Comparative Analysis of Distribution System Using Power World Simulator

Vivek Kumar[1], Bobby kumar[2], Sachin kumar jha[3], Harpreet Kaur Channi[4]
[1, 2, 3] Dept of Electrical Engineering
[4]Assistant Professor, Dept of Electrical Engineering
[1, 2, 3, 4] Chandigarh University, Gharuan, Mohali, Punjab,India

Abstract- *This paper presents comparison of distribution system and elaborate the efficient method to solve the power flow problem in radial distribution system and loop distribution system of power system . The distribution system mainly depends upon voltage of static load. (1) Radial distribution system are of two types one way and two way system. (2) Loop distribution system. Both systems are compared on the basis of voltage, current and power factor for domestic and industrial type of load. A power world simulator software is used to simulate different distribution system.The software is used for comparative analysis of real power loses and load balancing.*

Keywords- distribution, efficient, flow, loop, static, voltage, simulator

I. INTRODUCTION

The distribution system is the part of an electric power system after the transmission system that is committed to delivering electric energy to an end user[1]. A drop in voltage levels results when demand for electricity surpasses the capacity of the distribution system. A system whereby power is received at the utility supply voltage level by a single, incoming substation. Through a series of step downs and splits, the power is converted for individual end-use equipment.

1. Radial distribution system- In this system of power supply, current is supplied to load in linear way by local grid. This can be done by 2 ways.(a)Grid on one side of load or one generation system.(b)Loads are between two supply grids and hence get supply from both ends. This system is used only when substation or generating station is located at the center of the consumers. In this system, different feeders radiate from a substation or a generating station and feed the distributors at one end as shown in figure 1. Thus, the main characteristic of a radial distribution system is that the power flow is in only one direction. Single line diagram of a typical radial distribution system is as shown in the figure below. It is the simplest system and has the lowest initial cost [2].

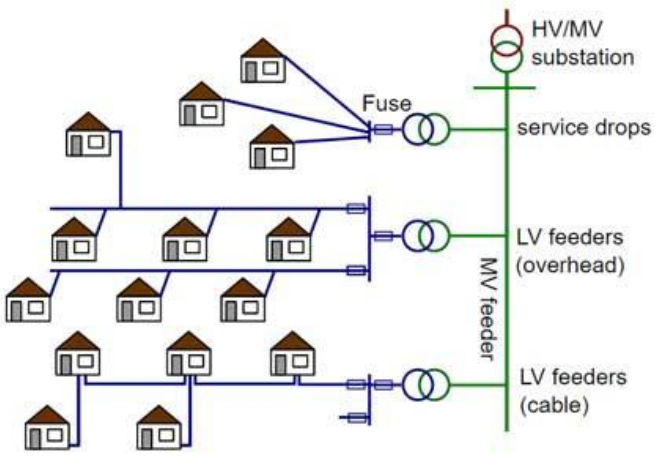

Figure 1 Radial system

2. Ring distribution- In this system of power supply the loads or receiver are in ring form and the supplier or grid placed one point of this ring and supplies the power. A similar level of system reliability to that of the parallel feeders can be achieved by using ring distribution system as shown in figure 2. Here, each distribution transformer is fed with two feeders but in different paths. The feeders in this system form a loop which starts from the substation bus-bars, runs through the load area feeding distribution transformers and returns to the substation bus-bars[3-4].

This is all about comparing two different modes of power distribution i.e. between radial power distribution and ring distribution system as shown in figure 1.In radial system as the number of load increases and we move away from grid the voltage id decreased and so current increases whereas in ring distribution system the voltage and current supply remains almost same. Now if there is fault in any load in ring distribution system no other receiver load is affected but in case of radial distribution system if any fault is there all the loads leading it don't receive supply[5-6].

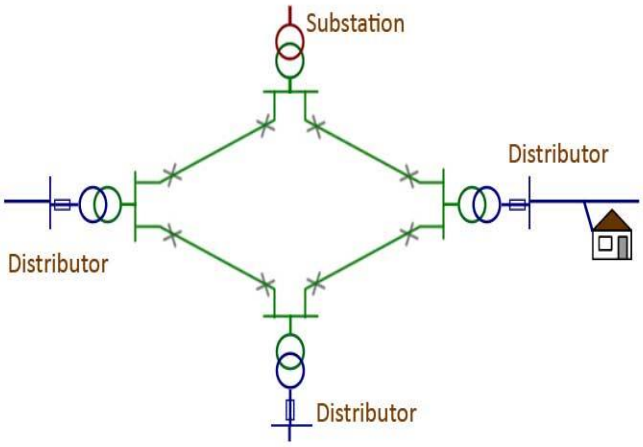

Figure 2 Ring distribution system

II. SIMULATION IN POWER WORLD SIMULATOR

Power World Simulator is an interactive power system simulation package designed to simulate high voltage power system operation on a time frame ranging from several minutes to several days. The software contains a highly effective power flow analysis package capable of efficiently solving systems of up to 250,000 buses.

