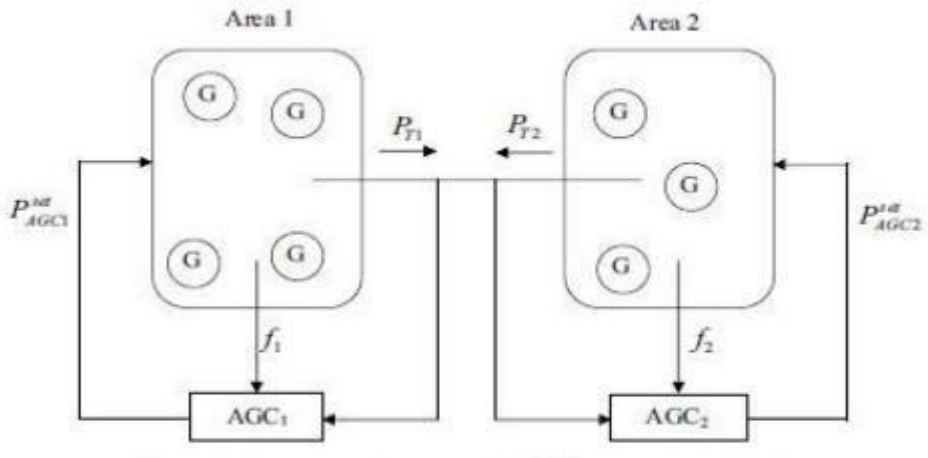
UNCONTROLLED TWO AREA LOAD FREQUENCY CONTROL SYSTEM

AGC IN A MULTI AREA SYSTEM

- In an interconnected (multi area) system, there will be one ALFC loop for each control area (located at the ECC of that area).
- They are combined as shown in Fig for the interconnected system operation.
- For a total change in load of ΔPD, the steady state Consider a two area system as depicted in Figure.
- The two secondary frequency controllers, AGC1 and AGC2, will adjust the power reference values of the generators participating in the AGC.
- In an N-area system, there are N controllers AGCi, one for each area i.



P_{T1} = Tie line power for Area 1 = $\sum_{j \in \Omega_1} P_{T1}^j$ = Sum over all tie lines

- A block diagram of such a controller is given in Figure 4.2. A common way is to implement this as a proportional-integral (PI) controller:
- Deviation in frequency in the two areas is given by

$$\Delta f = \Delta\omega 1 = \Delta\omega 2 = -\Delta PD / \beta 1 + \beta 2$$

where

$$\beta 1 = D1 + 1/R1$$

$$\beta 2 = D2 + 1/R2$$

E expression for tie-line flow in a two-area interconnected system Consider a change in load ΔPD1 in area1. The steady state frequency deviation Δf is the same for both the areas.

That **is**

$$\Delta f = \Delta f1 = \Delta f2.$$

Thus, for area1, we have

$$\Delta Pm1 - \Delta PD1 - \Delta P12 = D1\Delta f$$

Where, Area 2 ΔP12 is the tie line power flow from Area1to Area 2; and for

$$\Delta Pm2 + \Delta P12 = D2\Delta f$$

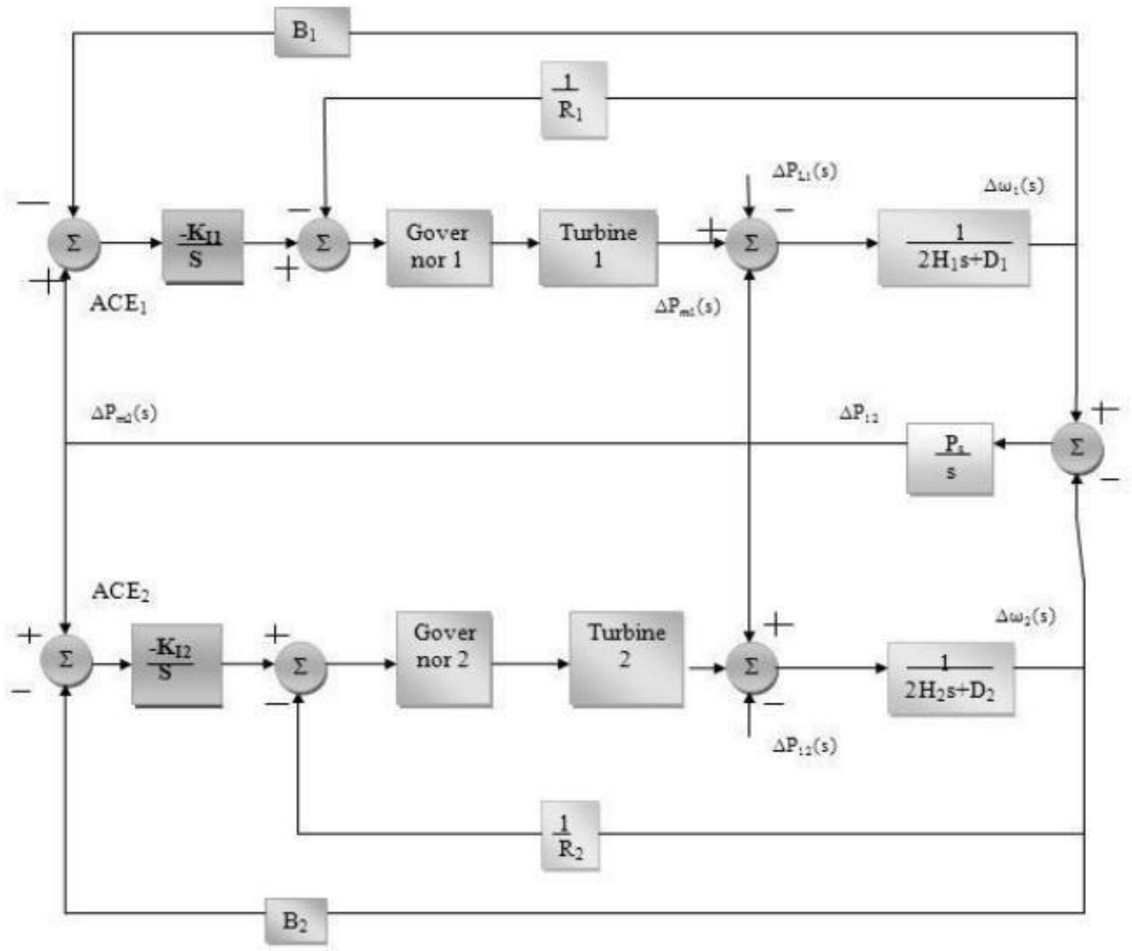
The mechanical power depends on regulation. Hence

$$\Delta Pm1 = -\Delta f\ 1 \Delta Pm2 = -\Delta f\ 2$$

Substituting these equations, yields

$$(1/R1 + D1)\ \Delta f = -\Delta P12 - \Delta Pm$$

$$(1/R2 + D2)\ \Delta f = -\Delta P12 - \Delta Pm$$



AGC for a multi-area operation

Solving for Δf, we get

$$\Delta f = -\Delta PD1 / \beta 1 + \beta 2$$

- Where $\beta 1$ and $\beta 2$ are the composite frequency response characteristic of Area1 and Area 2 respectively.
- An increase of load in area1 by $\Delta PD1$ results in a frequency reduction in both areas and a tie-line flow of $\Delta P12$.
- A positive $\Delta P12$ is indicative of flow from Area1 to Area 2 while a negative $\Delta P12$ means flow from Area 2 to Area1.
- Similarly, for a change in Area 2 load by $\Delta PD2$, we have

$$\Delta f= -\Delta PD2/ \beta 1 + \beta 2$$