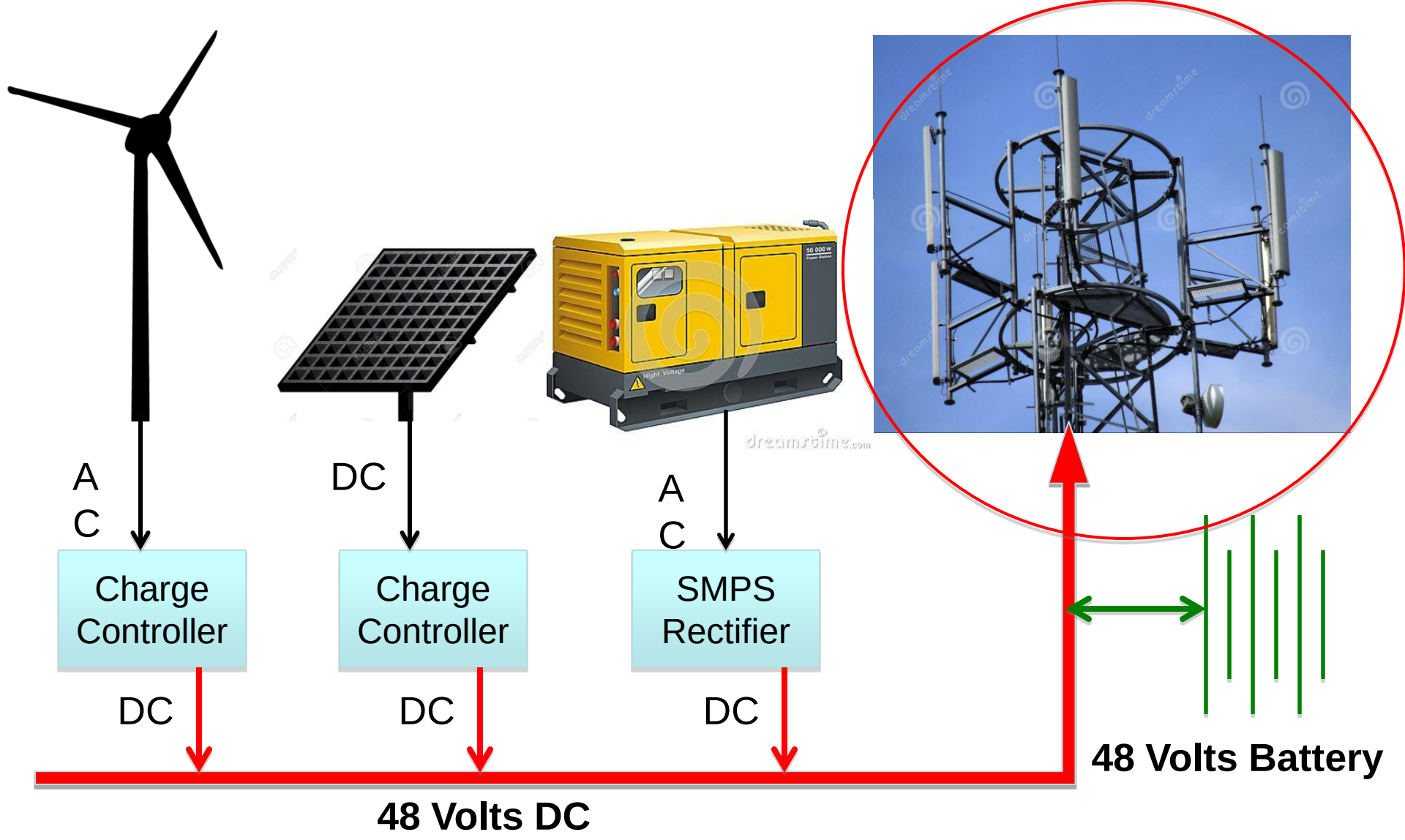
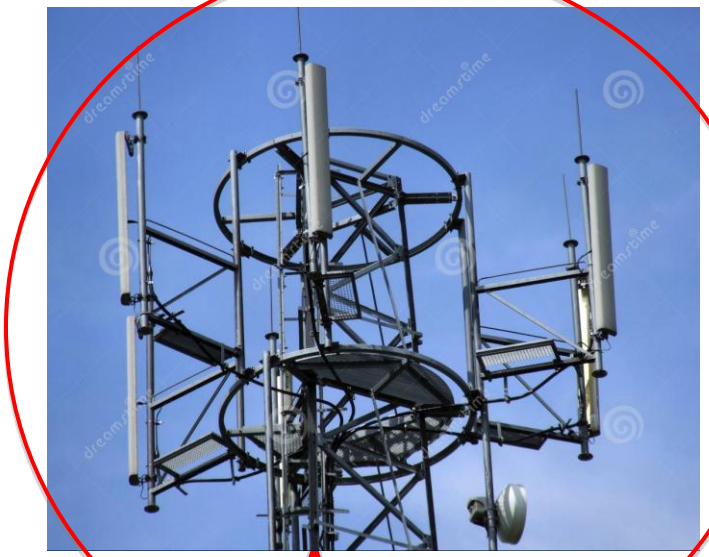
Wind Solar Battery Hybrid For Mobile Phone Towers

