

CPRE Seminar Understanding Wind and Solar Power, Phillip Bratby, 15/11/2013

1 We have seen and heard in the news lately two major items; firstly rapidly rising electricity costs and secondly, one that hasn't received as much attention, that the country is coming close to running out of power and that the lights are likely to go out this winter or next winter - rolling blackouts. The National Audit Office has stated that price rises will continue until at least 2030. Independent commentators have said that the National Audit Office has underestimated the size of the price rises. I will try to show how these situations have come about and what part wind power and solar power have played.

2 But before that, I want to say something about the difference between power and energy. I often ask people whether they know the difference between power and energy, and I know very few people do. Energy is what we pay for in our electricity bills. It is how much electricity we have used - measured in kWh, a unit of energy. Power is the rate at which we use the electricity, the rate at which electricity is converted to heat, light etc. It is also the rate at which a power station converts one form of energy into electricity. Thus a 3kW kettle uses electricity at a rate three times that of a 1kW kettle. Most people don't really need to understand the difference between energy and power, but it is vitally important that those in charge of the country's energy supply should; but my experience from observing energy ministers over many years is that they don't - which is very worrying.

3 The National Grid is considered by many engineers to be one of the greatest engineering feats of all time. It has been in existence for over 70 years and has never once failed. It consists of power stations and the transmission grid (the large pylons we are familiar with) for transmitting, at very high voltage, the electricity from power stations around the country to the local distribution networks, for onward distribution at low voltage to consumers. Why has it been such a success? Well the answer is simple. It has been a success because it was devised, built and operated by scientists and engineers – there was little political interference and it was not driven by Government targets! In the pre-privatisation days of the CEGB, everything was run by the CEGB, and although it was a very inefficient organisation, it employed very good power engineers and there was never any talk of the lights going out. The relevant Government ministry also employed competent engineers who oversaw the work of the CEGB.

4 So how and why, in a country that gave the world the industrial revolution, are we running out of electricity and becoming like a third-world country, unable to guarantee to

provide its citizens and industry with a reliable and affordable electricity supply? In the days of the CEGB the purpose of energy policy was to ensure a reliable supply of electricity, for business and households alike, at the lowest possible cost. Today, the sole purpose of energy policy is to enable the UK to decarbonise our energy supply in pursuit of compliance with EU directives and the Climate Change Act; there is no regard for the reliability of supply, energy security or the cost of the electricity.

5 Independent power engineers have been warning successive Governments about the inevitable consequences of this energy policy for about 20 years. What is needed is sufficient, controllable power stations that can meet the peak winter demand with spare capacity to allow for breakdowns. And what have the politicians and civil servants in the Department of Energy and Climate Change (DECC) been doing? Well they have been closing old power stations and not replacing them with new ones and they have been deliberately closing coal-fired power stations for environmental reasons and not allowing replacement ones to be built. Instead, they have been forcing electricity consumers to subsidise unreliable wind farms and more recently solar farms. When I say wind and solar farms, I am also talking here about individual wind turbines and solar panels.

6 So why do I say unreliable, why can't wind farms and solar farms replace the power stations that are being closed? What do we mean by "reliable"? In engineering terms, something is reliable if it will start when demanded and will continue to operate as needed. For example your car is 100% reliable if it will start and get you to your destination every time. To do that it needs to be mechanically well-built and maintained, but it also must have a source of fuel that can be controlled, in the case of a car, a fuel tank and an accelerator peddle . Conventional power stations are reliable - they are controllable - they can be started when wanted, they have a fuel store and the fuel input can be adjusted to ensure that the electricity produced matches the electricity being consumed from second to second and so keep the grid system stable. In this electronic era, it is vital that the grid frequency is maintained stable. Wind and solar farms are unreliable and are not controllable because there is no way of storing the fuel, which is the wind and the sunshine. They cannot be started when wanted and are not controllable because their output depends solely on how much the wind is blowing and how well the sun is shining. We cannot accurately forecast how much electricity they will produce, and the amount can change exceedingly rapidly. In engineering terms, they are completely unreliable as providers of electricity. Essentially, their unreliable and uncontrollable output is a liability to the grid and makes the life of the grid

operators very hard when they are trying to balance the supply to the demand in order to maintain stability.

7 In winter, when it is dark and cold and the wind isn't blowing, all the wind farms and solar farms between them produce NO ELECTRICITY. That is at the time of peak electricity demand. What this means is that we still need as many power stations available to supply electricity when the wind doesn't blow and the sun doesn't shine, a situation which occurs several times a year. So we can begin to see that if the Government is closing power stations, not allowing replacement ones to be built and encouraging the building of wind and solar farms instead, there arises the possibility of a shortage of electricity - the lights will start to go out - this means rolling blackouts (or the unthinkable alternative of complete grid failure).

