

ORDERS OF MAGNITUDE (POWER)

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[http://en.wikipedia.org/wiki/Orders_of_magnitude_\(power\)](http://en.wikipedia.org/wiki/Orders_of_magnitude_(power))

This page lists examples of the [power](#) in [watts](#) produced by various different sources of energy. They are grouped by [orders of magnitude](#), and each section covers three orders of magnitude, or a factor of one thousand.

Yoctowatt (10⁻²⁴ watt)

Zeptowatt (10⁻²¹ watt)

- ~10 zW - *Tech*: approximate power of [Galileo space probe's](#) radio signal (when at [Jupiter](#)) as received on earth by a 70 meter [DSN](#) antenna.

Attowatt (10⁻¹⁸ watt)

- 1 aW - *Phys*: approximate power scale at which operation of [nanoelectromechanical systems](#) is overwhelmed by thermal fluctuations. [\[3\]](#)

Femtowatt (10⁻¹⁵ watt)

- 2.5 fW - *Tech*: minimum discernible signal at the antenna terminal of a good [FM](#) radio receiver
- 10 fW (-110 dBm) - *Tech*: approximate lower limit of power reception on digital spread-spectrum cell phones

Picowatt (10⁻¹² watt)

- 1 pW - *BioMed*: average power consumption of a human [cell](#)
- 2.5 pW - *BioMed*: Sound intensity per square centimeter for average human threshold of hearing at 1000 Hz; 1 [phon](#) or 0 [dB SPL](#)
- 150 pW - *BioMed*: Power entering a human eye from a 100 watt lamp 1 km away

Nanowatt (10⁻⁹ watt)

- 2-15 nW - *Tech*: Power consumption of some PIC Microcontroller chips, such as the PIC12F683, when in "sleep" mode. (actual consumption when sleeping depends on voltage supply used, see data sheet, Electrical Characteristics section).

Microwatt (10⁻⁶ watt)

- 1 μW - *Tech*: approximate consumption of a [quartz wristwatch](#)
- 3 μW - *Astro*: [cosmic microwave background radiation](#) per square meter

Milliwatt (10^{-3} watt)

- 5 mW - *Tech*: laser in a [CD-ROM](#) drive
- 5-10 mW - *Tech*: laser in a [DVD player](#)
- 100 mW - *Tech*: laser in a [CD-R](#) drive

Watt

Watt

- 4 W - *Tech*: the power consumption of an [incandescent night light](#)
- 5 W - *Legal*: maximum power output of a [CB](#) or hand-held radio transmitter
- 20-40 W - *BioMed*: approximate power consumption of the human brain
- 30-40 W - *Tech*: the power of the typical household tube light
- 60 W - *Tech*: the power of the typical household [light bulb](#)
- 82 W - *Tech*: peak power consumption of [Pentium 4](#) CPU
- 100 W - *BioMed*: approximate average power used by the [human](#) body
- 120 W - *Tech*: power output of 1 m² [solar panel](#) in full [sunlight](#) (approx. 12% efficiency)
- 253 W (2,215 [kWh/year](#)) - *Geo*: per capita average power use of the world in [2001](#)
- 290 W - *Units*: approximately 1000 [BTU](#)/hour
- 300-400 W - *Tech*: typical [PC](#) power supply
- 400 W - *Tech*: legal limit of power output of an [amateur radio](#) station in the [United Kingdom](#)
- 500 W - *BioMed*: power output of a person working hard physically
- 745.7 W - *Units*: 1 [horsepower](#)
- 750 W - *Astro*: the amount of [sunshine](#) falling on a square metre of the Earth's surface on a clear day
- 900 W - *BioMed*: power output of a healthy human (non-athlete) averaged over the first 6s of a 30s cycle sprint. ^[1]

Kilowatt (10^3 watt)

- 1.366 kW - *Astro*: power received from the [Sun](#) at the [Earth's](#) orbit by [one square metre](#)
- 1.39 kW (12.2 MWh/year) - *Geo*: per capita average power use in the [U.S.](#) in [2003](#)
- 1.5 kW - *Tech*: legal limit of power output of an [amateur radio](#) station in the [United States](#)
- up to 2 kW - *BioMed*: approximate short time power output of sprinting professional cyclists
- 1 kW to 2 kW - *Tech*: heat output of a domestic electric [kettle](#).
- 3.3-6.6 kW - *Eco*: average [photosynthetic](#) power output per [square kilometer](#) of [ocean](#) [4]
- 30 kW - power generated by the four motors of GEN H-4 one man helicopter
- 16-32 kW - *Eco*: average photosynthetic power output per square kilometer of [land](#) [5]

- 10 kW to 50 kW - *Tech:* [ERP](#) of [clear channel AM](#) [6]
- 50 kW or 100 kW - *Tech:* highest allowed [ERP](#) for an [FM band radio station](#) in the [United States](#). [7]
- 40 kW to 200 kW - *Tech:* approximate range of power output of typical [automobiles](#)
- 167 kW - *Tech:* power consumption of [UNIVAC 1](#) computer
- 250 kW to 800 kW - *Tech:* approximate range of power output of '[Supercars](#)'

Megawatt (10⁶ watt)

