

Power Sources for Mobile Devices



by [scalespeeder](#)

Power Sources

Batteries, the Achilles' heel of the digital age



The Bad News

Battery capacity is only developing in a slow linear rate, much slower than electronics

The Good News

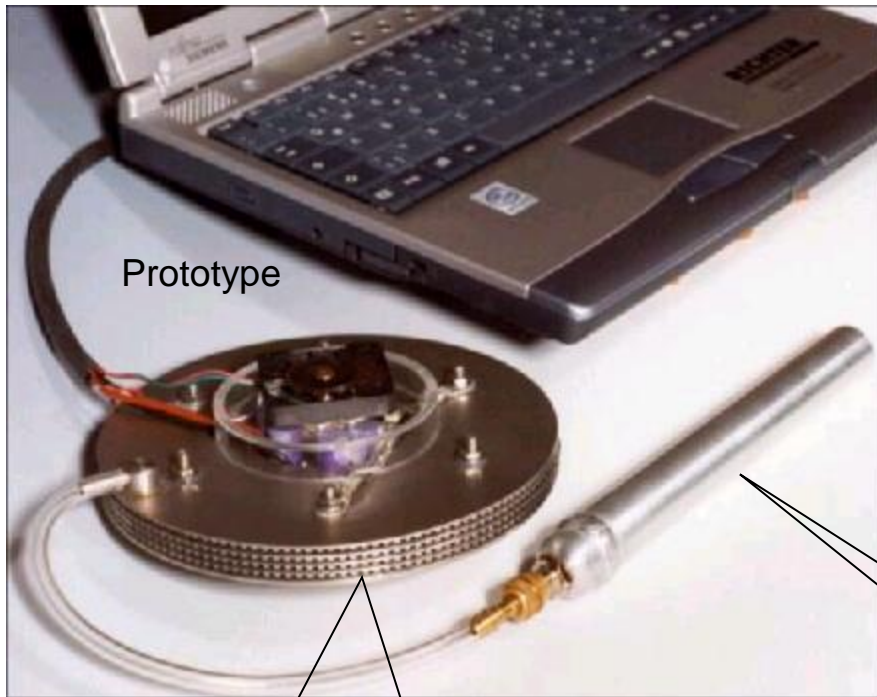
- Due to smarter energy solutions we need less energy per function
- Due to the miniaturisation the power consumption decreases
- Alternatives are emerging

Power Sources

Micro fuel cells

LET'S MAKE SURE.

- Commercially available probably before 2006
- First versions is recharging only. Replacing batteries probably not before 2007
- Uses methanol+air to produce the power



Prototype

The Fuel cell producing electricity from methanol

Fuel is methanol

Power Sources

Micro fuel cells (cont.)

- No electricity socket is needed, Just the methanol and air
- Several different techniques are competing
- **Recharging**
 - one laptop battery requires about 2 dl fuel to recharge
 - the recharging cost will initially be about 3\$
- **Replacement**
 - current prototypes runs for 5-10 hours on a laptop without new fuel cartridge
 - Potential, within a few years, is up to 40 hours

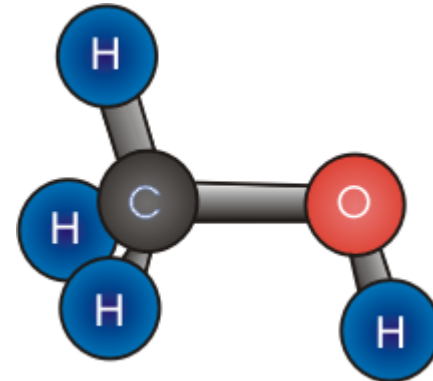


by [Laurel Fan](#)

Power Sources

Micro Fuel Cells, issues still to be solved

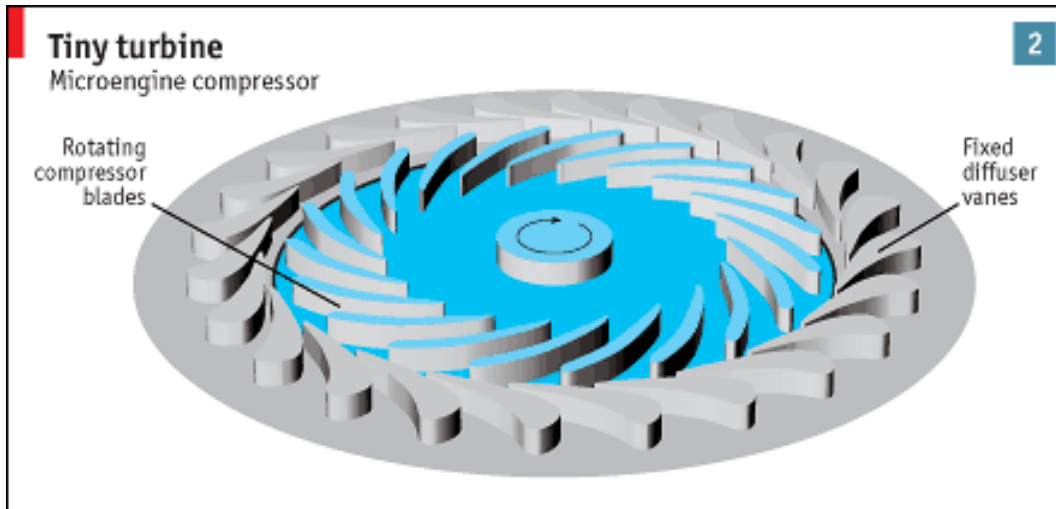
- **Distribution** of methanol to consumers
- **Safety** issues – carrying methanol (on air planes for instance)
- A broken fuel cell – **fire** risks?
- **Cost** of the fuel
- **Cost** of **maintaining** the fuel cell
 - There is a membrane inside that needs to be replaced
- Methanol is **toxic**



http://commons.wikimedia.org/wiki/File:Methanol_struktur.png

Power Sources

Micro Turbines



- Small size “jet engines” producing power
- MIT (and others) project
- Spinning with 20000 revolutions a second
- At least 5 years to go before available
- Similar pros and cons as Micro fuel cells

