

POLITICS

How sustainable is the UK nuclear power industry?

Opinions on the place for nuclear power in the UK energy set-up have always been polarised between industry and trade union supporters, and opponents who just see problems. The inexorable rise of smaller scale renewables has complicated the matter further. Here, Nick Cottam attempts to plot a course through the middle.

Too expensive and too dangerous, runs one side of the argument on nuclear energy. Carbon-free and an essential part of the energy mix runs the other. As for which is to prevail in the UK and in other parts of the world, the jury is still out. Is there the policy commitment to make the next generation of nuclear energy happen – or will nuclear simply give way to renewable energy with support from gas and a good dose of carbon capture and storage (CCS)?

To date, the UK's experience in seeking to renew its nuclear estate is not encouraging. By the end of the decade all but one of the country's eight nuclear power stations will be retired and out of action. At present the UK's existing nuclear power plants contribute about 20% of the country's electricity – a carbon-free contribution which is still a significant factor in the UK's 2050 net zero target for carbon.

'Wind and solar energy alone can't get us to net zero,' says Paul Spence, EDF's Director of Strategy and Corporate Affairs. 'A significant amount of reliable low-carbon power is needed alongside renewables if we are to build a manageable, secure and affordable energy system.'

EDF has a foot in both camps. In the UK alone the company already operates more than 30 wind farms and plans to double its capacity. With its partner China General Nuclear Power Corporation (CGN), EDF is also constructing Hinkley Point C in Somerset, the only new nuclear power station currently being built in the UK.

With more support, both locally and at the national level, EDF would also like to develop identical new builds at Sizewell in Suffolk and nearby Bradwell in Essex. So what's the problem?

Investment costs

The main hurdles to building new nuclear power plants are the sheer scale of investment required and the long lead times. Hinkley Point C is already way over its original budget with projected build costs now up to £22.5bn. Last year, EDF warned that costs could rise by another £2.9bn and that the operation of the first reactor at the plant could start as late as 2027.

As the International Energy Agency (IEA) notes: 'the risk of construction problems, delays and cost overruns, and the possibility of future changes in policy on the electricity system itself' can all be barriers to investment in new nuclear.

Relative cost can also be a factor in those long lead times. When a strike price of £92.50/MWh was agreed for Hinkley Point C, some renewables projects were being awarded contracts at £140/MWh. Yet in the UK, the cost of offshore wind, for example, has plummeted to around £40/MWh. Hinkley Point C is now more than twice as expensive, the proposal being that UK consumers should pay a surcharge of £6 per head per year for the privilege of carbon-free nuclear electricity.

Consumers might of course take comfort from the fact that, once fully operational, Hinkley will be able to produce around 7% of the country's electricity.

Avoided emissions

Putting costs to one side, nuclear advocates such as Paul Spence have no hesitation in playing the net carbon zero card. 'Being serious about climate change,' he says: 'means thinking seriously about nuclear, even for those who have been suspicious of the technology. That's why a growing number of environmentalists recognise the decades-long contribution nuclear has made to lowering carbon

emissions and its important role in the future.'

Advocates of nuclear's role in helping the UK and other advanced economies reach net zero carbon put this in terms of an eye watering large offset. Over a 60-year lifespan, notes Hinkley Point C's Managing Director Stuart Crook, the electricity generated by the plant's two reactors will offset 9mn tonnes of carbon dioxide (CO₂) emissions a year. Now whatever side of the nuclear fence you sit on, this is a mighty strong argument in favour of retaining and enhancing nuclear as part of the energy mix.

Conversely, countries that are turning away from nuclear power, such as Germany, are failing to cut carbon emissions as far as they need to and are having to resort to coal and gas as their 'firm' power source – and spend huge amounts on renewable energy.

In its 2019 report: *Nuclear Power in a Clean Energy System*, the IEA argues strongly that nuclear energy should continue to be part of the mix in advanced economies, and that governments should develop consistent policies to support what is a carbon-free energy source.

'In the case where no further investments are made in advanced economies to extend the operating lifetime of existing nuclear power plants or to develop new projects, nuclear power capacity in those countries would decline by around two-thirds by 2040,' notes the report. See also **Figure 1**.

This would in turn lead to cumulative CO₂ emissions rising by 4bn tonnes by the same date, making it that much more difficult to transition to a sustainable energy system.

Decommissioning issues

That said, nuclear disaster always lurks in the public consciousness.

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What about the risk of another Chernobyl or more recently a Fukushima, where mass radiation poisoning was only prevented by evacuating 100,000 people from their homes? Aside from costs and construction impacts, the risks relating to nuclear facilities are what inhibit many politicians when it comes to making long-term commitments to nuclear energy.

Accidents certainly, but also the disposal of nuclear waste, particularly High Level Waste (HLW), which in fact accounts for less than 0.1% of the UK's radioactive waste. The vast majority of such waste is what's known as Low Level Waste (LLW) or Very Low Level Waste (VLLW), including existing waste and that arising out of the current decommissioning programme.

Because of the scale of nuclear decommissioning in the UK, which covers 17 sites around the country, the Nuclear Decommissioning Authority has been able to develop a standardised design for the safe storage of radioactive waste, including at Sellafield, the UK's largest and most complex site. According to Programme Manager David Hubbard: 'The design cuts down the need for maintenance and reduces the amount of hands-on control needed to provide a safe and secure environment for the waste containers.'

Smaller-scale reactors

While the UK has a burgeoning and increasingly standardised decommissioning industry, the same doesn't apply to new builds – but it could, suggests Paul Stein, Chief Technology Officer at Rolls-Royce. In a recent Energy Institute podcast conversation for the Energy Institute, Stein introduced the concept of the Small Modular Reactor (SMR), a bit like a nuclear version of prefabricated housing, whereby each piece gets built in a factory before being brought together on site for assembly.

