Proposed Botley West Solar farm

Some information & thoughts to help frame the debate on the proposed solar farm

Summary

Offshore wind produces electricity more cheaply than solar and there are plenty of sites on which to build new farms, and plenty of capital to fund it. Offshore wind has all of the advantages and none of the disadvantages of solar. We simply don't need large solar farms on greenfield land.

Background

The UK clearly needs more renewable energy – low carbon electricity was 43% of UK electricity production in 2021, the government targets this being 95% by 2030 (note 1). Solar has a role to play in this growth of renewables, but there are other solutions, notably offshore wind. The evidence would suggest that the UK can meet its renewable goals through using offshore wind combined with rooftop solar and thus not have to resort to large solar farms on greenfield land.

One obvious issue with solar in the UK is that the UK is not particularly sunny. The energy industry measures efficiency by referring to "load factor", which is the amount of energy actually produced by a plant or installation compared to the theoretical maximum if it worked all the time. Average solar load factors in the UK over the last 10 years ranged from 9.6% to 10.5% (2) – and only around 5% in the winter months (which is when energy demand is highest). This compares with 28.4% in California and 20% in Spain (3). Given that the cost of a solar panel and installation is more or less the same but that much less energy is produced, this of course makes solar energy in the UK far more expensive to produce than in sunnier areas.

In relative terms, Northern Europe is clearly more suited to wind power than solar. Onshore wind load factors in the UK averaged 26%, more than twice as high as solar. Offshore wind is far more promising though – winds offshore tend to be stronger and much more consistent (not being disrupted by land features), so installed offshore wind load factors averaged 40% in the UK in 2021 (4). But importantly, technological progress in offshore wind has been enormous over the last few years, significantly improving its position compared with onshore wind or solar. Modern offshore wind farms are typically situated far out to see (120km off the Lincolnshire coast in the case of the world's largest, Hornsea), which means they are not visible or hearable from shore. Ships can transport enormous blades and nacelles that would be very difficult to move on land. The latest generation of turbines are rated at 15 MegaWatts (MW) for a single turbine, with a height of 280 metres; in comparison the average size of an onshore wind turbine in the UK is under 2 MW. The huge size of the new turbines enables them to catch much more wind (wind is stronger and more consistent the higher above the surface you go) and this has increased load factors - the latest turbines have load factors of around 55% and even expected to move towards 60%. Further, although manufacturing and installation costs of a larger turbine are greater, the increase is much less than the increase in capacity, leading to a significant fall in the cost per MW. When coupled with

the higher load factors, the cost of the electricity produced has fallen substantially in recent years. And the UK, with large area of suitable coastline with a relatively shallow sea bottom (5) has an abundance of potential sites where large offshore wind farms could go.

This massive reduction in the cost of offshore wind is relatively recent but is dramatic. In 2014 the UK government awarded a contract to Hornsea 1, what would become the biggest offshore wind farm in the world at a guaranteed price of £140 per MWh (Megawatt/hour) for 15 years – at huge premium compared with the prevailing wholesale electricity cost of around £45/MWh at the time, in other words, a large government subsidy for what was then a developing technology. Solar in 2014 received a price of £66.60 / MWh – still a significant subsidy but clearly much cheaper than offshore wind.

The cost of solar generated electricity has fallen over the last 8 years to £46 / MWh (a 31% fall but these rates are all inflation indexed, so the actual fall is 19%). But the massive increase in the sizes of the offshore turbines meant that the price of offshore wind electricity fell to £37.35 / MWh, little more than a quarter of its previous cost. Importantly, in 2022 for the first time offshore wind became cheaper than solar.

The government has periodic bidding rounds for renewable energy and signs "contracts for difference", essentially a 15 year fixed price agreement, with suppliers. In the July 2022 round (6), the government signed up 7 GW of new offshore wind farms and 2.2 GW of solar, with the solar being 23% more expensive than the offshore wind. It also signed up 0.9 GW of onshore wind at a price of £42.47 / MWh – so onshore wind is cheaper than solar but more expensive than offshore wind. Given that offshore wind 1/ is already cheaper, 2/ is continuing to show more cost reduction as blades and turbines continue to get bigger, and 3/ requires no trade offs in terms of the visual impact on land, it is easy to see why there are vastly more offshore wind projects being built. Remember too that the much higher load factors on offshore wind mean that the electricity that will be generated from these new projects is skewed even more heavily towards offshore wind – of those 2022 projects in the three technologies, offshore wind will generate 90% of the new electricity.

