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Dear Mr Jones

Re; Wind Farm at Wadlow Farm, West Wrattling

I am writing in reply to your letter dated 29 November, your reference S/1018/06/F. You asked for comments on the Planning Application from RES Developments Ltd on the basis of their reply, dated 14 November, to earlier comments.

My concern is the evaluation of the likely performance of the Wind Farm as a viable source of electrical power given the proposed location and the given engineering details for the 13 wind turbines proposed. I note the crass statement from the advice PPS22 as quoted by RES that "technical and commercial feasibility is irrelevant as a planning issue". Perhaps this is one reason, as shown in the recent report by the Renewable Energy Foundation, for the performance of many wind farms at efficiency levels below-and often well below- expectation. I am pleased that RES, in their reply, despite this advice, give some technical details.

I have comments on the section of the RES reply "Wind Speed/Capacity Information as follow:-

I believe that RES follow a reasonable path through the stages of the theoretical consideration of the mean wind speed at the site, which is a principal element in the evaluation of the all-important capacity factor. However, the path chosen is a particular one and other paths give different results. In a nutshell my criticism is the RES results are interpreted at a level of accuracy they cannot withstand.

If we examine, from the REF analysis, the performance of other operational wind farms in East Anglia with similar turbine installations we find the following:-

Swaffham Wind Park, 1 turbine, 1800kW, 70m hub rotor diameter.
Average capacity factor over 2005 is 26.52%. Average over 22 monthly data as given is 25.18+-9.37%.

(Note the errors given are the standard deviations of the data and express the fluctuations attributed to the variations in mean wind speed from month to month).

Coldham Wind Farm, 8 turbines, 2000kW, 80m rotor diameter.
Average capacity factor over 5 monthly data as given is 18.50+-7.77%

Longhill Wind Turbine, March, 1 turbine, 2000kW, 82m rotor diameter.
Average capacity factor over 11 monthly data is 26.458+-6.84%.

Somerton Wind Turbine, Great Yarmouth. 1 turbine, 1800kW, 70m rotor diameter.
Average capacity factor over 2005 is 27.64%. Average over 22 monthly data as given is 23.3+-13.1.

Presumably each of these installations with similar wind turbines was provided, as with the present proposal, with a supporting theoretical case that the capacity factor “will be in excess of 30%”. On a few occasions (in three of these cases) the averaged capacity factors for a single month exceed 30%, but, as indicated, the fluctuations in wind speed from month to month are so great that the longer term averages are all under 30%, some well under 30%

I want to emphasise the strong similarities between the set-ups for these four cases and the proposals for the Wadlow Wind Farm. I want also to pose the question “What grounds are there to predict that the Wadlow installation will not fall into the same pattern of underachievement?”

The given data correspond to all the turbine installations at present in production in East Anglia having very high hub heights and rotor diameters as at Wadlow. Very costly and environmentally intrusive high turbine installations are selected to make the most of sites when the expected mean wind speed-at least initially from the DTI data base of mean annual wind speeds-is low. Mean wind speed increases with height.

Turning to the details of the calculations in the RES Reply, I note:-

The increase, in effect put forward in the Reply, in the long-term mean wind speed above that actually measured with an anemometer at 50m height (6.74m/sec replacing 6.4m/sec) at the site is said to be due to the inclusion of the effects of correlation with longer-period Met Office data taken at the Wattisham Station (about 30 miles from the Wadlow site). In harmony with the consideration of correlation, examination of the data for all five of the sites listed above shows all the curves of capacity factor as a function of time (monthly basis) show a reasonable general similarity with the ups and downs of the curves occurring at similar times in the year. All the sites are in locations shown on the DTI map for mean annual wind speed of 5 to 6m/sec at a height of 25m. However the differences between the detailed wind characteristics at the five locations are clearly shown by the different ratios of standard deviation to data mean. Therefore correlations based on the data in principle from each of these sites will give a different longer- term mean. In any case, obtaining a long term average mean wind speed and related capacity factor does not appear to be a useful concept when considering the day to day running of the wind farm. It is far better to consider the operational capacity factor from the day- to- day data taken at the actual site.

Second, RES have chosen a power-law approach (as against other approaches e.g. the logarithmic approach which gives lower values-but depends on the assumption for surface roughness) to projecting the wind speed from one height at the site to another. The often-used exponent for this equation is 0.14, no support is given by RES for

their selection of the value they use, 0.219, which increases the mean wind speed above the usual increase by 5%.

Finally, concerning the topography, RES use the physical flow model MS3DJH which was adopted in 1994 to assess the accuracy of the earlier DTI Data Base of Wind Speeds. Evaluation of the effects of topography is highly complex and has much moved on in computational engineering in the development of computational fluid dynamics (e.g. Bitsuamlak, Stathopoulos and Bedard, Journal of Aerospace Engineering, October 2004, 135-145). It is unclear to state, without major calculation, the changes that improved modelling will give to the wind speed calculations.

In summary RES have used older computational models to consider turbulent flow and boundary conditions over the Wadlow terrain and two small but significant “tweaks” to increase the average wind speed to be used to determine the final capacity factor. With these “tweaks” the expected average just creeps over the 30% mark. Deleting these “tweaks” by merely altering the approach the theoretical nominal value of the capacity factor is about 27%. But this value is subject to a large range of caveats related to the approximations made in the model selected.

As stated above, the pathway through the calculation selected and followed by RES is quite acceptable, but the result achieved should be stated with some idea of the likely range of errors due to incomplete and inaccurate factors involved in the modelling, and further to take account of the common experience for other similar turbine installations that the theoretical capacity factor overestimates the values achievable in practical operation. Bearing all the factors in mind I believe a capacity factor for the installation can only be given within a range of values. I adhere strongly to the capacity factor of **20+-5%** I predicted and submitted previously to South Cambs District Council following a detailed analysis of the Wadlow Wind Farm based on the DTI Wind Data Base I confirmed this result in a later (third) submission on the basis of later calculations using a theoretical analysis directly from the measured Wind Rose data for the site actually provided by RES in their first submission.

In conclusion, despite the introduction of very high turbine towers, if the achievement of a capacity factor of a year-long average of 30% or more is regarded as an acceptable efficiency, then I regretfully have to state that the low wind conditions at Wadlow Farm-as at the other installations in East Anglia listed above- mean that, in my opinion, the project will fail to reach this benchmark.

Yours sincerely

Professor R E Burge