

Optimal commitment - solution Methods

Priority-list schemes

Dynamic programming (DP) Method

Lagrange's relaxation (LR) Method.

Priority-list scheme could be obtained after an exhaustive enumeration of all unit combination at each load level.

Let us consider a plant having 3 units. The cost characteristics and minimum & max. limits of power generation (MW) of each unit are as follows:

$$C_1 = 0.00284 P_1^2 + 8.46 P_1 + 600 \text{ Rs/hr} \quad 200 \leq P_1 \leq 650$$

$$C_2 = 0.002936 P_2^2 + 8.32 P_2 + 420 \text{ Rs/hr} \quad 150 \leq P_2 \leq 450$$

$$C_3 = 0.006449 P_3^2 + 9.884 P_3 + 110 \text{ Rs/hr} \quad 100 \leq P_3 \leq 300$$

Prepare UC table to supply a total load of 600 MW most economically

Number of combinations - $2^n = 2^3 = 8$

Combination	units			P ₁ max	P ₁ min	P ₁	P ₂	P ₃	C ₁	C ₂	C ₃	Total
	1	2	3									
1	OFF	OFF	OFF	0	0	-	-	-	-	-	-	-
2	"	"	ON	300	100	Inter	Inter	Inter	-	-	-	-
3	"	ON	OFF	450	150	"	"	"	-	-	-	-
4	"	ON	ON	750	250	0	450	150	-	4758	1682	6641
5	ON	OFF	OFF	650	200	600	0	0	6698	-	-	6698
6	ON	OFF	ON	950	300	500	-	100	5540	-	1162	6702
7	ON	ON	OFF	1100	350	292	307	-	3320	3253	-	6573
8	ON	ON	ON	1400	450	249	258.05	100	2813	8818	1162.8	4854

Priority list Method:

Priority	ordering	of units	P_{min}	P_{max}
1	9.434	150	150	450
2	9.438	200	200	650
3	11.17	100	100	300

Priority list for supply of 1400 MW

Combination units	Combination P_{min}	Combination P_{max}
1, 3	450	1400
2, 1	350	1100
2	150	450

The most efficient unit is loaded first to be followed by the less efficient units in order as load increases. In this method, first we compute the production cost of each unit. Then, in the order of ascending costs, the units are arranged to commit the load demand. Priority order table is as above.

Dynamic Programming

If the load is assumed to increase in small but finite size steps, dynamic programming (DP) can be used.

The total no. of units available, their individual cost characteristics and load cycle on the system are assumed to be known.

It shall be assumed that the load on each unit or combination of units changes in suitably small but uniform steps of size Δ MW.

Starting with any n units, the most economical combination is determined for all the discrete load levels at the combined o/p of the two