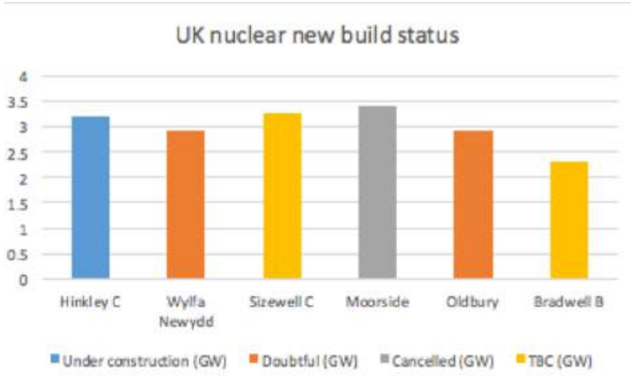
Briefing: Filling the nuclear gap
January 2019

- **The future of the Government's plans to roll out six new nuclear power stations across Britain is looking increasingly parlous, as the Wylfa project becomes the second power station to be scrapped in just two months. Wylfa's demise makes the Oldbury project extremely unlikely to proceed, while Toshiba has already backed out of developing its Moorside station.**
- **These three power stations would have generated 73 TWh of low carbon power per year, or 21.8% of current demand. Their absence leaves space for new low-carbon capacity to fill the gap.**
- **Filling the 'nuclear gap' with alternative low-carbon power sources would keep bills down, maintain secure energy supply and allow the UK to maintain progress towards legally binding climate targets.**

In August 2016, ECIU analysis showed that alternative sources of energy were more than capable of stepping in to cover the proposed output from EDF's 3.2 GW Hinkley Point C power station, when the future of the project looked in doubt.[i]

Later that year, the UK government opted to approve the project. Since then, however, the developers of further nuclear capacity have been unable to agree terms with the Government for new power plants. The cancellation of Moorside[ii] and Wylfa[iii] leaves a **capacity gap of 6.3 GW**, which would have produced **49.5 TWh of low carbon power** per year. The UK's current electricity demand is 335 TWh per year.[iv]



Plans to build a 2.9 GW unit at Oldbury in Somerset are also in doubt should Wylfa be scrapped, as they share the same developer[v] Were this project to fall to the same fate as Moorside and Wylfa, the **nuclear capacity and generation gaps would be 9.2 GW and 73 TWh, respectively**.

Table 1 shows the capacity of each major form of renewable energy source that would be needed to fill the nuclear gap left by the cancellation of three power stations.

	Capacity needed (GW)	Expected cost (£/MWh)	Notes
Onshore wind	28	£40	33% load factor assumed
Offshore wind	14	£50	66% load factor assumed
Solar PV	104	£45	9% load factor assumed

Table 1. Renewable capacity needed to fill the energy gap from Moorside, Wylfa and Oldbury nuclear power stations.

The intermittency of wind and solar power means that the four flexibility mechanisms would need to be employed to ensure security of supply. Of these – storage, demand-shifting (demand-side response, DSR), trade with neighbouring countries through interconnectors, and fast-ramping gas plants – the first two have the greatest potential.

Analysis by the Association of Decentralised Energy in 2016 found that there was a potential of 9.8 GW of DSR available in the UK.[vi]

DSR alone, however, would not be the optimum solution. A combination of energy storage – in the form of pumped hydro, both in the UK and in interconnected countries, and batteries – would also help with system stability. Batteries can both provide power when weather conditions limit wind and solar output, and provide auxiliary services to the grid vital for voltage and frequency control. National Grid expects 12-29 GW of storage to be installed by 2050.[vii]

The UK is also currently increasing interconnector capacity. The 1 GW NEMO link to Belgium is expected to begin operations early this year, and capacity could be as high as 20 GW by 2030.[viii]

Most reputable estimates of the cost of balancing renewable energy sources with flexible technologies add £5-20/MWh to the cost of energy from wind and solar.[ix] The inflexibility of nuclear power stations also imposes a cost on the system, as output cannot be altered to meet demand, but this has not been scrutinised to the same level as the system cost of renewables and is typically omitted from cost projections.

A representative scenario, in which 80% of the energy output of Moorside, Wylfa and Sizewell C was replaced in equal measure by onshore and offshore wind, with the remaining 20% by solar PV would entail an average price of **£50-65/MWh**, including the cost of system balancing. This is **13-33% cheaper than the cost of energy from nuclear** (not accounting for nuclear system costs).[x]

This would see an additional 11.3 GW of onshore wind and 5.7 GW of offshore wind capacity, as well as 20.8 GW of new solar PV capacity (Table 2). Renewable capacity is already set to increase on current levels, as more – and cheaper – capacity continues to come online.

	Additional capacity needed (GW)	Current capacity (GW)	Increase (%)
Onshore wind	11.3	12.9	+88%
Offshore wind	5.7	7.9	+72%
Solar PV	20.8	13	+160%

Table 2. Renewable capacities needed to fill nuclear energy gap in representative scenario. Data from BEIS, RenewableUK

The four flexibility mechanisms needed to balance variable power sources work by shifting demand away from peakload hours (DSR), thereby reducing the amount of installed generating capacity needed; by boosting trade with neighbours, allowing excess power to be exported and electricity to be imported when needed; to store power from times of surplus to times of need; and to utilise fast-ramping, distributed gas power stations.

ECIU's recent report with New Resource Partners on a UK electricity system powered by 50% variable renewables explores these in more detail, and is available here.

[i] https://eciu.net/assets/ECIU_Hinkley_What-if.compressed.pdf
[ii] https://www.theguardian.com/environment/2018/nov/08/toshiba-uk-nuclear-power-plant-project-nu-gen-cumbria
[iii] https://www.ft.com/content/80b1c286-1589-11e9-a581-4ff78404524e
[iv] https://www.carbonbrief.org/analysis-uk-electricity-generation-2018-falls-to-lowest-since-1994
[v] https://www.constructionnews.co.uk/markets/sectors/nuclear/edf-could-shelve-suffolk-nuclear-plant-if-unfeasible/10029734.article
[vi] https://www.theade.co.uk/resources/flexibility-on-demand-giving-customers-control-to-secure-our-electricity-su
[vii] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770703/electricity-storage-planning-consultation.pdf
[viii] http://fes.nationalgrid.com/media/1363/fes-interactive-version-final.pdf
[ix] http://www.ukerc.ac.uk/publications/the-costs-and-impacts-of-intermittency-2016-update.html
[x] Representative scenario based on potential contributions from each power source, considering projects already in development and scale of UK resource. Renewable energy costs based on approximations of latest auction results, both in the UK and in other countries, and on industry forecasts for technologies that are currently without a route to market in the UK. Assuming £75/MWh for new nuclear projects, operating at 90% load factor, based on industry projections..