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Low watt, niche examples

- Human body produces power
 - “Shoe Power”, generating power while walking. (MIT 1996)
 - Using keystrokes to recharge batteries (Compaq patent 1999)
 - Other body related power sources like body heat, blood pressure and breath
- Harvesting from the environment
 - Solar cells
 - Vibrations
 - Heat

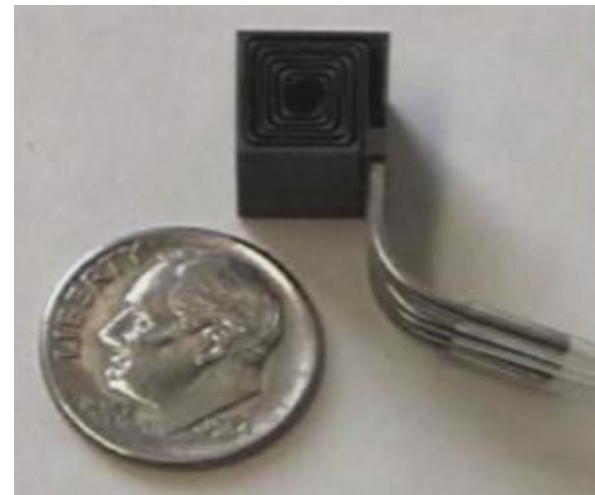


The electromagnetic vibration generator.

Power Sources

More exotic examples from the labs

- **Microbe fuel cells** generating electricity from organic material, like sugar or even insects.
- **Microcombustion** technology generates electricity by slowly burning tiny amounts of liquid hydrocarbons



Power Sources, overview



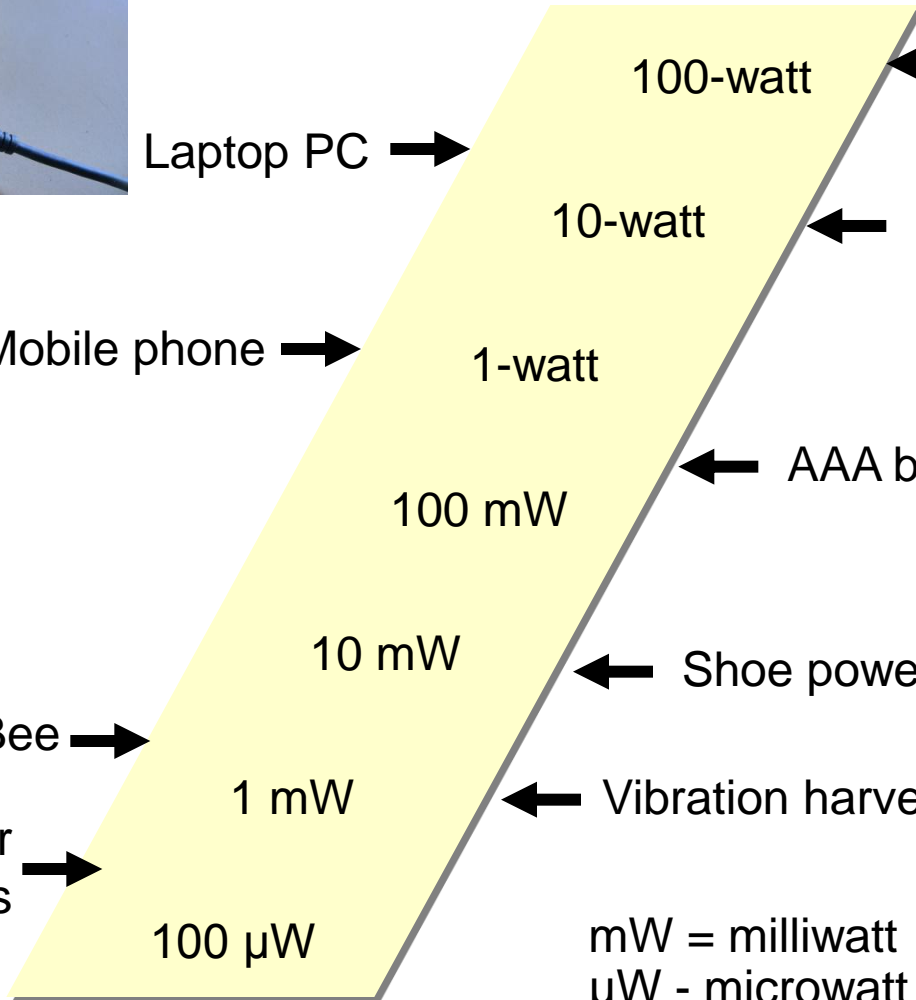
By Arria Belli

Laptop PC →

Mobile phone →

ZigBee →

Sensor nodes →



mW = milliwatt
μW - microwatt



By oskay

Source: Gartner

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Power Sources

Summing up

- Batteries will continue to dominate
- Micro fuel cells will enter the market before 2006 but still a lot of issues to be solved
- Micro turbines and microcombustion will take even longer before commercial introduction
- For low power energy there are several available solutions