Equipment & System Design

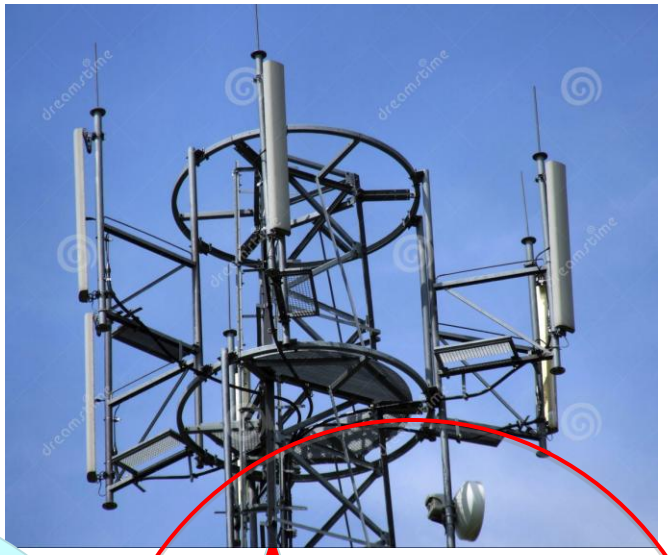
Rajarshi Sen



A schematic diagram



1 KW (assumed)



Battery Capacity =
(1KW X 24Hrs) ÷
0.6 = 40 KWH
= 48V800 AH

1 KW

48 Volts Battery

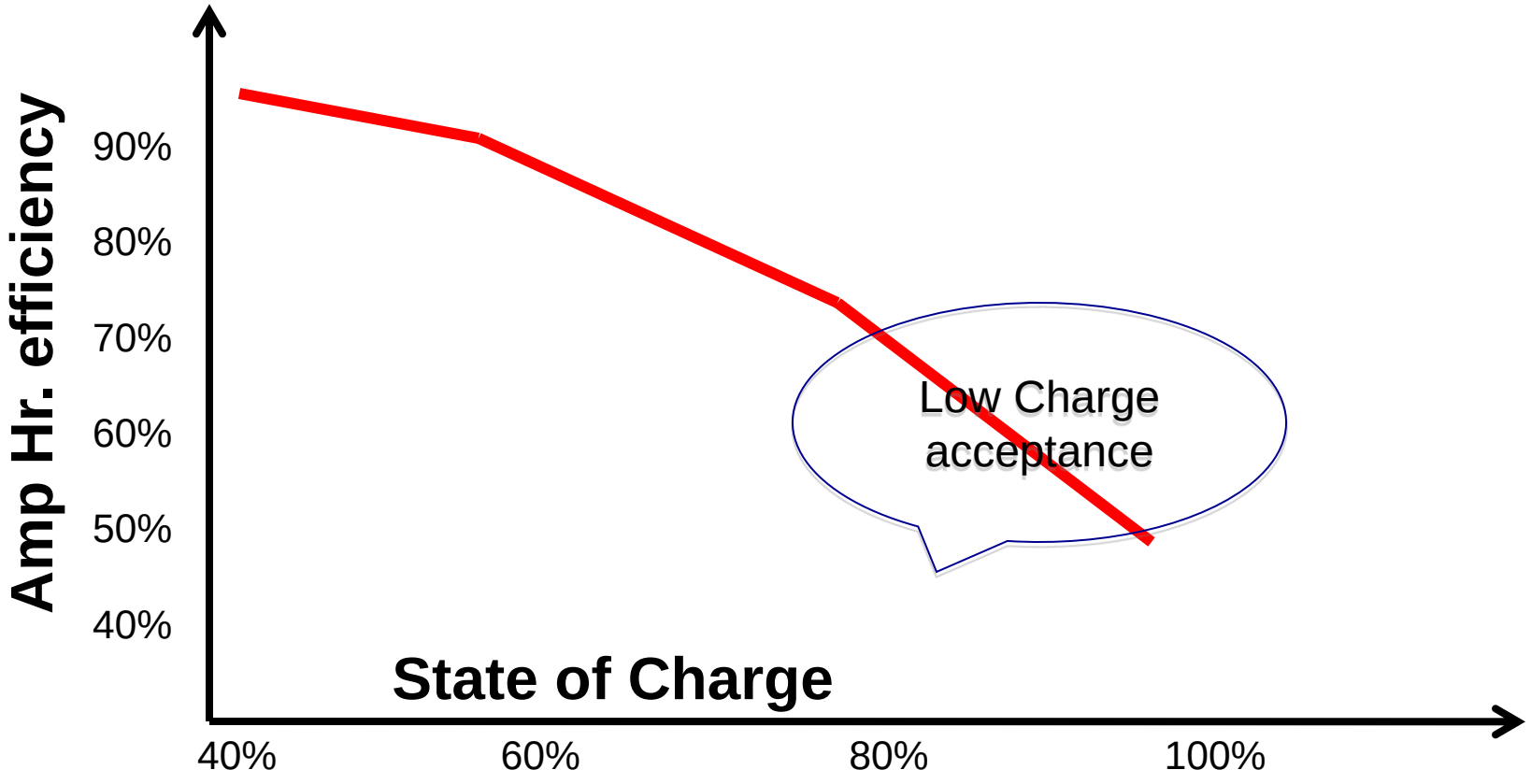
What if we undersize the battery?

