THE HIDDEN COST OF CLIMATE POLICIES AND RENEWABLES

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Regulation Economics
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Executive Summary

Australia's excessively high electricity prices are undermining our economic resilience and competitiveness and cutting our standards of living. Since 2002 Australian governments, in a misguided quest to reduce carbon dioxide, have introduced climate policies at the expense of cheap coal and gas power. Our electricity prices, once the lowest in the world, have become one of the most expensive.

This report, commissioned by Senator Malcolm Roberts, undertakes a comprehensive analysis of climate policies and renewable energy subsidies. Australians will be shocked to know the true financial burden of these policies on households and industry. These hidden costs drive up all costs of living, including electricity, food, water and transport.

In summary, the report states the financial impact of climate policies and renewable subsidies:

- costs households at least $13 billion annually, or around $1300 per household;
- accounts for 39% of household electricity bills, not 6.5% the Government typically quotes;
- causes a net loss of jobs in the economy; with every green subsidised job created, 2.2 jobs are lost.

This analysis shows the cost of these climate policies to household electricity bills is an extra $536 per annum, significantly more than the touted $90 per household per annum. In effect the government-imposed climate policies and renewable subsidies account for 39% of householders' electricity costs. The total cost to households, if we add the higher electricity costs passed on through businesses, equals $13 billion or $1300 per household.

Australians have been kept in the dark regarding the true costs of climate policies which are driving up our everyday cost of living. In a true market economy wind and solar power are spectacularly unviable and currently cost taxpayers $8 billion per year. Even with nearly two decades of increasingly favourable policies and subsidies, the renewables industry has yet to grow up and show itself beyond a fledging and dependent infant, acting as a parasitic malinvestment on our energy system.

The true cost of electricity would be $13 billion per year less if cheap and reliable coal production was not lumbered with misguided climate policies that force investments in renewables. The ongoing subsidies to renewable power provide a huge and distorted market advantage, and by default, reduces the market for low cost coal-based power generation. This market distortion increases the wholesale prices of electricity to $92.5 per MWh, up from $45.4 per MWh.

The renewables industry gloriously claims job creation yet fails to disclose the full story. Studies, notably one from Spain in 2009, show that if a government's so-called "green" energy subsidies and advantageous regulations were directed at the broader economy, 2.2 more jobs would be created for each "green" job.

Investment in supposedly green energy is a malinvestment. Governments have taken liberty and licence to both blatantly distort and exclude key facts to keep Australians literally in the dark about the inflated costs and future unreliability of our electricity system.

It defies all sense that Australia's average price per kwh for electricity is three times that of India and China when they are using our coal. All Australians have a right to benefit from our rich natural resources and governments have an obligation to foster high growth environments for Australian industry, and support high standards of living for all of us. The parasitic and hapless renewables industry will provide neither.

Despite Australia's Chief Scientist stating that Australia's efforts to reduce carbon dioxide will have virtually no effect on global temperatures, climate change policies persist and add alarmingly high costs to households.

My conclusion is that the way forward must involve the termination of all regulatory favours which uniquely reward renewable energy supplies and the cessation of budgetary support for all energy supplies. Such reform measures include ceasing to subsidise transmission links and other grid measures to compensate for the inherent deficiencies of the weather-dependent wind and solar.

Summary Points

- As a result of climate change policies, Australia's electricity supply, having been amongst the lowest cost in the world, has become high cost and unreliable.
- Direct charges on households as a result of climate change policies account for 6.5 per cent of electricity prices or $90 per household, according to the Australian Energy Market Commission. But a more comprehensive accounting brings the price increase of these measures to $536 per household, with the subsidies amounting to 39 percent of costs.
- As well as regulatory subsidies to renewables, the more comprehensive cost accounting includes:
    - Taxpayer subsidies to renewable energy;
    - Consequential increases to wholesale prices (temporarily low at present due to COVID-19) due to forced closures and cost impositions on coal generators;
    - Additional costs of transmission; and
    - Further administrative costs.

