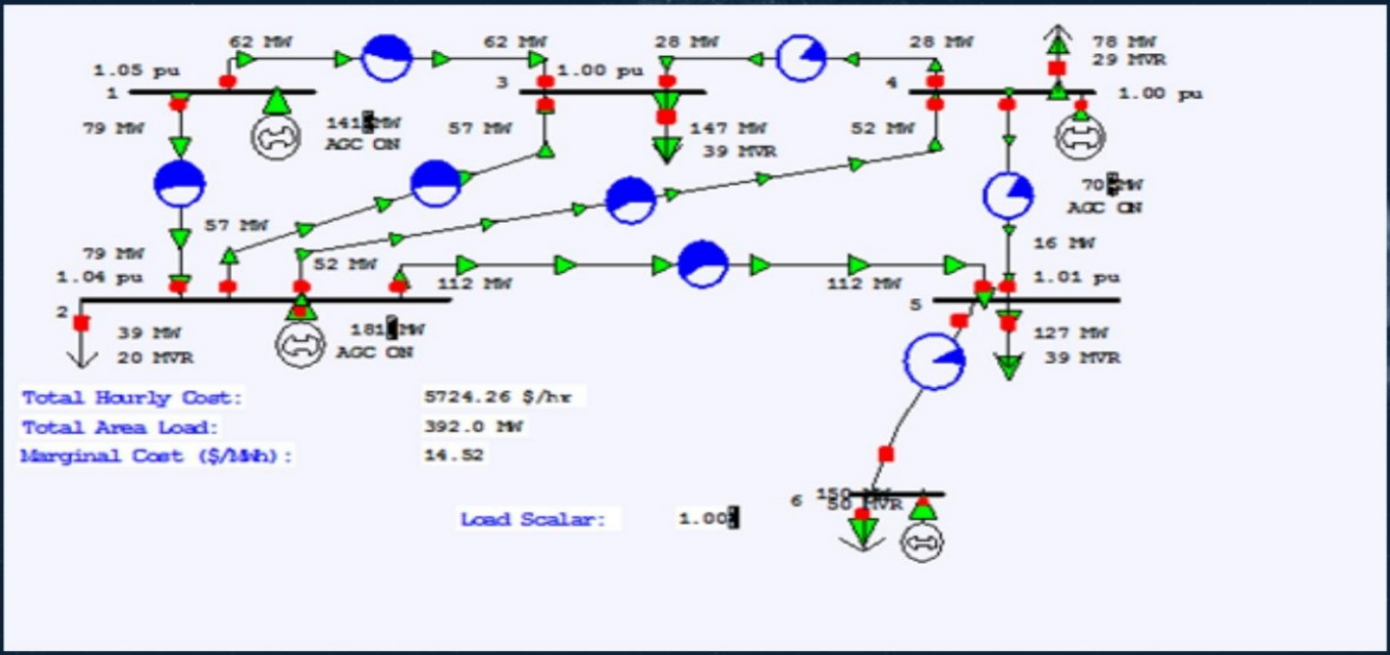
INVESTIGATION OF THE USEFULNESS OF THE POWERWORLD SIMULATOR PROGRAM DEVELOPED BY "GLOVER, OVERBYE & SARMA" IN THE SOLUTION OF POWER SYSTEM PROBLEMS