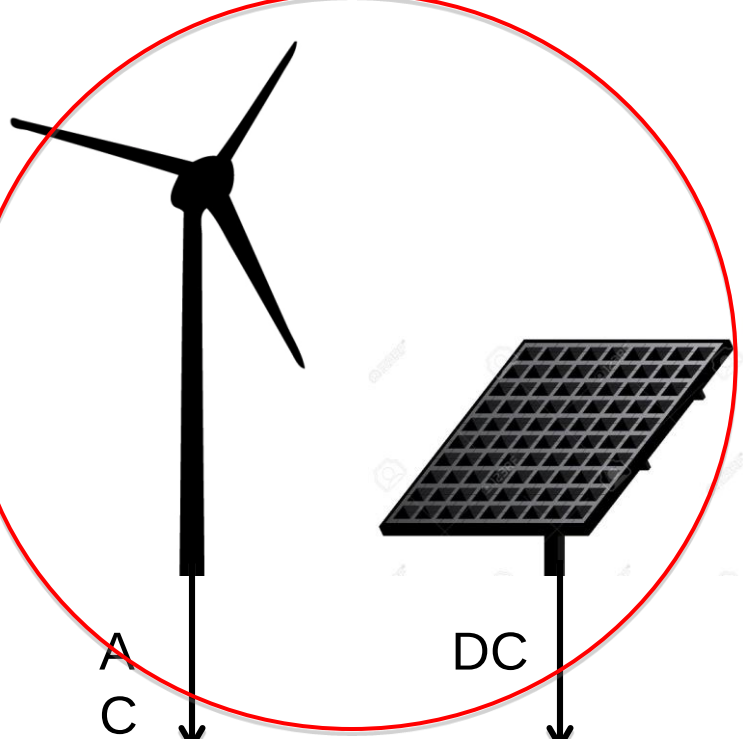
- Say 12 Hours backup = (1KW X 12 Hrs.) ÷ 0.6 = 20KWH
- Max charge current @15% of capacity = 3KW
- Recharge 24 KWH in 6 peak solar/wind Hours @ 4KWh
- So, 1KW X 6H = 6KWH energy will be wasted

What if we oversize the battery?

