Comment: Nuclear waste must be out of sight, but not out of mind
We’ve got an awful lot of nuclear waste to safely dispose of and it’s going nowhere without our help

Rebecca Bell, The Observer

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Should you be anything like me, you will have a place in your home packed full of obsolete technology – VHS players, bulky-backed TVs and brick-like mobile phones, forming a peculiar shrine to the past few decades. Most of the time I ignore it, but the moment has come when our flat is full and it has to go. These electronics contain dangerous heavy metals and don’t belong in the landfill, so what do I do with them?

The UK is struggling with a similar dilemma, but on a much larger scale. Nuclear power has played a big part in our energy use over the past 30 years with the benefit that it produces much less CO2 than fossil fuels, but it comes at a price; the process produces harmful waste products that must be managed for millennia. By the end of the century, the UK will have around 300,000 cubic metres of higher activity radioactive waste, enough to fill about one quarter of Wembley Stadium. What’s more, the UK pioneered a number of early experimental nuclear reactors that produced waste that is much harder to manage than material from modern reactors.

Although I can take my old tech to the recycling centre for safe disposal, the disposal of radioactive waste is a lot trickier. Whether you support the future use of nuclear power or not, we have a moral and ethical responsibility to dispose of this waste securely.

Radioactive waste is such a problem because it remains dangerous for tens of thousands to millions of years. To put that in context, 10,000 years ago our ancestors were hunting with flint blades, and nearly 1m years ago early humans were making their first tentative steps on to British soil. Who knows what will happen in the next million years.

At the moment, most of the UK’s radioactive waste is stored at ground level in vaults and buildings at Sellafield. Zoe Shipton, professor of geological engineering at the University of Strathclyde, says: “This cannot continue long term, as at the surface the waste will be exposed to many possible threats, including terrorism, tsunamis and climate change.”

The vaults and buildings also require ongoing maintenance. Bearing in mind that the longest-running civilisation, the ancient Egyptians, were only around for 3,500 years, it is naive to think we can pass down information on how to monitor and maintain these buildings for hundreds of thousands of generations. The best – and as far as many experts are concerned, only – option is to put the waste out of harm’s way in a geological disposal facility.

This is now happening in a number of countries including the US, France and Finland. Rebecca Lunn, professor of engineering geosciences at the University of Strathclyde, says: “Geological disposal of nuclear waste involves the construction of a precision-engineered facility deep below the ground into which waste canisters are carefully manoeuvred. Before construction of a
geological repository can even be considered, an environmental safety case must be developed that proves the facility will be safe over millions of years."

Safety cases take between 10 and 20 years to develop and involve scrutiny of the site and scientific modelling to predict how the site will withstand the tests of time. There is no one-size-fits-all solution and the design of a geological repository depends on the rock in which the facility is being built (not all areas will be suitable) and the types of waste being disposed of. In one design, waste is packaged into canisters made from thick steel or copper. The integrity of the canister is ensured by preventing their corrosion, minimising the risk of damage by earthquakes and engineering barriers to stop any radiation reaching the surface if it does escape.

Clay is effective for geological disposal because it does not allow water or anything leaking from a canister to flow through it. Clay also flexes, helping to dampen shockwaves from earthquakes and protecting the canisters from damage. Rocks such as granite are brittle and crack when they are stressed. Although water cannot travel through granite, it can flow along its cracks. In these rocks, a facility would be located where there were very few cracks and waste canisters would be entirely surrounded by a thick layer of clay called bentonite, which swells when in contact with water. This seals any gaps between the waste and the rock and also cushions the canisters from earthquakes.

There are currently no geological repositories in Britain and after Cumbria county council voted not to continue with the process to find a site last year (despite Copeland and Allerdale district councils voting to go forward) there aren’t any sites under consideration. In the UK, communities must first volunteer their area to be considered as a possible site. After that, a search for a suitable site is made. This process may then take up to 20 years and will include a financial benefits package for the volunteer communities, as well as long-term employment opportunities.

“The success of any facility will depend on local support. We must begin a lively, informed public debate to overcome the challenge of siting UK facilities and to fulfil our obligation of making our radioactive wastes safe for future generations,” says Lunn.

Like your packed garage or loft full of decades of rubbish, we can continue to ignore the problem, but in the long term it needs to be addressed.