

Some Issues Concerning Electricity Generation and Wind Power

Following the planning application by West Coast Energy to build five wind turbines on Matlock Moor, a lot of disinformation is starting to circulate. Consequently I thought it would be useful to provide some information on the national issues concerning electricity generation, including wind power.

On Government figures, the UK needs to replace a total of 23 gigawatts (GW) of electricity generating plant by 2020. This is 30% of existing capacity. The shortage is being caused by the decommissioning of the current nuclear power stations and the closure by 2015 of nine old coal and gas-fired power stations.

Consequently, investment in new industrial-scale generating capacity is urgently needed to ensure that there will continue to be sufficient capacity to meet peak demand – known as “security of supply”. Otherwise the lights will surely go out. This has to be achieved at the same time as reducing carbon dioxide (CO₂) emissions to mitigate climate change. The challenge is enormous, as are the costs – which will ultimately fall on consumers.

In 2000 the Government set a target for 10% of electricity to be supplied from renewable energy by 2010, and in 2006 announced an aspiration to double that level by 2020. Current level of achievement is 4.5% of which nearly a quarter is wind energy. The Government expects wind to contribute two-thirds of the 2020 target.

Many industry experts doubt the ability of UK energy policy to deliver on either security of supply or renewables targets. Recently, two leading experts, energy specialist Professor Sir Ian Fells (September 2008) and Oxford economist Professor Dieter Helm (December 2008) have separately described UK energy policy as “unfit for purpose” and they have each made detailed proposals to put this right. Professor Fells believes that it is just not physically possible to build and connect the number of additional wind turbines needed in time to meet the 2020 target for renewables.

In fact Government policy on renewable electricity generation has received wide criticism, with the National Audit Office (2005), the Office of Gas and Electricity Markets (2007) and the Renewable Energy Foundation (2008), amongst others, also highlighting the bias towards wind energy. All argue that a complex and extremely expensive scheme of subsidies – involving Renewables Obligation Certificates (ROCs) and the Climate Change Levy exemption – is starving other renewable electricity projects, using alternative technologies, and of higher intrinsic merit, from badly-needed investment.

No wonder that these excessive subsidies have led to a dash for wind – witness the huge surge in planning applications for onshore wind turbines. This is easily understood. Using industry figures from January 2008, a 2 megawatt (2 MW) turbine could expect annual revenues of around £200,000 from the sale of electricity on the wholesale markets plus a further £300,000 in subsidy, for which we are all paying through higher prices. Such turbines recover their capital costs in around 5 years and so make a £10million contribution to the developer's profit over a 25-year lifetime. Without the £7.5million in total subsidy over that time the economics would be quite different. In fact Paul Golby, the chief executive of E.ON UK (formerly Powergen) said: "Without the ROCs nobody would be building wind farms".

The rationale for building wind turbines appears to be that CO₂ emissions are saved and that there are no adverse consequences from the introduction of wind power. This is not so. Twenty years of European experience shows that wind-generated power is not only variable and unpredictable but also uncontrollable. If anybody has any doubt about the intermittency of wind, then just think about the recent cold spell that we have endured, in which there was very little wind whilst electricity demand would have been high.

Consider the effect of the unpredictability of wind-generated power when it is introduced into the electricity supply system. Because electricity cannot be stored on a large scale, the supply of electricity has to be matched to the demand all the time, on a second-by-second basis. Because of the unpredictability of wind generation, fossil-fuel burning generation must be on continuous standby, ready to cut in whenever the wind drops. The standby units are up and running, generating electricity, but at a level below their maximum outputs. This leaves some reserve capacity to provide instant cover for loss of wind. Operating fossil-fuel burning generation in this way generates more CO₂ per unit of electricity than if operating at optimum efficiency. So wind power's superficial saving in CO₂ emissions is reduced by the extra CO₂ that is emitted by the standby plant.

If wind-generated power is only a small proportion of the total then the reserve can be provided from existing fossil-fuel plant. But once wind generation reaches a critical proportion of the total then EXTRA fossil-fuel capacity has to be built just to back up the wind generation. This is the paradox of wind power. When wind turbines are put into the network, more CO₂ is generated elsewhere and we have to build more conventional plant as backup, in order to maintain security of supply. This is counter-intuitive and many people continue to believe, wrongly, that wind turbines can replace conventional generation, but the truth is the exact opposite! This is not helpful when the UK is already facing the loss of 23 GW of existing generating capacity.

Paul Golby has stated that Britain would need to construct 44 GW of extra coal and gas-fired plant if the Government's 2020 target was reached, just to back-up wind power. Professor Helm summed it up when he said, "We would need to have more conventional power stations to allow us to have 'windmills'. What an Alice-in-Wonderland world!"

Policy-makers seem to have very little understanding of this negative impact of wind generation. But it must not be ignored. Evidence from Denmark and Germany suggests that CO₂ emissions savings from the use of wind turbines are at best small and at worst, they may actually lead to an increase in CO₂ emissions. Professors Fells and Helm argue that what the UK needs is a renewable energy policy that encourages all low-carbon generation on merit, rather than being skewed in favour of wind power, with all its problems.

Note that CO₂ emissions can also be reduced by more effective action on energy saving; one only had to look around the roofline during the recent snowfall to see where more insulation could be used to good effect. Simple actions such as installing energy-saving light bulbs can also be extremely effective on a national scale.

For example, if every one of the 24.4 million homes in the UK were given one low-energy light bulb to replace a single 100 watt tungsten bulb, this would consume 80% less energy. If it were used for three hours a day on average then it would save 87.6 kilowatt-hours (kWh) per household each year, amounting to 2,137 gigawatt-hours (GWh) for the nation. This is

equivalent to saving 244 MW of continuous generation or 406 typical wind turbines (of 2 MW capacity operating at 30% load factor). Now that would be a good investment.

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