Table A1

Household electricity costs: comparison of AEMC^ and total costs 2018/19 ($)

	AEMC	Subsidy Free Cost	Subsidy Free Decrease
Government regulations	90	0	-90
Government fiscal subsidies	0	-151	-151
Network costs	601	531	-70
Wholesale costs	540	321	-219
Residual costs	140	135	-5
Total	**1371**	**835**	**-536**

^ Australian Energy Market Commission

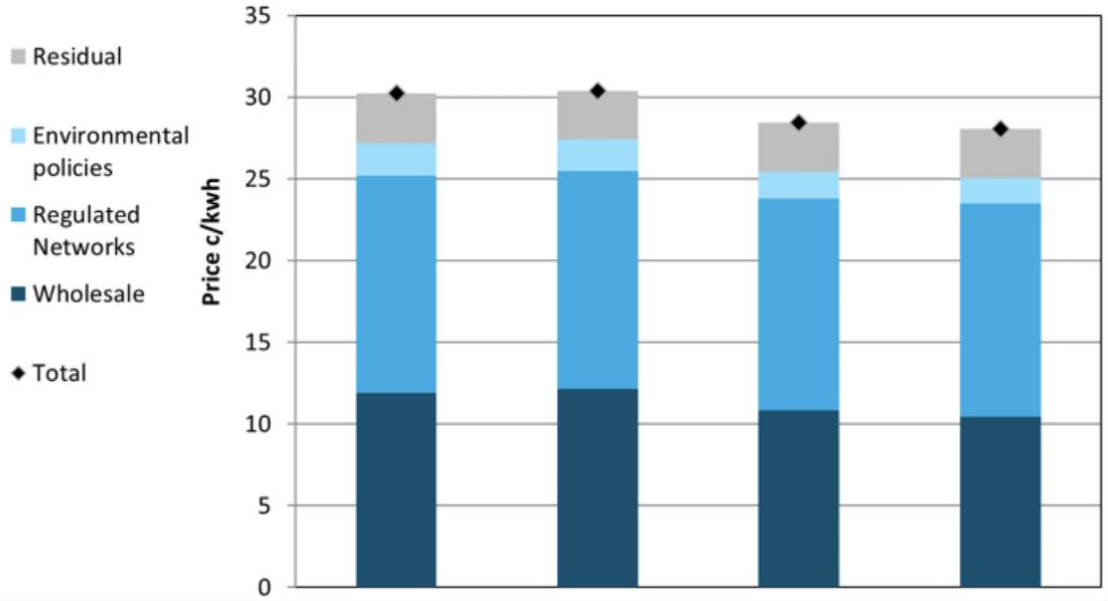
- Households take up half of total supply, hence national costs are likely to exceed $13 billion. An alternative "top down" estimate, using aggregate national data would place the annualised cost at $14.9 billion.
- In addition, there are costs, including $8 billion a year of wasted investment spending on wind and solar facilities that are unviable without subsidies.
- Though proponents of renewable energy claim that it brings about increases in jobs and associated economic activity, the opposite is the case. Because the renewable energy displaces less expensive, more reliable supplies it means higher costs, reduced productivity and few jobs.

1. Costs of Government Environmental Policies

1.1 The Different Costs Involved

The Australian Energy Market Commission (AEMC) undertakes an annual comprehensive collection of electricity costs for households and allocates these to different features of the supply. The following summarises the costs assessed in December 2019.