- 48 Hours backup = (1KW X 48 Hrs.) ÷ 0.6 = 80 KWh
- Daily discharge is 24KWH or 30% of 80KWh capacity

charge efficiency is reduced from 85% to 60%





A
C

DC

A
C

Charge Controller

Charge Controller

SMPS Rectifier

DC

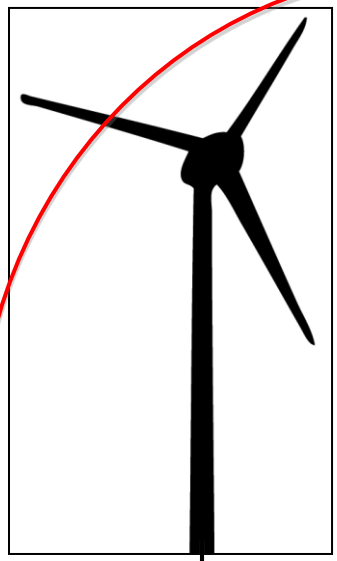
DC

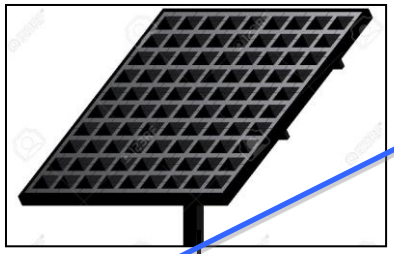
DC

48 Volts Battery

48 Volts DC

Proper controller setting to allow wind & solar generate together





A C

DC

Charge Controller

Charge Controller

DC

