INTERNET OF THINGS SPARKS RACE TO REPLACE THE BATTERY*

The internet of things promises companies a way to monitor valuable equipment and machinery. But when deployed in remote or hostile locations it poses a challenge.

How can you continually power the sensors that communicate mission-critical data on the condition and performance of isolated assets that are beyond the reach of the electricity grid? Batteries often provide the answer, of course, but replacing them raises logistical problems, particularly at sites such as offshore wind farms or weather monitoring stations, where the task would be difficult, costly and potentially risky.

Jerry Luo at Cranfield University in the UK is among the scientists and engineers who believe the answer lies in energy harvesting — the harnessing of small amounts of local energy that would otherwise be lost. Using photovoltaic materials to generate power from light, piezoelectric energy from vibration and thermoelectric power from heat, the cost and risk of operating a growing number of power-dependent remote assets can be minimised.

A particular problem for offshore wind turbines, says Mr Luo, is "scour" — the erosion of the seabed around their base. "Left untreated, scour problems can lead to serious damage and even collapse," he says.

With that in mind, he and his team have explored harvesting piezoelectric energy to convert into electricity the vibrations that occur routinely in a wind turbine's structure. This supplies sufficient reliable power to the sensors that detect and monitor scour and other damage. "By using energy harvesting, the structural health monitoring system we envisage is economical, self-sustainable and requires minimal intervention," he says.

It is not only remote locations where such technology has potential. Batteries are logistically inconvenient at any site that has a high concentration of sensors — for instance factory floors and smart office buildings, according to Rich Kapusta, chief marketing officer at Alta Devices. The Silicon Valley company has developed solar-harvesting technology based on a material called gallium arsenide that it claims is more efficient, lightweight and flexible than conventional photovoltaic technology.

While significant progress has been made in developing ultra-low-power sensors in recent years, industrial IoT applications increasingly require data to be collected and transmitted by sensors in larger volumes, at more frequent intervals — or both.

This is the kind of "big data" that will feed artificial intelligence systems capable of anticipating looming problems and costs by predicting, say, the progression of wear on wind turbine foundations or a mechanical fault with a lift in a smart building.

*"Internet of Things Sparks Race to Replace the Battery", Financial Times