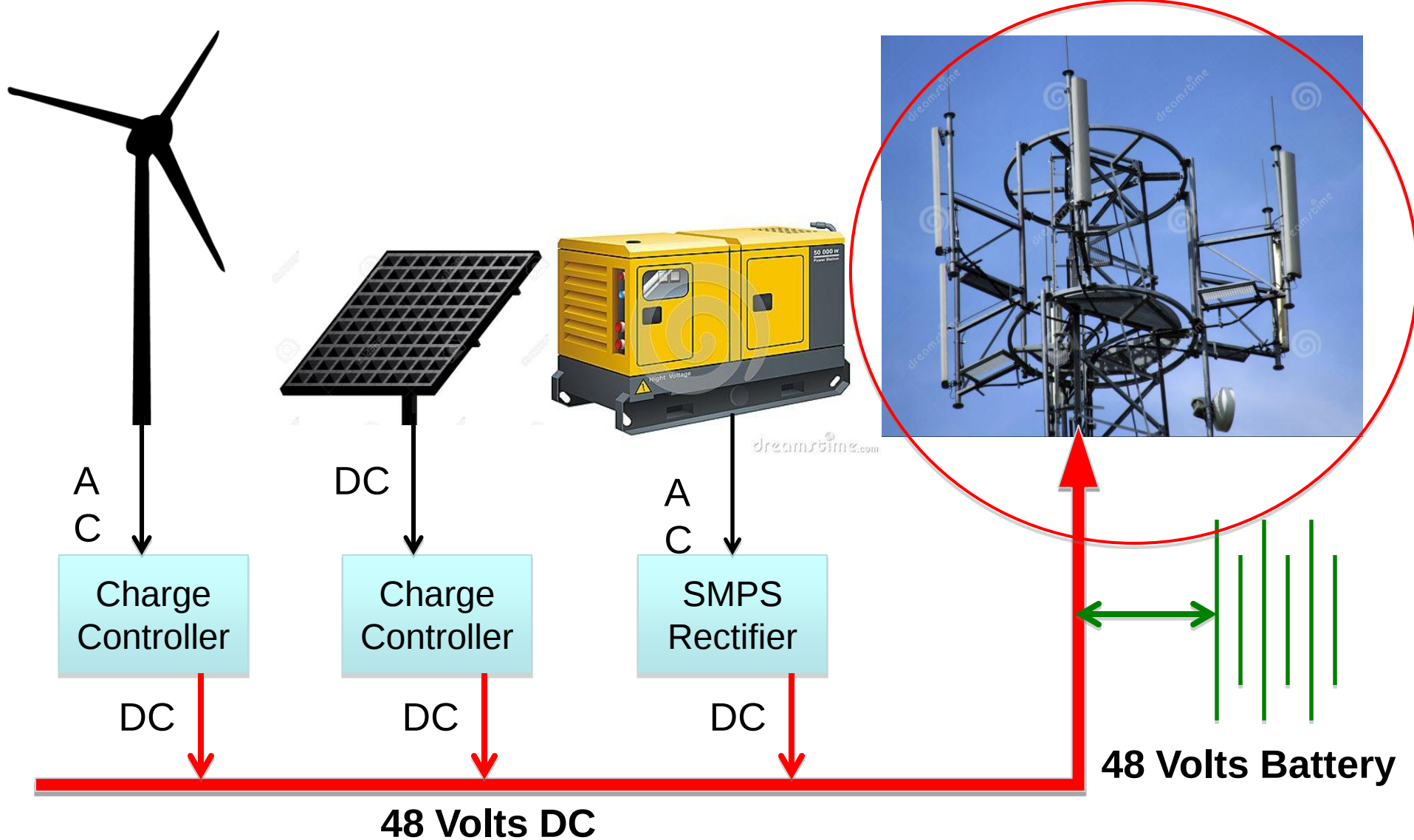


Wind Solar Battery Hybrid For Mobile Phone Towers

Equipment & System Design

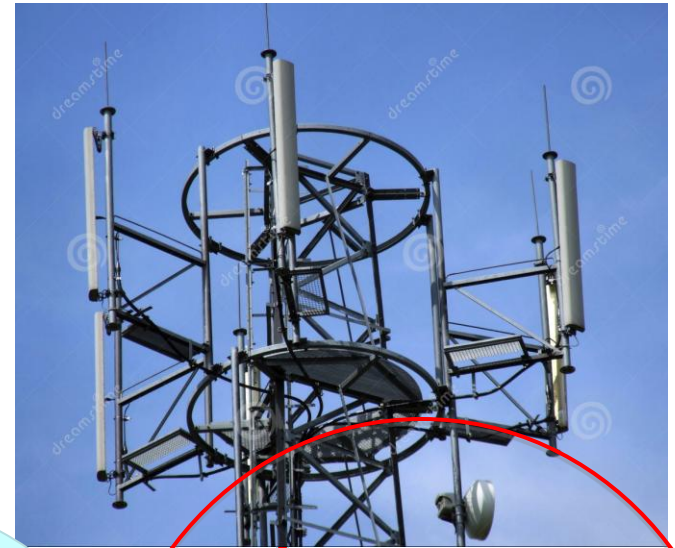
Rajarshi Sen



