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Low Wind Power Output in 2010: An Information Note

Background

In today's *Times* (02.02.11) it is reported that Scottish and Southern Energy (SSE) has published data confirming that its wind turbine fleet has reported a 20% reduction in energy generation in the last year. SSE is said to have released this data in response to requests from concerned shareholders.[1]

This is consistent with data examined by Renewable Energy Foundation at the request of the *Sunday Telegraph*, which resulted in a report by Andrew Gilligan to the effect that the UK wind fleet load factor in the year October 2009 to September 2010 was very low in comparison to previous years.[2]

REF is receiving requests for further detailed information on this matter, and is therefore releasing the following information note.

UK Wind Power Output in 2010

In response to Mr Gilligan's query, REF considered all wind farms, both onshore and offshore, with an installed capacity of 1 MW or greater, taking all Ofgem data (see www.renewablesandchp.ofgem.gov.uk) since April 2002 in monthly tranches, and calculated each month's load factor in the standard way (actual output/theoretical maximum output), given the installed capacity of wind generators for that month. From this we calculated the average annual load factors.

For the purposes of Mr Gilligan's research we calculated actual load factors for October 2009 to September 2010, since stable empirical data for the last three months of 2010 was not yet available in the public domain from Ofgem. However, by using other industry standard empirical sources it is possible to estimate the output and load factor for those months with a high degree of confidence.

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[1] http://www.thetimes.co.uk/tto/business/industries/utilities/article2896287.ece

[2] http://www.telegraph.co.uk/earth/energy/windpower/8261827/Britain-is-becoming-less-windy-raising-doubts-over-Governments-wind-farm-strategy.html

The following chart shows UK windfarm fleet load factors for the years 2003 to 2010. The dark blue bar gives the Load Factor for the year labeled on the axis below, for example 2003. For 2003 to 2009 this figure is empirical. The light blue bar calculates the Load Factor for the period from October in the previous year to September in the year on the axis. For example, the light blue bar over 2003 gives the load factor for the period October 2002 to September 2003; and the light blue bar over 2010 gives the load factor the period October 2009 to September 2010. These figures are empirical.

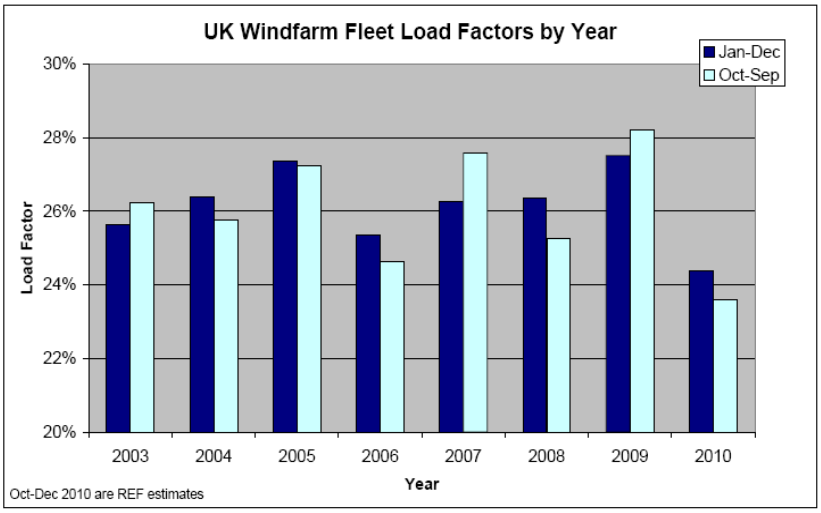

Figure 1: UK Windfarm Fleet Load Factors by Year.

Source: Renewable Energy Foundation.

The load factor shown in the dark blue bar for 2010 contains empirical data for January to September, and estimates based on other industry sources for October to December. This gives a slightly higher load factor than has been measured empirically for the year October 2009 to September 2010, but is still relatively low.

