Nuclear expert, Sue Ion, dramatically underestimates output of wind turbines

Kevin Anderson 27 Feb 2013

Professor of Energy and Climate Change
Tyndall Centre for Climate Change Research, University of Manchester

Sue Ion suggests 1500 offshore wind turbines generate the same electricity as one nuclear power station; the real number is much lower – somewhere between 250 and 600.

In Radio 4's the Life Scientific (Tuesday 26th February), Jim Al-Khalili interviewed the former technical director of British Nuclear Fuels, Sue Ion.

Early on in the programme Sue Ion emphasised how she is committed *"to try and do more to help get facts across as opposed to just let the media run with whatever they thought … sometimes stories run when they actually do have no foundation in fact"*.

Certainly the world of energy and climate change is awash with educated eloquence trumping quantitative analysis – and any attempt to rescue the latter from the former has to be welcomed.

However, despite Sue Ion's concern about energy stories often having "*no foundation in fact"*, when it came to drawing comparisons between electricity generation from nuclear and wind power her comments only added to the misinformation that pervades energy debates.

"To get a feel for the numbers" Jim Al-Khalili asked about "*the amount of energy produced by one modern nuclear power station - how may wind turbines would that need?"*

Sue Ion was very specific and categorical in her response; *"well you're talking about one thousand five hundred* [1500] *of the modern turbines out at sea. So to get the space for that is similar to that of greater London – so you'd be covering the area that is currently greater London with wind turbines – out at sea."*

The real numbers are however very different.

Over a typical year, one of the proposed new nuclear power stations would generate the same quantity of electricity (TWh) as would 250 to 600 modern offshore wind turbines … figures far removed from the 1500 Sue Ion claims.

***

The following calculations demonstrate how the 1500 estimate dramatically exaggerates the real numbers and, in so doing, inadvertently risks misleading both the public and policy-makers.

Calculations and Assumptions

The following calculations are premised on proposals for new-nuclear build, assuming full operation by 2020 and assuming the load factor is significantly improved from the UK's experience of operating nuclear stations. The figures for wind turbines similarly are premised on appropriately sited designs, with a good capacity factor and assuming turbines at sizes equivalent to the larger models now being installed and those likely to be installed before 2020.

NUCLEAR
Three reactor designs are now being considered for UK new-build.

- Areva's EPR – with a capacity of 1.6GW
- Westinghouse's AP1000 – with a capacity of 1.15GW
- Hitachi-GE's Advanced Boiling Water Reactor – with a capacity of 1.3GW

Assume an 85% load factor for all the nuclear designs

Note: this is 5% higher than is sometimes suggested should be the starting value for nuclear load factors, and is 25 percentage points above the mean UK load factor for nuclear power between 2007 ad 2011 (i.e. 60.1%).

WIND
Currently, installation of 6MW turbines is proceeding, with 8MW designs planned for installation by ~2014, heading towards 10MW within a few more years. Some companies are already proposing designs of up to 15MW per turbine. For comparing with the nuclear designs operational by 2020, these calculations assume 6 to 10MW turbine designs.

Assume a conservative capacity factor of 40% for offshore wind turbines.

For a well-sited large and offshore turbine, a 40% capacity factor is not unreasonable figure to assume. It is worth noting, as the capacity (MW per turbine) increases, so does the hub height and hence the typical capacity factor. Moreover, if sited off the West coast of the UK the capacity factor is likely to be higher still.

COMPARISON
The three nuclear designs with a 85% load factor would generate between **8.6TWh and 11.9TWh each year**

A 6MW and 10MW wind turbine with a 40% capacity factor would generate **21GWh and 35GWh/year respectively.**

Consequently, between 244 and 567 turbines are required to generate the same quantity of electricity in a year as the three proposed new-nuclear designs