A schematic diagram



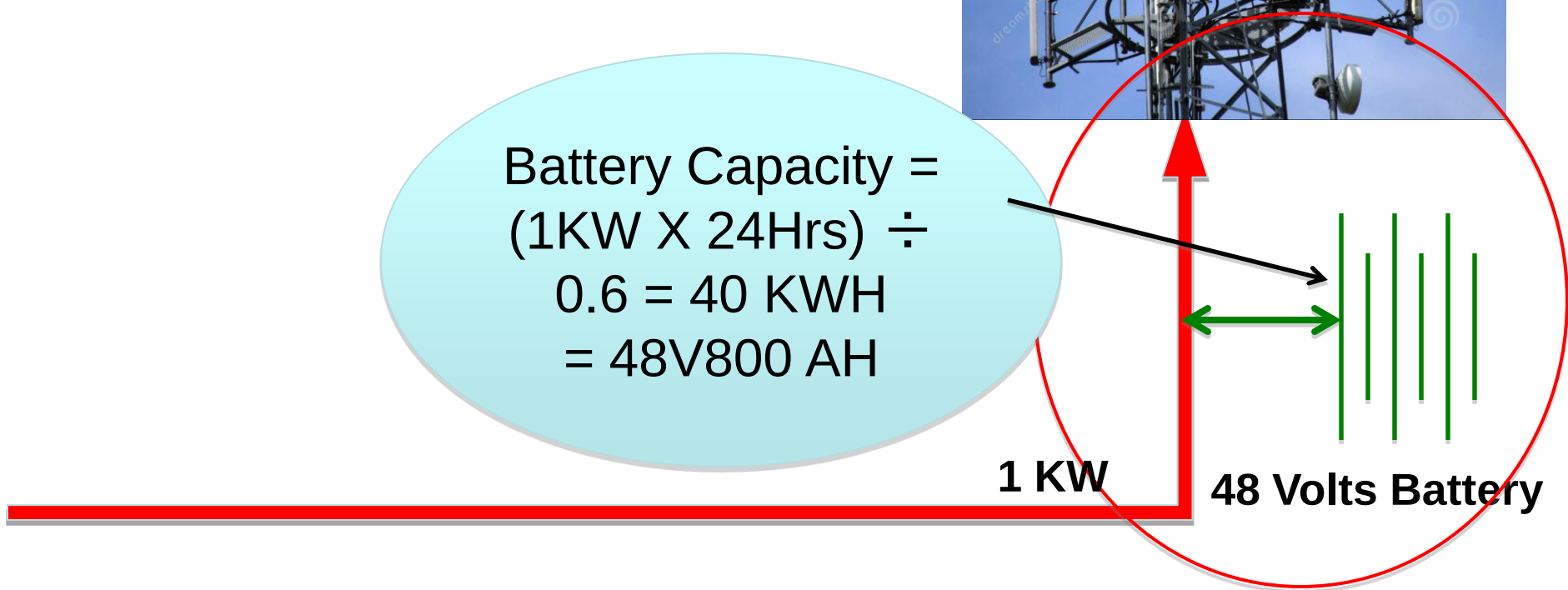
1 KW (assumed)



Battery Capacity =
 $(1\text{KW} \times 24\text{Hrs}) \div$
 $0.6 = 40 \text{ KWH}$
 $= 48\text{V}800 \text{ AH}$