Table 1: AEMC estimated composition of household costs



	2018/19 Base Year		2019/20 Current Year		2020/21		2021/22	
	c/kwh	$/year	c/kwh	$/year	c/kwh	$/year	c/kwh	$/year
Environmental policies	**1.98**	**$90**	**1.94**	**$89**	**1.67**	**$76**	**1.51**	**$68**
LRET	0.77	$35	0.64	$30	0.40	$19	0.27	$13
SRES	0.68	$31	0.74	$34	0.67	$31	0.62	$29
Jurisdictional Schemes	0.35	$16	0.39	$18	0.39	$18	0.41	$18
Efficiency Schemes	0.18	$8	0.18	$8	0.20	$8	0.20	$8
Regulated Networks	**13.28**	**$601**	**13.36**	**$604**	**12.94**	**$584**	**13.06**	**$590**
Transmission	2.22	$101	2.09	$95	2.18	$100	2.28	$105
Distribution	10.05	$456	10.34	$468	9.88	$446	9.90	$448
Metering	1.01	$44	0.93	$41	0.88	$38	0.87	$38
Wholesale	**11.90**	**$540**	**12.14**	**$550**	**10.84**	**$496**	**10.45**	**$477**
Residual	**3.05**	**$140**	**2.92**	**$132**	**2.97**	**$134**	**3.04**	**$137**
Total	**30.21**	**$1,370**	**30.35**	**$1,375**	**28.42**	**$1,290**	**28.06**	**$1,273**

Source: AEMC analysis

Note: * Note that the figure excludes Northern Territory due to the lack of information from the jurisdiction – See the notes at the start of the report for further details.

(LRET is the Large-scale Renewable Energy Target; SRES is the Small-scale Renewable Energy Scheme largely in support of roof top installations).

For 2018/19, this puts energy costs at 39.4 per cent; network costs at 44 per cent; environmental costs at 6.5 per cent and the residual (retail) at 10.1 per cent.

The Australian Energy Regulator (AER) (p.239) has different estimates - 33 per cent for energy, 43 per cent for networks, 8 per cent for environmental costs and 16 per cent for retail. The Australian Bureau of Statistics (ABS) has a far higher estimate of household electricity costs ($1,827 in 2018/19), while the Australian Competition and Consumer Commission (ACCC) (p.13) put it at $1,549 for 2017/18. The ACCC estimates wholesale costs at 33 per cent of household bills, 36 per cent for small and medium enterprise and 50 per cent for large businesses.

The identified (6.5 per cent) environmental costs ($90 per household, $855 million in aggregate) are not, nor are they claimed to be, a comprehensive measure. The AEMC's assigned costs include only those directly impacting on households. These are in the form of regulatory requirements imposed by governments on electricity customers via electricity retailers. Other costs, all of which are passed on to consumers or taxpayers, comprise:

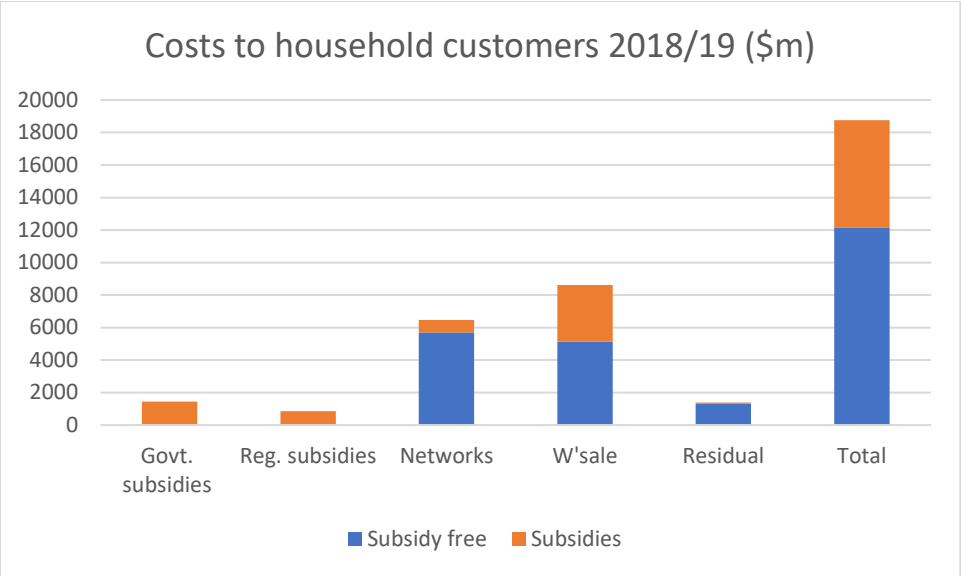
- Fiscal subsidies estimated at $1,438 million. ($151 per household);
- Consequential costs of higher wholesale prices due to subsidised electricity forcing the closure of unsubsidised plant and preventing new such plant from being built; the 2018/19 wholesale price at $92.5 per MWh is increased from an underlying price of $55 per MWh, a cost per household of $219 or $3,496 million in aggregate. Prices, at July 2020, have been driven down due to the COVID-19 crisis but these lower levels cannot be maintained, with present policy settings, unless the world economy fails to recover;
- Additional costs to accommodate the intermittency and low strength of wind and solar. These, fifty per cent of which are allocated to households, include:
    - Costs incurred by the market operator to accommodate the greater minute-by-minute supply and demand imbalances inherent in wind/solar rich systems; these costs are estimated at $5 per year per household or $50 million in aggregate);
    - Longer term costs of $15,975 million, entailing annual charges of $1,512 million, on reserve plant, including Snowy 2.0, the Tasmanian Marinus link and other new transmission lines but excluding Renewable Energy Zones' cost. Households are apportioned half of these costs ($756 million or $70 per household).

