A Study on Transmission of Power and Its Control

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ABSTRACT: *The power system is a collection of several tools or devices that are used to supply power from one position to another. There is a certain amount of loss during transmission when transferring power from one location to another place. Many methods of control, some of which are artificial control systems, intelligence control systems, have operated the power system. Service control of the power system operating in parallel operation or two is a case, single area case, often steam engine control, thermal plant by using these controllers. Current flow is very helpful work of the power system in a proper manner, so the Yunnan power grid dispatching was addressed in this paper.*

KEYWORDS: *Current, Voltage, over voltage, Under Voltage, Short Circuit Condition, Distribution, fault, Generation, Power system control, Transmission.*

INTRODUCTION

Power system operation controls answer the problem of generation, distribution, transmission, including many control processes in these systems, such as

What is AGC?

AGC stands for Automatic Generation Control, and AGC is a method used to modify the power output of multiple generators at various power plants in response to load changes.

For better adjustment, it is also presumed that the power grid balances the generation and load. The balance can be performed here in all electrical quantities, such as the frequency of systems. System frequency can categories into two parts:

1) If it is increasing (all machines of system will accelerate)
2) If it is decreasing (Generators will slow down)

Therefore, there is adjustment needed in the machine for better adjustment according to the change in device frequency. One generating unit in a system was configured as the regulating body for the balance between generator and load prior to the use of AGC and this is manually operated. Automatic generation control (AGC) comes into existence when interconnected power systems exist, which helps sustain the power exchange at the intended levers over the tie lines. AGC is fully computer-based now. In AGC, two voltage and frequency parameters are primarily regulated. We may compare two parameters in terms of electricity.

1. Active power generated and active power load demand.
2. Reactive power generated and reactive power load demand.

According to which;

CASE I:

When active power is generated and demands us to study load frequency controls are applied.

Pg is not equal to Pd.

CASE II:

When reactive power generated and demand is studied voltage control is applied[1].

So, AGC includes LFC (load frequency control) and excitation control.

AGC = LFC + Excitation Control. The generated power Pg is transferred to the bus where it is distributed in Fg and Vg components and given input to the comparator.

1. Fg (Frequency generated) is an input to the comparator and it will compare Fg with reference value Fref and give input Fe to the governor to control the system input. So in this case three conditions can be defined.

   Fe=[Fg-Fref]

   Fe = Error frequency

1.1 Fg=Fref , Fe=0, Valve opening is constant.

1.2 Fg>Fref , Fe>0, Valve crosses until Fg=Fref

1.3 Fg<Fref,Fe<0, Valve will be open until Fg=Fref.

2. Vg(Voltage generated) will be compared with Vref and give input Ve to the excitation system.

   Vc=[Vg-Vref]

   So, according to this Vg will be controlled by an excitation system, that's why this is an excitation control loop.

   Response time of excitation control is more fast with respect to Load frequency control.

   As per knowledge from block diagram of AGC in LFC section most of the equipment are mechanical and excitation control have mainly electrical section, and response time of mechanical system is too slow w.r.t electrical system.

Tmech>Telec

T= time response

That's why response time of a LFC is in minutes and excitation control is in seconds.

What is speed regulation parameter(R)?

[R=f/p] Hz/Mw

Here f=change in frequency from no load to full load

p= Change in power from no load to full load

So, [f=Fo-Ff]

Here as load increases from no load to full load frequency decrease by f.

R is constant for a given generator

So, [f1/p1= f2/p2]

Speed regulation constant (%)

Here % shows % change in frequency so, f=f/Fo*100

Ex A generator having 20% speed regulation and Fo=50 Hz so

f=2/100*50=1Hz

So Ff=F0-f=(50-1)=49Hz

Block diagram of speed governing systems is shown in which flow of power has been shown, first steam is fed into the turbine through a governor valve and then mechanical power is transferred from turbine to generator which produces electrical power.

Here, all unit transfer functions are of first order.

In view of control purpose some feedback mechanism has been setup which are

Pc= Input to the generating unit (which is to be controlled when generated power is to be controlled).

Ptieline = It is due to interconnected power system some power is transferred to another generation unit like

Pd= Change in demand due to change in load

ACE = Area control error

So, according to block diagram

[Pc+Ptie]-f/R

R= speed regulation parameter

Load sharing in Parallel generator in an interconnected power system when two generators are dividing or sharing load and how combinational frequency will be implemented

So On sharing two combination is possible

1. Will different speed regulation
2. With same speed regulation

What is economic load dispatch?

Economic load dispatch is done to reduce the operation cost of generation. Purpose of economic load dispatch is to reduce the operation cost. Increment in cost (by controlling Ic we can reduce the cost of generation), so that the total system load is divided among various generating units that are the unit operate of equal increment cost[2].

Thermal power plant input and output

Input of thermal in kilojoule/hour and output of thermal in Mw.

Heat Rate: It is ratio of input to output

H.R = Input/Output

For Thermal H.R = Kilojoule per hours/Mw

For Hydro H.R = M^3 per sec/Mw

Incremental rate : It is the ratio of small change in input to small change in output,so two type of increment rate can be defined [3]:

1. Incremental full rate (KJ/Hr/Mw)
2. Incremental fuel cost (RS/Hr/Mw) Economic Scheduling:

Here economic scheduling can be studied or controlled by controlling incremental cost.so to study the same start with a simple graph to discuss significance of increment cost (Ic).

From fig 5, two generator 1 and 2 power is shown w.r.t Ic Wc so that for the same Ics value the power generated by generator 1 is P1 and from generator 2 is P2.

And P1>P2

So, for the same power generation the Ic demand will be higher for generator 1.

For optimization when will reduce the cost of generation we will have to get a point where Ic will be minimized, for Ic of generator 1 should be increased and Ic for generator 2 should be decreased. That's why placed arrow marks on generator 1 and generator 2 graph showing increasing and decreasing respectively

To study the same will take two generators Gt and G2 for an increment power system.

LITERATURE REVIEW

Many papers on power system activity control have been published in this article entitled Impact of Speed Governor Deadband on AGC Analysis for Two Thermal Areas- In this paper, Hussein A Kazem and Sohar University's Thermal System addressed the two-area system, power system block diagram. The power system model is the flow of power system operation, power governor system block diagram.[4].

In a research paper entitled A Critical Analysis on AGC Interconnected Power System Strategies by Pasala Gopi and Dr. P. Linga Reddy, Pasala Gopi and Dr. P. Linga Reddy disclosed the types of models of the power system and the types of interconnection lines. The classical control system, modern control system, centralised and decentralised control system and control goals of the sub-area were also addressed.[5].

A research paper titled Research on the Automatic Generation Control (AGC) coordinated control modes between provincial dispatching and regional dispatching in Yunnan Power Grid by XU Danli ∗a, CAI Bao Rib, LIU Yanquanc ,LIU Xinc discussed about the AGC centralized control system and AGC in yunnan power grid, intelligence control system and other control system[6].

CONCLUSION

The paper provides an analysis and study of the use of AGC (automatic generation control), the use of AGC and the speed controller method in the field of power system operation. What a dead band is and how the stability of the mechanism can be affected [5]. Usage of AGC (application of AGC) AGC block diagram the importance of the governor's dead band has been demonstrated. In AGC, the effect of nonlinearity on the system stability generation control of the power systems of the nonlinear system was used by various controllers and the basic controller described in this paper was then used. It has been found that in the case of a PI controller, the overshoot of the controller decreases relative to the integral controller. It's possible to use AGC controllers. AGC controllers can be used in artificial intelligence or in application of neuro fuzzy systems[7].

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