Module 7-3
Radial Connection

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One Area Radially Connected to Assisting Areas

- For planning purposes utilities often employ macro-modeling to study the effects of interconnections.
- Often they represent the assisting areas by an equivalent area with a tie line having capacity constraints. Thus the two area problem is important from the point of view of practical applications.
- A more general configuration of an area M connected to assisting areas Ai is shown below:

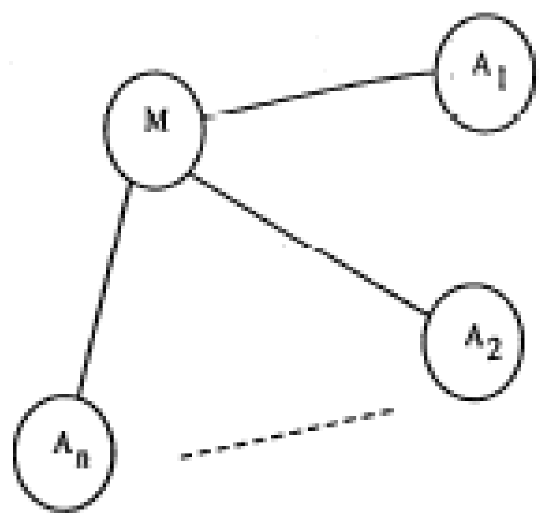

Figure 1. Area M connected with area A_1 to A_n

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- Each of the areas is assumed to have a set of generators and load. The tie lines are assumed to have several capacity states with corresponding probabilities. The tie impedances (in DC power flow) do not make any difference in the results because each assisting area can independently adjust its angle to transmit power.

- The basic concept employed is that of equivalent generating unit. Each of the assisting areas is represented by an equivalent generating unit for a given load state, convolved with the generating units of area M and then the reliability indices are found as in single area studies.

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- The steps involved in creating an equivalent generating unit of area Ai are:

1. Develop the generating system model by unit addition algorithm.
2. Using the load state, find probabilities and cumulative frequencies of positive margins in area Ai .
3. Combine these probabilities and frequencies with the tie line model to find the probabilities and frequencies of the equivalent assistance.

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- Capacity Assistance Including Tie-line Limitations:

Let

M_i = value of positive margin in state i , i=1 to n.

PM_i , FM_i = cum probability and frequency of state i .

T_i = capacity of tie line state i, i=1 to m.

PT_i , FT_i = cum probability and frequency of tie line state i .

- If positive margins are arranged along the rows and the line capacities are arranged along columns as in figure below:

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