REF
RENEWABLE ENERGY FOUNDATION

Information Note

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High Rewards for Wind Farms Discarding Electricity 5-6th April 2011

Introduction

In the recent April *Operational Forum,* National Grid revealed that substantial "constraint" payments were made to a number of Scottish wind farms in the first week of April.[1] A constraint occurs when the grid system or a section of the system is unable to absorb all the electricity being generated, and some generators that are contracted to generate must be asked to stand down.

The April event occurred because the Scottish grid network could not absorb all the energy being generated, and chose to constrain wind power off the system, paying very high prices to compensate wind generators for the lost income, in some cases as high as 20 times the value of the electricity which would otherwise have been generated. In total approximately £890,000 pounds was paid over a few hours to six wind farms, these costs being ultimately destined to pass on to the consumer.

REF has consistently argued that the scale and pace of wind power development has exceeded the ability of the system to integrate this uncontrollable energy source, and that high costs to the consumer would result as a consequence. Writing in the preface to Paul-Frederik Bach's 2010 study for REF, Professor Michael Laughton observed:

> *The outstanding major concern in the work reported here, and one with very serious implications – especially for the United Kingdom with its predominantly island system with inadequate international interconnection capacity – is the extent to which subsidized wind power can, in practice, be used within the system without*

[1] http://www.nationalgrid.com/NR/rdonlyres/4867F8D6-28E4-4335-BF0A-EAE4592920D3/46496/01_OperationalUpdate.pdf

needing to be constrained off: in other words wasted, or exported at whatever market prices, perhaps disadvantageous ones, prevail elsewhere.[2]

The payments on the 5-6 April confirm the reality of these concerns, even at relatively low levels of wind power currently installed in the UK (just over 5 GW of capacity) and are a worrying sign of things to come.

We conclude that the scale and pace of wind development in the United Kingdom needs to be rethought, and more emphasis placed on the provision of economical solutions to the grid-balancing problem. Some will judge that constraint payments show that the grid network, particularly that interconnecting England and Scotland, needs to be expanded. However, it should be noted that such network enhancement is not cost free, and would have a very significant impact on consumer bills. Indeed, all the currently available solutions for the problems posed by uncontrollable generation such as wind power are expensive. It is conceivable that invention and innovation could reduce these costs, but at present the subsidies to renewables and the socialization of integration costs mean that there is no commercial incentive for technologists to seek less expensive solutions.

We note that it is at least arguable that more flexible renewable generators, including dedicated biomass, biomass cofiring, anaerobic digestion, and energy from waste are under-represented in the renewables mix. This should be remedied, not least because they can be integrated into the system at lower cost to the consumer.

High Wind and Heavy Rain on the 5-6 of April

National Grid describe the requirement to reduce power output on the 5-6th of April as being due to strong winds and heavy rain in Scotland over that night. This resulted in surplus wind and hydro output at a time when the options for absorbing the excess power – pumped storage or export to England, for example – were not sufficient, though National Grid has not yet provided details of these problems.

National Grid is required to balance the supply and demand of electricity at all times, whatever fluctuations occur in each. The electricity Balancing Market exists to facilitate this and allows electricity generators to submit offers to sell and bids to buy energy from the system by increasing or decreasing generation. As necessary, the most cost-effective offers

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[2] Michael Laughton, "Introduction", in Paul-Frederik Bach, *The Variability of Wind Power: Collected Essays 2009-2010* (REF: London, 2010), viii. Freely available from REF, on request.

and bids are accepted by the electricity grid operator to balance the system, taking into consideration physical system constraints, such as grid bottlenecks and the ability of generators to deliver within the timescales required.[3]

The National Grid report demonstrates that there was a limited range of power stations capable of reducing output on request in early April, and that the costs of paying these generators to reduce their output covered a substantial range. The most economical plant was coal-fired, which offered to *pay* £28 per MWh not to run.[4] Some coal-fired, gas fired and hydro generators were willing to reduce output at no cost, but some of these relatively economical offers could not be taken up by NG because the electricity system must always have access sufficient controllable and flexible electricity generation sources to ramp up and down in order to maintain system frequency.

Due to these limited options National Grid was obliged to pay wind farms to reduce output. The offer prices which the various Scottish wind farms set for such a reduction ranged from £150 per MWh to £1,000 MWh. Fossil-fuelled power stations routinely pay into the system when asked to reduce output because they still receive their contracted payments, but also make savings on the fuel they have not had to burn.

Conversely, wind farms, when asked to reduce output, forego subsidies worth approximately £50-£55 per MWh, from the Renewables Obligation Certificates (ROCs) and Levy Exemption Certificates (LECs), so require payment so as not to be out of pocket.

However, it can be seen from the National Grid report and other data in the public domain,[5] that the wind farm operators that were paid to reduce output on the 5-6th April set prices significantly in excess of this level.

For example, Farr wind farm was paid £800 per MWh to reduce output, nearly 16 times the value of the subsidy foregone. The following list shows the wind farms compensated for not generating in the first part of April 2011.