8 In summer, we could have the opposite effect. Here, if Government targets are met, about 20GW of solar (as recently stated by the Government) and about 30GW of wind, then the uncontrolled supply of electricity from these two sources alone could overload the grid. Why is this situation being encouraged by the Government?

9 So why aren't the big energy suppliers building new power stations to replace those being forced to close by the Government. They aren't building nuclear power stations because for years Governments have dithered and dithered and all the expertise has been sold off or lost with the passage of time. Only now are we seeing one nuclear power station being allowed to be built, at huge cost to the consumer and by a foreign company. They can't build coal-fired power stations (which incidentally provide the cheapest electricity) because the Government is insisting that they are fitted with some means of capturing the carbon dioxide produced when coal is burnt - a technology which doesn't exist and the cost of which would be unimaginably high. They won't build gas-fired power stations because they may not be profitable to operate. This is because wind and solar farms take priority access to the grid. Nobody is prepared to build a power station that won't be allowed to operate profitably. All the investment (and we're talking over £100billion) that should have gone into building new power stations over the last 20 years has been wasted on wind and solar farms.

10 So, apart from the unreliability and uncontrollability, what else is wrong with wind and solar - after all politicians have been telling us for years that "the wind is free" and we must make use of it. It is not the fact that wind or the sun are free, it is the cost of turning wind energy and solar energy into electricity that is phenomenally expensive, and that makes the

price of electricity produced by wind and solar between two times and six times the wholesale price of electricity from conventional power stations.

11 A factor which makes the electricity wind and solar farms produce very expensive is that there is very little energy in the wind or the sun. Technically, wind and sunshine have very low energy density. Hence wind turbines need to be huge and solar farms need to cover vast areas of land in order to produce sensible amounts of electricity. For example, in round terms, a modern 1,000MW (1GW) power station needs less than 100 acres of land, whereas to produce the same amount of electricity from the wind or the sun would need over 100 square miles of land - and no-one would be able to live in that land. Of course, as I've already said, we still need the power stations for when the wind doesn't blow and the sun doesn't shine. Arguments such as "*I would rather have a wind farm than a nuclear power station*" are just nonsense as a wind farm cannot be an alternative to any conventional power station, be it nuclear, coal or gas.

12 Looking at the performance of wind and solar we see that a wind farm will on average only produce about 25% of its peak power (known as its rated capacity) and for only about 1% of the time is there enough wind to produce the maximum power. For about 15% of the time wind farms produce no power. Solar farms are even worse, on average only producing about 10% of the peak power and for only a few hours a day in mid-summer when it isn't cloudy do they produce peak power. Obviously for 50% of the time it's dark and they produce nothing. Both wind and solar farms have short lifetimes (typically 20years or less) and their performance degrades markedly from first day of operation (due to erosion, wear and tear, maintenance, breakdowns). Conventional power stations last up to 60 years and their performance can be maintained at the maximum value throughout their life.

13 So how expensive is wind power and solar electricity compared to conventionally generated electricity?

Onshore wind farms (subsidised via the RO Scheme):	Double
Offshore wind farms (subsidised via the RO Scheme):	3 times
Individual wind turbines (subsidised via the FiT):	From 2 to 6 times
Solar (subsidised via the FiT):	From 2 to 5 times

There are lots of Government statements that wind is the cheapest form of renewable energy, but they never add that it is still two to six times the cost of conventional electricity. If we take an example, say a 500kW turbine. It will cost about £1million to install and in its complete lifetime, it may produce electricity with a value of about £800,000. In other words it can't

even recover its capital cost, let alone pay for loss of interest on the capital, maintenance, repair, operation and removal. Wind farms and solar farms are thus not viable and need the massive subsidies.

14 There are many other issues of great concern with wind and solar power, which there isn't time to go into in any detail. Both industrialise and damage the landscape; one of the greatest possessions of our small island is its unique landscape, which is rapidly being ruined.

15 Wind turbines emit noise which creates unacceptable impacts which can seriously damage the health of nearby residents - this is an issue which successive Governments have swept under the carpet. There are three types of noise emitted by wind turbines, of which two, Excess Amplitude Modulation (EAM) and low frequency or infra-sound, which can seriously damage people's health, are totally ignored by the Government.

16 Wind turbines undoubtedly devalue houses nearby and damage tourism; again something strenuously denied by the Government and industry. Solar panels built on farmland reduce food production.

