

Business

Why Britain's energy future lies in a little box of tricks



AMBROSE EVANS-PRITCHARD

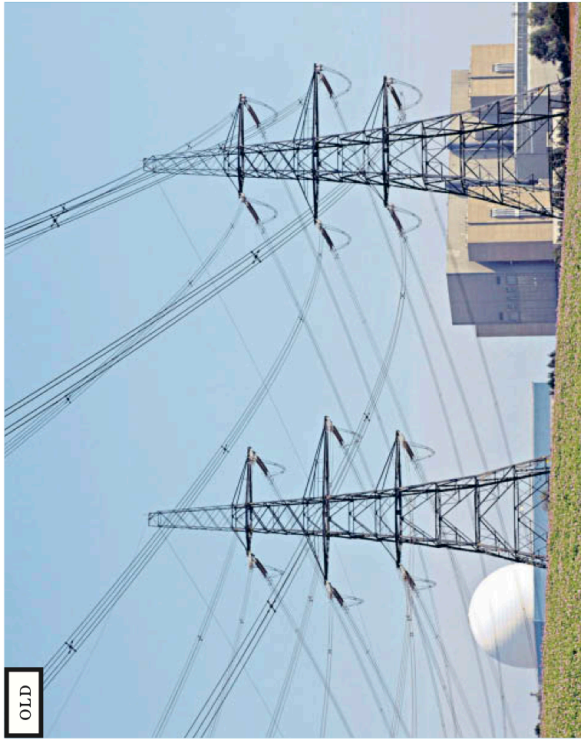
It may sound far-fetched, but research in Cumbria has found a way of creating power from radioisotopes

Imagine a nuclear battery in a little box that uses decaying isotopes to generate cheap and clean electricity around the clock for decades with no combustion, fission, or noise. It just sits silently and emits constant power. This far-fetched idea is becoming real. Vaulting advances in materials science and the use of isotopes are set to radically change the cost calculus of radioisotopes. Companies are springing to life with prototypes that could be on the market before the next general election.

As it happens, the UK is the world leader in the rarified field of isotope batteries. A British-Australian start-up with research operations in Cumbria has found a way to harness gamma rays from the radioactive decay of cobalt-60 into electricity. "There is much more energy in a gamma ray," said McLLeod.

The idea is based on research into atomic batteries by Russian and American scientists in the Fifties. McLLeod estimates the "levelised cost" of electricity at \$7.17 (£5-12) per megawatt hour, cheaper than thin-film solar (\$36-44), gas combined cycle (\$44-68), or nuclear (\$18-192), once scale is achieved. The capital cost is under \$300,000 per megawatt, a tiny fraction of the \$6,000-10,000 average cost for the large nuclear reactors that produce the electricity.

If the company can deliver anything close to this cost the technology offers tantalising possibilities for the UK's net-zero drive, and for wider global use. There has been a surge of interest from American investors since the Biden administration swept into Washington on an electrification mission. Cobalt-60 is relatively safe with a half-life of 5.2 years, though you



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sitting on the world's largest stockpile of rare earth minerals in Selkirk, listed today on government books as a giant liability but with the potential to become an asset instead.

Dr Tim Tinsley, head of the NNL's radioisotope programme, said nuclear batteries kill two birds with one stone. "You would be repurposing a waste product into something of value, and contributing to a net-zero agenda," he said.

The raw material for cobalt-60 is found in the Democratic Republic of the Congo, Australia, Zambia, and more controversially from the Congo.

This standard form of cobalt is not scarce but nor is it cheap. It currently fetches \$45,700 per metric tonne on the London Metal Exchange, driven up by the voracious needs of lithium car batteries. Demand will settle down as ways are found to replace the metal with nickel. Tesla is working on cobalt-free batteries.

The larger issue is that cobalt-59 has to be converted in an industrial reactor by bombarding it with neutrons. There are 85 such reactors in Europe, some already producing isotopes for X-rays, scanners, smoke detectors, measuring devices, and so on.

Others are scattered all over the world. They are crying out for business, especially in ex-Soviet states such as Armenia and Kazakhstan. McLLeod said he had already been recycled again and again by putting it back in a reactor every 10 years. By then the isotopes have partly decayed into nickel. There are almost no operating costs once the system is up and running.

Tinsley said it was unclear whether there is a big enough global supply of cobalt-60 to produce power at commercial scale. Infinite Power says the world's supply is 100 tonnes. We can easily build a one-gigawatt plant within current supply," said McLLeod.

Once the technology takes off, demand creates its own supply. It becomes commercially worthwhile to build small industrial reactors just to make the cobalt-60 round-the-clock. That at least is the idea.

McLeod said the radioisotope technology has lain dormant because the world was too cheap. He compared it to the early days of the 19th Century, when the steam engine was deemed useless by early oil drillers and tipped into rivers in Pennsylvania. A single twist in technology turned waste into liquid gold.

What is clear is that there are countless technologies emerging across the world that are changing the calculus on CO₂ abatement faster than governments, economists, and consumers can keep up.

Britain is the can lead there are so many breakthroughs are happening, perhaps because the country never succumbed to the technology luddism of the precautionary principle, and perhaps because the grip of vested interests is relatively weak (the same thing).

The UK may achieve net-zero much sooner than widely supposed, and at a nice profit.



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double its total generation to decarbonise just half of all road transport traffic, although a static analysis exaggerates the apparent difficulty. EV car batteries would themselves be part of the solution by charging at night and releasing power back to the grid at peak times for an arbitrage profit. Nevertheless, cobalt-free alternatives to cobalt-60 are the answer to cobalt's scarcity, said the Director of Business, Energy, and Industrial Strategy.

"We'll be rolling out the first EV charging points within 12 months. The UK government is extremely positive. They see it as a way to promote export-led industry and rebuild trade links with Commonwealth countries," said McLLeod.

Britain has a strong incentive to make use of spent nuclear fuel. It is

Harnessing the power of decaying isotopes could be an energy solution. Below, CEO Robert McLLeod



'You would then be repurposing a waste product into something of value, and contributing to a net-zero agenda'

would not want it in your kitchen. The small pencil-sized sticks are placed in tubes, protected by 11in (30cm) steel in boxes. They are sealed in cement buildings when scaled up for serious power units in Sark, or rural Africa, or in warehouse-size power plants of 100 megawatts or larger for industrial hubs. "It is modular so we just add more boxes. Our plan is a one-gigawatt plant within two years," said McLLeod. The company has signed a letter of intent to build its first 30 megawatt plant in the UK.

Hydrogen production from isotopes at viable cost is several years away. Separating hope from reality is difficult with new technologies. A bandwagon effect is creeping in. One California start-up is raising funds to develop "a smartphone that you never charge" and EVs that never need recharging using a nano-diamond battery, allegedly at minimal cost. Sceptical British scientists roll their eyes.

The UK government has lumped on Infinite Power's cobalt-60 battery to help solve an immediate conundrum: how to switch from combustion engines to EVs without breaking the grid, already under transition stress as it goes from being a 20th century fossil-based system to a 21st century flexible system of distributed green power. The UK would in theory have to