., "Residential implementation of critical-peak pricing of electricity," Energy Policy, vol. 35 pp. 2121-2130, 2007.

[4] Hoff, T. E., Perez, R., Braun, G., Kuhn, M., and Norris, B. The Value of Distributed Photovoltaics to Austin Energy and the City of Austin. 2006. Austin Energy.

[5] Conejo, A. J., Arroyo, J. M., Alguacil, N., and Guijarro, A. L., "Transmission loss allocation: a comparison of different practical algorithms," IEEE Transactions on Power Systems, vol. 17, no. 3,pp. 571-576, 2002.

[6] Al-Rajhi, A. N. and Bialek J.W. Marginal and Tracing Pricing of Transmission an Empirical Comparison. 2002. 14th Power Systems Computation Conference.

[7] Mutale, J., Strbac, G., Curcic, S., and Jenkins, N., "Allocation of losses in distribution systems with embedded generation," IEE Proceedings-Generation Transmission and Distribution, vol. 147, no. 1, pp. 7-14, 2000.

[8] Conejo, A. J., Galiana, F. D., and Kockar, I., "Z-bus loss allocation," Power Systems, IEEE Transactions on, vol. 16, no. 1, pp. 105-110, 2001.