The government's Energy Security Strategy does suggest a large increase in solar power, from 4% of the UK's electricity production to c.10%. Offshore wind is currently around 13% of the UK electricity production and is expected to quintuple its production, increasing share to around 50% (7). Onshore wind is currently around 13% and is projected to grow modestly (the Labour Party has recently said it wishes to accelerate this, though given it is more expensive than offshore wind and frequently unpopular with local communities this seems a surprising decision). The increase in solar is intended to be "particularly on domestic and industrial rooftops", which seems to make sense. Offshore wind has consistently beaten expectations on cost and total amount of capacity deployed, so its reasonable that should there be political will then offshore wind could grow even faster if required.

Using greenfield agricultural land for solar, with implications for both food production and an unsightly industrialisation of the countryside seems unnecessary. The required gains in renewable

energy production could be made more cheaply and with fewer adverse affects with offshore wind and rooftop solar.

The Botley Solar Farm Project

Blenheim (mainly, though it seems there are a few other landowners including Merton College) stands to make £2m per year from this project (per The Telegraph 3 Nov 2022 rent will be £600-1000 per acre – note 8). Of course there is nothing wrong with Blenheim making money from a development project. But we should not view the "climate emergency" as a reason to give carte blanche to developers, because there are alternatives as noted above. We should view the proposed solar farm in a rational way similar to other property developments such as building new housing. Naturally, developing agricultural land into something "built", whether that be houses or solar farms, will generate a large profit to the landowner, if planning is granted. But the planning system exists precisely to control this. We can't blame Blenheim for trying to make money from developing their land, but it doesn't mean they should be allowed to do whatever they want.

Some people have suggested that the existing solar farm at Yarnton is a good example of a low impact solar farm – "we can't even really see it" is the comment. This is broadly true, because Yarnton is a 43 acre project in a flat field by the side of a main road and completely surrounded by mature hedges. It is not visible from any house or footpath. However, the Botley project is 60 times as big, and would be visible from a great number of houses and footpaths, as well as roads so its impact is really not comparable. If Blenheim were to agree to put solar panels ONLY where not visible from houses, footpaths or roads (ie in fields screened by mature hedging and where the topography does not make them visible from elsewhere) then this wouldn't seem too bad, but clearly the project would have to be very significantly smaller.

Even if we assume solar is required rather than even more offshore wind, just this one project would mean that Oxfordshire would be supporting 5-8x it's fair share of the UK's total (based on land area). In reality there are other many smaller local projects in the county that will contribute. We simply don't need such a large scheme. The Botley project is ten times the size of the UK's current largest solar farm.

There are other large solar projects proposals which have generated significant local opposition. Just a few weeks ago a huge 616 acre solar farm project in Nottinghamshire was cancelled after a sustained local crossparty campaign. The Botley project is four times larger.

My view would be that this project should be either cancelled in its entirety or significantly scaled back. A valid desire for low carbon energy doesn't mean we should avoid thinking about the pros and cons in the same way as any other landowner development project.

Notes

1. British Energy Security Strategy April 2022. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1069969/british-energy-security-strategy-web-accessible.pdf
2. Feed-in Tariff load factor analysis, BEIS, Dec 2021. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1043243/Feed-in_Tariff_load_factor_analysis_2020-21.pdf
3. https://www.statista.com/statistics/1019796/solar-pv-capacity-factors-us-by-state/
4. https://www.renewableuk.com/page/UKWEDExplained/Statistics-Explained.htm
5. Currently large scale offshore wind towers can only be installed in around 30-35 metres or less water depth. This is not too restrictive in the UK, but is a significant impediement where the continental shelf slopes quickly to deep water – the west coast of France for example, or California. Floating wind test projects are under development (and the UK is a leader in this too) but these are currently prototypes and far too expensive for mass installation. Costs will come down and this could lead to even more scope for offshore wind over time.
6. CFD Round 4 results July 2022. https://www.newpower.info/2022/07/offshore-wind-price-continues-to-fall-in-cfd-allocation-round-4/
7. Total UK electricity demand has been broadly flat for the last 20 years due largely to energy efficiency measures. However, with increasing electrification of domestic heating (heat pumps) and transport, McKinsey expects electricity demand to begin to grow by around 2% p.a. https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/facing-the-future-net-zero-and-the-uk-electricity-sector
8. https://www.telegraph.co.uk/news/2022/11/03/dukes-heir-plans-britains-biggest-solar-farm-blenheim-estate/
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