1 KW

48 Volts Battery



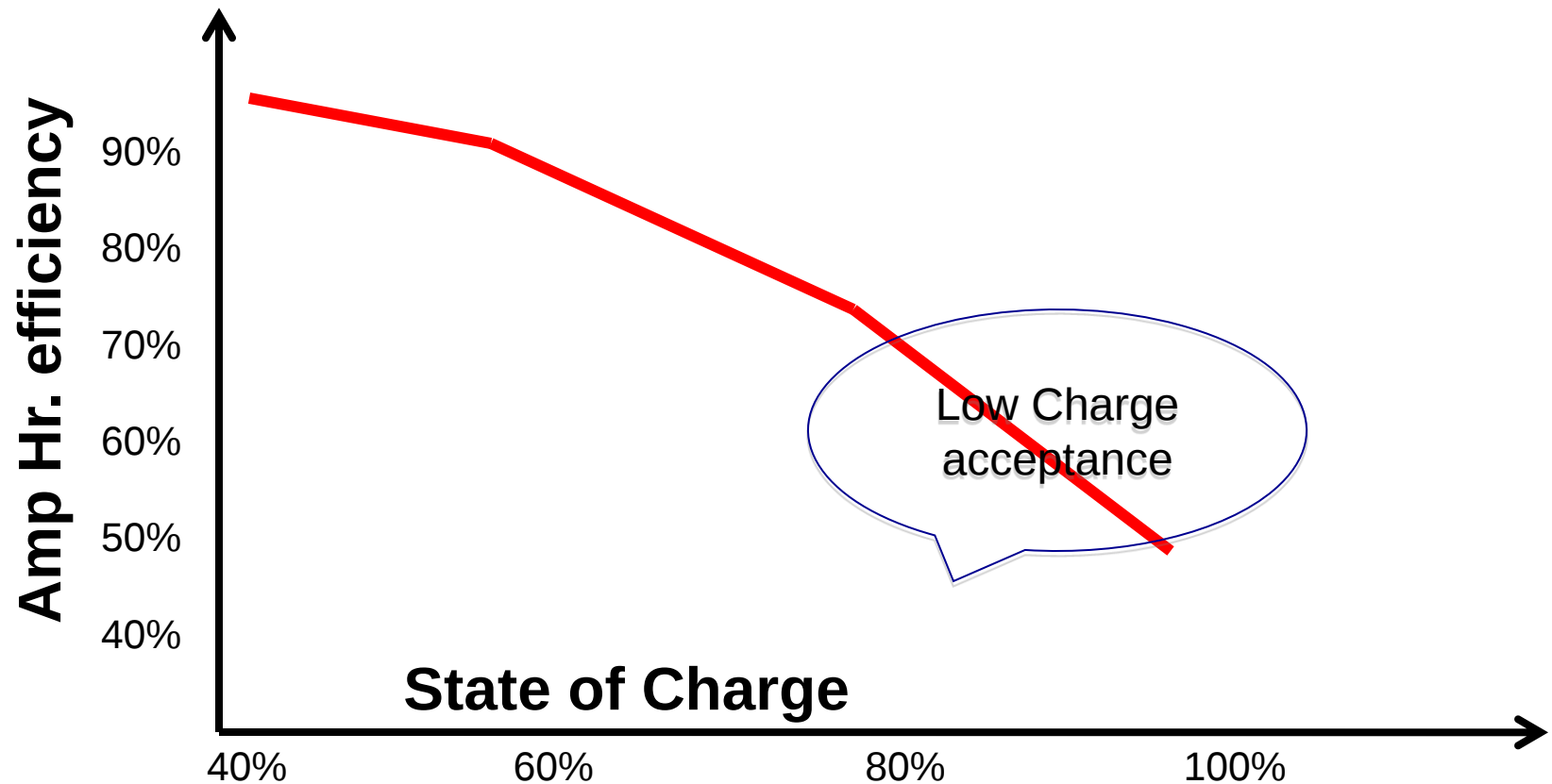
What if we undersize the battery?

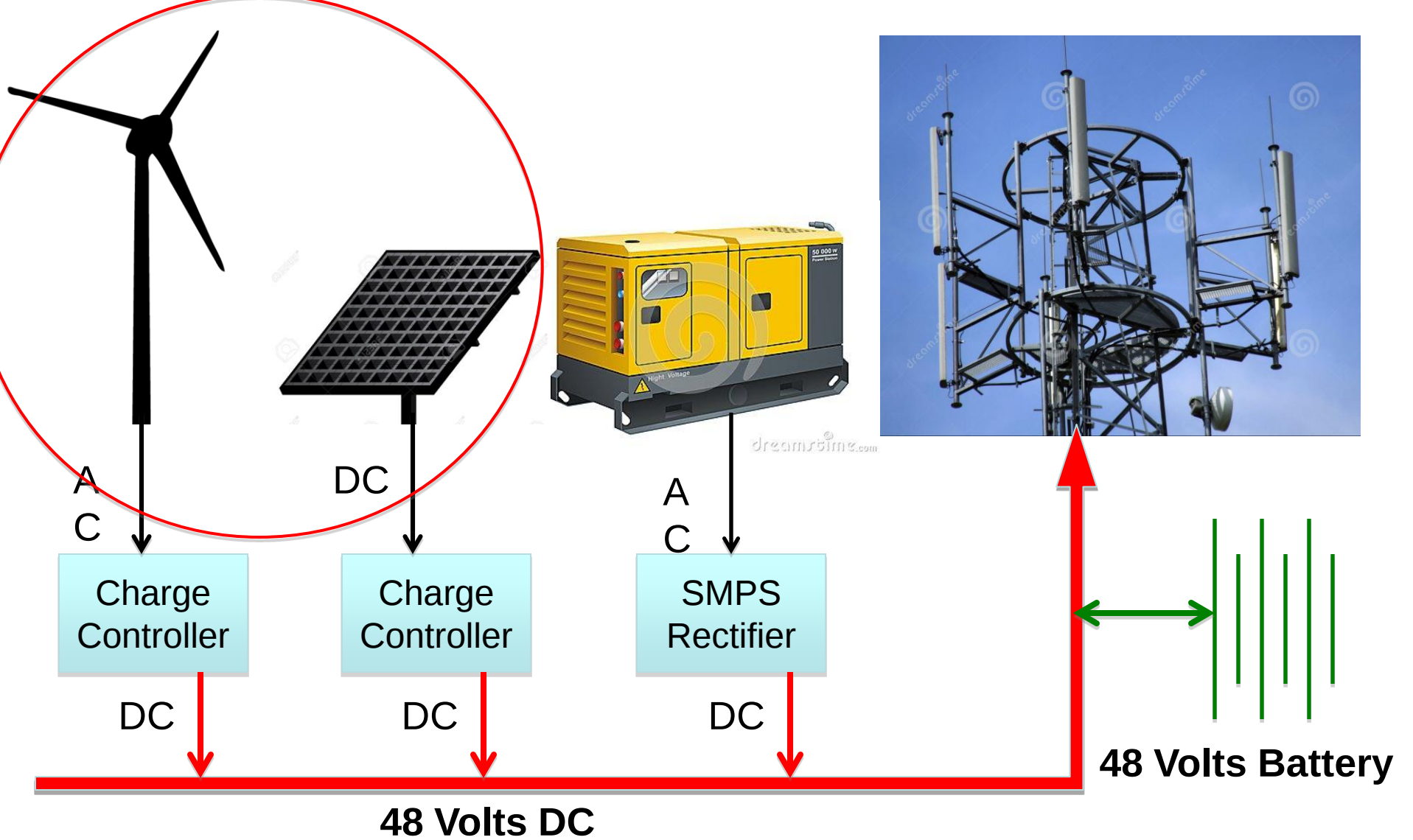
- Say 12 Hours backup = $(1\text{KW} \times 12 \text{ Hrs.}) \div 0.6 = 20\text{KWH}$
- Max charge current @15% of capacity = 3KW
- Recharge 24 KWH in 6 peak solar/wind Hours @ 4KWh
- So, $1\text{KW} \times 6\text{H} = 6\text{KWH}$ energy will be wasted

