International Journal of Applied Research 2016; 2(3): 834-835

ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2016; 2(3): 834-835
www.allresearchjournal.com
Received: 22-08-2016
Accepted: 24-09-2016

Shashi Yadav
Research Scholar, Singhania University, Rajasthan, India

Dr. Anand Kumar
Associate Professor, Jaat College, Rohtak, Haryana, India

Correspondence
Shashi Yadav
Research Scholar, Singhania University, Rajasthan, India

AGC and AVR for multi area power system: Demand side management

Shashi Yadav and Dr. Anand Kumar

Abstract
This paper deals with the automatic generation control (AGC) of interconnected thermal systems with combination of the automatic voltage control (AVR) and Demand Side Management (DSM). In this particular work thermal unit is considered with four area concept. The primary purpose of the AGC is to balance the total system generation against system load and losses so that the desired frequency and power interchange with neighbouring systems are maintained. Any mismatch between generation and demand causes the system frequency to deviate from scheduled value. Thus high frequency deviation may lead to system collapse. Further the role of automatic voltage regulator to hold terminal voltage magnitude of synchronous generator at a specified level. The interaction between frequency deviation and voltage deviation is analyzed in this paper. System performance has been evaluated at various loading disturbances. On the other hand, in those days more emphasis on generation side rather than demand side. In this paper DSM scheme is also considered. Demand side management is normally used to reduce the total load demand of power system during periods of peak demands in order to maintain the security of the system. It has been used for this purpose in the past 10 years so that utilities an differ the need of reinforce their networks as well as the need of increasing the capacity of the generators. Research has been carried out in order to identify additional functions and benefits that demand side management can bring to end users and utilities. In this paper schedules loading availability strategy is used to maintain the load.

Keywords: Automatic generation control (AGC), Automatic voltage regulator (AVR), area control error (ACE), economic dispatch, frequency response, voltage response, governor Action, power system operation, tie line control, scheduled loading availability (SLA)

Introduction

The AGC problem, which is the major requirement in parallel operation of several interconnected systems, is one of very important subjects in power systems studies. In this paper, the power system with four areas connected through tie lines is considered Mat lab/Simulink environment. The perturbation of frequencies at the areas and resulting tie line power flows arise due to unpredictable load variation that goes mismatch between the generated and demanded powers. The objective of AGC is to minimize that transit deviation and to provide zero steady state errors of these variables in a very short time. The generator excitation system maintains generator voltage and control the reactive power flow. The generator excitation of older system may be provided through sleep rings and brushed by means of DC generation mounted on the same shaft as the rotor of the synchronous machine. A change in the real power demand affects essentially the frequency, whereas a change in the reactive power affects mainly the voltage magnitude. The interaction between voltage and frequency controls is generally weak enough to justify their analysis separately. The source of reactive power is generators, capacitors, and reactors. The generator reactive powers are controlled by field excitation. Other supplementary method of improving the voltage profile in the electric transmission systems are transformer load tap changers, switched capacitors, step voltage regulators and static war control equipment. The primary means of generator reactive power control is the generator excitation control using automatic voltage regulator (AVR). The role of an AVR is to hold the terminal voltage magnitude of synchronous generators at a specified level.
An increase in the reactive power load of the generator is equipped by a drop in the terminal voltage magnitude.

The voltage magnitude is sensed through a potential transformer on one phase. This voltage is rectified and compared to DC set point signal. The amplified error signal controls the exciter field and increases the exciter terminal voltage. Thus, the generator fields' current is increased which results in an increase in the generated emf. The reactive power generation is increased to a new equilibrium, raising the terminal voltage to the desired value. Demand side management (DSM) has traditionally seen as a means of reducing peak electricity demand so that utilities can delay building further capacity. In fact, by reducing the overall load on an electricity network DSM has various beneficial effects, including mitigating electric current system emergencies, reducing the number of blackouts and increasing system reliability. Possible benefits can also include reducing dependency on expensive importance of fuel, reducing energy prises and reducing harmful emissions to the environment. Finally, DSM has a major role to play in differing high investments in generation, transmission and distributing network. Thus, DSM applied to electricity systems provides significant economic reliability and environmental benefits.