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[3] For a more detailed description of the electricity balancing market see for example, http://www.nationalgrid.com/uk/Electricity/GettingConnected/FAQs/Whatisthebalancingmarket.htm

[4] See p6 of the NG April Operational Update document

[5] See for example, www.bmreports.com and the more detailed Tibco service data available at http://www.bmreports.com/tibcodata/yyyy-mm-dd/

Wind Farm	*Rate Paid per MWh*	*Total paid in April 2011*	*Wind Farm Owner*
Whitelee	£180	£308,000	Scottish Power
Farr	£800	£265,000	RWE nPower
Hadyard Hill	£140	£140,000	SSE Renewables
Black Law	£180	£130,000	Scottish Power
Millennium	£300	£33,000	Falck Renewables
Beinn Tharsuin	£180	£11,500	Scottish Power

From REF's research, it appears that there have been other occasions when wind farms have been paid to reduce output, starting from a National Grid test run involving Whitelee and Black Law in May 2010.[6] The set of wind farms paid to date to reduce generation appears to consist of the same six listed above. The following map shows the location of the wind farms.

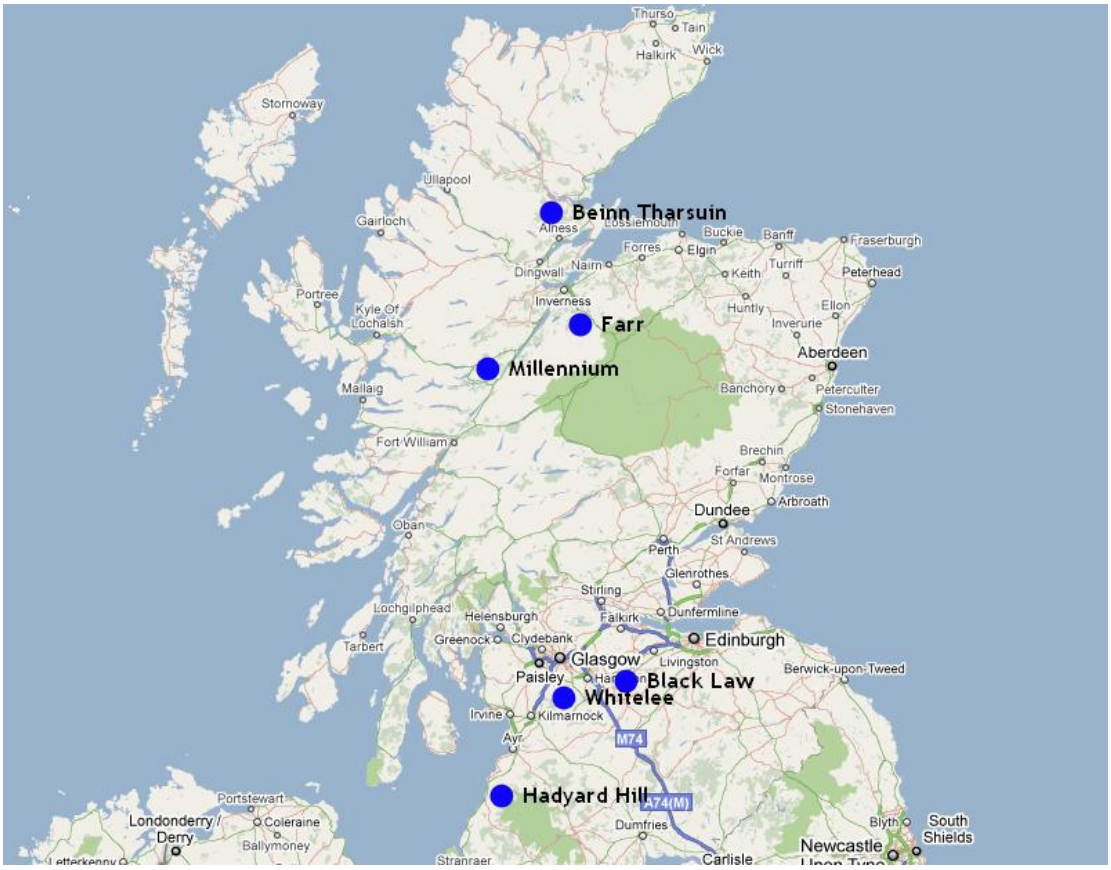

Fig 1. Location of wind farms that have received payments to reduce output to 30 April 2011.

[6] http://www.telegraph.co.uk/earth/energy/windpower/7840035/Firms-paid-to-shut-down-wind-farms-when-the-wind-is-blowing.html

It seems that Hadyard Hill is most likely to be asked to curtail power, having reduced output on 5 dates in April 2011. Whitelee has received the largest total sum as a result of being paid to reduce output on 30 May 2010 (the test run), on the 29th of October 2010, and on the 6th of April 2011. We estimate the total paid to Whitelee's owners for these curtailments is approximately £460,000. These payments are in addition to the subsidy payments enjoyed by Whitelee of approximately £28 million per annum, and lead to the observation that constraint payments are already likely to be a significant proportion of the total income of some wind farms.

REF estimates that the constraint payments made to wind farms to date have reached approximately £1 million.

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