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# Review of Load Flow Analysis for Three Phase Radial Distribution System

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## Abstract:

This paper based on review of load flow analysis of radial distribution system. The problem on unbalancing of reactive power is in single phase and three phases. Therefore to improve & enhancing voltage profile and stability of the existing power system, load flow analysis is alternative solution. Here is review on different approaches by different author's for load flow analysis in three phase radial distribution system to improve voltage stability and to minimize the transmission line losses. Different optimization techniques may be use to identify as well as applied in three phase radial distribution system with analysis of different authors review and based on merits and demerits of radial distribution system. Local search optimization is also described based on this review.

## I. INTRODUCTION

Power flow or load flow studies are performed for the determination of the steady state operating condition of a power system. This is the most frequently carried out study by power utilities and is required to be performed for power system planning, operation, optimization and control. At the design stage, load flow analysis [3, 9] is used to check whether the voltage profiles are expected to be within limits throughout the network.

The effectiveness of the backward forward sweep method in the analysis of radial distribution systems has already been proven by researchers, by comparing it to the traditional load flow methods. The forward backward sweep method [1, 3, 5] is commonly used due to its computational efficiencies and solution accuracies.

Radial distribution system [2] [3] can be modeled as a network of buses connected by distribution lines, switches & transformers. The load-flow study of radial distribution network is of prime importance for effective planning of load transfer Local Search is a family of general-purpose techniques for search and optimization problems, which are based on several variants of the simple idea. Each Local Search technique prescribes a different strategy for dealing with the foggy situation. The application of Local Search algorithms to optimization problems dates back to early 1960s. Since that time the interest in this subject has considerably grown in the fields of Operations Research, Computer Science and Artificial Intelligence. Local Search algorithms are non-exhaustive in the sense that they do not guarantee to find a feasible (or optimal) solution, but they search non-systematically until a specific stop criterion is satisfied. Nevertheless, these techniques are very appealing because of their effectiveness and their widespread applicability [24, 26, 28].

## II. RESEARCH SUMMARY

There is summary of different academician/researchers given in below table:

| Sr. No. | Author's Name | Methods/Technique | Optimization | Outcome |
|---|---|---|---|---|
| 1. | Yuntao Ju, Wenchuan Wu, Boming Zhang, Hongbin Sun | Loop Analysis | Forward Backward Sweep | Three-Phase Models To Check The Performance Of Forward Backward Sweep Method |
| 2. | A. D. Rana, J. B. Darji, Mosam Pandya | KCL And KVL | Forward Sweep And Backward Sweep | Transmission Line Losses ,IEEE 33 Bus Radial Distribution System |
| 3. | M. E. Baran And F. F. Wu | Non-Linear Equations | Newton-Raphson Method | Computational Efficiency In Power Flow |
| 4. | Puthireddy Umapathi Reddy, Sirigiri Sivanagaraju, Prabandhamkam Sangameswararaju | Zero Sequence-Voltage And Current | Forward Backward Sweep | 19-Bus Unbalanced System For Grounded Star-Delta And Delta Grounded Star Transformer Connections |

## III. RADIAL DISTRIBUTION SYSTEM

According to scheme of operation, distribution system may be classified as:1) Radial distribution network 2)Ring main system 3) Interconnected System.
Selection of Radial distribution system based on load flow study can be possible for analyzing, study and review about three phase radial distribution system.

