Power Electronics for the Next Generation

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So You Need Power?

- Who Gives a Watt.
  - And what does that Watt Cost you?

Workhorse of a Spacecraft Power System

- ## NiCad Battery
  - 22 Watt Hour / Kg
    - TRMM Spacecraft 2 batteries with total weight of 278 Pounds (126 Kg)

- ## Nickel Hydrogen
  - 30 to 40 Watt Hour / Kg
    - HST 6 Batteries with a total weight of 930 Pounds (421 Kg)

- ## Lithium
  - 80 Watt Hour / Kg
    - SDO 1 Battery with a total weight of 97 Pounds (44 Kg)

Battery Weight Does Not Include

- Solar Arrays
- Power Handling Electronics
- Harness
- Spacecraft Structure to Handle the Weight of the Batteries
- Cooling Equipment

Crude Voltage Estimates for Batteries Over One Orbit

- NiCad Battery

- Nickel Hydrogen

- Lithium Ion

Allowed Voltage Variation on Electronic Logic

- CD4000 Logic

  - 5v to 20v allowed ripple 1 volt at 5 volt input.

- 74HC Logic

  - 2v to 7v Allowed ripple 0.5 volt at 4 volt input.

- FPGA's

  - 3.14v to 3.45 and 1.43v to 1.57v Allowed ripple 0.015 volt input.

  Neon Logic

Allowed Voltage Variation on Electronic Logic

- ## Neon Logic
  - 95v to 150v allowed ripple 15 volts – 20 volts

- ## CD4000 Logic
  - 5v to 20v allowed ripple 1 volt at 5 volt input.

- ## 74HC Logic
  - 2v to 7v Allowed ripple 0.5 volt at 4 volt input.

- ## FPGA's
  - 3.14v to 3.45 and 1.43v to 1.57v Allowed ripple 0.015 volt input.