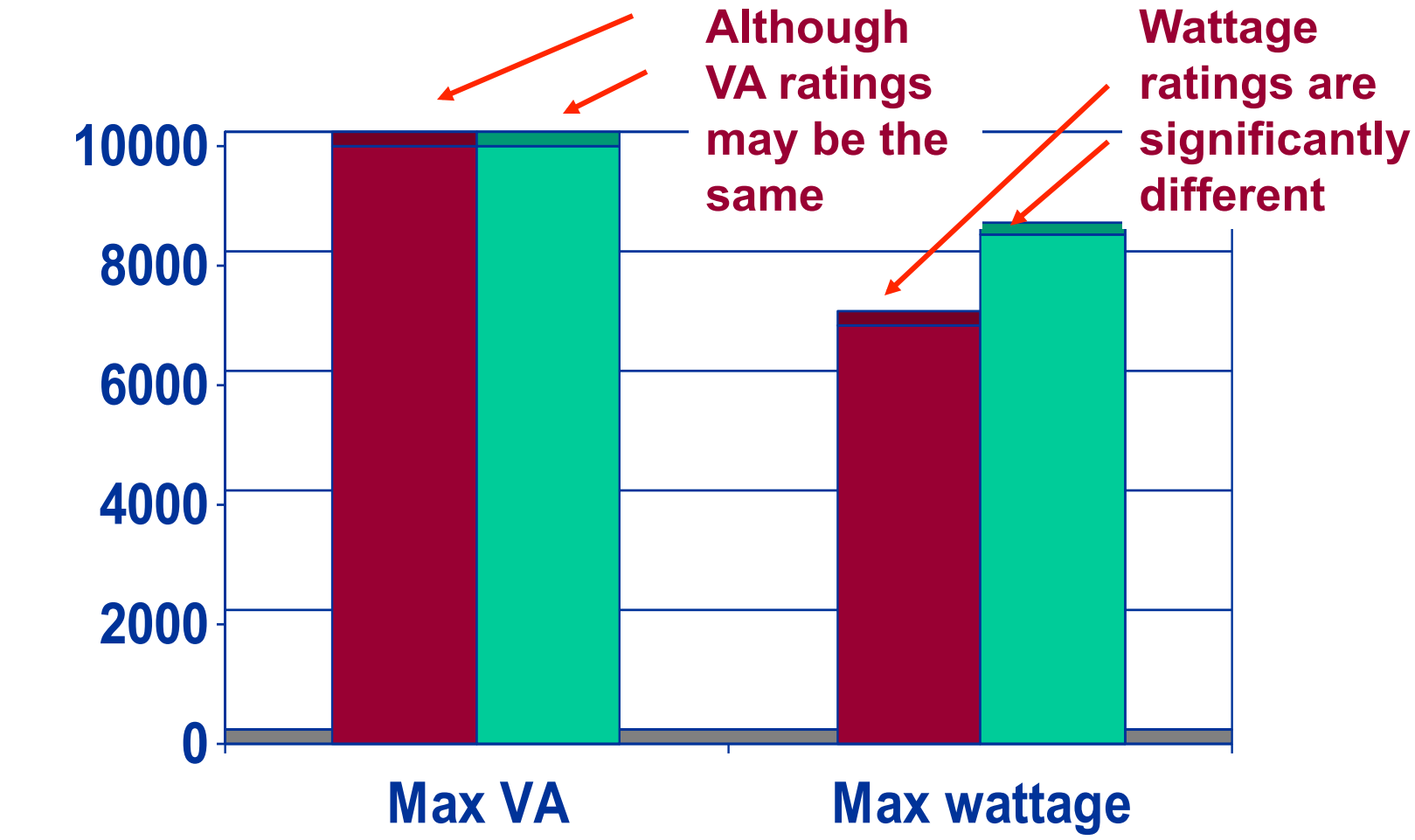

COOPER

Factors to consider before using UPS systems for emergency lighting

Output rating

- Static inverters and UPS systems have 2 maximum output limitations, **neither** of which can be exceeded:
  - Maximum VA rating
  - Maximum wattage rating
- With a UPS system the maximum output wattage will typically be 70 – 80% of the maximum KVA rating
- With a Cooper lighting and security static inverter the standard output wattage rating will be 85% of the maximum KVA rating


Although VA ratings may be the same
Wattage ratings are significantly different
10000
8000
6000
4000
2000
0
Max VA
Max wattage
Typical 10 KVA UPS system
10KVA Cooper lighting and security static inverter