'The cost of conventional reactors,' says Stein: 'is driven by the fact that these are large civil engineering projects built on site.' In the case of an SMR: 'We could use flow line technology similar to that which Rolls-Royce uses for producing jet engines. You move from a project-based to a product-based approach.'

The result, you feel, should be a more controlled, more cost-effective environment for a much faster nuclear new build. Stein agrees, arguing that a new fleet of SMRs could be safely assembled on

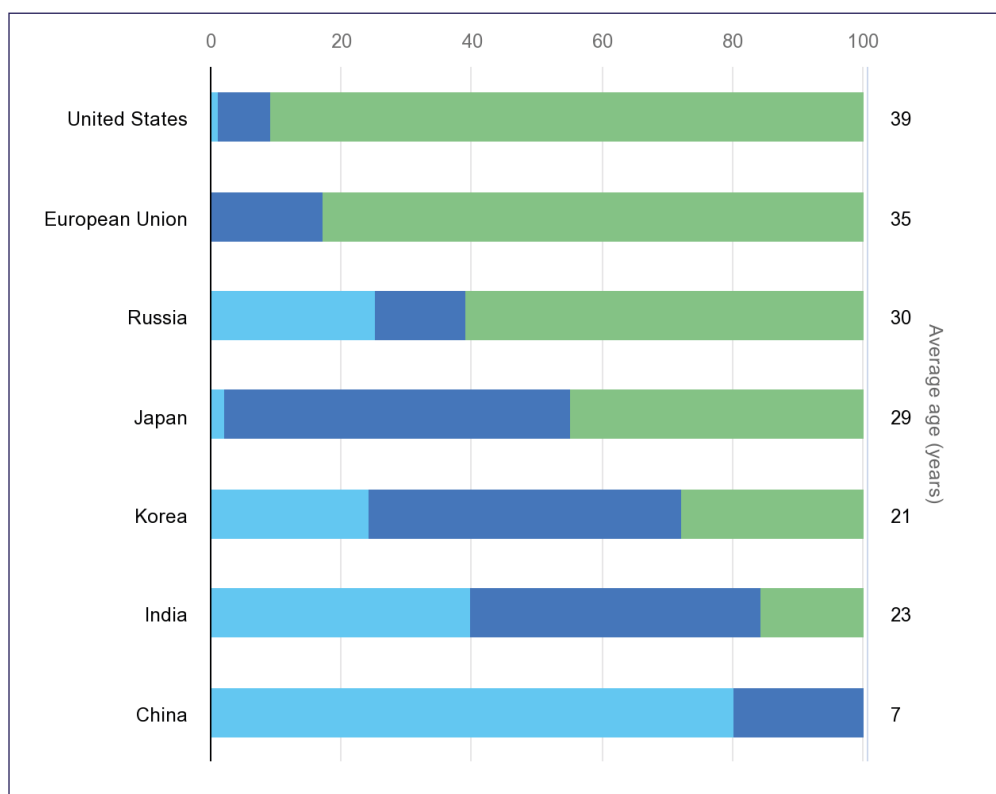


Figure 1. The age profile of nuclear power stations varies considerably around the world – the average age of stations in the US and the EU is over 30 years. Nuclear stations in Asia tend to be younger; the average age of stations in China is just seven years.

Key:
Pale blue: less than ten years
Blue: 10–30 years
Green: Over 30 years

Graph: IEA

decommissioned sites – and with a much lower environmental impact at the local level. 'Typically a 440 MW SMR would be about a tenth the size of a traditional power station,' he says.

Taking part in the same conversation, Kirsty Gogan, Global Director of Energy for Humanity, also argues that nuclear has to remain part of a net zero energy mix. On the waste issue: 'Nuclear is the only industry which takes responsibility for its own waste.' She says: 'Fossil fuels treat the sky as a waste dump.'

Nuclear build costs, she says, respond to scale – not larger stations, necessarily, but more building of identical components. 'The cost of nuclear builds in China and South Korea, for example, is half those in the US and Europe. This is because they've got very good at it. Once you start building up superior skills in the supply chain you can bring down costs very rapidly.'

Local environmental issues

High building costs are perhaps the main reason why the UK and other advanced economies are doing so badly in planning a new generation of nuclear facilities. In the UK, Hinkley's costs and delays, not to mention the station's construction impacts, have taken the wind out of Sizewell's sails (so to speak) on the opposite coast of England.

As Philip Ridley, Head of Planning and Coastal Management

at East Suffolk Council admits: 'If you were looking for a place to build a nuclear power station, you couldn't have chosen a more environmentally sensitive spot.'

If built, Sizewell C would sit in a coastal Area of Outstanding Natural Beauty (AONB), impacting on many local features. Nationally, the arguments for and against nuclear power as a sustainable energy source are much more closely related to carbon, cost and safety. Between concerns over environmental impact locally and wider concern around costs and safety, it is not a comfortable position for our political leaders.

'After all the Brexit noise, the UK's nuclear energy plans are crumbling,' says Chaitanya Kumar, a senior policy adviser for energy and climate change at the Green Alliance, a lobby group. 'Instead of doubling down on subsidised, expensive nuclear, the government should now be focusing on building cheaper alternatives in more renewables and electricity interconnection with Europe.'

Nuclear power, at its current staccato level of development in the UK, Kumar suggests, just doesn't make sense as a serious part of the energy mix. 'Right now,' he adds: 'a project like Sizewell C is being out-competed by renewables everywhere. Unless there is more backing from central government, I don't see how it will get built.'