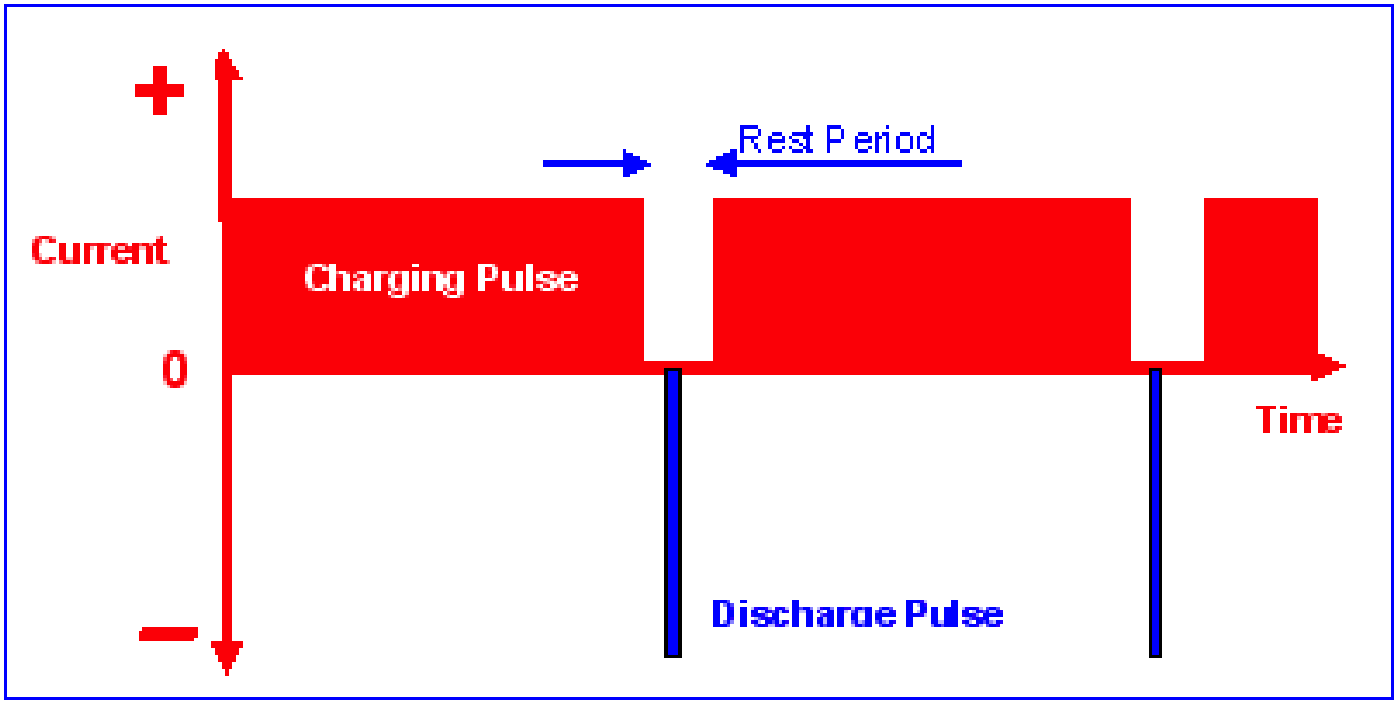
DC

48 Volts DC

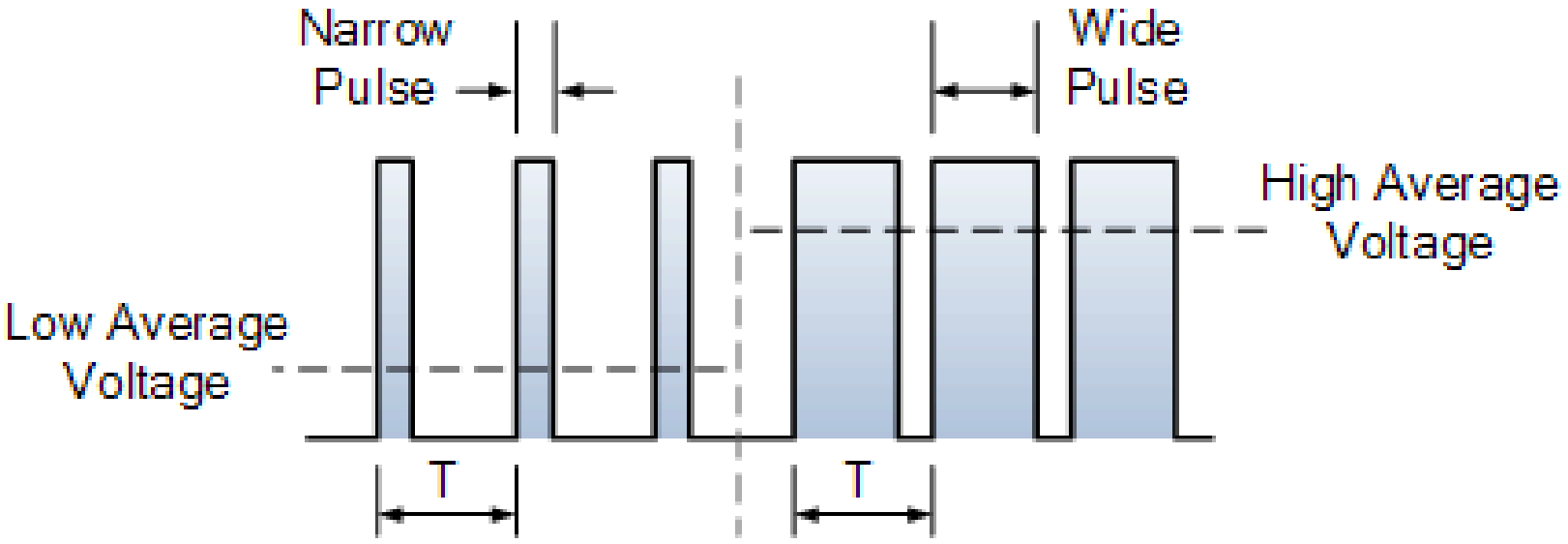
48 Volts Battery

Restricted use of peak power from Wind or Solar Since 9% maximum voltage rise allowed in BTS

pulse charging increases current but limits battery voltage



Or by pulse width modulation



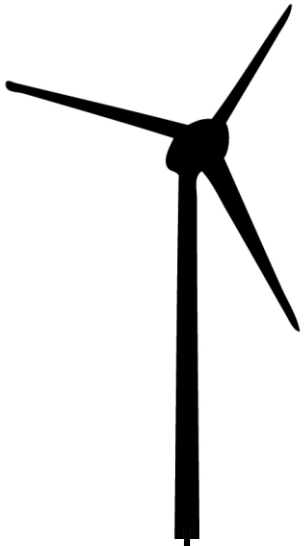
Sizing of Wind & Solar Capacity

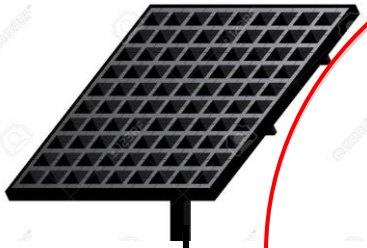
Energy from Wind + Solar = 28 KWh/day
(24 KWh Telecom need + 15% System Losses)