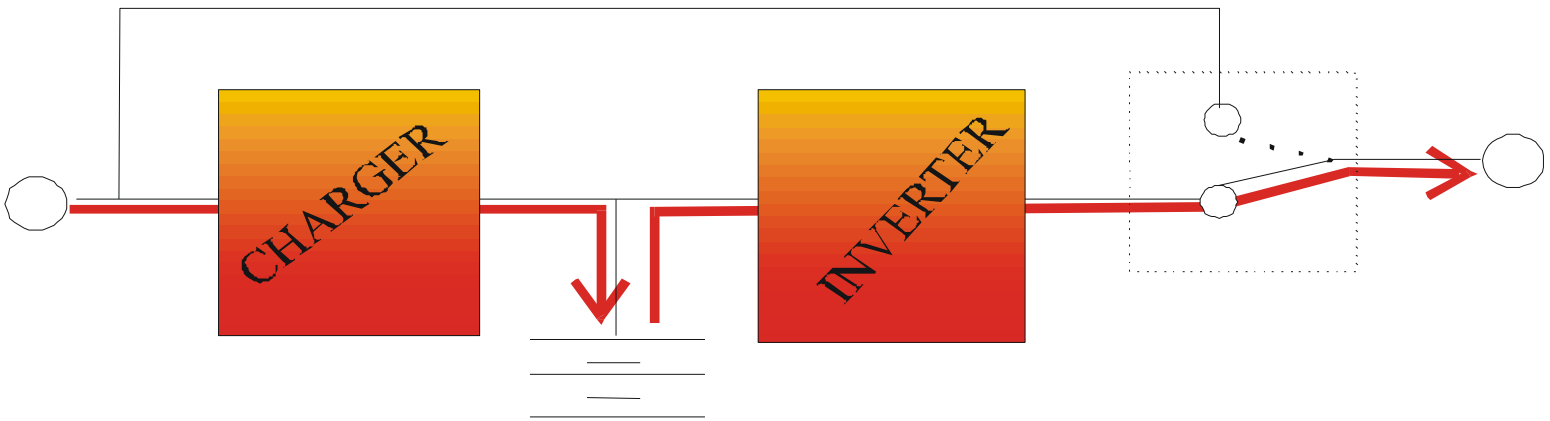
Design note

Establish both the VA and wattage requirement of the load and check that the proposed equipment is adequate for both – including spare capacity.

Overload ability

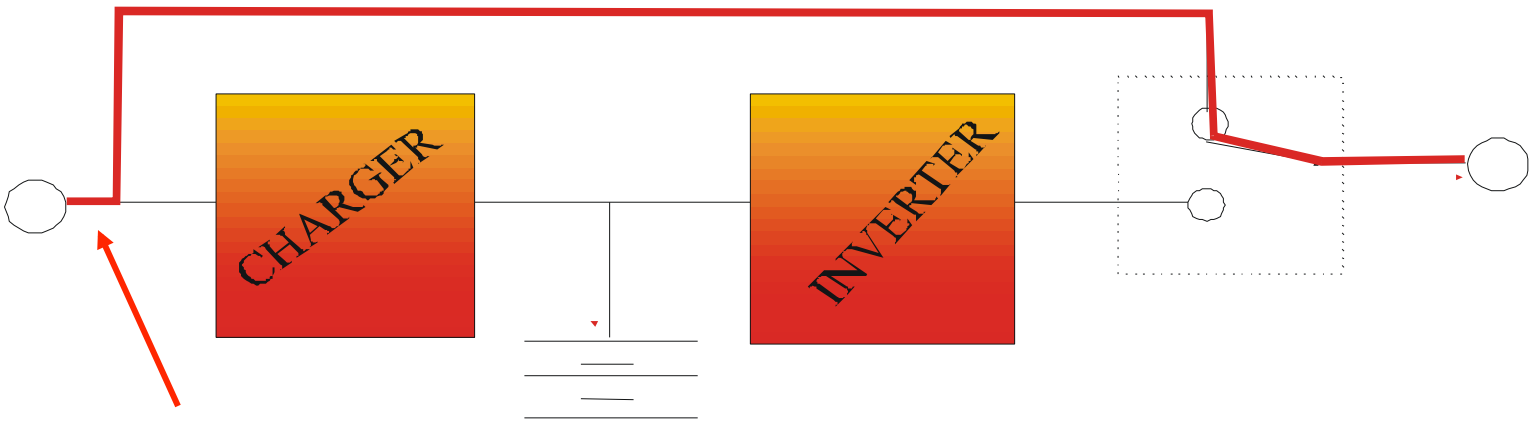
- UPS systems are not designed to strike the load from the inverter
- They normally divert to the mains derived bypass supply whenever presented with an overload
- This bypass is only available when mains is healthy, NOT WHEN MAINS FAILS
- The inverter has to be able to strike the load without the bypass circuit (see EN50171 section 6.5.3)

