- Demand factor = $\frac{\text{Max demand}}{\text{connected load}}$

- Affects economics

- Load factor = $\frac{\text{Average load}}{\text{Max demand}}$

Diversity factor = $\frac{\Sigma \text{individual Max demand}}{\text{Maximum demand of group}}$

- Utilization factor = $\frac{\text{maximum generator demand}}{\text{generator capacity}}$

Plant capacity factor = $\frac{E}{C \times t}$

E ← energy produced (kWh) in a given period

C → capacity of the plant in kW

t → Total number of hours

Plant use factor = $\frac{E}{C \times t'}$

t' → Actual number of hours the plant has been in operation

Unit cost = $\frac{\text{Total cost}}{\text{capacity}}$

input-output relation

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$I = a + bL + cL^2 + dL^3$

I → input

L → output

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Efficiency

$$\eta = \frac{L}{I} = \frac{L}{a + bL + cL^2 + dL^3}$$

Heat rate

$$HR = \frac{I}{L} = \frac{a + bL + cL^2 + dL^3}{L}$$

Incremental rate

$$IR = \frac{dI}{dL}$$

Tariff for electrical energy

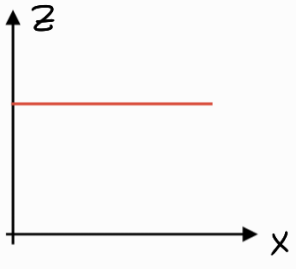
$$Z = ax + by + c$$

- Z: Total amount of bill for a period
- ax: Rate per kW of Max demand
- by: energy consumed kWh / energy per kW
- x: max demand kW
- c: constant consumer charge

Flat demand rate

$Z = ax$

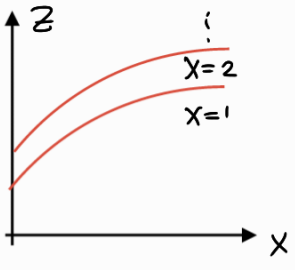
Bill depends on Max demand



used for street lighting

Hopkinson demand rate

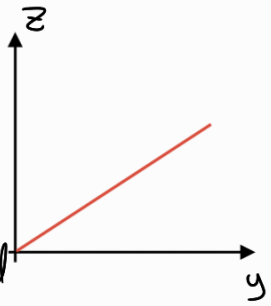
$Z = a + by$



used for industrial consumers

Straight meter rate

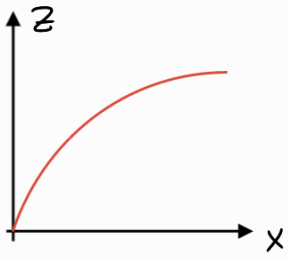
$z = by$



For Residential and Commercial consumers

Block meter rate

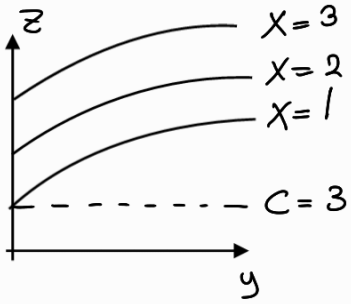
consumption ↑
charge ↓



used for industrial consumers

Doherty rate

$z = ax + by + c$



costumer charge is added

(fuel ↑, wages ....)

Economical analysis

Interest → Accumulated sum

$S_n = P + iP = P(1+i)^n$

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i → intrest rate

Compounded

$S = P\left(1 + \frac{i}{m}\right)^m$

m → number of intrest times per year

Amount of Payment

$$A = S\left(\frac{i}{(1+i)^n - 1}\right) = P\left(\frac{i}{1-(1+i)^{-n}}\right)$$

Depreciation rate

$$\frac{A}{S} = \frac{i}{(1+i)^n - 1}$$

The original invested capital = P = Depreciation of the plant + Value of plant

Methods to calculate depreciation rate

S.L.M: D = $\frac{\text{Capital cost} - \text{Salvage value}}{\text{life of equipment}}$

S.F.M: $A = \left(\frac{i}{(1+i)^n - 1}\right)(P-S)$

U.M: D of a given year = $\frac{\text{Capital}}{\text{capability in hrs}}$ × Actual hrs number of units

A.M: Depreciation = Δ annual appraisals at end of each year

Economic Selection

Total annual cost method

$$C = C_f + C_o$$

C_f → Annual fixed cost

C_o → Annual operating cost

$$C_f = R \times P$$

P → Principle

R → fixed charge rate

$$R = i + \frac{i}{(1+i)^n - 1} + t + s$$

i → Interest

$\frac{i}{(1+i)^n - 1}$ → DR

t → Taxes

s → insurance

To calculate average load → Draw → Area under curve / 24

lowest Bill when Load factor = 1

$$\frac{\text{Fixed cost}}{\text{Max demand}} + \frac{\text{Var. cost}}{\text{Energy generated}}$$

