22 January 2013

Dear Sir/Madam

.This is a response to your consultation on the 'Medium Plan Phase 2'

You state that the principal objective of the Utility Regulator in carrying out its electricity related functions is:

"to protect the interests of consumers of electricity supplied by authorised suppliers, wherever appropriate by promoting effective competition between persons engaged in, or in commercial activities connected with, the generation, transmission, distribution or supply of electricity."

You also note that, 'NIE has a statutory obligation "to develop and maintain an efficient, co-ordinated and economical system of electricity transmission"'.

It is our contention that with the Medium Plan Phase 2 proposal, neither the Regulatory objectives nor NIEs obligations have been complied with.

No adequate information has been provided as part of this consultation exercise to permit those uninformed of the principles underlying power generation, to investigate the economic case for adding increasing amounts of unpredictable wind energy to the grid. You seem to be assuming that by simply using the terms 'renewable energy' and 'the 40% target for renewable generation by 2020', that this excuses the absence of a properly reasoned economic case with alternatives being set out to the public who are being asked to pay for the proposal.

Further, you have made no case whatsoever as to why the general public should pay for the grid upgrade instead of those who anticipate making very substantial profits from the production of wind energy and who are demanding access to it. Indeed, in a situation were wind energy suppliers required to shut down temporarily to balance the grid, can be compensated for providing no energy through 'constraint', You have not applied a 'negative constraint' by introducing a minimum threshold of production which they must reach before they can enter the grid in the first place. This virtually guarantees no increase in base load, but a significant increase in dispatching by local power stations, at a cost to the public.

As you know, the grid should not be normally used for the mass transfer of power from one end of the country to the other, but is instead used to balance supply and demands. Wind energy, which tends to concentrate generation capacity where the wind resource is, not where the demand is, destroys the efficiency of this model, and requires considerable grid upgrades,as you now propose. There is also increasing pressure to

similarly upgrade the grid in other parts of the province to facilitate the connection of further wind capacity.

You have not attempted to inform the public on the implications of increasing wind penetration on the operation of the grid. That, because the grid cannot store any energy, and power must match demand at all times, there is a need also to be able to adjust power at all times to match the demand. But since demand is only predictable to a certain level, some power stations are at all times 'throttled back' from what they might be producing or held as spinning reserve. How will a substantial increase of wind capacity on the grid impact on this system and what are the efficiency and cost implications?

Another issue that was unimportant with conventional power stations, but is relevant to any debate on renewables, is power density. Wind energy necessarily has a massive impact on the environment, simply because the scale of it has to be so large to collect what is a very diffuse and fleeting amount of energy. Yet there is no cost/benefit analysis or opportunity cost shown in your plan to compare the environmental and other impact involved from the power density of 1000 MW of distributed wind energy against other comparators such as, for example, a conventional 400 MW CCGT power station with little or no requirement to upgrade the grid. You are therefore in reality not offering the public a full selection of options as implied. Instead, these appear to have been artificially restricted to those desired by the wind lobby and have not been based on a proper economic, financial and environmental appraisal.

Of all the aspects of renewable energy, none is greater in impact or less well understood by those outside the industry than the question of intermittency, and how it relates to dispatchability. There is only one way to realistically add dispatch to large numbers of renewable power sources, and that is through co-operating them with conventional power. This is a 24 hour a day balancing act between dissimilar power sources, but wind cannot survive on the grid without conventional dispatch.. This is because:

1. The wind turbine is massively sensitive to wind speed. Below its maximum output, power varies as the cube of wind speed. This means that minor errors in forecasting wind speed lead to quite large variations in actual power from what was expected. Analysis of actual UK wind data reveals that in general the actual wind output versus what was predicted has at least a 10% error in any given period. When wind output is small, that is insignificant, and is absorbed by the normal dispatch capability of existing power stations, but when intermittent renewable energy reaches a significant proportion of the grid, it starts to be extremely relevant. The increase in wind capacity envisaged in the proposed plan is just such a scenario and that 10% error amounts to a significant impact on the co-operating conventional power stations that would have to be kept on spinning reserve to cater for variations in wind against forecast.

2. Under conditions of high wind, sometimes wind farms must shut down in order to avoid turbine damage due to over stressing the gearbox and bearings. Failure to do this can and has resulted in turbine fires or even turbine destruction, so a higher than safe wind speed will tend to see whole banks of turbines going into safety shut down, pulling extremely high amounts of power off the grid, suddenly. Not only must this eventuality be catered for by extra spinning reserve, it is also liable to destabilize the grid and place unacceptable ' brown outs' or short duration low power events on the grid.

3. Conversely, resumption of normal operation of wind farms in high wind conditions can create the opposite effect, a power surge that can trip the grid, and must be met with immediate shut down of whatever fast acting conventional power is available.

As SONI stated at a Wind Workshop on 28 November 2007:

“It has been established by observation that wind can reduce to zero over a period of 30 minutes – high wind speed shutdown. In the absence of foresight this is equivalent to losing a single 400 MW generator.”

