Review on Load Flow Analysis Using Different Methods

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ABSTRACT:- The power system analysis is important to know about current state of system and also for future expansion.This analysis is carried out at the state of planning, operation, control and economic scheduling. The main objectives of this survey is to collect the information on the research taken place previously.

KEYWORDS:- Load flow Analysis, NR Method, GS Method, FDLF.

INTRODUCTION

Load flow studies are used to ensure that electrical power transfer from generators to consumers through the grid system is stable, reliable and economic. The principal information obtained from the power flow study is the magnitude and phase angle of the voltage at each bus, and the real and reactive power flowing in each line.

The load flow study provides information about line and transformer loading (as well as losses) throughout the system and voltages at different points in the system for evaluation and regulation of the performance of the power systems. Further study and analysis of future expansion, stability and reliability of the power system network can be easily analyzed through this study. Increasing demand of the power and complexity of the power system network, power system study is a significant tool for a power system operator in order to take corrective actions in time. The advent of digital computers, load flow solutions were obtained using network analyzers.[1]

There are many techniques in-order to address the load flow problem, the techniques are numerical methods that are used to solve non-linear equations in order to obtain the steady state parameters of the system. In network design and load flow analysis were carried out using ETAP and the resulting conclusions were taken as considerations for future expansion of power systems. In load flow studies are performed using Newton-Raphson and decoupled load flow methods and a comparison is made amongst systems with and without unified power system controllers.[10]

REVIEWS ON LOAD FLOW ANALYSIS

When load flow analysis has been performed for voltage sensitive loads, as compared with the load flow solution for constant power load, it is shown that the constant current and constant impedance loads required additional iterations to obtain the solutions and the load flow solution with voltage sensitive loads are more accurate than those for constant power load.[2]

Load flow analysis has been be performed in ETAP(Electrical Transient And Analysis Program) for normal operation, maximum load operation and no load operation. ETAP provides the output of load for these scenarios.% loading of bus are allowed upto 80% during FEED stage & upto 90% in detail engineering stage .Results shown that 5% margin should be considered in MCC & DB bus. Load flow analysis using ETAP details about modeling electrical equipment parameters, modeling worst case scenario for equipment sizing. [7]

The Newton Raphson method is more reliable because it has less power penalty and less iteration than the other methods. In general, despite its longest computation time, the NR algorithm requires the least number of iterations to converge. However, as accuracy increases, the computation time of GS is much lower than other methods. The number of iterations for Gauss-Seidel increases directly with the number of buses in the network, while the number of iterations for the NR method remains virtually constant, regardless of the size of the system. However in FD method, because the convergence properties of the fast decoupling technique are geometrically related to NR quadratic convergence, it requires more iteration. Since, because of the high accuracy load flow obtained in a few systems only, the Newton-Raphson method is better to the use and more reliable than any other method. [11]

The author shows Gauss Seidel method is well known and established while Newton Raphson method is most recent ad most sophisticated method of power flow studies. Polar coordinates are preferred for N-R while rectangular coordinates for Gauss Seidel method. Time taken to perform one iteration of computation is lesser in Gauss Seidel method while compared to N-R method but the number of iterations required for G-S method are more than N-R method. In G-S method rate of convergence is slow plus convergence characteristic is linear while N-R method has quadratic convergence characteristics. G-S method takes more computer time and costs more than N-R method. G-S method is used to compute the solution of small system problems while N-R method is used with advantage for large power systems. [8]

When author presents the 3phase load flow for power distribution system where loading in this system is very unbalanced. This linear approximation is not suitable for power distribution systems due to their high ratio and unbalanced operation Furthermore, they are delta connected. Results are evaluated in terms of the voltage error. The methodology demonstrated to be valid for balanced and unbalanced power systems. Results were very accurate regardless of the ratio. Exactitude of methodology can be estimated by the minimum voltage on the system. Very low voltages increase the error. Potential applications of the proposed methodology include convex optimization, optimal power flow, and distribution system dynamics among others. PV nodes as well as other controls usually present in power distribution systems are not considered.

The introduced error by inaccurate representation of the power flow controlling device is relatively small, increasing with higher phase shifting angles (about 5 % of the line flow). However, this is an additional error and precaution has to be taken when drawing conclusions based on simulations using DC power flow when PSTs are involved .[5]

The algorithm is formulated and designed in MATLAB programs for formation of bus admittance matrix, converting polar form to rectangular form, Gauss-Siedel method and Newton Raphson method were used for analyzing the load flow of the IEEE-30 bus systems. The voltage magnitude and angles of a 30 bus system were observed for different values of Reactance loading and the findings have been presented. From the findings, it is concluded that increasing the reactance loading resulted in an increased voltage regulation. Gauss-Siedel has simple calculations and is easy to execute, but as the number of buses increase, number of iterations increases. On the other hand, in Newton-Rahpson method, the calculations are complex, but the number of iterations is low even when the number of buses is high. [3]

The results were compared solving the load flow problem for a standard IEEE-30 and 57 bus test cases using Gauss - Seidal ,Newton Raphson and fast decoupled load flow techniques in MAT .It shows that The N-R method has faster rate of convergence because of its quadratic convergence characteristic. The technique is said to home-in to the solution. [10]

The IEEE 14 bus system was analyzed by using Guass-Seidel method. This is verified by calculating hand calculations by using the Guass-Seidel equations and MATLAB program for 5 bus sample system. Both these results are found equal .so this type of MATLAB programming is very useful for solving load flow problems. This MATLAB program can be applicable for any number of buses. The standard IEEE 14 bus input data is used for IEEE14bus system and sample 5 bus input data is used for 5 bus system. The future scope for this project can be extended with Newton-Raphson method and Fast Decoupled methods. [4]

The purpose of the research was to draw a comparison of load flow solution between simulink and IEEE Radial distribution

subcommittee solution. The comparison of voltage magnitude and voltage angles at various buses for different phases has been done .The simulink model takes vary less number of iteration for load flow convergence. The simulink models with minimized losses can serve the researchers in the field of power systems. [9]

This paper present, standard 12 bus and IEEE-69 bus system is used.The significant improvement in voltage profile with the reduction of cost and energy losses is observed by installing DG at different buses for composite load model over constant power model.

CONCLUSION

This paper has presented a review literature of load flow analysis. The simulink model takes very less number of iteration for load flow also minimizes the loses . Further study is needed for better study is needed for better result.

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