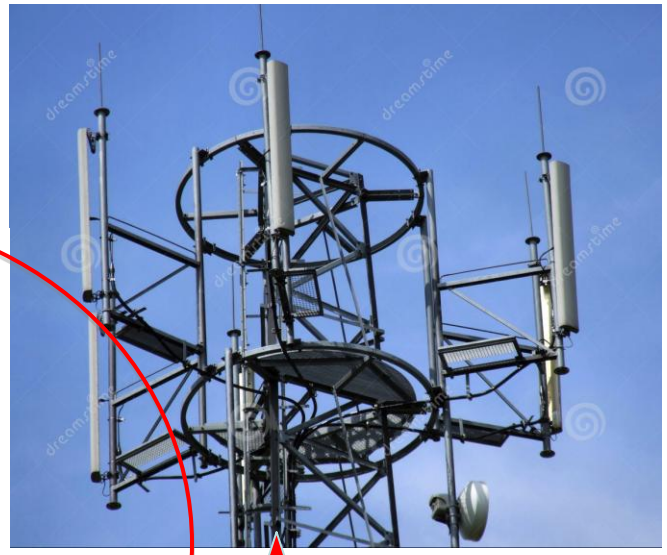
If location PLF of Wind = 25% & PLF of Solar = 18%

Wind output = 25 ÷ (25+18) = 58% or 16KWh
Wind Turbine Capacity = 16 ÷ (24 X 0.25) = 3 KW

Solar output = 18 ÷ (25+18) = 42% or 12KWh
Solar PV Capacity = 12 ÷ (24 X 0.25) = 2 KW