When DSM is applied to the consumption of energy in general-not just electricity but fuels of all types-It can also bring significant cost benefits to energy users (and corresponding reductions in emissions). Opportunities for reducing energy demand are numerous in all sectors and many are low cost, or even no cost, items that most enterprises or individuals could adopt in the short term, if good energy management is practised.

System Investigated

The AGC system investigated consists of four areas, Area 1, Area 2, Area 3 & Area 4 of different size is reheat thermal system (1). An automatic voltage regulator for an excited AC generator comprising at least one controlled rectifies for conducting the field current of the generator, a trigger signal supply means for supplying a trigger signal to the controlled rectifier. When the controlled rectifier is forward biased, a voltage detection circuit for detecting the output voltage generator, and inhibiting circuit for inhibiting turn- one of the controlled rectifiers when the instantaneous value of the voltage detection circuit exceeds as predetermined voltage, characterised in that the voltage detection comprises a phase shifting circuit receiving and shifting the phase of the generator. A multi area interconnected system is represented in a ring fashion and in a longitudinal manner. In practice it is a combination of the two. A simplified representation for an interconnected system in a general form is shown in figure 1.

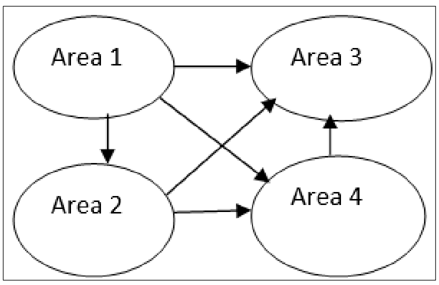

Fig 1: Simplified diagram of interconnected system

Demand Side Management

The total amount of real power in network emanates from generators stations, the location and size of which are fixed. The generation must be equal to demand at each moment and since this power must be divided between generators in unique ratio. In order to achieve the economic operation, we conclude that individual generator output must be closely maintained at predetermined set point. What it does.

Conclusion

In this paper attempt is made to develop AGC scheme with AVR and DSM. In this scheme coupling between AGC and AVR is employed and interaction between frequencies and voltage exist and cross coupling does exist. AVR loop affect the magnitude of generated EMF E as the internal emf determines the magnitude of real power. It is concluded that change in AVR loop is felt in AGC loop. It is concluded that the generation must be equal to demand at each moment, since this power must be divided between generators in unique ratio, in order to achieve the economic operation. It is seen that some time demand is very large than generation and sometime surplus power in a duration of 24 hours so it is important to remember that demand undergo slow but wide change throughout the 24 hours of the day. So this is a need to manage generation as well as demand.

References

1. Yao Zhang, Lili Dong, Zhiqiang Gao. Load Frequency Control for Multiple-Area Power Systems, 2009 American Control Conference Hyatt Regency Riverfront, St. Louis, MO, USA, 2009.
2. Nasser Jaleeli, Donald Ewart N, Lester Fink H. Undertaking automatic generation control, IEEE Transaction on power system 1992;7(3):1106-1122.
3. Hicks GV, Jeyasurya B, Eng P. An investigation of automatic generation control for an isolated system, IEEE Canadian Conference on Electrical and Computer Engineering 1997;2:31-34.
4. Jyant Kumar, Kh-Hoi NG, Gerald Shevle. AGC simulator for price based operation. IEEE transaction in power system 1997;12(2):527-532.
5. Jayant Kumar, Kh-Hoi NG, Gerald Shevle. AGC simulator for price based operation part-II, IEEE transaction in power system 1997;12(2)::533-538.
6. Yang TC, Imen H, Zhu QM. Decentralized load-frequency controller design based on structured singular values, IEE proc. Gener, Transm, Sistrib 1998;145:1.
7. Vaibhav Donde, Pai MA, Ian Hiskens A. Simulation and optimization in an AG system after Deregulation, IEEE transactions on power systems 2001;16(0-3).
8. Li Pingkang Bejing, Ma Yongzhen. Some New concepts in Modem Automatic Generation Control Realization, IEEE, 1998, 1232-1236.
9. Hadi Saadat. Power Syatem Analysis, Mc Graw-Hill, New Delhi, 2002.
10. Hongming Yang, Yeping Zhang, Xiaojiao Tong. System Dynamic Model for Demand Side Management, Electrical and Electronic Engineering, 3rd International Conference on 6-8 Sept., 2006.