GENERATING POWER FROM WIND TURBINES

By

David Short

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In view of the current debate on the pros and cons with regard to the proposed expansion of the nuclear production facilities, it is suggested in many quarters that much greater use be made of wind turbines to replace fossil fuel production and possibly existing nuclear facilities.

With this in mind this paper has been written to examine some of the effects on the landscape and some of the underlying economics of resorting to large scale power generation by the use of wind turbines.

The paper does not purport to be anything other than an hypothesis and a very brief study, but nevertheless it does point to some quite astonishing statistics with regard to the use of wind power in general which should cause us to think very carefully before committing further resources to this method of energy production.

Let us begin by considering that all existing nuclear and fossil fuel methods are replaced by wind power alone and that no other methods of renewable energy are employed.

The Drax power station's output is currently some 4000 Megawatts (MW) which represents approximately 7% of the total output of the UK (1)

The total UK output from hydroelectric, wind generation, biomass and geo-thermal sources is approximately 3%. The output from nuclear sources is approximately 23% and from all other sources is some 74%. (2)

It follows that total UK output from non-renewable sources 554,840 MW of which some 127,613 MW is from nuclear sources.

Modern wind turbines generate anything from 0.75 MW to 3.6 MW - say 2.18 MW on average, therefore to replace to replace the output of Drax it would require say 4,000/2.18 = 1,835 turbines and to replace the entire UK output of non - renewables would require 554,840/2.18 = 254,513 wind turbines. To replace all fossil fuel sources only (i.e. 554,840 - 127,613 = 427,227 MW) it would require 427,227/2.18 = 195,976 turbines approximately.

The diameter of an average turbine blade is some 66 metres (3) and therefore the linear distance required to accommodate the turbines can not be less than 254,513 x 66 = 16,798 kms in the case of a total replacement of non-renewables or 195,976 x 66 = 12,934 kms. in the case of replacement of fossil fuel generators only.

The length of the entire coastline of England, Scotland and Wales is not less than 17,800 kms. (This is longer than the coastline of the entire eastern seaboard of the U.S.A).

Thus we can see that if turbines were placed linearly along the coast of the U.K. there would be one turbine every 1.06 km. to generate sufficient power to replace the entire out put of non-renewable energy of the U.K. and there would be one turbine every 1.4 km. To generate the output from fossil fuels alone.

Land Area occupied by Turbines

If the turbines used in the generation of power are multi-directional, that is to say each set of blades can rotate horizontally through 360 degrees then the land surface are occupied by each turbine cannot be less than the area of circle of radius 33 metres which equates to 3421 square metres. However most turbines do not rotate through 360 degrees but only through about 90 degrees so the land area they could be said to occupy would be about 3,421/4 = 853 square metres, therefore the area of land required to replace the Drax facility would not be less than 1,835 x 853 = 1,565 square kilometres. (In fact it would be considerably more than this to avoid the screening effect of the turbines on each other and other factors, but we shall disregard this point for the sake of this study)

Therefore the total land area consumed in replacing all non-renewable power stations would be not less than 0.853x 254,513 = 217,099 square kilometres and to replace fossil fuel facilities the total land area consumed would be not less than 0.853x 195,976 = 167,168 square kilometres.

The area of London’s Larger Urban Zone (LUZ) is approximately 1,579 square kms. Therefore to replace all non-renewable sources with wind

turbines would occupy a land area amounting to 217,099/1,579 = 137LUZ's and in the case of all fossil fuel facilities, wind farms would occupy an area equivalent to 167,168/1,579 = 106 LUZ's.

Conclusion

Do we really want to occupy a land area equivalent to 137 new Londons or even a small fraction of that figure in order to generate electricity? Answer-No!

Better buy some shares in the nuclear generating companies or in British Coal!

SOURCES

1/ Drax Power website

2/National Statistics website

3/ Blue canyon Wind farm website