Now it is proposed to increase this to the equivalent of a 1000 MW generator.

And should it be thought that we can try and average out the fluctuations over a wider geographical area, or in the words of the classic phrase 'the wind is always blowing somewhere', it is not true. High pressure over the whole of N Europe creates almost zero output from any wind turbines on a continental scale. Furthermore, as alluded to earlier, the benefits of transmitting power over long distances are nullified the longer the length of the path.

These comments on variability can only lead to the conclusion that intermittent wind energy is relegated to the lowly role of being a bolt on fuel saving device that may or may not save fuel and depends on conventional energy for its consistent operation. This, in turn, leads to a number of questions that must be answered before an informed judgment can be made on the plan you have placed before the public:

Firstly : Will the average decrease in demand (as seen by conventional power stations) afforded by intermittent generators reduce overall demand and fuel? And if so, by how much?

Secondly, does an increase in dispatch requirements (output variability to match demand) increase fuel usage for the same level of average demand? And if so, by how much?

Thirdly, overall, if there is a gain in average electricity generated by intermittent renewables, is this greater than the losses incurred in dealing with their intermittency?

The absence of any costing of these questions for various degrees of wind penetration removes any validity from the whole consultation exercise.

Even the use in Northern Ireland of gas power stations, which are much faster to start up, and can be online in 45 minutes operating at full efficiency, will have a cost. Every single start of a gas turbine burns a significant amount of fuel, energy that is irrevocably lost when its switched off and cools down again. So although it can be held in cold reserve and still be operating in less than an hour, conversely if its offline all day it's going to be cold on restart and will need nearly as much fuel to start up as it would have burnt all day in hot stand-by mode. Once again, the more starts and stops there are, the more energy is lost and the more wind on the grid, the more starts and stops there will be.

Another implication from a significant increase in wind penetration is the increased high dispatch on conventional power stations which in turn means increased heat cycling and

increased mechanical stress. This leads to shorter lifetimes and more energy used on repair and replacement of capital plant, as does the installation of very low capital cost plant for peaking demand. How will such additional expenditure be recovered from the suppliers of wind energy who will be causing it?

One final point is worth noting, since it is frequently used to obscure the issues raised above, and that is the influence of wind energy on the CO_2 output of fossil-fired generation of electricity.

The interaction of wind energy with fossil-fired electricity generators could, until recently, only be discussed with the help of models since real-time operations data was not available to the public. However, when independent researchers obtained the real-time operations data about the introduction of wind energy in a part of the U.S., the study shows, that wind energy plays havoc in systems dominated by coal generation.

Now EirGrid, the Electricity Transmission Operator in Ireland, has given a new opportunity to study the influence of wind energy on a conventional generator system, using real time data.

This shows, that in the absence of hydro energy the CO_2 production of conventional generators increases with wind energy penetration. Thus, building wind turbines without constructing adequate storage of energy is futile. It only leads to high extra costs and hardly any fuel or emission saving. Therefore, the introduction of wind energy without buffer storage leads to increased fossil fuel use and CO_2 emissions and is a non-sustainable practice.

As Professor Gordon Hughes of Edinburgh University notes, if carbon reduction is the aim of the policy, renewable energy for its own sake is an extraordinarily expensive way - in terms of materials, direct and indirect costs, and environmental impact - to achieve remarkably little.

In conclusion, and in the absence of any information provided by you as part of this consultation, there is doubt that intermittent wind energy may result in a net reduction of fuel used by conventional power generators. Even if it did, it would certainly be less than the figures used by the renewable industry to justify their products. It is also very doubtful, as the studies above show, if it justifies itself as a carbon reduction measure, and if so, it does start to make it very expensive indeed. Furthermore the low or no net reduction in fuel burn and the absolute necessity of co-operation with fossil plant to balance the intermittency and provide the dispatchability that it lacks, engenders no increase in energy security and very little insulation from fuel price fluctuations - two reasons that are often upheld for its adoption.

When the intermittency problem is analysed, we find that intermittent non-dispatchable power actually carries very little value at all. What society requires, is dispatchable power that can be on tap when its required, and turned off when it's not, and it requires in addition a large component of cheap baseload power, that never needs to be turned

off. What it does not require is wilful power that's here today and gone tomorrow. If the power density of renewable energy makes it large, awkward, expensive, and environmentally challenging, the intermittency destroys its value completely.

In our opinion the regulator has missed a significant opportunity to demonstrate fulfilment of their role to protect the interests of consumers. Instead the regulator appears to have been placed in the position of becoming an advocate for the wind industry. The absence of any presentation of even the most basic economic and financial cost/benefit analysis of the various alternatives available, and the real implications for electricity costs in the longer term of placing so much wind capacity on the grid, appear to demonstrate an absence of true independence. We therefore suggest that a fuller and more public consultation should be undertaken when a costed assessment of a full range of alternatives has been presented to the general public.

Yours faithfully

Daniel Kane (Dr.)
Director
Windwatch NI