UPS Normal mode of operation



Load is supplied via charger / battery / inverter

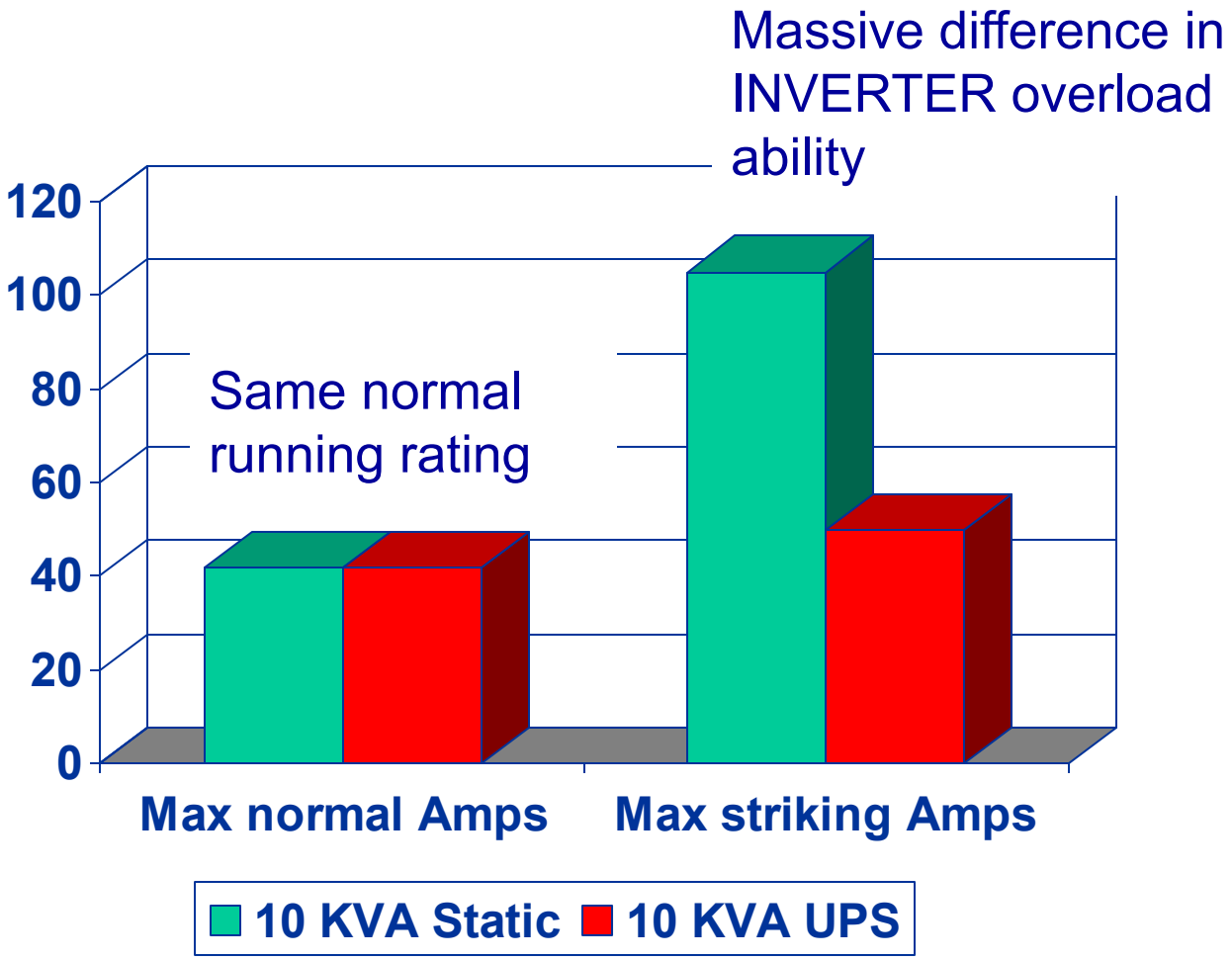
UPS in bypass mode



Bypass supply is only available when mains is healthy

Load is supplied directly from mains input.

UPS systems have limited overload ability in mains failed mode



Design note

Ensure that the inverter has sufficient rating to strike the load from from a previously unpowered state, without the mains input to the unit being present.

Compliance with EN50171

- EN50171 is the design standard for central power systems for emergency lighting applications.

Inverter overload ability section 6.5.3

- The inverter must be able to strike the load in the mains fail condition without the aid of the bypass circuit:
  - Test Method:
    - Fail the mains input to the central battery system
    - Shut down the inverter
    - Restart the inverter without applying the mains input, the load must fully restrike within 5 seconds

Inverter overload ability section 6.5.8

- Without the aid of the bypass circuit the inverter must be able clear the largest distribution protection device and then recover to full output voltage within 5 seconds :

Battery recharge Section 6.2.3

- After a rated discharge the battery must be capable of recharging the battery to 80% capacity within 12Hrs

Battery design life section 6.12.2

- For systems with a rating greater than 500 Watts for 3 hours or 1500 Watts for 1 hour, the battery must have a minimum 10 year design life.

