Voltage Profile Improvement And Optimal Placement of Svc In IEEE 30 Bus Test Systems

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Abstract- *The power system loss minimization becomes more important because the need of power generation is newer days. The loss minimization improves the voltage profile which improves the load ability of the system. In many types of Flexible AC Transmission System devices Static Var Compensators (SVC) are cost vise it is affordable and it improves the system performance with lesser size. Here SVC is optimally placed during a test system of 30 bus system. Genetic algorithm is employed to seek out the optimal results.*

I. INTRODUCTION

Power generation is the important one in economic growth and also the industrial development of the country. A power system is the interconnected system with the several components in converting the non-electrical energy continuously to the electrical energy. The produced energy is transferred to the customers. Management of power system has become more difficult than the earlier days because to operate on closer of security limits, environmental constraints in the expansion of transmission network, power transfer in the long distance has increased and fewer operators in the operation of power system.

Indian power sector has made the remarkable progress from the independence. The total installed capacity of power generation has gone from 1,362MW in 1947 to more than 2, 00,000 MW up to the year 2012. In India the power generation is estimated at 11% of the total energy and 15% of the peak capacity requirements. The transmission network has been increased in the urban areas and the industrial areas. The demand of power has been overstepped the general power supply. However the country is facing both the shortage of energy and the peak demand of power source due to the population growth rate has doubled in every year.

II. PROBLEM FORMULATION

Basically optimal Power Flow is a power flow problem which gives the optimal settings of control variables for a given settings of load minimizing. .A selected objective functions such as cost of active power generation or losses.

Objective Function

Maintaining the acceptable voltage stability levels in the normal, stressed and contingency conditions is an important concern in the power system planning and the operation.

The objective is to min

$$F(x)=\sum_{i=1}^{N_G}(a_i + b_i P_{GI} + C_I P_{GI}^2)$$

Where

F(x) is total production cost ($/h).
$N_G$is the number of generation including the slack bus.
$P_{Gk}$is the power output of generator i in MW.
a_i, b_i, c_iarethe unit cost coefficients ofith generator.

Equality Constraints

The objective function is subjected to the following equality constraints

Load flow constraints:

$$P_{Gi} - P_{Di} = \sum_{j=1}^{N_B}|V_i||V_j||Y_{ij}|COS(\delta_i - \delta_j - \theta_{ij})$$
i = 1… N

$$Q_{Gi} - Q_{Di} = \sum_{j=1}^{N_B}|V_i||V_j||Y_{ij}|Sin(\delta_i - \delta_j - \theta_{ij}).$$
i = 1… N

Inequality Constraints

The objective function is subjected to following inequality constraints

Real and reactive power generation limit for each generator bus

$$P_{Gi}^{min} \leq P_{Gi} \leq P_{Gi}^{max}$$
$$Q_{Gi}^{min} \leq Q_{Gi} \leq Q_{Gi}^{max}$$

Voltage magnitude limit for each bus

$$V_j^{min} \leq V_j \leq V_j^{max}$$

Power flow limit constraint of each transmission line

$$S_l \leq S_l^{max}$$

Where,

P_{Gi}, Q_{Gi} are the active and reactive power generations at bus i.
P_{Di}, Q_{Di} are the active and reactive power loads of bus i.
V_i, δ_i are voltage and angles at bus i.
P_{Gi}^{min}, P_{Gi}^{max} are the real power minimum and maximum generation limits at bus i.
V_i^{max}, V_i^{min} are the maximum and the minimum valid voltages in each bus.
θ_{ij} is the phase angle difference between the voltages at buses i and j.

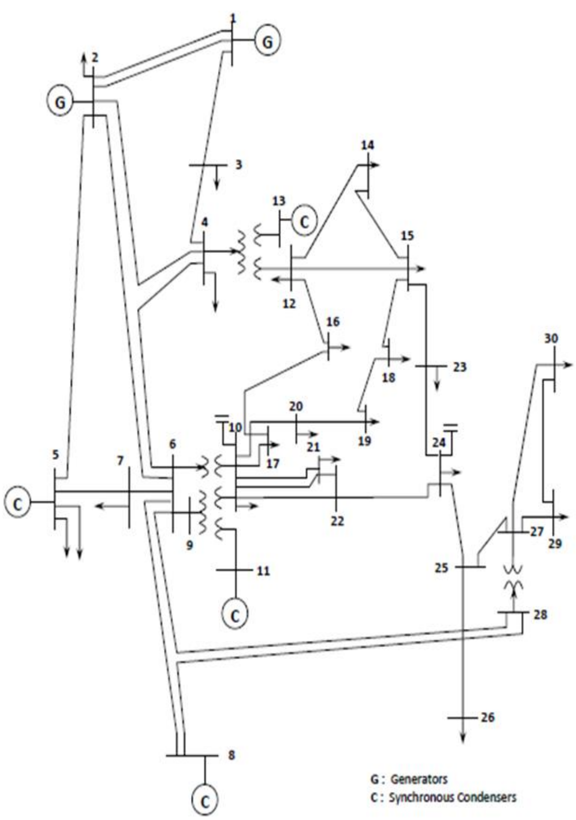

Fig no 1. **IEEE 30 BUS SYSTEMS**

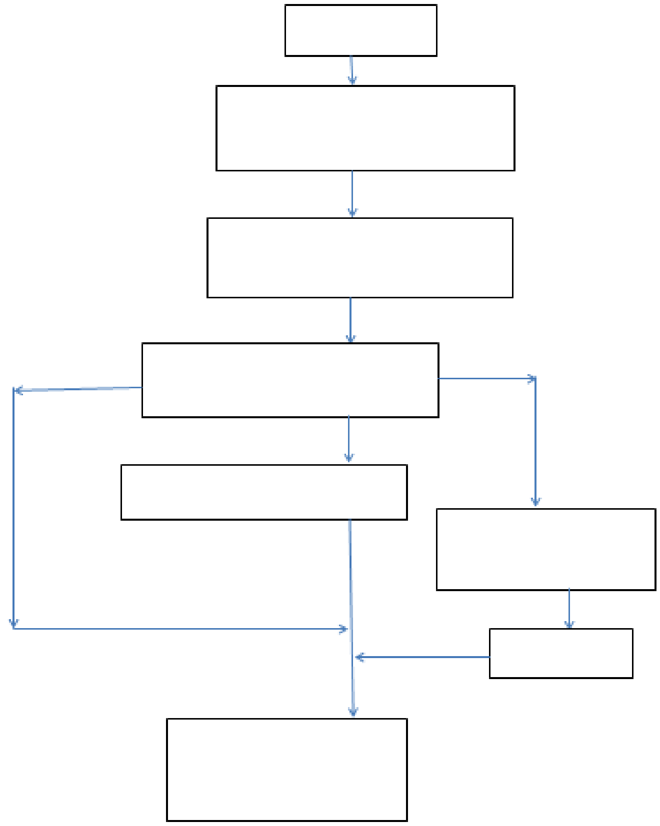

Fig no 2. Flow chart

III. CONCLUSION

An optimal power flow problem has been solved using various techniques. The voltage limits analysis is taken through the method in GA algorithm of optimization problem. By identifying the weak voltage points in the buses and also analyzing the critical line of the bus which has successfully investigated in the IEEE30-bus system.

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