- 1.3 MW - *Tech:* power output of [P-51 Mustang](#) fighter aircraft
- 2.5 MW - *BioMed:* Peak power output of a [Blue Whale](#)
- 3 MW - *Tech:* Mechanical power output of a diesel [locomotive](#)
- 10 MW - *Tech:* Highest [ERP](#) allowed for a [UHF television station](#).
- 10.3 MW - *Geo:* Electrical power output of [Togo](#)
- 140 MW - *Tech:* average power consumption of a [Boeing 747](#) passenger aircraft
- 190 MW - *Tech:* peak power output of a [Nimitz class aircraft carrier](#)
- 900 MW - *Tech:* electric power output of a [CANDU](#) nuclear reactor
- 959 MW - *Geo:* average electrical power consumption of [Zimbabwe](#) in [1998](#)

The productive capacity of electrical generators operated by utility companies is often measured in MW. Few things can sustain the transfer or consumption of energy on this scale; some of these events or entities include: lightning strikes, naval craft (such as [aircraft carriers](#) and [submarines](#)), engineering hardware, and some scientific research equipment (such as the [supercollider](#) and large [lasers](#)).

For reference, about 10,000 100-watt lightbulbs or 5,000 computer systems would be needed to draw 1 megawatt. Also, 1 MW equals approximately 1360 [horsepower](#). Modern high-powered [diesel-electric](#) railroad [locomotives](#) typically have a peak power output of 3–5 MW, whereas a typical modern [nuclear power plant](#) produces on the order of 500–2000 MW peak output.

Gigawatt (10⁹ watt)

- 1.21 GW - *Sci-fi:* electrical power usage of the [flux capacitor](#) in "[Doc](#)" [Emmett Brown](#)'s [De Lorean time machine](#) in the movie [Back to the Future](#), mentioned several times throughout the movie and forming a critical [plot point](#).
- 1.3 GW - *Tech:* electric power output of [Manitoba Hydro](#) Limestone [hydroelectric](#) generating station
- 2.074 GW - *Tech:* peak power generation of [Hoover Dam](#)
- 2.1 GW - *Tech:* peak power generation of [Aswan Dam](#)
- 3 GW - *Tech:* approximate peak power generation of the world's largest [nuclear reactor](#)
- 12.6 GW - *Tech:* electrical power generation of the [Itaipu Dam](#), the world's largest [hydroelectric](#) power plant
- 12.7 GW - *Geo:* average electrical power consumption of [Norway](#) in [1998](#)
- 18.2 GW - *Tech:* projected electrical power generation of the [Three Gorges Dam](#) in [China](#) when complete.
- 190 GW - *Tech:* average power consumption of the first stage of the [Saturn V](#) rocket

Terawatt (10^{12} watt)

- 1.7 TW - *Geo*: average electrical power consumption of the world in [2001](#)
- 2 TW - *Astro*: Approximate power generated between the surfaces of Jupiter and its moon [Io](#) due to Jupiter's tremendous magnetic field.^[2]
- 3.34 TW - *Geo*: average total (gas, electricity, etc) power consumption of the [U.S.](#) in [2005](#) ^[3]
- 15 TW - *Geo*: average total power consumption of the human world in [2004](#)
- 44 TW - *Geo*: average total heat flux from earth's interior (See figure in <http://physicsweb.org/articles/news/9/7/16/1>)
- 75 TW - *Eco*: based on global [net primary production](#) (= [biomass](#) production) via [photosynthesis](#)
- 50 to 200 TW - *Weather*: rate of heat energy release by a [hurricane](#)
- 290 TW - The power the [Z Machine](#) reaches in 1 billionth of a second when it is fired

Petawatt (10^{15} watt)

- 1.25 PW - *Tech*: world's most powerful [laser](#) pulses (claimed on [23 May 1996](#) by [Lawrence Livermore Laboratory](#)).
- 1.4 PW - *Geo*: estimated heat flux transported by the [Gulf Stream](#).
- 4 PW - *Geo*: estimated total heat flux transported by [Earth's atmosphere](#) and [oceans](#) away from the [equator](#) towards the poles.
- 174.0 PW - *Astro*: total power received by the [Earth](#) from the [Sun](#)

Zettawatt (10^{21} watt)

- 135 ZW - *Astro*: Approximate [luminosity](#) of [Wolf 359](#)

Yottawatt (10^{24} watt)

- 5.3 YW - *Tech*: Power produced by the [Tsar Bomba](#) fusion bomb, the most powerful device ever made
- 386 YW - *Astro*: [Luminosity](#) of the [Sun](#)

Greater than Yottawatt

- 3.31×10^{31} W - *Astro*: Approximate [luminosity](#) of [Beta Centauri](#)
- 1.23×10^{32} W - *Astro*: Approximate [luminosity](#) of [Deneb](#)
- 5×10^{36} W - *Astro*: Approximate [luminosity](#) of the [Milky way](#) galaxy.
- 1×10^{45} W - *Astro*: Approximate [luminosity](#) of a [Gamma ray burst](#)
- 3.63×10^{52} W - *Phys*: The [Planck power](#), the basic unit of power in the [Planck units](#).
- $5 * 10^{64}$ W - *Sci-fi*: Approximate power output of the gridfire weapon from [The Culture](#) novels by [Iain M. Banks](#)