World Academy of Science, Engineering and Technology
International Journal of Electrical and Computer Engineering
Vol:8, No:09, 2014

Dual Set Point Governor Control Structure with Common Optimum Temporary Droop Settings for both Islanded and Grid Connected Modes

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Abstract : For nearly 100 years, hydro-turbine governors have operated with only a frequency set point. This natural governor action means that the governor responds with changing megawatt output to disturbances in system frequency. More and more, power system managers are demanding that governors operate with constant megawatt output. One way of doing this is to introduce a second set point in the control structure called a power set point. The control structure investigated and analyzed in this paper is unique in the way that it utilizes a power reference set point in addition to the conventional frequency reference set point. An optimum set of temporary droop parameters derived based on the turbine-generator inertia constant and the penstock water start time for stable islanded operation are shown to be also equally applicable for a satisfactory rate of generator loading during its grid connected mode. A theoretical development shows why this is the case. The performance of the control structure has been investigated and established based on the simulation study made in MATLAB/Simulink as well as through testing the real time controller performance on a 15 MW Kaplan Turbine and generator. Recordings have been made using the labVIEW data acquisition platform. The hydro-turbine governor control structure and its performance investigated in this paper thus eliminates the need to have a separate set of temporary droop parameters, one valid for islanded mode and the other for interconnected operations mode.

Keywords : frequency set point, hydro governor, interconnected operation, isolated operation, power set point
Conference Title : ICEE 2014 : International Conference on Electrical Engineering
Conference Location : Singapore, Singapore
Conference Dates : September 11-12, 2014