Economic Dispatch of Two Generating Units (Equal Incremental Cost)

Loading of two generating units for the lowest fuel cost by equal incremental cost, from their quadratic cost curves, the demand and unit limits.

Method: Equal incremental cost rule with unit limits

Input parameters

Unit system: SI

Parameter	Value	Unit
Unit 1 linear cost coefficient (per MWh)	7.0000	
Unit 1 quadratic coefficient (per MW²h)	0.008000	
Unit 2 linear cost coefficient (per MWh)	7.5000	
Unit 2 quadratic coefficient (per MW²h)	0.009600	
Demand	400.00	MW
Unit 1 minimum	50.000	MW
Unit 1 maximum	250.00	MW
Unit 2 minimum	50.000	MW
Unit 2 maximum	250.00	MW

Calculated results

Parameter	Value	Unit
Unit 1 output	232.39	MW
Unit 2 output	167.61	MW
System incremental cost (per MWh)	10.718	
Variable fuel cost per hour	3,585.5	

Notes for this case

• With fuel costs F_i = a_i + b_i P_i + c_i P_i² (P in MW, cost per hour), total cost is lowest when both units run at the same incremental cost dF/dP = b_i + 2c_i P_i = λ. Solving for λ such that the outputs add up to the demand gives the dispatch; a unit that reaches a limit is held there and the other takes the rest. Fixed costs a_i do not change the dispatch, so they are left out of the cost shown. Transmission losses are ignored.

Formula and method

$$\frac{dF_i}{dP_i} = b_i + 2c_i P_i = \lambda, \quad P_1 + P_2 = P_D$$

Variables

b_1	Unit 1 linear cost coefficient (per MWh)	-
c_1	Unit 1 quadratic coefficient (per MW²h)	-
b_2	Unit 2 linear cost coefficient (per MWh)	-
c_2	Unit 2 quadratic coefficient (per MW²h)	-
P_D	Demand	W
$P_{1,min}$	Unit 1 minimum	W
$P_{1,max}$	Unit 1 maximum	W
$P_{2,min}$	Unit 2 minimum	W

$P_{2,max}$	Unit 2 maximum	W
P_1	Unit 1 output	W
P_2	Unit 2 output	W
λ	System incremental cost (per MWh)	-
F	Variable fuel cost per hour	-

Method and standards

Economic dispatch.

Assumptions and limits

- Quadratic cost curves; no losses; both units running.

References

Equal incremental cost rule with unit limits

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/electrical/power/economic-dispatch-two-units

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Reopens the calculator with the inputs of this report.