What if we oversize the battery?

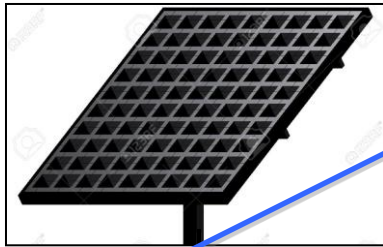
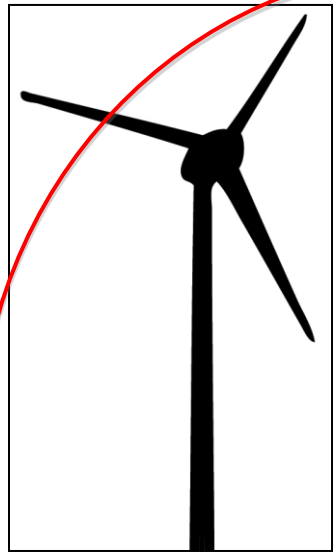
- 48 Hours backup = $(1\text{KW} \times 48 \text{ Hrs.}) \div 0.6 = 80 \text{ KWh}$
- Daily discharge is 24KWH or 30% of 80KWh capacity

charge efficiency is reduced from 85% to 60%





Proper controller setting to allow
wind & solar generate together



A
C

DC

Charge
Controller

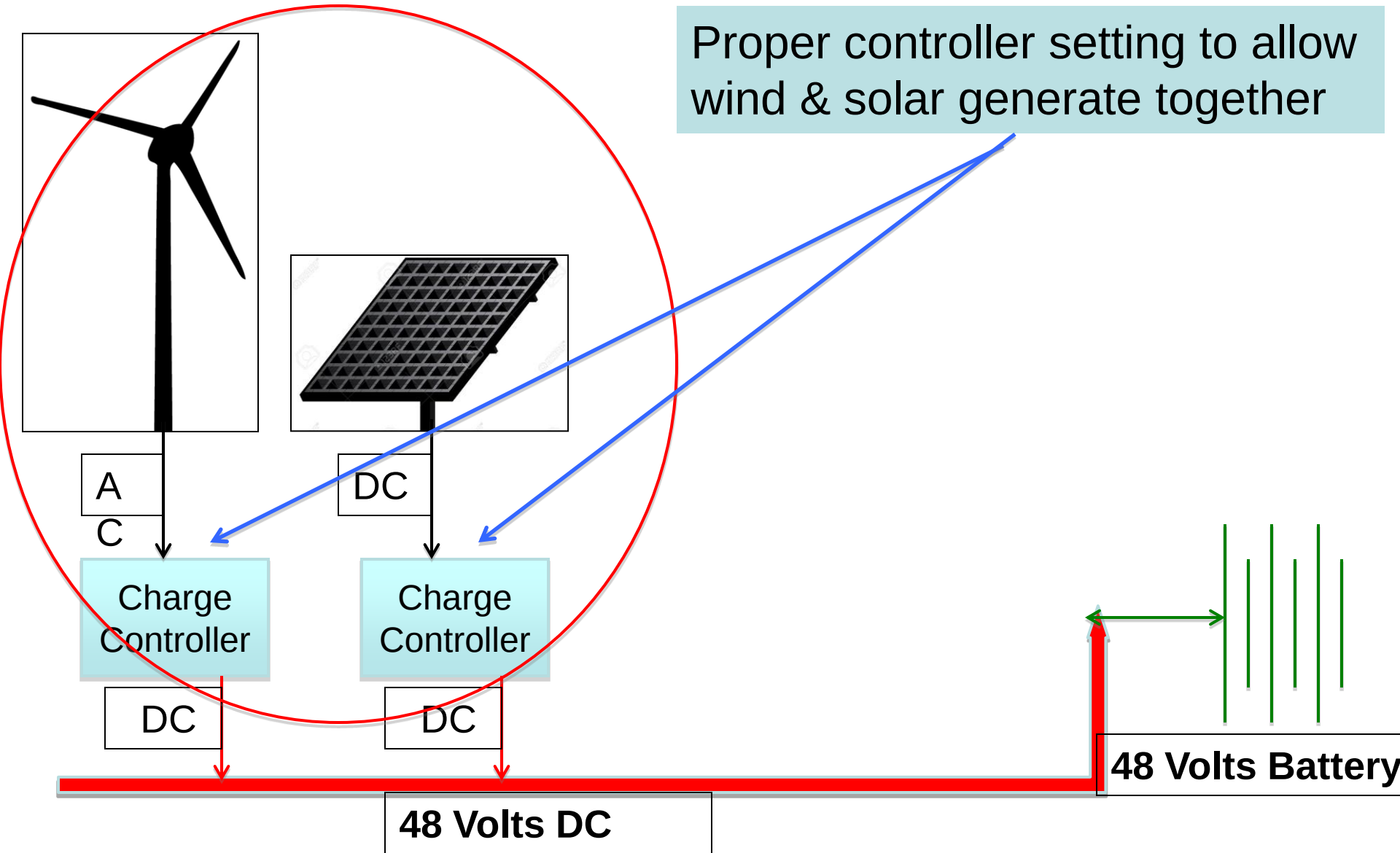
Charge
Controller

DC

DC

48 Volts DC

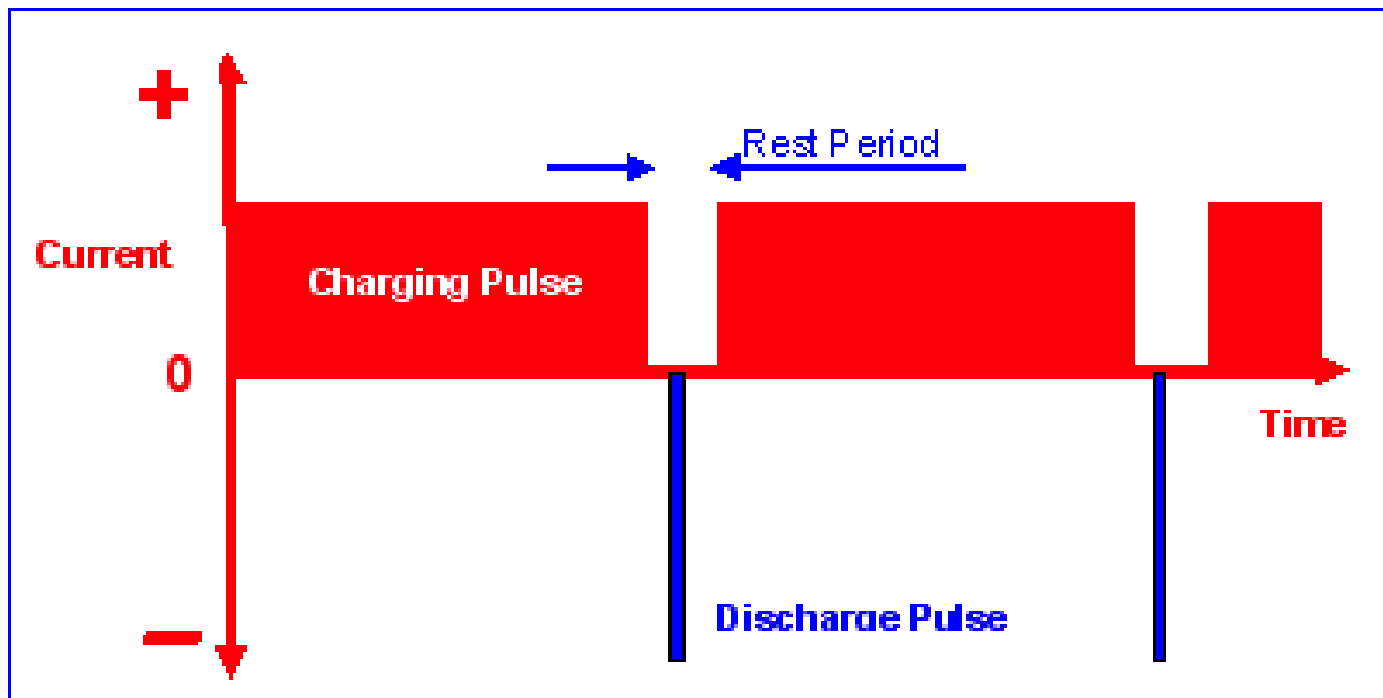
48 Volts Battery



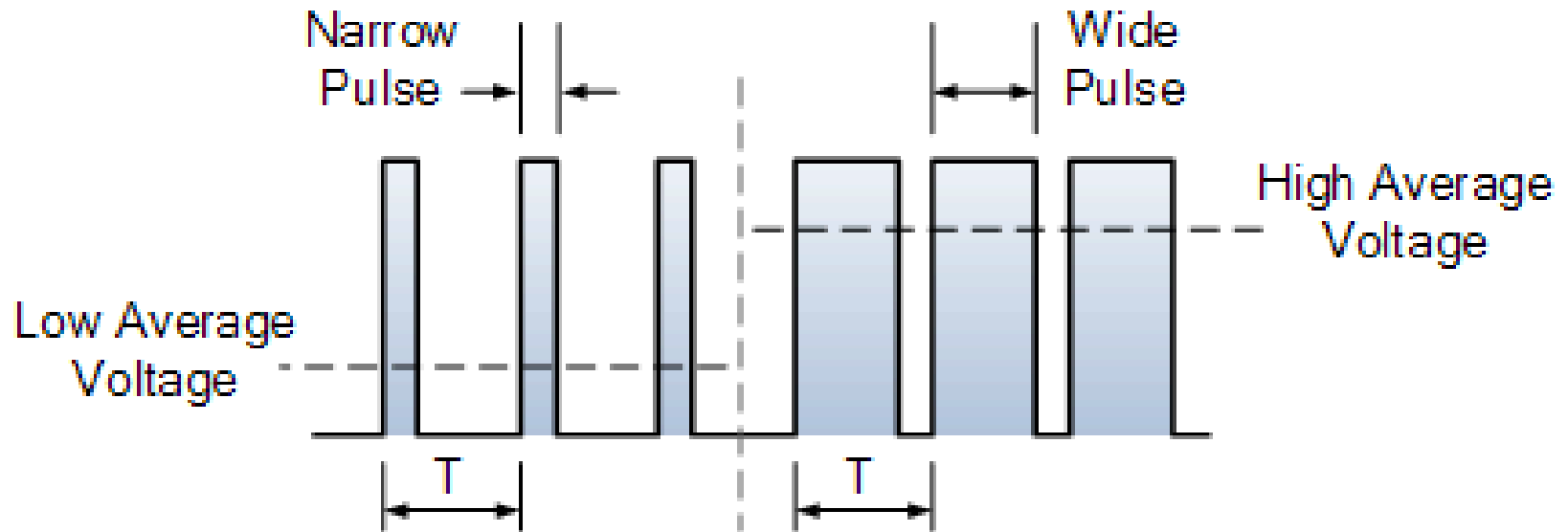
Restricted use of peak power from Wind or Solar