17 And now I want to say something about the wind turbine scam. This is the practice of unscrupulous developers putting up a 800 or 900kW turbine and derating its output to 500kW. This way they get nearly twice as much income from the Feed-in-Tariff (FiT), whilst producing a lot less electricity. This scam has been going on for nearly two years. It has been brought to the attention of Ministers and DECC civil servants (who have said it is a minor problem that they will deal with - but haven't). It has been brought to the attention of the CEO of the Planning Inspectorate, who says Planning Inspectors have been made aware of the scam (yet still allow appeals). Ofgem, the industry regulator, is also aware of the scam. It has been brought to the attention of Local Planning Authorities, but North Devon, Torridge, Mid Devon and West Devon planning officers ignore the scam. These are four sets of civil servants, who are supposed to serve the people, but who allow this scam to continue and to grow. The effect of the scam is to put up electricity bills unnecessarily and increase fuel poverty. It is a national disgrace, but nothing is done to stop it. It could be stopped if planning policy was rigorously applied, but it isn't. Why are developers allowed to get away with this scam, make a fortune and cause widespread distress and increased fuel poverty?

18 So what is the point of wind power and solar power? We are told by the Government that the purpose is to reduce carbon dioxide (CO₂) emissions in order to "tackle climate

change". But it is now becoming clear that, because of the need to back-up wind and solar power with controllable fossil-fuel power stations, wind and solar do not reduce CO₂ emissions, but may actually increase them. In other words, the policy behind the construction of wind and solar farms was introduced without carrying out the engineering due diligence to see what the impact of their construction and operation would be on CO₂ emissions. Successive Governments have not produced any evidence to show that wind and solar farms reduce CO₂ emissions. The policy has therefore had the opposite effect to that which was intended. It is another example of "the law of unintended consequences".

19 Now a word about jobs. During my time in the energy supply industry there was continual striving to produce more electricity with fewer people, i.e. improving productivity and thus reducing energy prices. Now one of the objectives of Government energy policy seems to be to subsidise the creation of as many jobs as possible regardless of the cost; the complete opposite of increasing productivity. Our electricity could be supplied efficiently by a few tens of thousands of people, but instead it is increasingly being provided inefficiently and expensively by, we are told, hundreds of thousands of people. It has been estimated that for every subsidised job created in the renewable energy industry, 3.7 jobs are destroyed in the real economy.

20 Wealth is created by doing things more efficiently. Conversely, wealth is destroyed by doing things less efficiently. Generating electricity from the wind and the sun is hugely inefficient and therefore is destroying enormous amounts of wealth. It is also redistributing wealth from the poor to the rich. Every wind turbine and every solar panel that is erected is putting up the price of electricity and destroying wealth.

21 I want to take the proposed Atlantic Array as an example. It will produce intermittent and uncontrollable electricity at a cost 3 times that of conventional power. All the turbines will be imported, at a cost of at least £3billion, as will most of the jobs. It will have a lifetime cost of about £3.8billion and it will at most produce electricity with a value of about £2.5billion and will thus be subsidised by the electricity consumer by about £5billion. It will also need a conventional power station providing back-up at all times, but nowhere is this fact mentioned. By being so inefficient, the Atlantic Array, if permitted, would destroy wealth on a truly massive scale. And yet the Government thinks it is a marvellous scheme! Every time an offshore wind farm is completed, the PM, deputy PM or an Energy Minister goes and officially opens it and says what a marvellous thing it is!

22 Now let's look at what has been happening in Torridge, where there has been a rapid rise in the number of applications to put up single wind turbines. So far this year there have been about a dozen applications for the derated 500kW turbines (the scam described above), each of which would produce electricity at 5 times the wholesale price. The applicants typically exaggerate the electricity produced and claim that each of these turbines will supply about 300 homes with their electricity, so that's about 4000 in total (so far this year). If the electricity were supplied solely to each of those homes, they would see the cost of electricity rise by 5 times. So you can see, how with more turbines being applied for and built, the price of electricity will rocket over the next few years.

23 In addition, we are beginning to see in Torridge the impact of the construction of unplanned wind turbines. Turbines are appearing in all sorts of sizes, shapes, colours, numbers of blades and rotation speeds in close proximity to each other. What is occurring is a giant unplanned wind farm across Torridge, in which most residents will end up living inside the wind farm.

24 So to conclude by coming back to the first two headlines - rising electricity prices and the increased likelihood of blackouts. I hope I have shown what wind and solar power are doing. They produce expensive electricity which is leading to rapid price rises and prices will continue to rise in the future. They are destroying wealth on a massive scale. They don't eliminate the need for conventional power stations. They have priority access to the grid, so the new power stations needed to replace the ones the Government is forcing to close are not being built. The money that is needed for investment in new power stations is being wasted on solar and wind farms. So I hope you can see why we have rising electricity prices and are heading for blackouts. With all the wind turbines and solar farms that are in the pipeline but not yet built or operational, you can see that electricity prices will continue to rocket, while the probability of blackouts gets ever greater.

Some References:

- 1 Worth the Candle, The Economic Impact of Renewable Energy Policy in Scotland and the UK, Verso Economics, March 2011.
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- 3 Feed-in-Tariffs. <https://www.ofgem.gov.uk/environmental-programmes/feed-tariff-fit-scheme/tariff-tables>