A. Simulation Of radial system in Power world simulator

Figure 1 shows the radial system having generation capacity of 9MW,1MVar.Figure 2 and 3shows Radial System voltage results using word simulator and Radial System capacity results using word simulator

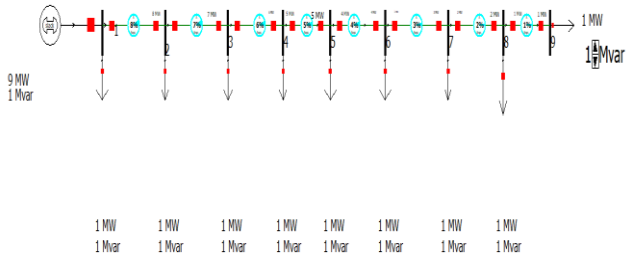

Figure 1Radial System

Radial feeder depend upon load the distribution line resistance of feeder are increases in on load to another load.

B. Simulation of Ring Distribution system in Power world simulator

Figure 4 shows the ring distribution system having generation capacity of 9MW,1MVar.Figure 5 and 6 shows ring distribution System voltage results using word simulator and ring distribution System capacity results using word simulator

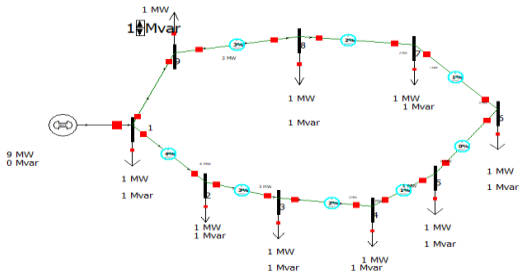

Figure no 4. Ring distribution system

III. CONCLUSION

Radial and ring feeder are the electrical energy distribution system . Ring main distribution system is more reliable than radial because in this system the load (consumer) is being fed by more then one feeder and in case of failure of one feeder there is an alternative path to supply power to the connected load. Whereas, in radial there is no alternative path to supply the load in case of power interruption.

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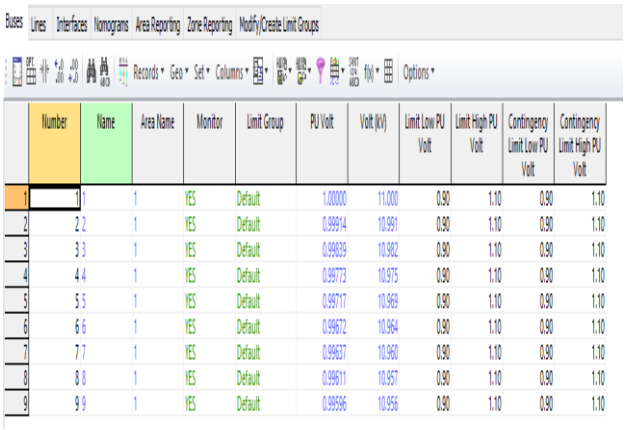
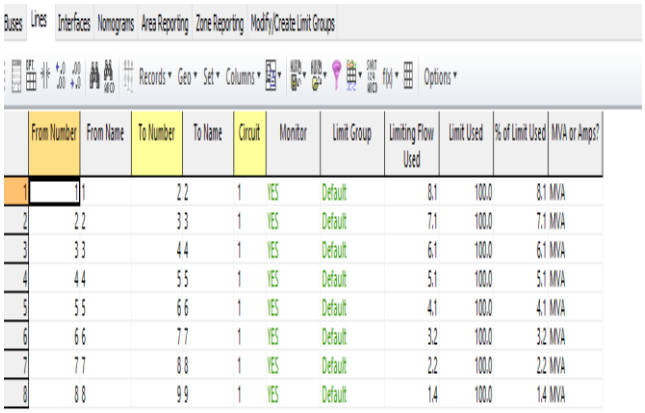