Since 9% maximum voltage rise allowed in BTS

pulse charging increases current but limits battery voltage



Or by pulse width modulation



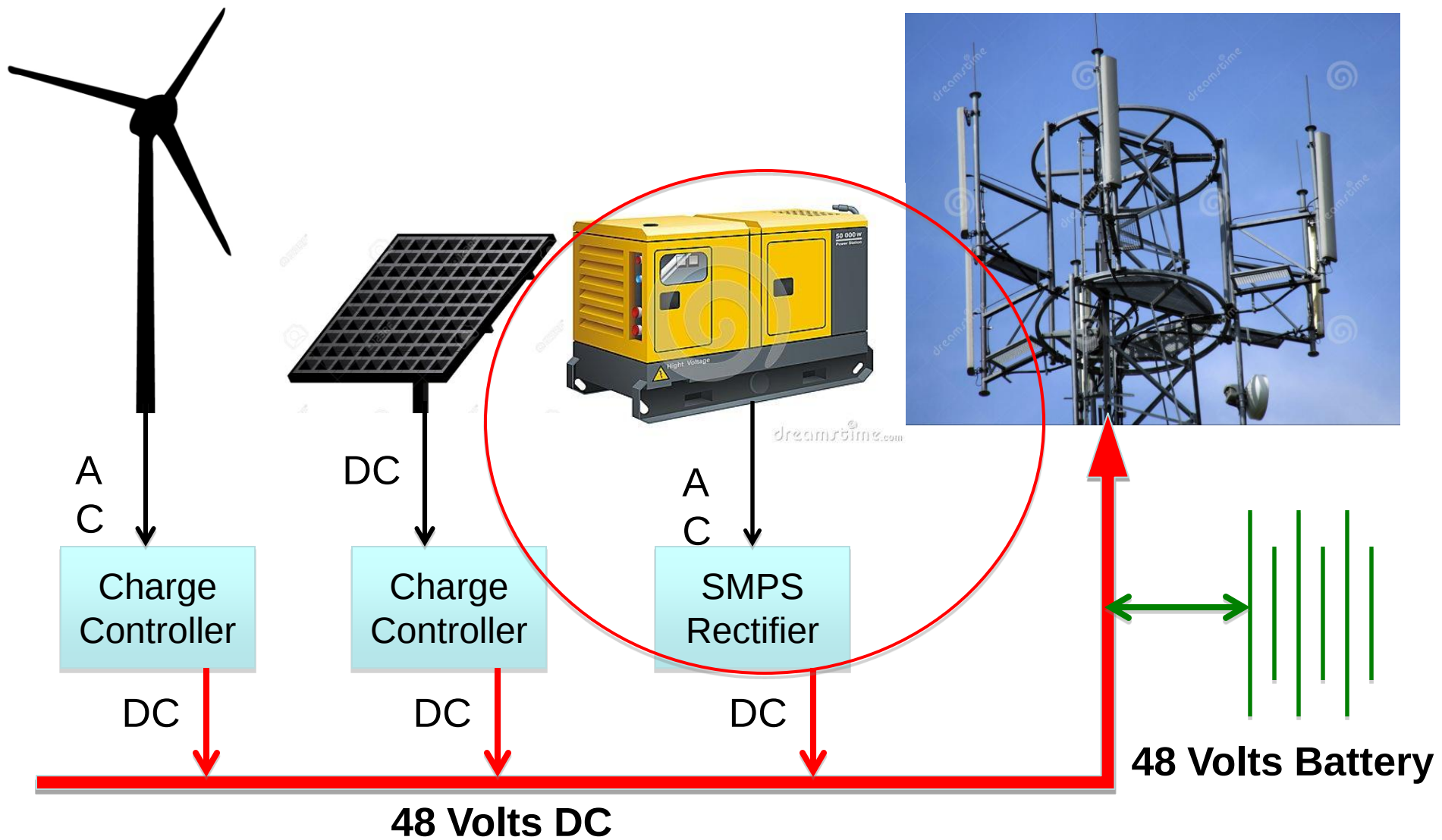
Sizing of Wind & Solar Capacity

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

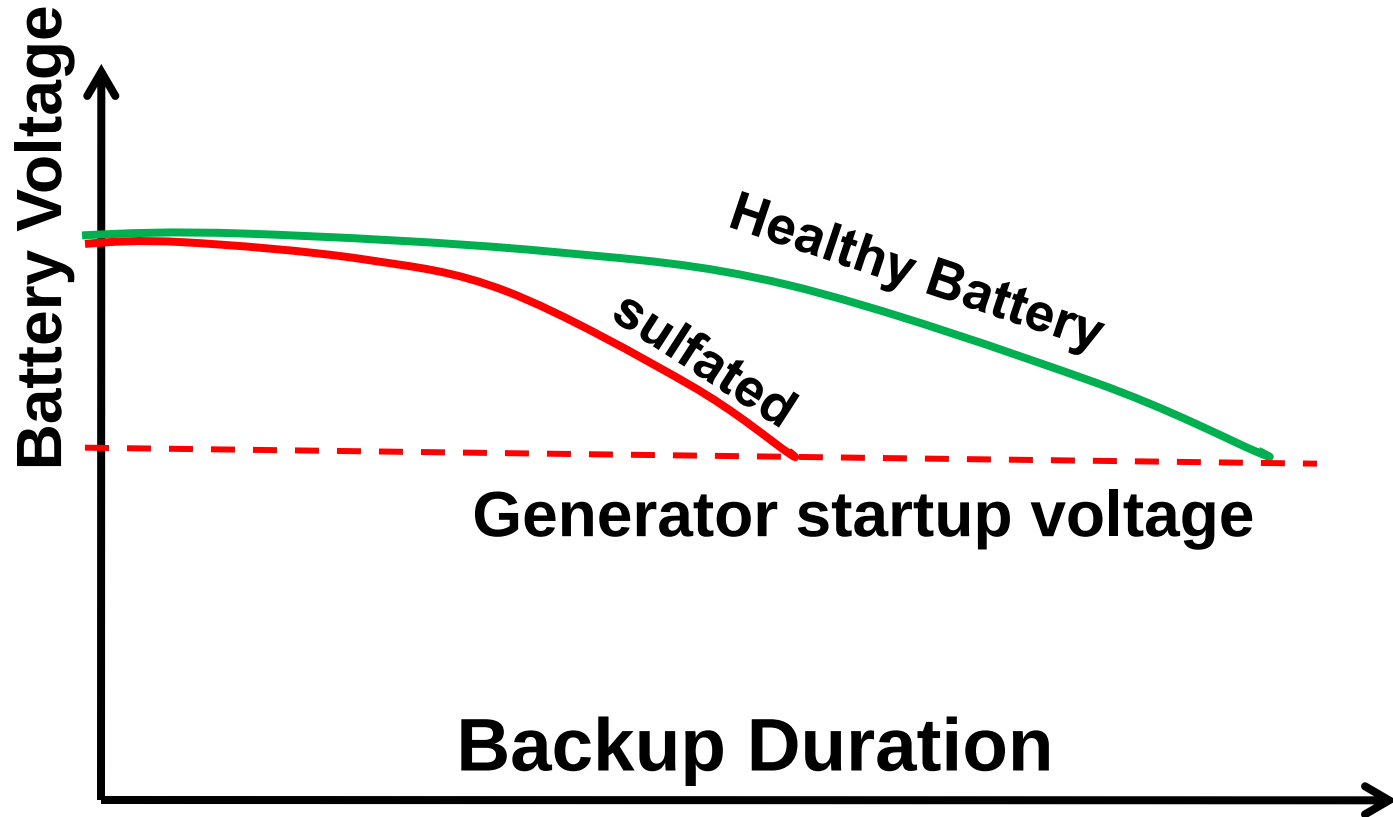
If location PLF of Wind = 25% & PLF of Solar = 18%

