

CLARITY GUIDES

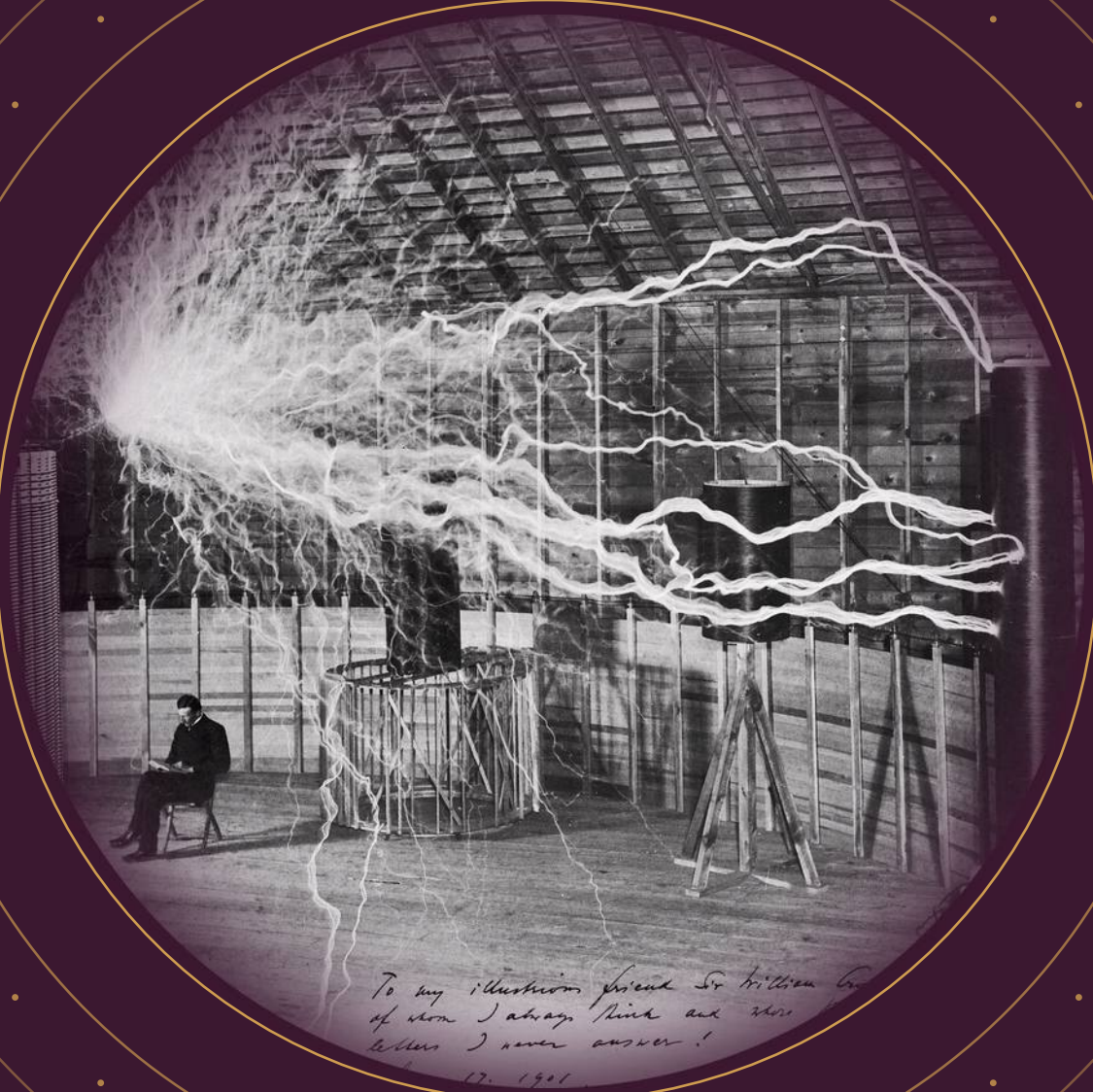
In a world full of disinformation, get **Clarity.**

THE PHYSICS · THE MATHS · THE CLAIMS · THE SCAMS

FREE ENERGY

Is it real, or just maths?

An honest, plain-English guide for non-scientists



*To my illustrious friend Dr William Crookes
of whom I always think and whose
letters I never answer!
17. 1901*

Published by Clarity Guides · Cover: Nikola Tesla's laboratory, Colorado Springs, c.1899. A multiple-exposure publicity photograph. Wellcome Collection. Public domain

Preview – full guide coming soon – goclarity.uk

ABOUT THIS GUIDE



Search “free energy” online and you will find two completely different worlds. One is a precise idea that chemists and engineers use every day. The other is a world of magnet motors, water-powered cars and machines said to give out more power than they take in.

This guide explains both, in plain English. You do not need any science or maths beyond simple sums: every equation is explained in words, and the important ones come with a worked example. We cover the real physics first, then show exactly **where the bookkeeping goes wrong** in famous free-energy devices, the real technologies that are often mistaken for free energy, the truth about zero-point energy, the real story of **Nikola Tesla**, and how to protect yourself from free-energy scams.