A
C

DC

A
C

Charge Controller

Charge Controller

SMPS Rectifier

DC

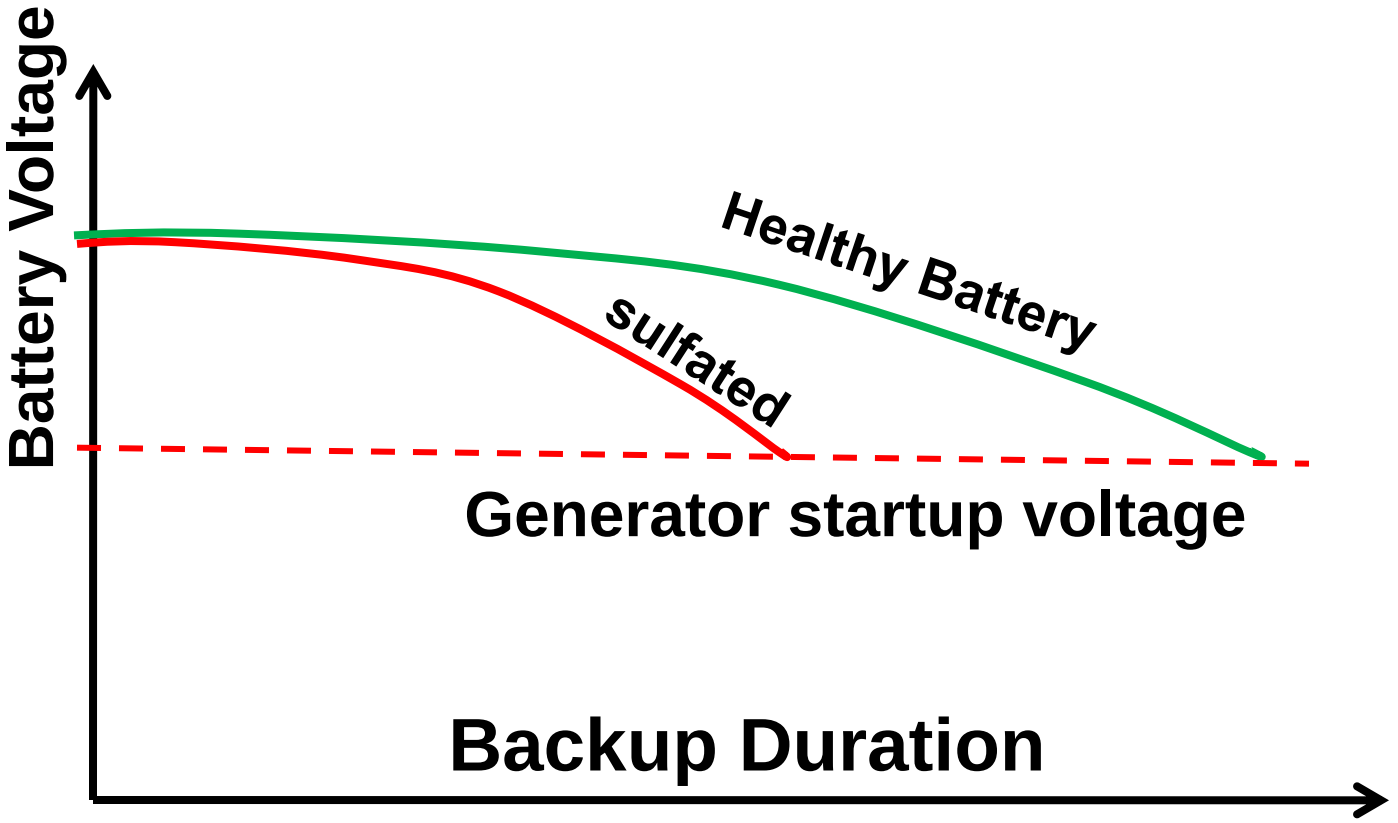
DC

DC

48 Volts Battery

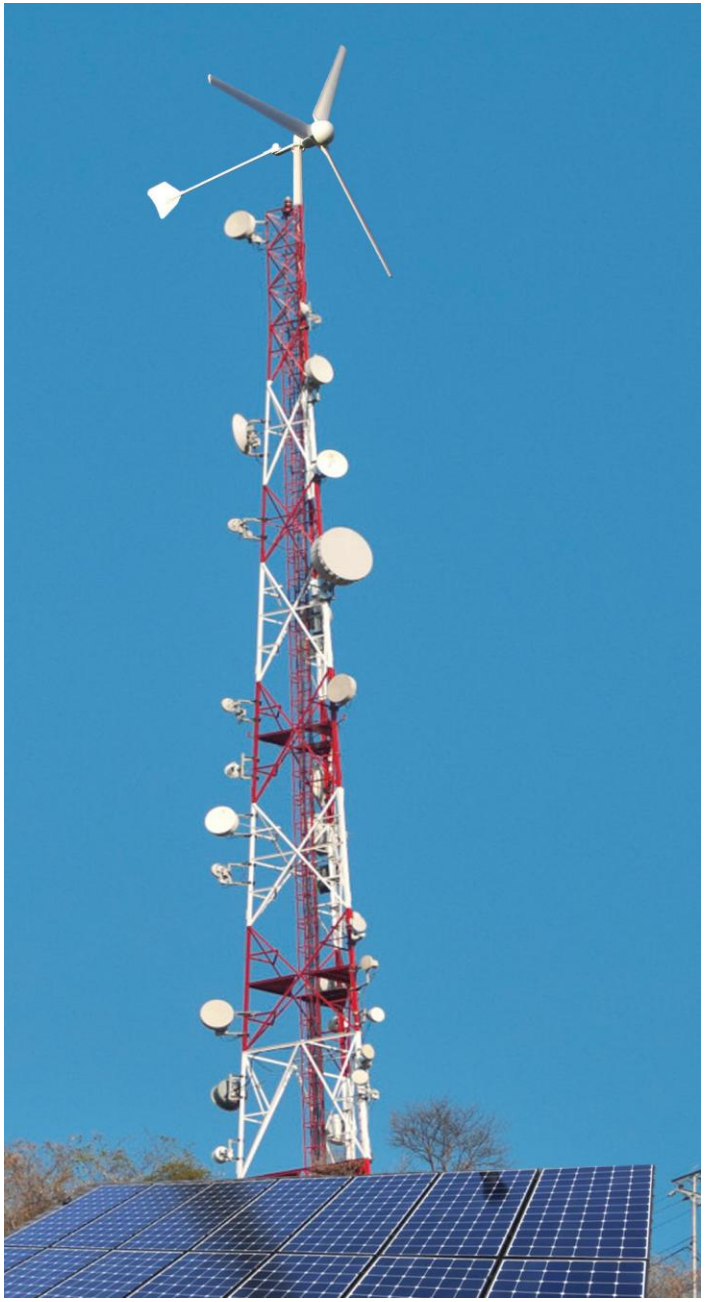
48 Volts DC

Setting DG startup voltage



Not the best position

Best
Position



Challenges & Solutions

- Thrust from Gust
- Graduated Braking
- Machine Vibration
- Higher capacity alternator
- Vibration during Yaw
- Damping the yaw
- Natural frequency vibration
- Electronic speed control

That’s All