

## **ABSTRACT**

### **OPTIMIZATION STUDY FOR DETERMINATION LOCATION PLACEMENT OF DISTRIBUTED GENERATION AT THE THREE PHASE DISTRIBUTION SYSTEM USING BINARY LINEAR PROGRAMMING (BLP) METHOD**

**By**

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In the electric power system, losses power and voltage drop problems can be solved by optimization technique. One of the method of optimization that can be used is the Optimization Placement of Distributed Generation using Binary Linear Programming. Binary Linear Programming method that is used has two solutions, there are 0 or 1. Number 1 represents the Distributed Generation is injected into the system while 0 represents there is nothing of Distributed Generation injected into the system. Distributed Generation is one of dispersed generation technologies that has a small capacity, ranging from tens of kilowatts (KW) until Megawatt (MW). Optimization is performed to find the optimal solution placement location where the resolution is able to accommodate the constraints in the power system, which are power flow constraint, voltage constraint and others.

In this research, optimization can reduce losses power, voltage drop, moreover reducing injection power on the slack bus. Proven by using third case, case 11 buses for initial simulation program, case IEEE 34 buses and case 119 buses feeder Katu GI Menggala and using two types of Distributed Generation, Diesel Power Plant and Solar Power Plant 1 phase which is injected into the three phase distribution system. As the result of optimization , voltage on all case increase according to the standard voltage value (  $0.9 < V < 1.05$ ), power losses declining and Injection Power on the slack bus after optimized is lower than before optimized.

**Keywords:** Optimization Study - Location Placement, Distributed Generation, Method of Binary Linear Programming.

## ABSTRAK

### STUDI OPTIMASI PENENTUAN LOKASI PENEMPATAN *DISTRIBUTED GENERATION* PADA SISTEM DISTRIBUSI TIGA FASA DENGAN METODE *BINARY LINEAR PROGRAMMING (BLP)*

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Dalam sistem tenaga listrik, permasalahan rugi – rugi saluran serta jatuh tegangan sistem dapat diatasi dengan teknik Optimasi. Salah satu metode optimasi yang dapat digunakan yaitu Optimasi Penempatan *Distributed Generation* menggunakan metode Binary Linear Programming. Metode *Binary Linear Programming* yang digunakan mempunyai solusi berupa bilangan biner yaitu 0 atau 1. Bilangan 1 merepresentasikan adanya *Distributed Generation* yang diinjeksikan ke sistem sementara 0 merepresentasikan tidak adanya *Distributed Generation* yang diinjeksikan ke sistem. *Distributed Generation* merupakan salah satu teknologi pembangkit tersebar yang memiliki kapasitas kecil, berkisar belasan kilowatt (KW) sampai Megawatt (MW). Optimasi dilakukan untuk mencari solusi optimal lokasi penempatan dimana dalam solusi yang didapat mampu mengakomodir konstrain dalam sistem tenaga listrik, yaitu konstrain aliran daya, konstrain tegangan dan lainnya.

Dalam penelitian ini optimasi dapat mengurangi rugi – rugi daya (*losses power*) jatuh tegangan (*drop voltage*) serta mengurangi injeksi daya (*injection power*) pada slack bus. Dibuktikan menggunakan 3 case, yaitu case 11 bus untuk simulasi awal program, case IEEE 34 bus serta case 119 bus Penyulang Katu GI Menggala serta menggunakan 2 tipe *Distributed Generation* yaitu Pembangkit Listrik Tenaga Diesel (PLTD) dan Pembangkit Listrik Tenaga Surya (PLTS) 1 fasa yang diinjeksikan kedalam sistem distribusi 3 fasa. Hasil penelitian didapat bahwa setelah dioptimasi tegangan pada ketiga kasus meningkat sesuai dengan standar nilai tegangan  $0.9 < V < 1.05$ , rugi – rugi daya (*losses power*) menurun serta injeksi daya (*Injection Power*) pada slack bus menurun dibanding sebelum dioptimasi.

Kata Kunci : Studi Optimasi – Lokasi Penempatan, *Distributed Generation*,  
Metode *Binary Linear Programming*.