Bial's Clustered Configuration Renders Noise Modelling Invalid

Summary

The configuration of the proposed Biala wind farm is such that, according to the NSW Government's own guidance, it will exacerbate noise generation. The structure is of a form that the consequent noise production is not scientifically understood well enough to express mathematically and therefore cannot be modelled. Thus noise modelling for the Biala wind farm, given current scientific knowledge, is invalid.

The noise modelling and the proposal should be rejected until either the proponent presents a wind farm configuration that conforms with the guidance of the *NSW Wind Energy Handbook*, or the consultants are able to conclusively demonstrate their noise modelling has been validated against a real, operating wind farm with a configuration similar to that proposed for Biala.

The Case

The proposed Biala wind farm consists of a clustered, dense mass of turbines, a large number of them apparently located less than 500 metres apart – in some cases much less – in all directions. The EIS says rotor diameter will be 150 metres. So the inter turbine separation in numerous cases will be less than 3.5 rotor diameters and in some instances less than 3.

The *NSW Wind Energy Handbook*, 2002, published by the NSW Government, says:

"A wind-farm layout must take into account that turbines have substantial 'wakes', which interfere with each other depending on wind direction and spacing. The general rule of thumb for spacing (the '5r-8r rule') is five times rotor diameter abreast and eight times rotor diameter downwind." (page 53)

It is well known that when turbines operate in the wake turbulence from other turbines it not only affects turbine efficiency but very substantially increases noise including infrasound.

See, for instance, "A discussion of wind turbine interaction and stall contributions to wind farm noise", Alex Laratro, Maziar Arjomandi, Richard Kelso, Benjamin Cazzolato, *Journal of Wind Engineering and Industrial Aerodynamics*, 2014, 127: 1-10; *Wind Turbine Acoustic Noise*, Anthony L. Rogers, Ph.D., James F. Manwell, Ph.D., and Sally Wright, M.S., PE, Renewable Energy Research Laboratory, University of Massachusetts at Amherst, amended January 2006; *Wind Turbine Noise and Vibration*, Dr Colin Kestell, School of Mechanical Engineering, University of Adelaide, 2010; "The Variability Factor in Wind Turbine Noise", Jim Cummings, Acoustic Ecology Institute, presented at *5th International Conference on Wind Turbine Noise*, Denver 28-30 August 2013.

So even though it is well known that close inter-turbine spacing exacerbates noise generation, Newtricity is proposing a layout where most turbines breach the spacing recommended by the NSW Government in its *NSW Wind Energy Handbook,* and for a great many of them the separation is less than half the recommended distance.

However, as well as knowing there is the mechanism here for a serious noise problem, the situation is compounded by unpredictability. That means that the purported noise modelling done on behalf of Newtricity is invalid.

Cummings concludes “Unlike most other community noise source, turbine sounds vary rather dramatically in both dB levels and sound quality.” (p.15). Laratro, *et al* tell us “The current state of research into stall noise and wind turbine wake structure is also reviewed and it is concluded that the available information and collected data on wind turbine wake are insufficient to determine how strong this role is” (p 1).

If a physical phenomenon is not understood well enough to express in mathematical equations, as Laratro tell us is the situation with inter-turbine wake effects and noise, then it is impossible to create a model of the process, since a model is just a set of interrelated equations, plus parameters and data.

Thus the purported noise modelling presented on behalf of Newtricity for Biala must be of unknown and unsubstantiated validity, given the turbine cluster structure at Biala. Note, the statement by Laratro, *et al* about the lack of relevant detailed knowledge of the physics involved was published in 2014, so this is not an outdated statement.

Until Newtricity’s consultants can present strong evidence that their model has actually been validated in practice on tightly clustered wind farms such as proposed for Biala, and for the size and number of turbines proposed, under a representative range of atmospheric conditions, the Department has no option but to reject the noise predictions and thus the wind farm proposal.

To accept the proposal under these circumstances would be a statement that the Department really has no interest in the validity of noise modelling and simply wants someone to produce some numbers claiming the wind farm will comply with noise conditions, irrespective of how anti-scientific may be the means by which those numbers were produced.

Mark Tomlinson
19/10/2015