Fixed cost → \$; Max demand → KW

Var. cost → \$; Energy generated → KWh

Fixed cost: كلشي طاعد ا اا

Running cost

Var. cost → Running cost

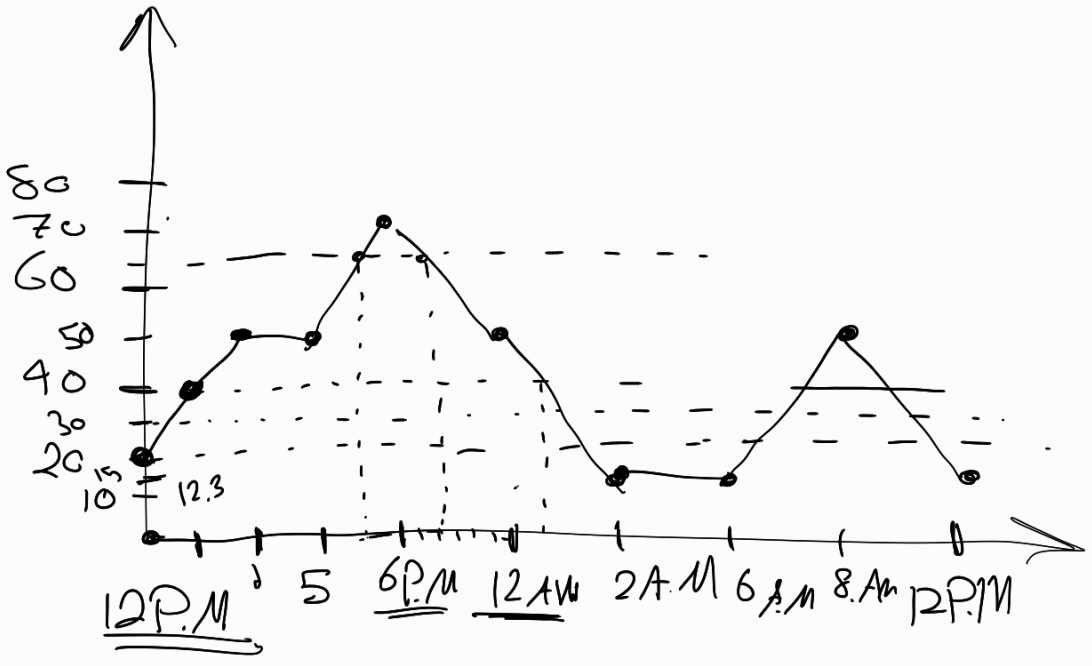
Kg

$$\frac{\cancel{KJ}}{\quad}$$

$$\times \frac{\cancel{KJ}}{N} \times 0.24$$

Weigh

$$\frac{\$}{KN}$$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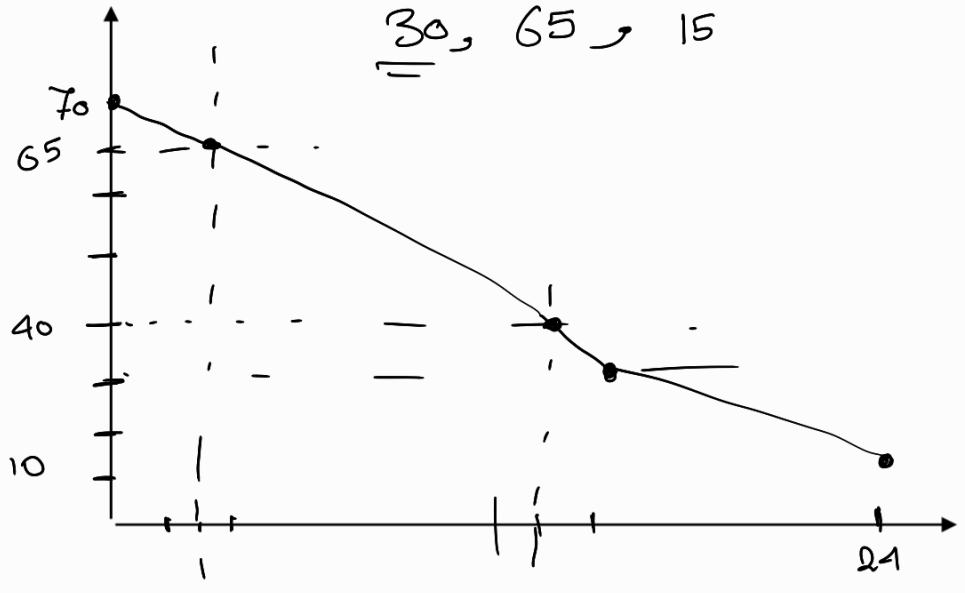
12AM
2A.M
6A.M
8.AM
12P.M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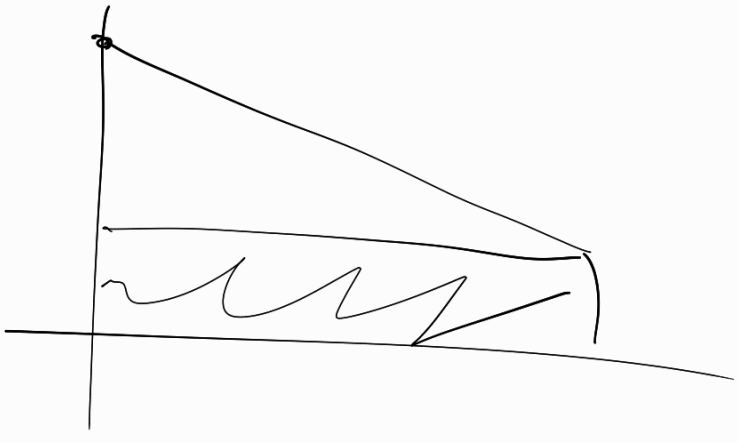
21



Total cornel.