Building upon the AEMC 2018/19 data, **Table 2** and **Chart 1** show a 54 per cent increase ($6,594 million) in annual costs to households ($598 per household, equivalent to 1.6 per cent of median income after tax and Medicare) from government interventions.

Table 2: Household cost increases from government policies 2018/19

Household cost increases from government policies 2018/19 basis ($M)	
Government regulatory subsidies	855
Government fiscal subsidies	1,438
Induced price increases	3,496
Increased network costs	756
Increased admin. costs	50
Total	**6,594**

Chart 1: Electricity market's increased costs and prices due to regulatory measures



The chart is synthetic as it includes charges (for example increased network fees) that are in train but were not levied in 2018/19. Some increased costs have not been included, for example, those incurred by retailers and regulatory management to administer the greater complexity of inputs required by regulations.

The cost increases in **Chart 1** cover only those falling directly on households. Households account for about half of electricity demand, though in the end, consumers pay all the costs.

In addition to these costs, the subsidies to large-scale renewables brought about wasted investment of $58 billion, 2007 - 2018; for rooftop facilities the wasted investment was $23 billion, 2011 - 2019. Hence, in addition to their direct costs, the subsidies bring about an average of $8 billion a year in parasitic malinvestment.

The outcome of the higher costs imposed by governments not only means increased charges to households as electricity consumers and taxpayers but a loss of highly productive energy-intensive industries. Modelled estimates are that real wages are 23 per cent below the level they would be without the regulatory intrusions which also result in over half a million fewer jobs.

Australia's green energy subsidies have transformed the nation from having the cheapest electricity among major global entities to one of the dearest. For households, the average Australian price at 25 (US) cents per kwh, is three times the average price in India and China, which do not have our cheap coal, and almost twice that of the US (the average of which is boosted by some states' green policies). We do, however, remain better placed than Germany, where the "Energiewende transition" has brought prices to 36 cents per kwh.

1.2 Subsidies to Renewables and Other Climate Change Measures

1.2.1 The Commonwealth Subsidies

Assembling the hundreds of different programs and estimating their costs is very difficult. Even the Commonwealth offers no comprehensive specification of the programs across different departments, though in earlier times – perhaps because a headline figure was viewed as unambiguously positive - such an exercise was undertaken.

For 2009/10 the aggregate spending on climate change and energy identified in the Commonwealth budget was $891 million (about $1,070 million in 2019 dollars). The summation in 2009/10 not only included the climate change department but other departmental spending in Treasury, Trade, CSIRO and Industry.

