WIND POWER

IMPORTANT QUESTIONS AND ANSWERS

A Commentary for Politicians and Senior Bureaucrats

Here are the **simple questions** along with **simple answers** about Wind Power that need to be asked and answered **on behalf of taxpayers and power consumers**. The questions and answers are applicable Australia wide, but figures presented apply, in some cases, to Victoria specifically. The simple conclusion is reached that **generation of Power from wind saves virtually no greenhouse gas and is a monumental and total waste of money**. Detailed proof of may be found in many technical articles on the net and one particular reference is quoted for those who wish to do a little research for themselves.

Does wind power:

1. *measurably reduce greenhouse gas ("GHG") emissions from power generation* – **no, detailed analysis shows net savings are miniscule, no more than about 5% of that claimed by promoters (and supported by government);**

2. *allow the decommissioning of a single fossil fuelled power generator* – **no, not at anytime;**

3. *allow us to meet the 20% target for renewable energy contribution* – **we can meet that target just by building enough turbines, about 5600 in Victoria at a cost of about $17 billion, but would also have to build additional matching gas turbine infrastructure costing some $3 billion and we would not reduce emissions measurably;**

4. *increase energy costs* – **yes, very significantly;**

Who pays *for the increase in costs* – **the power consuming public.**

How Can This Be?

The ***unfortunate but nature driven flaw*** in the generation of power from wind is that **wind speed is highly variable over short periods of time**; and further, if the wind speed changes, the energy produced by the wind turbine changes by the cube of the change in wind speed; eg., if wind speed halves or doubles, the energy produced decreases or increases by eight times.

Compounding this, ***power grids cannot store power***; there is no economically practical way to store large amounts of power. Thus grid managers must control the power ***input*** to the grid, otherwise there will be power failures. The introduction of large amounts of highly variable and unpredictable wind power provides a significant challenge to safe and reliable management of power grids.

How Were Australian Power Grids Managed Without Wind Power?

Power producers can be categorized as providers of **base**, **intermediate** or **peak** load power.

Base load is the predictable, steady, long term load and is usually the cheapest form of bulk power that needs to be provided by the lowest cost source. **Coal** fired generators are traditionally used for this purpose, (with nuclear also being used for this purpose in some less enlightened nations). However coal has two drawbacks, it is the most polluting power source and is unable to respond in an efficient way to changes in demand.

Gas fired generators are used to provide **intermediate or "shoulder" load** (the load between base and peak load). There are two types, **open** and **closed cycle** gas generators ("OCGG" and "CCGG" respectively). OCGG's are easier to ramp up or down, but produce higher cost power and more GHG's than the CCGG's.

Accordingly CCGG's are preferentially used to meet shoulder power demand and OCGG's for peak demand, which is generally short term in nature. Gas generators produce between one third and one half the GHGs of coal generators.

Hydropower is only available in limited quantities, but has a high value as it can respond very quickly to changed requirements and is the ultimate method for balancing the grid. It produces no GHG's.

How are Grids to be Managed with the Introduction of a Significant Amount of Wind Power?

Now that we are set to introduce large amounts of wind power to the grid (in Victoria planning approvals have been granted for another **1550 MW** of wind, (equal to **18%** of the current capacity of all types of generation) the grid must have available OCGG capacity equal to the maximum output of the producing wind farms to balance, or "shadow" the wind power production. Otherwise the chronic variability of power from the wind turbines is simply unmanageable in the grid.

This OCGG capacity represents a heretofore unrecognised or unadmitted **additional cost to wind farms**; and in performing its shadowing role is a consequential additional generator of GHG's. It is this consequential GHG production **which has to be netted off against the gross GHG savings of wind** with an unfortunate result that **net savings in GHG are negligible - see table below.**

Whilst managing a grid is a moment to moment business and very complex; to estimate what is going on it is necessary to reduce the complexities to some basics. Accordingly, if we wish to calculate what happens when wind enters the grid **in significant quantities** we must add in the result of the necessary coupling of the wind facility with an OCGG; and as a result, a CCGG may and will be shut down.

Now this has a number of effects which can be summarised as follows:

	CCGG alone	**Wind/OCGG Couple**	**Change**	
Power costs	$54/MWh[1]	$121/MWh	$67/MWh	(additional cost)
GHG's produced	0.577 tonnes/MWh	0.519 tonnes/MWh	0.058 tonnes/MWh	(miniscule saving)
Capital Cost of 1,000 MW	$1.0 billion	$3.8 billion	$2.8 billion	(an incredible waste)

[1] MWh – is the measure of power (produced or consumed) in megawatt hours

So to build (and match with a OCGG) a wind capacity of 1000 MW capacity, total costs approximate $3.8 billion; whilst to build the same amount of capacity with a CCGG would be about $ 1.0 billion, ***a saving of approximately $2.8 billion.***

For the wind/OCGG "couple" the ***public is paying $67/MWH or 224% more for this portion of their electricity***. For the already approved 1,550 additional MW to be produced by wind, that amounts to $900 million extra each year. For the 20 year life of the wind/OCGG couple, the Victorian public will pay about ***$18 billion*** extra for their power.

For What?

Aren't we saving greenhouse gas emissions? Yes, but only about ***0.06 tonnes of CO_2 equivalent per MWh.*** Both the Victorian Government and the wind farm industry claim savings of about ***1.0 tonnes of CO_2 equivalent per MWh*** or ***17*** times this amount! They do this by ignoring the need to balance the variability of wind and therefore presenting a ***gross*** not a ***net*** figure. ***The net figure of GHG savings is so small that the only conclusion is that wind farms make no effective contribution to reducing GHG emissions from power generation***.

Would it make sense then just to build CCGG capacity and replace coal generation if that industry cannot deliver major improvements in pollutive emissions? Yes, and there is enough gas to do so. For every KWh of brown coal capacity so (permanently) replaced, GHG savings would be approximately 0.8 tonnes CO_2 equivalent.

Data Sources

The author has read many quite complicated articles (mostly from countries with a longer history and much greater penetration of wind turbines) on wind power and its innate problems. This material requires a degree in (preferably electrical) engineering to follow. Reducing that material to a summary for non technical readers is daunting.

The problem has to a large extent been solved by an Australian engineer, Peter Lang, who has a lifetime of experience in the power industry. He has written a paper **"Cost and Quantity of Greenhouse Gas Emissions Avoided by Wind Generation"** dated 16/2/2009 with references to some 17 other papers that have been used in his work.

The author has worked independently to produce figures on the same topic and has arrived at figures which support Lang's work, but has used Lang's numbers in this commentary.

P. R. Mitchell, Chairman
Science and Economics Committee
Australian Landscape Guardians Association Inc.