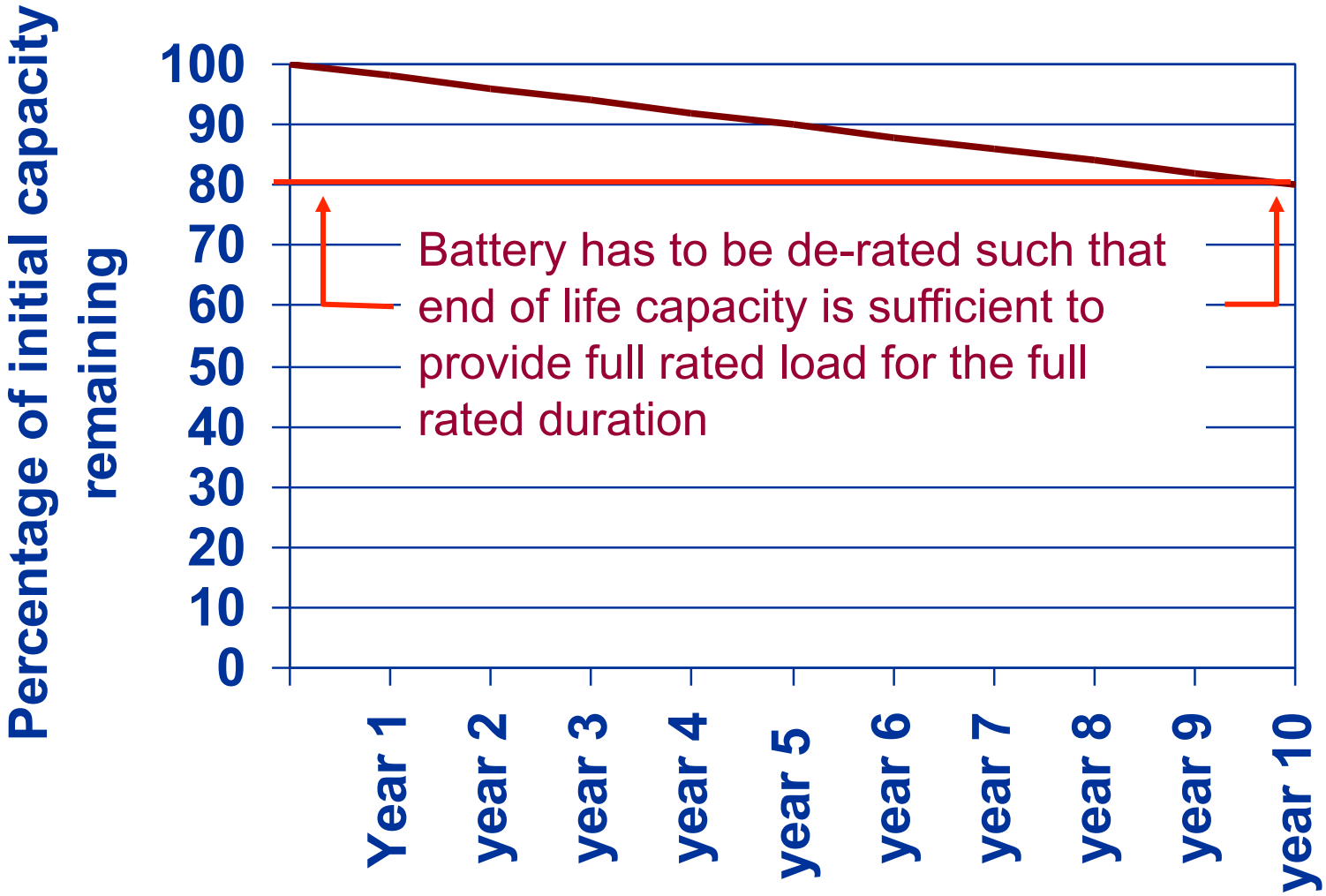
Battery de-rating (section 6.12.4)

- Most batteries will lose capacity during their service life.
- A valve regulated maintenance free battery will normally lose 20% of capacity over its design life
- EN50171 requires that the central system can perform its full rated duty for the full duration at the end of battery design life

Battery de-rating (section 6.12.4)

- To comply with EN50171 batteries must be sufficiently oversized such that they can perform their design duty at the end of design life

Depreciation of battery throughout life



Design note

Insist on a written statement from the proposed supplier that the equipment offered complies fully with the requirements of EN50171

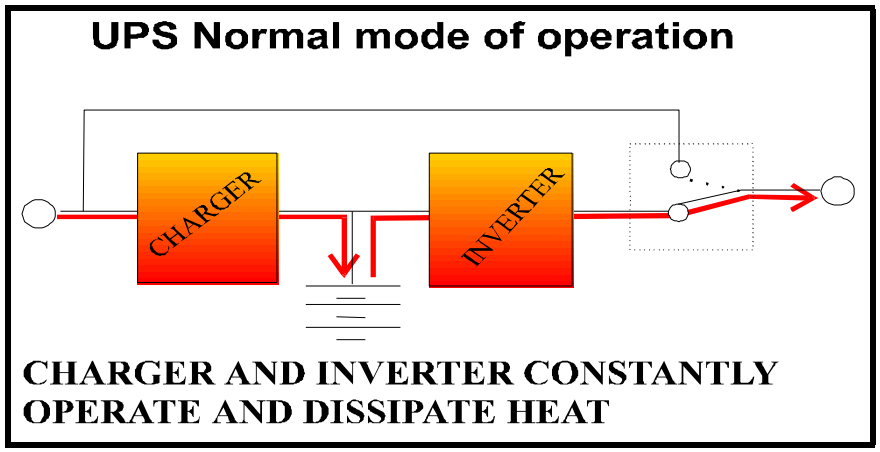
Battery voltage

- Many UPS systems use high voltage batteries to minimise costs.
- EN50272 lays down strict safety requirements for the installation and maintenance of high voltage batteries
  - There must be a minimum distance of 1.5 m. between touchable live parts of any batteries above 120 V.
  - For battery systems above 120 Volts insulated protective clothing and local insulated floor coverings will be required.