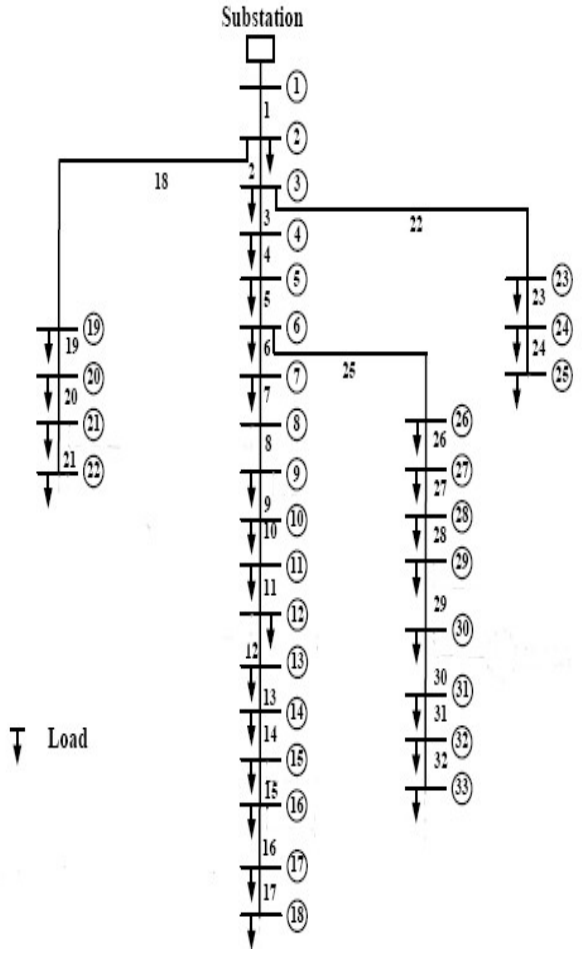



Figure:1 IEEE-33 bus Radial Distribution System

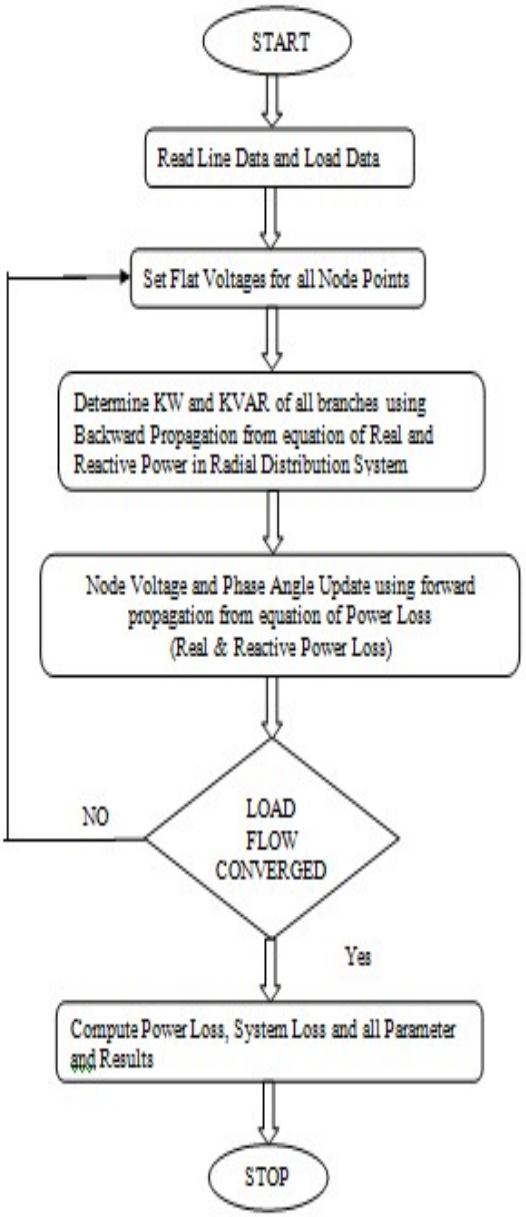
In above figure IEEE-33 bus system in which has distributiion from bus number 18, 22 and 25. It is used to analyze for three phase RDS.

Table:1 Discription of Radial Distribution System

| Load Flow in Radial Distribution System | Merits | Demerits |
|---|---|---|
| Newton - Downhill | 1. Not Depends on Initial Solution<br>2. Higher Convergence Rate | ➢ Convergence order is less than 2<br>➢ If jacobian matrix is singular then failed |
| Genetic Algorithm Based | 1. Simple Implementation<br>2. Suitable for Offline Problems | ➢ In Complex network excessive computation time<br>➢ Sensitive to controller parameter |
| Particle Swarn Optimization (PSO) | 1. Offline Problems suitable<br>2. Faster than Genetic Algorithm | ➢ Slower Convergence<br>➢ In complex network Unsuccessful |
| Artificial Neural Network | 1. Suitable for On-line problems<br>2. Least Computation Time | ➢ Other methods Need<br>➢ Specified Input Range Limited |
| Forward/Backward Sweep Method | 1. Jacobian Matrix is Not Needed<br>2. KCL equations<br>3. Not Depends on PV and DG Number for small Networks<br>4. Suitable for online and offline Problems | ➢ Unsuccessful for Heavy Load<br>➢ Unsuccessful for large scale network |

## IV. ALGORITHM

Load flow in three phase radial distribution can be analyzed by flow chart for determination of kW and kVAR.




## V. OPTIMIZATION TECHNIQUES

There are different optimizations techniques can be used in load flow study for three phase radial distribution system:

**Local search optimization:** These optimization techniques are applicable for determining number of busses, nodes and any other things in radial distribution system. 1) Metaheuristic methods 2) Stochastic optimization

Table 2: Characteristics of Local Search Methods

| Feature | Hill Climbing | Simulated Annealing | Tabu Search |
|---|---|---|---|
| Initial Solution | Not Specified | Random | Not Specified |
| Select Move | Random | Random | Best Non Tabu |
| Acceptable Move | Non-Worsening | Always improve Worsening | Always |
| Stop Search | Idle Iterations | Frozen System | Idle Iterations |

As per description of another optimization techniques shown in figure there has artificial intelligence, genetic algorithm, particle swarm optimization and forward backward sweep optimization but this method is further classified on the basis of branch current based, branch power based and branch impedance based.

## VI. AUTHOR'S BIOGRAPHY

Mr. Pawan Kaushal is pursuing Master of Technology in Power Electronics from Malwa Institute of Technology, Indore (M.P.), affiliated to Rajiv Gandhi Proudhyogiki Vishwavidyalaya, Bhopal. He is working an area of forward backward sweep, local search and optimal DG placement in RDS.

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