Power Plant Screening Curves and Crossover Capacity Factor

Annual cost per kW of two generating options against capacity factor from capital, fixed O&M, efficiency and fuel price, with the crossover capacity factor.

Method: Screening-curve method of generation planning

Input parameters

Unit system: SI

Parameter	Value	Unit
Plant 1 capital cost (per kW)	900.00	
Plant 1 fixed O&M (per kW·year)	20.000	
Plant 1 efficiency	38.000	%
Plant 1 fuel price (per GJ)	9.0000	
Plant 2 capital cost (per kW)	2,200.0	
Plant 2 fixed O&M (per kW·year)	45.000	
Plant 2 efficiency	40.000	%
Plant 2 fuel price (per GJ)	3.0000	
Discount rate	8.0000	%
Life (years)	25.000	
Capacity factor to compare at	60.000	%

Calculated results

Parameter	Value	Unit
Plant 1 annual fixed cost (per kW·year)	104.31	
Plant 1 variable cost (per MWh)	85.263	
Plant 2 annual fixed cost (per kW·year)	251.09	
Plant 2 variable cost (per MWh)	27.000	
Crossover capacity factor	28.759	%
Plant 1 cost per kW·year at CF	552.45	
Plant 2 cost per kW·year at CF	393.01	

Notes for this case

• Annual cost per kW = CRF·C + O + v·8.76·CF (v per MWh, 8.76 MWh per kW at CF = 1). The plant with the lower line is cheapest at that capacity factor; the crossover sets which plant should serve base and which peak load. Variable O&M and carbon prices can be added to the fuel price.

Formula and method

$$Y = CRF \cdot C + O + 8.76\, v\, CF, \quad v = \frac{3.6 c_f}{\eta}, \quad CF^{*} = \frac{A_2 - A_1}{8.76(v_1 - v_2)}$$

Variables

C_1	Plant 1 capital cost (per kW)	-
O_1	Plant 1 fixed O&M (per kW·year)	-
η_1	Plant 1 efficiency	-
$c_{f,1}$	Plant 1 fuel price (per GJ)	-
C_2	Plant 2 capital cost (per kW)	-

O_2	Plant 2 fixed O&M (per kW·year)	-
η_2	Plant 2 efficiency	-
$c_{f,2}$	Plant 2 fuel price (per GJ)	-
i	Discount rate	-
n	Life (years)	-
CF	Capacity factor to compare at	-
A_1	Plant 1 annual fixed cost (per kW·year)	-
v_1	Plant 1 variable cost (per MWh)	-
A_2	Plant 2 annual fixed cost (per kW·year)	-
v_2	Plant 2 variable cost (per MWh)	-
CF^*	Crossover capacity factor	-
Y_1	Plant 1 cost per kW·year at CF	-
Y_2	Plant 2 cost per kW·year at CF	-

Method and standards

Screening curves.

Assumptions and limits

- Constant prices; no unit commitment or reserve value.

References

Screening-curve method of generation planning

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/general/economics/generation-screening-curve

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Reopens the calculator with the inputs of this report.