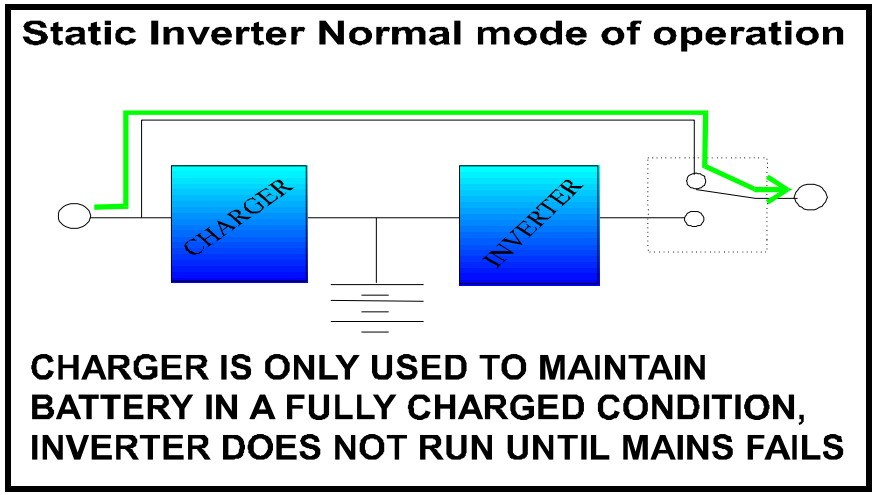
Design note

Insist on a maximum nominal battery voltage of 120V to avoid complex safety requirements

1. Heat dissipation

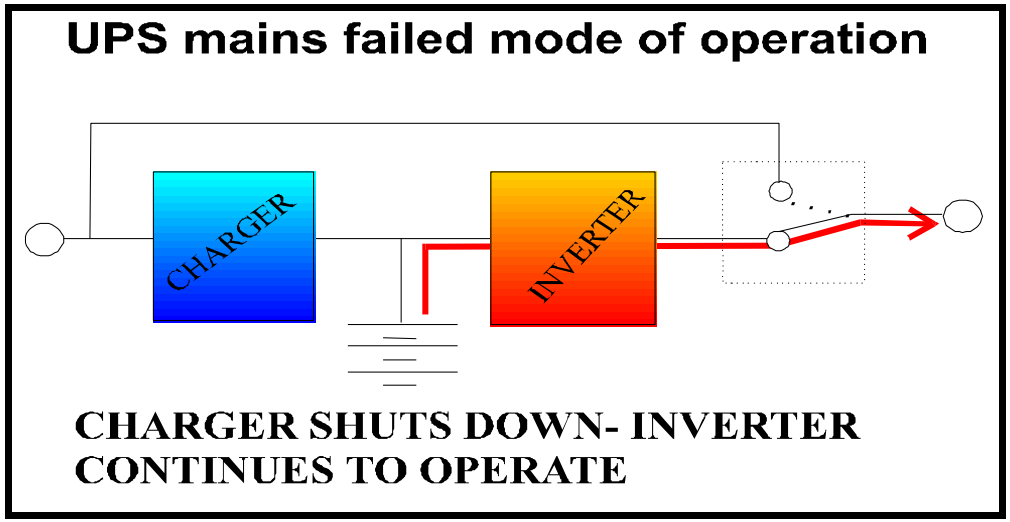


With a typical UPS system the charger continuously operates, using mains power to push power into the battery, the inverter continuously draws power from the battery and converts it back to mains power. Both the charger and inverter continuously operate at full load and generate substantial amounts of heat

