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## Power boosts for future gadgets

By Jo Twist

BBC News science and technology reporter

**Power generation is one of the big challenges facing not only the consumer electronics industry, as people do more with their devices, but also the military and scientific research.**



Lots of big name tech companies are working on power technologies

A recent global survey across 15 countries revealed that the most desired features in a future mobile device was a long-life battery.

Two-thirds of mobile and personal digital assistant owners said two days' active battery life was vital.

The report said that poor battery life on mobile devices was one of the main reasons people did not play more games, music and video on their devices more often.

But the field of power is one which has not kept up with the speed of advances in processor performance and capabilities of consumer electronics.

"The issue is that, as far as batteries go, there has not been major development. And even on the horizon, a doubling in performance would be a big, big step," explains Dr Vishal Nayar, from the UK's former defence research labs, Qinetiq.

**“ What very often makes more sense is a hybridised technology; so you have both - the fuel cell is like a battery recharger ”**

Gary Mepsted, Qinetiq

Power experts there think that although conventional batteries (lithium ions) will be around for long time yet, we may start to see more of a mix of power solutions over the next five to 10 years.

Scientists at Qinetiq are working on several power solutions. Many of their ideas will first benefit the battlefield soldier, who needs lightweight portable and reliable power systems, before they make their way into everyday gadgets.

### Old friends

Fuel-cell technology is one of the most promising fields for power. They convert the chemical energy stored in sources of fuel, such as hydrogen or methanol, into electrical energy.

They are one of the leading technologies that have the

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potential to leap ahead in terms of what batteries can do, thinks Qinetiq.

Companies such as NEC, Olympus and Toshiba, are just some of the hi-tech firms looking to exploit fuel cells for consumer devices; although in March this year, Nokia announced it was halting its plans to develop fuel-cell-powered devices because the sector was "not mature" enough.

Toshiba has developed a fuel-cell laptop, digital music player, and a mobile phone, but there is no confirmed date for the launch of any products. Last year, it showcased a tiny prototype fuel cell the size of a thumb.

It claims the methanol fuel cell could power gadgets for 20 hours or more.

Although methanol is one of the most promising source of fuel for smaller consumer electronic devices, according to experts, there are concerns around the potential toxicity of methanol vapour, as a result of methanol leaking across the membrane in a fuel cell.



Medis showed off its fuel cell recently in Japan

International flight regulations already prohibit taking methanol on aircraft because it is highly flammable. The regulations are to be reviewed in 2007.

So Qinetiq is already working with companies such as Olympus to come up with more efficient and non-flammable sources of fuel, such as solid hydrogen pellets.

Consumer electronics devices - multimedia mobiles, personal digital assistants, multimedia digital video players and cameras - will represent the first major mass market for fuel cells, according to chemical industry consultants.

The first available products powered by direct methanol fuel cells for portable consumer electronics are expected to be launched within two years.

With 470 million consumer electronic devices requiring portable power, it could represent a fuel cell business worth about \$25bn.

### Life in the lithium

But continuing improvements in fuel cell technology will not signal the death of the conventional lithium ion battery just yet.

Engineers and technologists continue to develop displays, chips and other innards that do not eat up as much power which prolongs the life of lithium ion.

One of the biggest challenges is that different functions on a laptop, for instance, require different amounts of power; it is a crisis of functionality versus total power available.

"The current situation is that there is a growing amount of functionality being added from everything to mobiles, laptops

and other consumer gadgets," explains Dr Nayar.

"There are some devices out there that are good at managing power, but if you start to use the DVD player function, immediately the lifetime will go down to two hours from five."

These kinds of peaks and troughs is something which methanol-based fuel cell technology does not deal with particularly well yet, he says.

Lithium ion batteries are being developed which use different chemical make-ups, and micro-components are also being refined using new nano-structure materials, to make them better at what they do to increase efficiency, cycle life, and power capability.



With more to do for gadgets, "power pain" has become a big issue

Lithium-ion phosphate and lithium-ion sulphur battery technologies are both being worked on as alternative battery make-ups, but they are some way off from becoming a commercial reality.

In the meantime, the scientists at Qinetiq think the most likely development in the near future will combine conventional lithium ion batteries with fuel cells.

"I think what is likely to happen, and what very often makes more sense, is a hybridised technology; so you have both - the fuel cell is like a battery recharger," says Dr Gary Mepsted, who heads up all of Qinetiq's fuel cell and battery research.

"For consumer electronics, the hybrid approach is going to be augmented because one area under rapid development is, rather than using batteries, people using supercapacitors for large devices.

"There is also growth in miniature supercapacitors. They don't have the resistive losses in conventional batteries. These power devices will potentially be a mix of fuel cells, energy storage and electronics," says Dr Mepsted.

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