

A brief Review on DG Allocation Problem in Distribution System

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Abstract

The demand of electrical energy is increased exponentially in recent times. So, fulfil this it is required to increase the generation. Further, the losses in distribution network is predominate as compared to generation and transmission. So, in order to address the above-mentioned issues, it is suitable to place DG technologies. But, integration of these poses new challenges. In this paper a brief review of DG allocation problem in DS and important findings from the existing literature are noted. Further, scope of possible areas with DG allocation problem in DS are mentioned.

Key words: Distributed generators, Distribution system, Power loss

1. Introduction

Due to escalation of demand it is necessary to escalate the power generation. So, in order to achieve we cannot directly dependent on conventional energy sources. For this power generation is done through renewable based sources. But, the utilization of these sources in a suitable way is significant. Next, the power loss in DS is more dominant as compared to generation and transmission. So, there is need to minimize the losses and fulfil the escalated demand. To achieve this goal, it is viable to place DGs optimally in DS. In this paper a brief review based on DG allocation problem and associated power loss minimization papers are discussed. Further, the type of DGs placed in DS gives different types of results.

2. Type of DG Technology

The classification of DGs into two categories i.e. renewable and Non-Renewable based. Again, the renewable based is further divided into solar, wind, biomass and so on. The classification and it is applications are given in Table 1.

Table 1 Different types of DG Technologies

Type of DGs	DG size	Application
Solar PV	Few watts to several kW	Base load and Standalone applications
Wind turbines	Hundred watts to Hundred MWs	Industry and Farms
Diesel Engines	Hundred MWs	Peak load shaving
Fuel cells	Tens of kW to MW	Base load application
Micro Turbines	A few kW to hundreds of MW	Peak shaving

3. Review of DG allocation Problem (Power loss minimization)

The main objective of DG allocation problem is to fulfil the demand and reduce the DS power loss. So many authors from last two decades solves this problem and produces the more prominent result that is tabulated in Table 2.

Table 2 A review of DG allocation problem with objective functions

S.no	Number of DGs	Objective	Objective Function	Design Variables
1	Multiple	Single	Power loss	Size
2	Single	Single	Power loss	Location and size
3	Multiple	Single	Power loss	Location and size
4	Multiple	Multiple objective with Weights	Power loss	Location and size
5	Single	Single	Power loss	Location
6	Multiple	Single	Power loss	Location and size
7	Multiple	Single	Max benefit/cost ratio	Number, type, size and location
8	Multiple	Single	Min cost	Location and size
9	Single	Single	Max profit	Location and size
10	Single	Single	Power loss	Location and size
11	Multiple	Single	Max profit	Location and size
12	Multiple	Multiple	Multi objective	Location and size
13	Single	Multiple	Multi objective with weights	Location
14	Multiple	Multiple	Multi objective	Location and size
15	Multiple	Multiple	Multi objective	Location and size
16	Multiple	Single	Power loss	Location
17	Multiple	Multiple	Multi objective	Location
18	Multiple	Single	Min Voltage deviation	Location and size
19	Multiple	Single	Power loss	Location and size
20	Single	Single	Power loss	Location and size
21	Multiple	Single	Power loss	Location and size
22	Multiple	Single	Power loss	Location and size
23	Multiple	Multiple	Multi objective	Location and size
24	Multiple	Multi objective	Multi objective	Location and size

4. Overall Analysis of DG allocation (Review)

From the overall analysis, the DG allocation problem is significant and most of the authors solved the mentioned problem and found some important findings. Placement of multiple DGs at different locations minimizes the loss to suitable extent as compared to single DG allocation. Also, the type of the DG placed

gives more positive results. Further, most of the contributions related to last decade considered power loss is the main objective (Single Objective). But, from the last ten years authors solved DG allocation a problem and considered multiple objective functions. So, from the overall analysis the significance of renewable DG allocation with dynamic load variations addressed few authors only. Also, most of the authors chosen technical objectives and not considered both technical as well as environmental objectives together. Finally, the combination of DG, capacitor, DSTATCOM and Electric vehicle placement and assess the DS performance is very less. So, lot scope is there in these aspects.

5. Conclusion

In this article a brief review of DG allocation problem in DS is described. Further, important findings from the existing literature is tabulated. Most of the authors, considered power loss as an objective function. Some of the authors placed multiple DGs and chosen multiple objective function. But, scope of the research in this field is placement of renewable DGs along with electric vehicle placement and asses the performance of the DS is still needs attention.

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