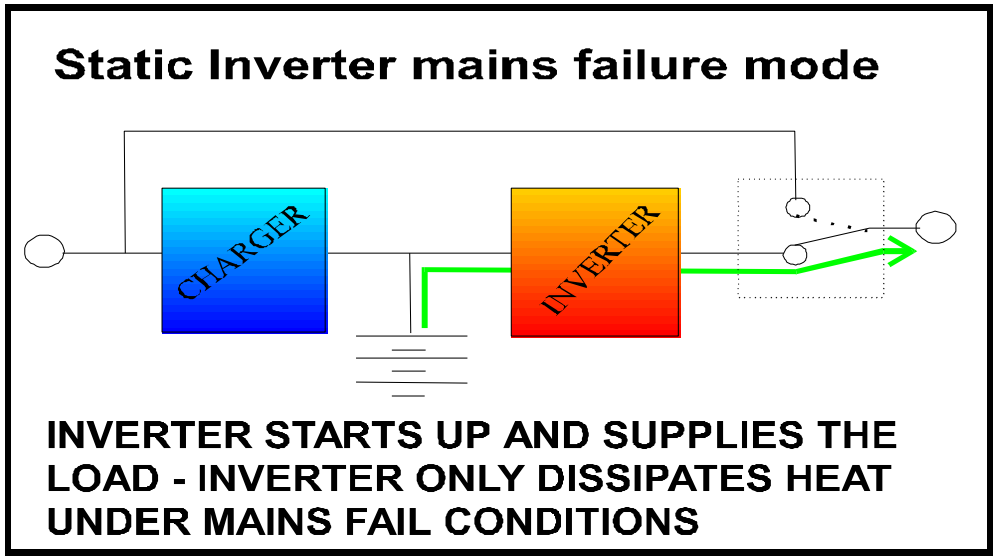


With a true static inverter system the normal load is supplied directly from the mains input, the charger provides only a tiny trickle charge and the inverter does not run at all.
Heat dissipation is negligible.

Heat dissipation



With a UPS system, when mains fails the inverter simply continues to draw power from the battery, because the charger does not replace this power, the battery begins to discharge



With a true static inverter, when the mains fails the inverter starts up and takes over supplying the load

Heat dissipation

- Under mains healthy conditions UPS systems generate significant amounts of heat
- Under mains healthy conditions true static inverters generate virtually no heat
- Under mains fail (emergency) conditions both systems generate comparable amounts of heat

Heat dissipation

- A 30 kW UPS system will continuously dissipate about 3KW of heat.
- If electricity costs £0.06 per unit then the running costs will be:
- £0.06 X 3 x 24 x 365 = £1,576.00 per year
- For a static inverter costs will negligible

Design note

When evaluating a static inverter or UPS system ask for full details of the full load heat dissipation

