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The grim cost of firming up solar and wind

Alan Moran

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20 March 2024

The ‘transition’ of the electricity supply industry has been forced by government subsidies to renewable energy generators with increased impositions on coal and gas with higher royalty charges and bans playing a secondary role. The first subsidies were introduced by John Howard in 2001 as the Mandatory Renewable Energy Target. He later described this as his worst political decision. It required electricity

retailers gradually to include wind or solar to comprise 2 per cent of their additional energy. This was quantified as 9,500 megawatt hours.

These measures pandered to concerns about the global warming. They also responded to lobbyists, who wheeled out experts claiming that renewable energy technology would follow a variation of Moore's Law, where computer chip performance doubles every two years. The application of this to electricity supply, it was argued, just needed a short-term leg-up.

Time has demonstrated this to have been spurious. The need wind and solar facilities have for subsidies, far from withering away, has escalated.

The initial measure provided a subsidy to renewables (and cost to consumers) growing to about $380 million per year. To his credit, John Howard resisted pressures to increase this but the Rudd/Gillard governments and state governments vastly expanded the support with new schemes for rooftop facilities and budgetary expenditures. The Turnbull and Morrison governments further expanded the subsidies, which at the outset of the present government's tenure amounted to $9 billion per annum.

The Albanese government has introduced a number of additional measures. These include the Safeguard Mechanism, which requires the major carbon-emitting firms to reduce their emissions by 30 per cent by 2030 or buy the equivalents in carbon credits. The cost is conservatively estimated at $906 million per annum.

The government is also set to introduce the Capacity Investment Scheme involving power purchasing agreements designed to attract $68 billion of spending on additional wind, solar, and batteries. The

best estimate of the cost to the taxpayer is $5,775 million per annum. In addition, the government is expediting the transmission roll-out.

Present subsidy levels are estimated at $15.6 billion per annum.

Subsidies to renewables ($ million per annum)

• Grid scale wind and solar		$1460
• Rooftop solar		$1503
• The Safeguard Mechanism requiring 30 per cent emission reduction or carbon credit purchase by large emitters		$906
• System security		$400
• Clean Energy Regulator		$750
• State Schemes (2019)		$1408
• Capacity Investment Scheme $68B investment by 2030 ($10.3B per year) 55 % of costs to governments		$5775
Long term (assume 15 year annualised)	Fund	Annualised
• Hydrogen Headstart	$2B	$133m
• Expansion of transmission from $23B to $100B	$77B	$510m
• CEFC	$20B	$1333
• ARENA	$1.5	$100
• Snowy 2	$20B	$1333
• **TOTAL**		**$15,611**

The effects of subsidies have come in three phases.

The first was in the decade after 2003 when renewables progressively increased their market share as required by regulations. By 2014/15, wind and solar had grown to about 7 per cent of the electricity market. The subsidised supplies placed downward pressure on the market price as well as taking market share from coal. That outcome was intensified by new Queensland gas supplies coming on stream. Without access to export ports, that gas was redirected to domestic electricity generation and the share of gas supplies in the National Electricity Market increased from 8 per cent to 12 per cent. Gas now has more lucrative markets overseas and governments are exerting pressure on the producers to allocate more than is commercially sensible to the domestic market.

This first phase came to an abrupt end when low prices and higher supplies forced major coal generators, Northern Power in South Australia and Hazelwood in Victoria, out of the market.

Those market exits led to a second phase, whereby reduced coal capacity brought a trebling of wholesale market prices from their 2015 level of $40 per megawatt hour (MWh). Covid caused a temporary downward blip but the wholesale price is averaging $119 per megawatt hour in the March quarter, 2024.

These higher prices reflect the higher cost of wind and solar and will continue to prevail and, in fact, increase. Price increases may be concealed by governments entering into power purchasing agreements but this means subsidies financed by taxpayers rather than electricity users.

The subsidies to wind and solar have now resulted in their market share growing from zero 20 years ago to over 30 per cent. This is ushering in the third phase of the 'transition', which involves desperately seeking ways to firm up the intermittent and largely unpredictable electricity supply from wind and solar.

Gas, coal, and nuclear can operate pretty much continuously and without special storage facilities, but weather and nightfall limit solar to generating only 20 per cent of the time and wind to about 30 per cent. And electricity supply from wind and solar generators is highly variable.

With wind and solar at their current market share, coal and gas can fill their troughs in supply, albeit unprofitably. But the policy in all Australian government jurisdictions is to force coal and most gas out of the market. Moreover, coal (and, for that matter, nuclear) is

technically ill-suited and costly to be used as a back-stop to variable wind and solar supplies. 'Social licences' aside, new coal or nuclear plants could not be commercially built except as near continuous baseload.

Other means of 'firming' wind and solar supplies are therefore increasingly required. One such is the conversion of Snowy Hydro into a pumped storage facility. Pumped hydro generates by releasing water when alternative supplies are short and uses electricity when it is in excess supply (and therefore cheap), to pump the water back uphill. Batteries supply and replenish on a similar basis.

Snowy 2 is planned to provide 376 megawatt hours of storage. The Capacity Investment Scheme is an attempt to augment this, though, notwithstanding its name, it earmarks 70 per cent of its intended power purchasing agreements simply for more wind and solar. These add nothing to replacing the dispatchable (controllable) power being lost from the forced retirement of coal plants. The Capacity Investment Scheme will add just 36 gigawatt hours of storage from the 9 GW of facilities planned to be contracted.

The Australian Market Operator's (AEMO) Integrated Systems Plan for 2050 envisages a total storage capacity of 642 gigawatt hours for a system double the size of the present one and overwhelmingly powered by wind and solar. This is utterly inadequate for backing up intermittent power.

Francis Menton has assembled a wealth of evidence of how much storage a renewables system would require. He authored a major report for the Global Warming Policy Foundation as well as many other papers like this. Basically, his work shows that a wind and solar system, if it is to provide a secure and reliable electricity supply,

requires some 26 days of storage. For Australia, this means 13,000 gigawatt hours of storage, which is 25 times what the AEMO Integrated Systems Plan envisages.

The highly regarded GlobalRoam consultancy estimated that the National Electricity Market (which excludes Western Australia), with perfect planning and no losses in storage or transmission, would require at least 9,000 gigawatt hours of storage. The costs of this, at $US 350 per kWh, would be three times Australia's GDP for batteries that would need to be replaced every 12 years.

It might be argued that Germany, with little storage back-up, already has wind and solar providing 45 per cent of its electricity and, although it has some of the world's highest prices, its supply is reliable. But Germany also has access to supplies from Polish coal and French nuclear power to firm up its wind and solar. Australia has a stand-alone system.

Our politicians are plunging us into a perilous future. Policies have already given us an electricity supply system with costs that cannot support energy-intensive industries. Those policies are now poised to bring about lower reliability than is compatible with a first-world economy.