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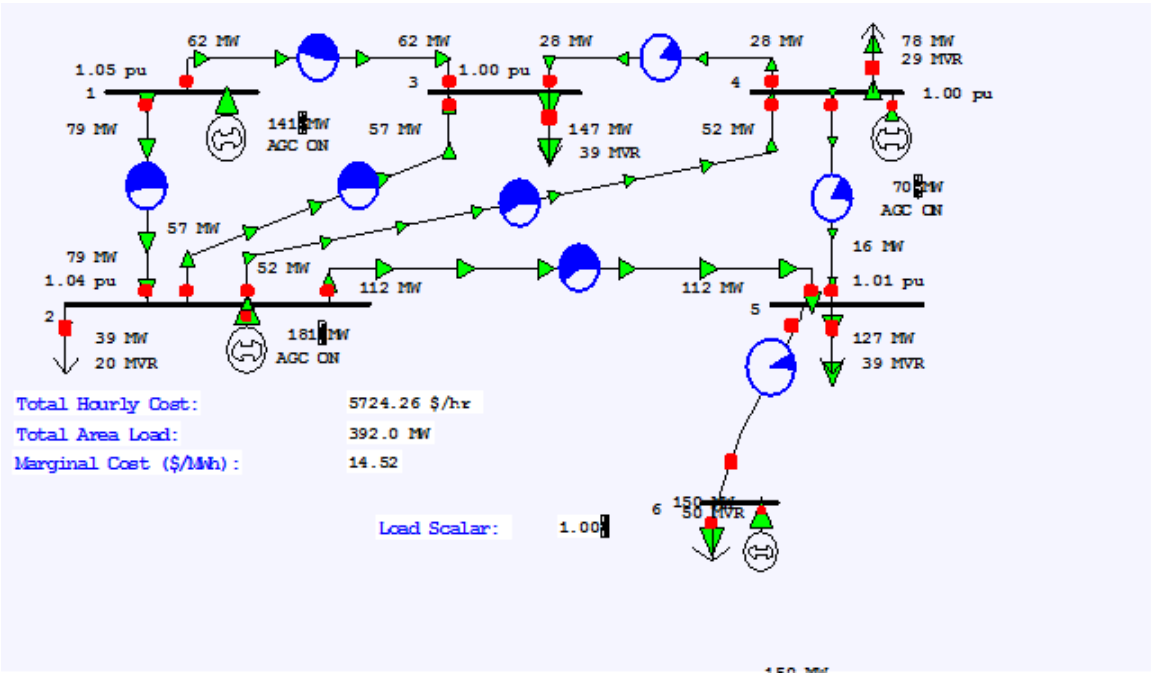
1. Introduction:

The objective of this project is to investigate the usefulness of the power system simulator PowerWorld program developed by "Glover, Overbye &Sarma". The results obtained from the power simulator program were presented for different case studies. The following power system network was used in this study. The system consists from 6 buses. Area 1 includes bus 1-5 while Bus 6 will be part of Area 1 in some case studies, or will form separate area 2 in other case studies for comparison purpose. Note that the Available Transfer Capability (ATC) analysis add-on which determines the maximum MW transfer possible between two parts of a power system without violating any limits, and the voltage adequacy and stability tool (VAST) add-on that can solve multiple power flow solutions in order to generate a PV curve for a particular transfer or a QV curve at a given bus, was not studied here because we don't have yet VAST add-on and the ATC add-on packages.



2. Theory Related To Project:

2.1 Load frequency control:

The turbine governor control eliminated the rotor acceleration and deceleration following a load changes during normal operation. However there is a steady state frequency error . One of the objective of load frequency control is to return the to zero.

In power system consisting of interconnected areas, each area agrees to export or import a scheduled amount of power through a transmission line connections or tie line to neighboring area. Thus , a second objective is to have each area absorb its own load during normal operation. This is achieved by maintaining the net tie line line power flow out of each area at it is scheduled value
The following summarizes the the two basic LFC objectives for an interconnection power system:

1. Following a load change, each area should assist in returning the steady ate frequency error to zero
2. Each area should maintain the net tie line power flow out of the area at its scheduled value in order for the area to absorb its own load

The following control strategy can be used

$$\Delta ACE = (p_{tie} - p_{tiesch}) + B_f (f - 60) \quad (1)$$

Where Δp_{tie} is the deviation of the net tie line power out of area from scheduled value while Δf is the deviation of area frequency from 60 Hz

The change in the reference setting Δp_{refi} of each turbine governor operating under LFC is proportional to integral of area control error, that is

$$\Delta p_{refi} = -K_i \int ACEdt \quad (2)$$

Each area monitors its own tie line power flow and frequency in the area control center. ACE is computed and the percentage of the ACE is allocated to each controlled turbine-generator unit. Raise or lower commands are dispatched to turbine-governors at discrete time interval of two or more seconds in order to adjust the reference power settings. As the commands accumulate, the integral action is achieved ACE is zero in each area only if both Δp_{tie} and Δf are zero