Overall, it is clear that the load factor for 2010 was low in comparison with preceding years, indicating that winds in this year, and particularly in the winter 2009-2010, were themselves relatively low.

This finding is consistent with data from Ireland and Northern Ireland. The following chart is taken from information published by Eirgrid at the Irish Renewable Energy Summit on the 20th of January this year.

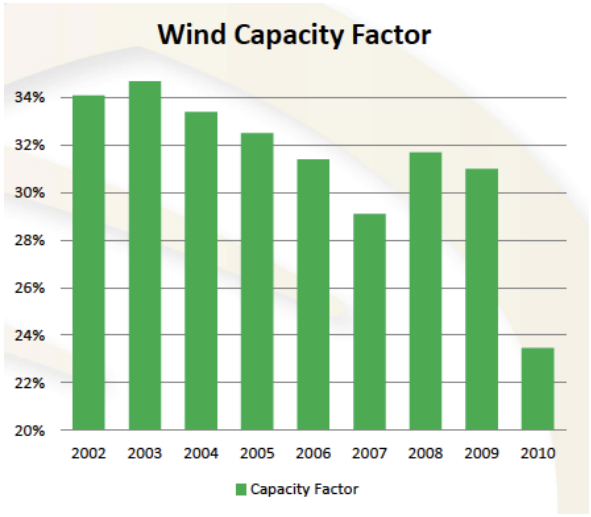

Figure 2: Irish Wind Power Load Factor 2002 to 2010. Source Eirgrid.[3]

According to Eirgrid load factor in 2010 was approximately 23.5%, as compared to 31% in the previous year, and the average figure of 32.3% for the years 2002 to 2009.

Comment

Wind power output is significantly variable and difficult to predict over several timescales, minutes, hours, days, weeks, months, and years.

Variability over short time scales has been much discussed, and it is now well known that low wind conditions can prevail at times of peak load over very large areas. For example, at 17.30 on the 7th of December 2010, when the 4th highest United Kingdom load of 60,050 MW was recorded, the UK wind fleet of approximately 5,200 MW was producing about 300 MW (i.e. it had a Load Factor of 5.8%). One of the largest wind farms in the United Kingdom, the 322 MW Whitelee Wind Farm was producing approximately 5 MW (i.e. Load Factor 1.6%).

Load factor in other European countries at exactly this time was also low. The Irish wind fleet was recording a load factor of approximately 18% (261 MW/1,425 MW), Germany 3% (830MW/25,777 MW), and Denmark 4% (142 MW / 3,500 MW).[4]

Such figures confirm theoretical arguments that regardless of the size of the wind fleet the United Kingdom will never be able to reduce its conventional generation fleet below peak load plus a margin of approximately 10%.[5]

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[3] Eirgrid (Jonathan O'Sullivan), "Facilitating the Transition to a More Competitive, Sustainable, and Low Carbon Electricity Future". Presentation to the Irish Renewable Energy Summit, 20th January 2011, Dundalk.

[4] Data drawn from public sources in all those countries.

[5] See Michael Laughton, Power Supply Security with Intermittent Sources: Conventional Plant Capacity Requirements", *Power in Europe*, 460 (10 Oct. 2005). See also Paul-Frederik Bach, *The Variability of Wind Power: Collected Papers 2009-2010* (Renewable Energy Foundation: London, 2010).

They also suggest that while widespread interconnection via the widely discussed European Supergrid, may assist in managing variability, its contribution will not on its own be sufficient to solve the problems, since wind output is approximately synchronised across very large geographical areas.

Conventional generators acting in the support role and guaranteeing that load is met will be faced with operating in a market that is physically and economically volatile.

The now emerging fact that wind power can be highly variable year on year adds further layers of complication to this problem. Conventional generators will not only have uncertain income over shorter timescales, but will face significant year on year variations.

The all but inevitable result of such uncertainties is higher prices to consumer.

Dr John Constable

Dr Lee Moroney

02.02.11