ON DECENTRALIZED REGULATORS FOR AUTOMATIC GENERATION CONTROL OF INTERCONNECTED POWER SYSTEMS

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By

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CERTIFICATE

This is to certify that the thesis entitled "On Decentralized Regulators for Automatic Generation Control of Interconnected Power Systems" being submitted by J.G. Ghodekar, for the award of the degree of Doctor of Philosophy to the Indian Institute of Technology, Delhi, is a record of bonafide research work he has carried out under my guidance and supervision. The results contained in this thesis have not been submitted to any other University or Institute for the award of any degree or diploma.

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ABSTRACT

The thesis is concerned with the design and evaluation of decentralized regulators for Automatic Generation Control (AGC) of interconnected power systems. Some new algorithms for the design of decentralized control of interconnected systems with special emphasis on multi-area power systems are proposed. These algorithms take into account the important aspects, such as stability of overall system, sensitivity to plant parameter variations and regulation of crucial variables in the system, requiring computations and feedback at subsystem level only.

Both the continuous and discrete decentralized AGC regulators are designed and their effectiveness is evaluated through extensive computer simulation. A symmetrical two-area thermal power system has been considered for illustrating the results. To display the added confidence in the algorithms proposed, a two-area hydro-thermal power system consisting of plants with widely varying characteristics and with fairly high interaction between the two areas has also been considered.

Since the power system models for AGC studies used in this thesis contain many inaccessible state variables, a decentralized observer for estimating the inaccessible local state variables and interaction variables is proposed. The performance of the

PUBLICATIONS BASED ON THE THESIS WORK

1. M. Gopal and J.G. Ghodekar, 'Sensitivity Reduced Design of Discrete Linear Regulator with Prescribed Degree of Stability', Proc. IEE, vol.130, Part D, No.5, pp.261-266, September 1983.

2. ———————————, 'Sensitivity Reduced Design of Continuous Linear Regulator with Prescribed Degree of Stability', Journal of the Institution of Engineers (India), vol.64, Part EL-3, pp.141-147, December 1983.

3. ———————————, 'Decentralized Controllers and Observers for Automatic Generation Control of Multi-area Power Systems', IEEE, International Conference on System, Man and Cybernetics, New Delhi, pp.1110-1115, January 1984.

4. ———————————, 'On Decentralized Observers for Interconnected Systems', IEEE Trans. System, Man and Cybernetics (~~Under revision~~) Nov. 1984.

5. ———————————, 'On Decentralized Controllers for Interconnected Power Systems', Int.J. Systems and Science (~~Communicated~~) Accepted.

6. ———————————, 'On Decentralized Stabilization of Interconnected Systems', The Journal of Large Scale Systems, Theory and Applications (Communicated).

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