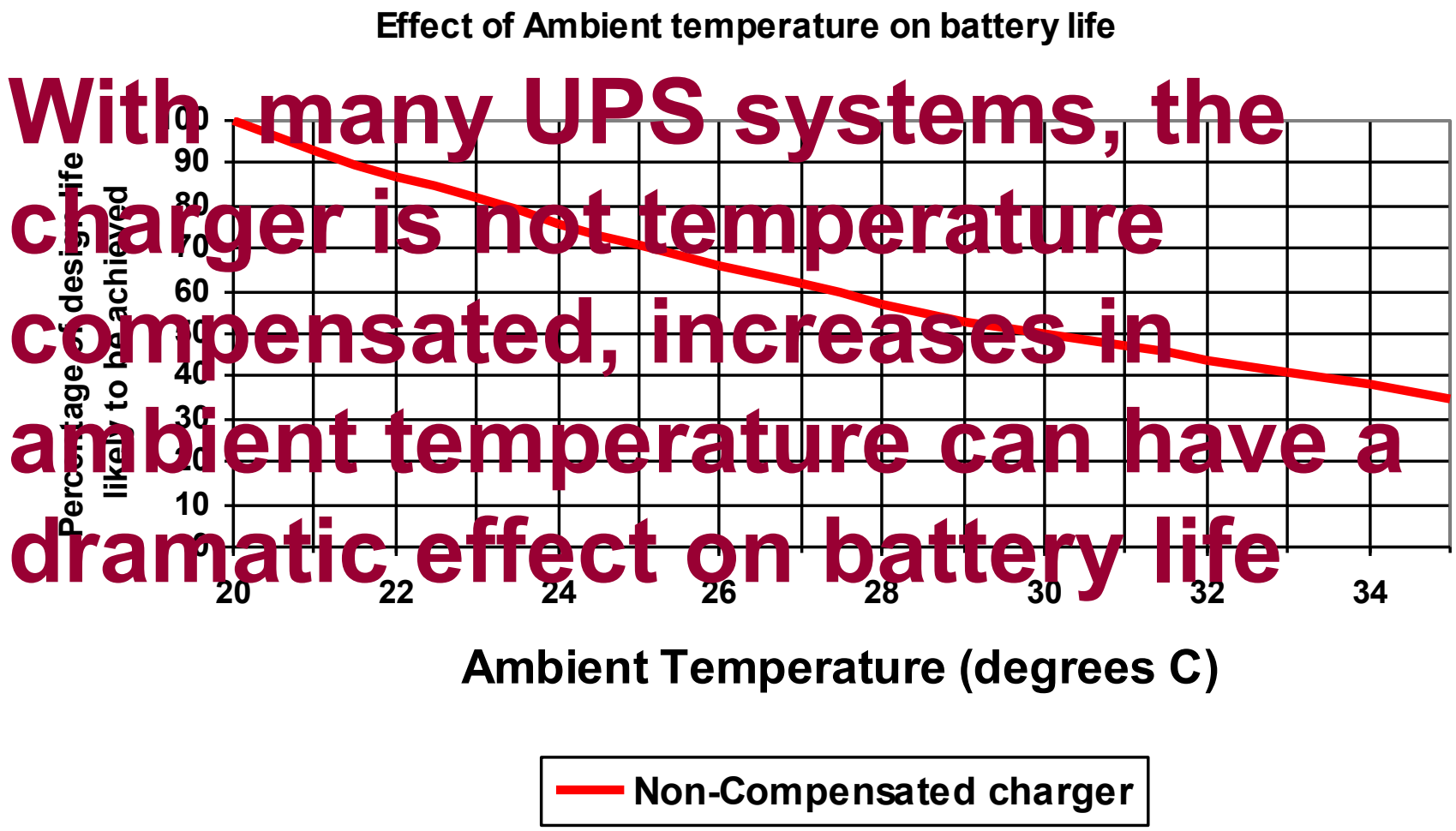
Effects of heat dissipation

- Batteries store the standby power for the system.
- The most common battery is a valve regulated maintenance free lead acid battery
- These batteries only provide their design life when used in ambient temperatures below 22^{o}C

Effects of heat dissipation

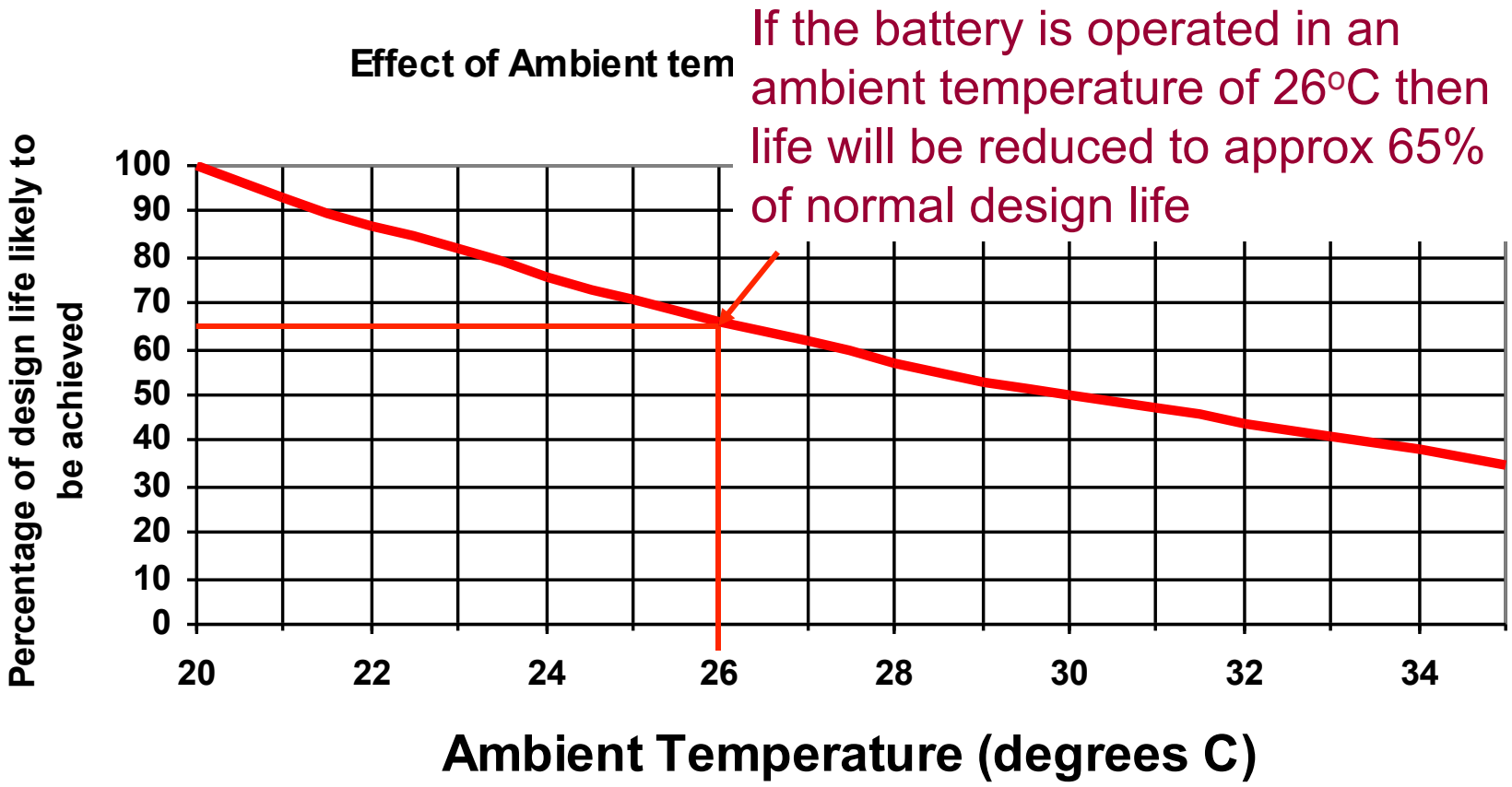
- If the heat generated by the UPS is not removed from the area where the battery is being stored then battery life is likely to be affected.
- The severity of the effect on life depends on whether or not the charger is temperature compensated
- In any event heat will have some effect on battery life