Wind output = $25 \div (25+18) = 58\%$ or 16KWh
Wind Turbine Capacity = $16 \div (24 \times 0.25) = 3 \text{ KW}$

Solar output = $18 \div (25+18) = 42\%$ or 12KWh
Solar PV Capacity = $12 \div (24 \times 0.25) = 2 \text{ KW}$



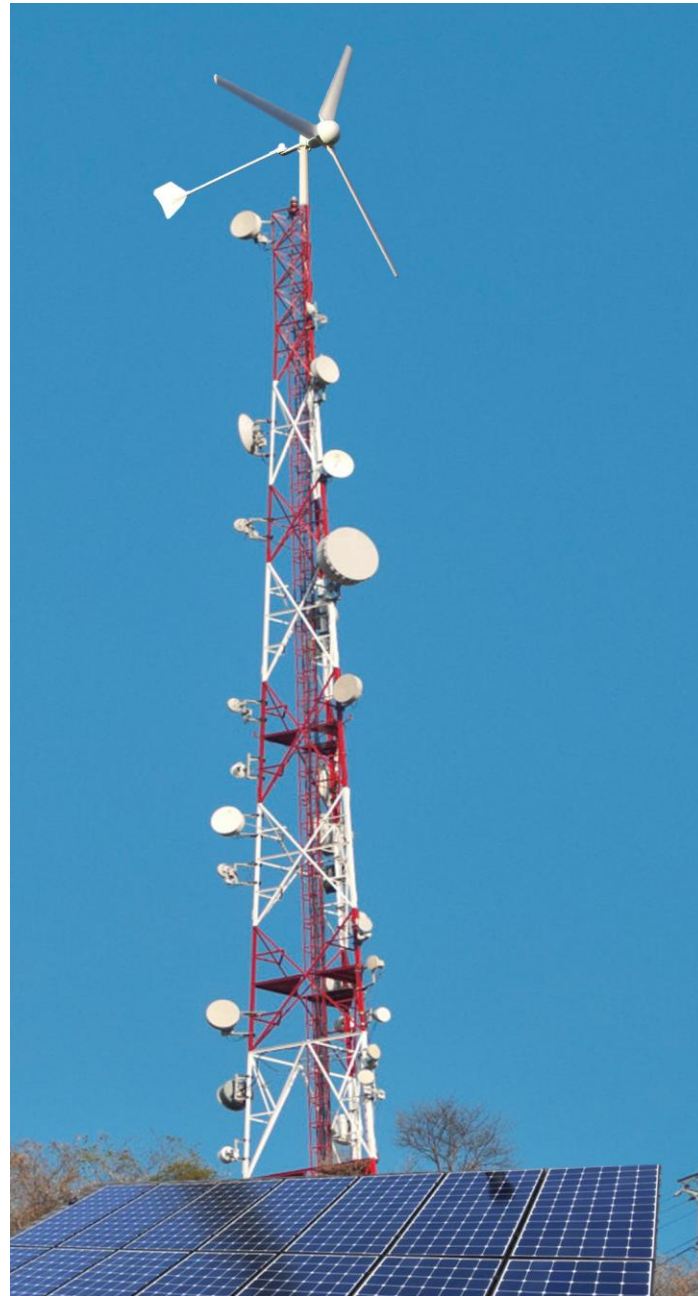
Setting DG startup voltage



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