Our labels. **ESTABLISHED** means physics that has been tested millions of times and is taught in every university. **CLAIM** means something a person or company says, which has not passed independent testing. **HISTORY** means a documented historical event.

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THE VERDICT



“Free energy” is real, but it does not mean what the adverts say. In physics, it is the part of a system’s energy that is **available to do useful work**. It is never energy from nothing.

REAL

ESTABLISHED

Gibbs free energy and **Helmholtz free energy** are exact, measurable quantities. They tell a chemist whether a reaction will happen on its own, and tell an engineer the most work a battery, fuel cell or engine could ever deliver.

IMPOSSIBLE

ESTABLISHED

A machine that puts out more energy than goes in (“over-unity”) would break the **first law of thermodynamics**, conservation of energy. A machine that runs forever on the heat around it, with nothing colder to dump heat into, would break the **second law**. Both laws have held in every experiment ever done, from steam engines to particle colliders.

NEVER SHOWN

HISTORY

In over 800 years of claims, from Bhaskara’s wheel (c.1150) to Steorn’s Orbo (2006–2009) and the E-Cat (2011 onwards), **no free-energy device has ever passed a proper independent test**. Several have been exposed as frauds, with hidden air tanks, belts or batteries.

TESLA

HISTORY

Nikola Tesla was a real genius who gave us AC power, but he never built a free-energy machine. His wireless-power tower needed a coal-fired power station, his “radiant energy” patent is a crude solar collector, and the 1943 review of his papers found no working device (chapter 6).

ZERO-POINT ENERGY

ESTABLISHED

Real and measured (the Casimir effect), but it is the **lowest** energy anything can have, so there is nothing lower to drop to and nothing to tap. Every “zero-point generator” on sale is unproven (chapter 4).

EASILY CONFUSED

ESTABLISHED

Heat pumps, solar panels, wind and tidal turbines and fuel cells can look like free energy. They are not: each one moves or converts energy from a real source you can measure, such as the sun, the air or a fuel.

OUR ADVICE

Never invest in, or pay for plans for, a device that claims to make energy from nothing. If a claim were true, it would be the biggest discovery in the history of science and would be tested openly in university labs, not sold on social media.

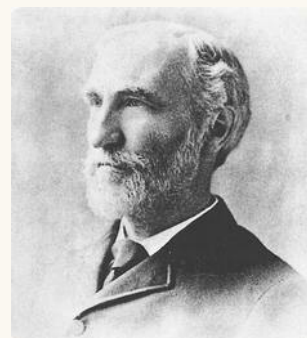


THE REAL THING

WHAT “FREE ENERGY” REALLY MEANS

In science, “free” does not mean “costs nothing”. It means **free to be used**: the share of energy you can actually turn into work, after nature has taken its cut.

HISTORY The idea came from two 19th-century scientists. The American physicist **Josiah Willard Gibbs** set out the maths in papers published between 1873 and 1878. The German physicist **Hermann von Helmholtz** coined the term “free energy” (*freie Energie*) in 1882. Today the international chemistry body IUPAC prefers the plainer names **Gibbs energy** and **Helmholtz energy**, partly to avoid exactly the confusion this guide is about.



J. Willard Gibbs (1839–1903) of Yale, about 1895. Public domain.

✦ WHY NOT ALL ENERGY IS USEFUL

ESTABLISHED Every object holds energy, but you cannot use all of it. Some is locked up as the random jiggling of atoms, which physicists measure as **entropy** (S), loosely the amount of disorder. Free energy is the total energy minus that unusable part.

$$G = H - TS$$

Gibbs energy (G) = enthalpy, roughly the heat content (H), minus temperature in kelvin (T) times entropy (S). Used when pressure stays the same, as in open air, a test tube or your body.

$$A = U - TS$$

Helmholtz energy (A) = internal energy (U) minus TS. Used when volume stays the same, such as gas sealed in a rigid tank.

✦ THE RULE THAT DECIDES WHAT HAPPENS

ESTABLISHED What matters is the **change** in Gibbs energy, written ΔG (“delta G”). At constant temperature and pressure:

- If ΔG is **negative**, the process can happen on its own (it is “spontaneous”), and up to that much energy can be taken out as useful work.
- If ΔG is **positive**, it will not happen on its own. You must put in at least that much work to make it go.
- If ΔG is **zero**, the system is in balance (equilibrium), and no useful work can be got from it.

“Spontaneous” does not mean fast. Diamond turning into graphite has a negative ΔG , but it is so slow that diamonds last for billions of years.

Sources: Gibbs, J. W. (1876–78) “On the Equilibrium of Heterogeneous Substances”, *Trans. Connecticut Academy*; Helmholtz, H. (1882) “Die Thermodynamik chemischer Vorgänge”; IUPAC Green Book, 3rd ed. (2007); Atkins & de Paula, *Physical Chemistry*.