Community Affairs References Committee

Social and economic impact of rural wind farms

Response to Question on Notice

25 March 2011

Question No: 2

Topic: Emissions

Question:

Senator ADAMS—The other part is the emissions. We have had some evidence about the actual building of the towers and also the manufacture of the towers. Is that calculated as well?
Mr Tonna—We have seen some studies into that. From what we have seen, as I recall, there was a relatively quick payback, if you like, of those emissions during the operation of the wind turbine. In a relatively short space of time the renewal energy generated by the turbine had offset those emissions used in its construction. I do not have the details in front of me of how long that might be. I am happy to establish what those sources are.

Answer:

In regards to advice on the Life Cycle Assessment (LCA) and the energy balance of wind farms and the sources of that information:

An LCA is an assessment of the entire lifecycle of a wind turbine (including tower, blades and foundations) from extraction and production of raw materials, to manufacturing of components, their transportation, installation, operations and maintenance, through to final dismantling and separation of components. Most current wind turbine LCAs apply the ISO 14040-44 standard *Environmental management - life cycle assessment - principles and framework* in quantifying the overall impact of a wind turbine and each of its components over an expected operating life of twenty years.

A wind turbine's energy balance reflects the time the turbine needs to be in operation before it has produced as much energy as it consumes throughout its lifecycle.
The energy balance estimates for wind turbines operating in Australia vary from four months to twelve months.

The main variables include transport of components to site, the type of foundations needed, number of turbines per site and the capacity factor of the site.

For example, a wind farm consisting of turbines of a given size, near a coastal port with the towers fabricated close by, using foundations into stable rock with a capacity factor of thirty five per cent would have a much faster energy payback period than smaller wind turbines, at an inland location with softer soil and a capacity factor of twenty five per cent.

The Department has drawn on a range of scientific and technical papers for information on LCAs and energy balance estimates. Some of these reference papers are listed below:

- *Greenhouse Gas Analysis of Electricity Generation Systems, 2000,* Christopher Dey and Manfred Lenzen.

- *Energy and CO2 life-cycle analyses of wind turbines - review and applications, 2001,* Manfred Lenzen, Jesper Munksgaard.

- *Life-Cycle Energy Balance and Greenhouse Gas Emissions of Nuclear Energy in Australia, 2006,* Integrated Sustainability Analysis, the University of Sydney

- *Life cycle assessment of a multi-megawatt wind turbine, 2007,* E.Martınez, F.Sanz, S.Pellegrini, E.Jimenez, J. Blanco.

- *Energy return on investment for wind energy, 2007,* Ida Kubiszewski, Cutler Cleveland, Peter K. Endres, Peter Saundry

- *Life cycle energy and greenhouse emissions analysis of wind turbines and the effect of size on energy yield, 2008,* R.H. Crawford.

- *Australia Energy Resource Assessment 2010 - Chapter 9 - Wind Energy,* ABARES