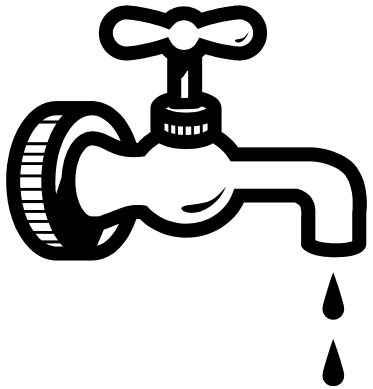
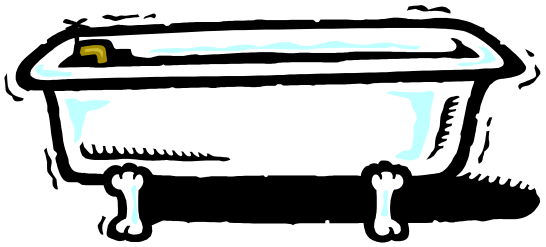
Units

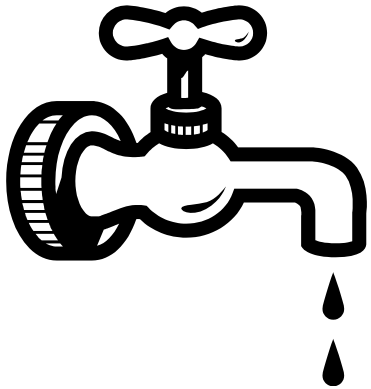


$$\frac{\text{Water Volume}}{\text{Time}}$$ FLOWS

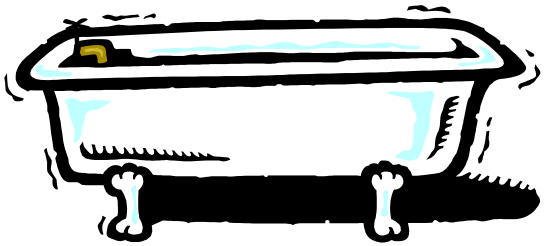


Water Volume STOCKS

Units



$$\frac{\text{Water Volume}}{\text{Time}}$$ FLOWS

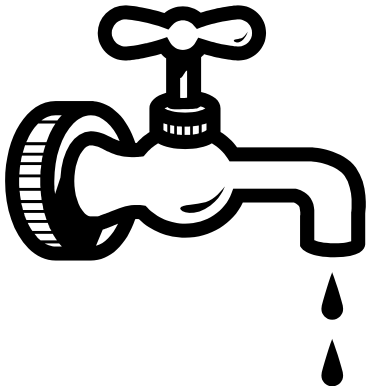


Water Volume STOCKS

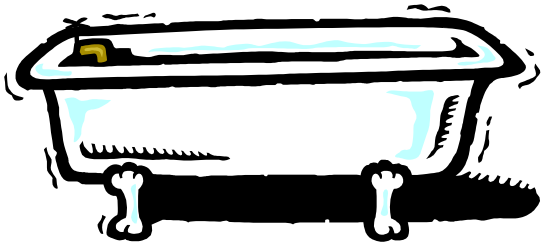
$$\text{Water Volume} = \left(\frac{\text{Water Volume}}{\text{Time}}\right)(\text{Time})$$

$$\text{Stock} = (\text{Flow})\ (\text{Time})$$

Units: Power and Energy



Flow is represented by power
(Called *power*, or *capacity*)



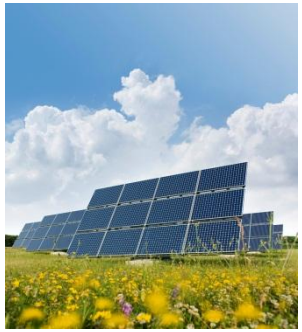
Energy is the **Stock**
(Called *energy*)

Units: Power and Energy

<u>Flow</u> is represented by power
(Called *power*, or *capacity*)

Energy is the **<u>Stock</u>**
(Called *energy*)

Units: Power and Energy



Power is measured in ***watts***

$$Power = \frac{energy}{time} = watts$$

Energy is measured in ***watt-hours***

$$Energy = Power * Time = \frac{energy}{time} * Time = watts * Time = watt \cdot hours$$

Units: Power and Energy

1 kilowatt = 1,000 watts

1 megawatt = 1,000,000 watts

1 gigawatt = 1,000,000,000 watts

Units: Power and Energy

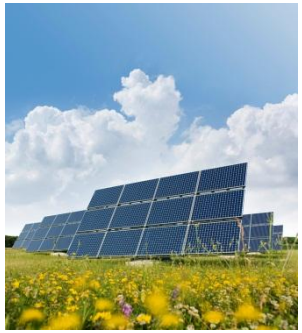
1 kilowatt-hour = 1,000 watt-hours

1 megawatt-hour = 1,000,000 watt-hours

1 gigawatt-hour = 1,000,000,000 watt-hours

Kilowatt-hour: KWh
Megawatt-hour: MWh
Gigawatt-hour: GWh

Power Plants Produce Energy Over Time



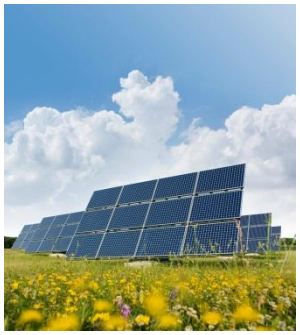
100 megawatts (MW)

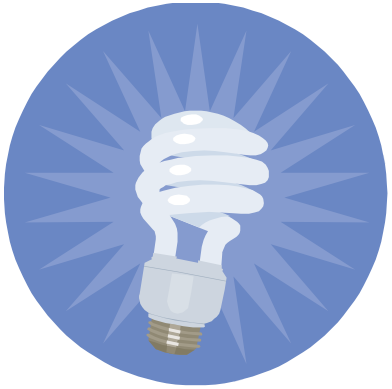
Operates for 10 hours

_____ energy?

$$Energy = (Power)(Time) = (100\ MW) \times (10\ hours)$$
$$= \mathbf{1,000\ MWh}$$

Capacity Factor





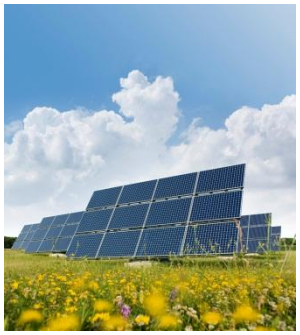
100 megawatts (MW)

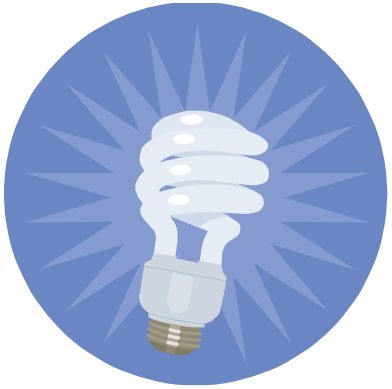
Operates 20% of the time for a year at 100% of its capacity

_____ energy?

$$Energy = (Power)(Time) = (100\ MW) \times (0.20) \times (1\ year) \times \frac{8760\ hours}{year} = \mathbf{175,200\ MWh}$$

Capacity Factor





100 megawatts (MW)

Operates 100% of the time for a year at 20% of its capacity

_____ energy?

$$Energy = (Power)(Time) = (100\ MW) \times (0.20) \times (1\ year) \times \frac{8760\ hours}{year} = \mathbf{175,200\ MWh}$$