Raiders of the lost amp

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Energy harvesting is a process that captures energy that would otherwise be lost as heat, light, sound, vibration or motion. It can use this captured energy to improve the efficiency of existing systems or even to power new technologies.

A high-profile example of energy harvesting is Kinetic Energy Recovery Systems (KERS). These recover the kinetic energy of a moving vehicle when it is braking and store it to use later when accelerating. KERS are currently being used by nine teams in the 2011 Formula One season and are under development for road vehicles.

NPL is part of the Metrology for Energy Harvesting project - a research collaboration that brings together Europe's expertise in measurement, energy harvesting and systems engineering. The consortium's research aims to make various energy-harvesting technologies more efficient and practical. It ultimately wants to help industry to develop energy harvesting technologies to lower costs and increase energy efficiency.

At the Summer Science Exhibition scientists from NPL will demonstrate the hidden sources of 'wasted' energy that they are looking to harvest. Their stand's interactive 'Energy Race' will pit different energy-capturing technologies against each other to produce electrical power.

Visitors can learn about the importance of thermodynamics in energy harvesting and about how vibrations can be used to produce electrical charge.

They can also see how energy harvesting is already being achieved through a variety of processes, including

- Vibration, movement and sound can be captured and transformed into electrical power using piezoelectric materials. Piezoelectricity literally translates as 'electricity resulting from pressure'. In these materials, electric charge is produced in response to applied mechanical strain. Human motion, low-frequency vibrations, and acoustic noise are just some of the potential sources that could be harvested by piezoelectric materials.

- Heat can be captured and transformed into electrical power using thermoelectric materials. When there is a temperature difference across one of these materials (i.e. one side hot, the other cold), a voltage is created across the material. If the temperature difference is kept constant, this voltage can be used to provide electrical power.

Laurie Winkless, a higher research scientist from NPL working on energy harvesting, said:
"The energy debate is more than fossil fuels versus renewable or nuclear - it's about getting as much as we can from what we already use. Energy harvesting is a way for industry and government to capture wasted energy and use it to make existing processes more efficient or for new applications such as wireless sensor networks. It can also help individuals to be more energy efficient, saving them money as well as contributing to the fight against climate change."

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