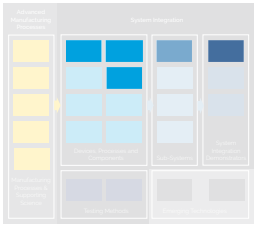

FLAGSHIP

SYSTEM INTEGRATION

Flexible energy harvesting for low power mobile devices (Flexipower)

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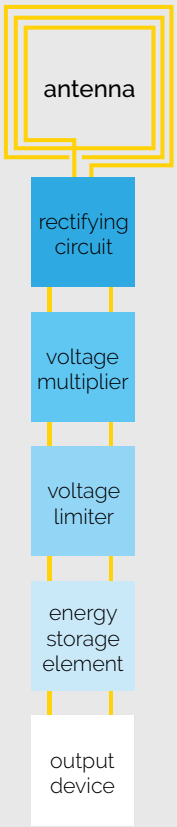
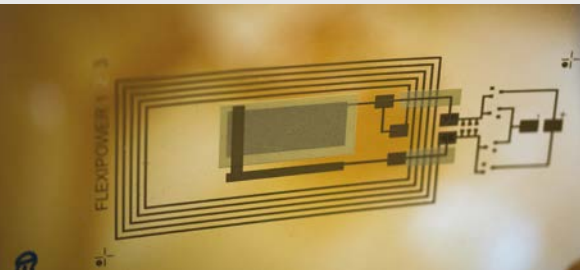
An RF energy harvesting system comprises a number of building blocks:





Devices created using high-volume, large-area, manufacturing techniques are increasingly in need of a power source which doesn't compromise the low cost, thin and flexible, nature of these printed devices. Coin cell batteries are a common choice due to their relatively low cost, however they can significantly increase the overall size of a printed device and their rigid form factor can reduce or negate the flexibility of the device. Flexipower is a printed energy harvesting system that can capture energy from a nearby radio frequency (RF) energy source using a printed or part-printed design. The use of printing technology will enable the devices to retain their low price and thin flexible form factor and eliminate the need for primary batteries in a wide range of applications.

The Flexipower project is developing architectures and processes to enable printing of RF energy harvesting components as a route to very high-volume, low-cost manufacture and to develop high-volume processes for the integration of these components into a thin, flexible system. The project is led by the Welsh Centre for Printing and Coating which has the expertise and infrastructure to enable the demonstration of the manufacturing of printed devices that can be scaled to very high volume – up to hundreds of millions. The project will focus on the most important opportunities for a printed solution, aiming at breakthrough technology which is well ahead of current industrial capability.

In many circumstances it may be cost-effective or necessary to combine silicon-based electronics with printed circuitry to provide features for certain applications. The creation of hybrid printed and conventional circuits will dramatically reduce the cost of devices compared to conventional electronics and allow novel designs freed from the constraints of rigid fibreglass PCBs. The project has developed a number of demonstrators which incorporate a range of conventional components such as LEDs and ICs to give capabilities which would be hard or impossible to achieve with printed electronics.

These designs focus on three main frequency regions which were selected based on feedback from industry. A device based on a bespoke 500kHz transmitter was created to demonstrate the maximum possible short range (<10cm) energy transfer. Such a device can provide enough power to light up dozens of LEDs and could be used to create an interactive packaging system. A second device was created to utilise the 13.56MHz RFID frequency present in most smartphones. These devices operate over a similar range, with lower powers, but the transmitters would already be owned by a large number of people. Finally, a system for the UHF RFID standard to transmit even smaller amounts of power but with a potential maximum range of 1m.

Work in the Flexipower project continues with the primary focus on developing high performance printed rectifiers to produce an entirely printed device. The project is also working to optimise the other system elements, especially energy storage devices in the form of supercapacitors or secondary batteries. We are working to match these devices with the needs of industry and will work closely with industry on related projects, especially in areas where improved materials are believed to be necessary to achieve the performance requirements.