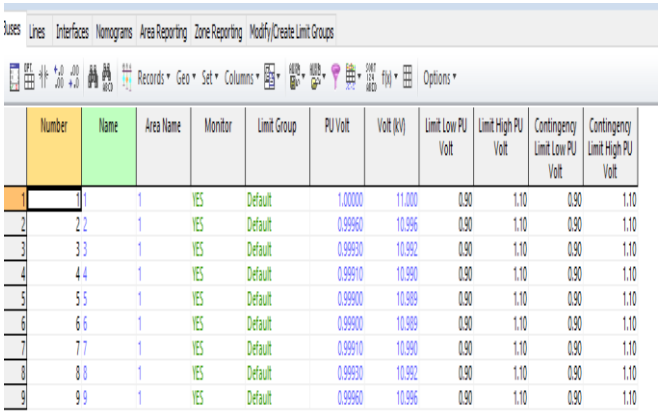
	Number	Name	Area Name	Monitor	Limit Group	PU Volt	Volt (kV)	Limit Low PU Volt	Limit High PU Volt	Contingency Limit Low PU Volt	Contingency Limit High PU Volt
1	1	1		YES	Default	1.00000	11.000	0.90	1.10	0.90	1.10
2	2	2	1	YES	Default	0.99914	10.991	0.90	1.10	0.90	1.10
3	3	3	1	YES	Default	0.99839	10.982	0.90	1.10	0.90	1.10
4	4	4	1	YES	Default	0.99773	10.975	0.90	1.10	0.90	1.10
5	5	5	1	YES	Default	0.99717	10.969	0.90	1.10	0.90	1.10
6	6	6	1	YES	Default	0.99672	10.964	0.90	1.10	0.90	1.10
7	7	7	1	YES	Default	0.99637	10.960	0.90	1.10	0.90	1.10
8	8	8	1	YES	Default	0.99611	10.957	0.90	1.10	0.90	1.10
9	9	9	1	YES	Default	0.99596	10.956	0.90	1.10	0.90	1.10

Figure 2 Radial System voltage results using word simulator



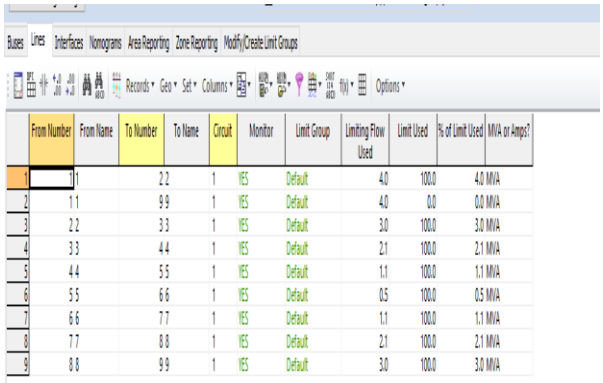
	From Number	From Name	To Number	To Name	Circuit	Monitor	Limit Group	Limiting Flow Used	Limit Used	% of Limit Used	MVA or Amps?
1	1	1	2	2	1	YES	Default	8.1	100.0		8.1 MVA
2	2	2	3	3	1	YES	Default	7.1	100.0		7.1 MVA
3	3	3	4	4	1	YES	Default	6.1	100.0		6.1 MVA
4	4	4	5	5	1	YES	Default	5.1	100.0		5.1 MVA
5	5	5	6	6	1	YES	Default	4.1	100.0		4.1 MVA
6	6	6	7	7	1	YES	Default	3.2	100.0		3.2 MVA
7	7	7	8	8	1	YES	Default	2.2	100.0		2.2 MVA
8	8	8	9	9	1	YES	Default	1.4	100.0		1.4 MVA

Figure 3 Radial System capacity results using word simulator



	Number	Name	Area Name	Monitor	Limit Group	PU Volt	Volt (kV)	Limit Low PU Volt	Limit High PU Volt	Contingency Limit Low PU Volt	Contingency Limit High PU Volt
1	1	1		YES	Default	1.00000	11.000	0.90	1.10	0.90	1.10
2	2	2	1	YES	Default	0.99960	10.996	0.90	1.10	0.90	1.10
3	3	3	1	YES	Default	0.99930	10.992	0.90	1.10	0.90	1.10
4	4	4	1	YES	Default	0.99910	10.990	0.90	1.10	0.90	1.10
5	5	5	1	YES	Default	0.99900	10.989	0.90	1.10	0.90	1.10
6	6	6	1	YES	Default	0.99900	10.989	0.90	1.10	0.90	1.10
7	7	7	1	YES	Default	0.99910	10.990	0.90	1.10	0.90	1.10
8	8	8	1	YES	Default	0.99930	10.992	0.90	1.10	0.90	1.10
9	9	9	1	YES	Default	0.99960	10.996	0.90	1.10	0.90	1.10

Figure 5 Radial System voltage results using word simulator



	From Number	From Name	To Number	To Name	Circuit	Monitor	Limit Group	Limiting Flow Used	Limit Used	% of Limit Used	MVA or Amps?
1	1	1	2	2	1	YES	Default	4.0	100.0		4.0 MVA
2	1	1	9	9	1	YES	Default	4.0	0.0		0.0 MVA
3	2	2	3	3	1	YES	Default	3.0	100.0		3.0 MVA
4	3	3	4	4	1	YES	Default	2.1	100.0		2.1 MVA
5	4	4	5	5	1	YES	Default	1.1	100.0		1.1 MVA
6	5	5	6	6	1	YES	Default	0.5	100.0		0.5 MVA
7	6	6	7	7	1	YES	Default	1.1	100.0		1.1 MVA
8	7	7	8	8	1	YES	Default	2.1	100.0		2.1 MVA
9	8	8	9	9	1	YES	Default	3.0	100.0		3.0 MVA

Figure 6 Ring distribution System capacity results using word simulator