Heat dissipation



With many UPS systems, the charger is not temperature compensated, increases in ambient temperature can have a dramatic effect on battery life

Heat dissipation

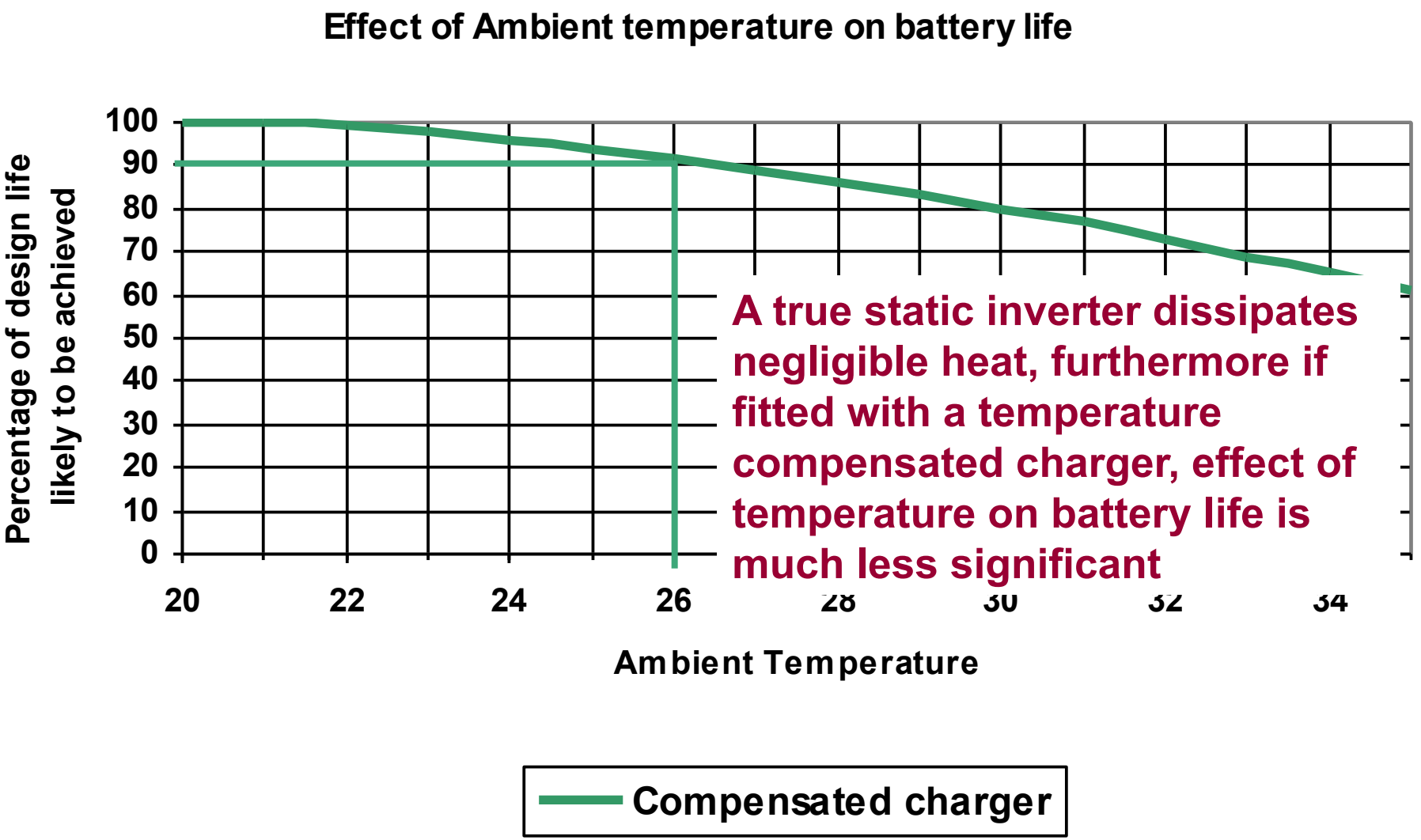


- With a true static inverter negligible heat is generated during normal mains operation
- Cooper lighting and security static inverters utilise temperature compensated chargers to minimise the effect of heat on battery life

Design note

When evaluating a static inverter or UPS system ask whether the charger is temperature compensated or not

Heat dissipation



Design note

When evaluating a static inverter or UPS system ask for details of the design life of the battery and for confirmation of what ambient temperature has to be maintained to achieve this life – will this require additional cooling in the battery room


COOPER Lighting and Security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