Commonwealth budget spending in 2018/19 identified for only the Energy and Environment department was $2,418 million. On this measure alone, what was sold as a temporary subsidy to expedite the take-up of renewable energy, confidently predicted to be on the cusp of being cheaper than electricity from fossil fuel, has turned out to require ever-increasing subsidies. As with so many previous government interventions, the renewables "infant" industry, while a marketing triumph for its exponents, has been unable to grow up and is consuming ever-increasing resources just to survive.

The Commonwealth readily identifiable budget subsidies for 2018/19 are shown below.

Table 3: Renewable energy outlays in the Commonwealth budget

CEFC commitments	1,460
CEFC costs	66
Clean Energy Regulator expenses	436
Clean Energy Regulator Dept appropriation	76
ARENA New projects	188
ARENA Operating costs	29
Department reducing GG emissions/adapting	50
Department energy programs	109
Support for GCCS; $75 million over 18 years	4
TOTAL	**2418**

(CEFC is the Clean Energy Finance Corporation; ARENA is the Australian Renewable Energy Agency; GCCS is the Australian government funded Global Carbon Capture and Storage Institute)

1.2.2 Commonwealth Regulatory Subsidies

When Prime Minister John Howard announced the proposal to introduce a Mandatory Renewable Energy Requirement scheme in 1997, he said it was for an additional 2 per cent of electricity by 2010 that was to come from "renewable or specified waste energy". Although an additional 2 per cent by 2010, on the basis of the consumption that year of some 250,000 GWh would have been 5,000 GWh, the MRET target was eventually set at 9,500 GWh. The requirement is set annually with retailers obliged to meet a quota which they can buy from producers of the eligible supplies. This price of such sales is reported.

A review of the scheme in 2004 (the Tambling Review) recommended the target be increased to 20,000 GWh by 2020. In June 2004 the Commonwealth announced that it did not believe expanding the target was economically justified and that it did not intend to increase the requirement. The scheme has however gone through other changes and is now fixed at a maximum of 33,000 GWh, a level that will be reached (actually slightly exceeded) in 2020.

In 2010 the 9,500 GWh limit was reached and the price (subsidy) that year averaged $37 per MWh, hence the cost was $372 million (about $410 million in current dollars). The government in January 2011 divided the scheme into large and small scale (roof-top) facilities with the former being increased to 41,000 GWh with the subsidy price having a de facto ceiling at $92 per MWh. The units installed under the Small-Scale Renewable Energy Scheme (SRES) have no limits but the subsidy to them has a price capped at $40 per MWh. The SRES subsidy is paid up-front for the estimated energy produced over the life of the installation and is used to defray the installation's costs.

The costs of the schemes in 2020 are shown in **Table 4**.

Table 4: Costs of Commonwealth off-budget renewable regulations

	Number (MWh)	Price per MWh	Cost
Large Scale (LRET)	33.7 million	$41.75	$1406 million
Small scale (SRES)	42.6 million	$39.40	$1681 million
TOTAL			**$3087 million**

This brings the identified annual cost of the Commonwealth budget and regulatory expenditures to $5,500 million. Confirming the specious nature of the claims on which these subsidies were sold - that they would wither away – the subsidies have risen fourfold over the past decade; this year's spend compares with the 2009/10 cost of $1263 million (about $1,480 million in current dollars).

1.2.3 State Schemes

With the exception of Western Australia and Tasmania, all states and the ACT have policies supporting renewable energy that are in addition to those of the Commonwealth. These are addressed below (the Northern Territory programs are excluded because they are too difficult to quantify).

The NSW, Victoria, South Australia and ACT programs comprise both direct budgetary financed support and regulatory cost impositions (in 2016, Queensland redirected its "Solar Bonus Scheme" from a charge on electricity consumers to one paid from the state budget). The AEMC estimates the costs based on the schemes amount to $457 million plus the Queensland Solar Bonus Scheme. As with the Commonwealth costs, the AEMC excludes state budgetary outlays from household regulatory costs.

State schemes' costs are included in **Table 5**.

Table 5: States' climate change program spending

			($M)	Total ($M)
NSW	Regulations:	CCF, ESS	346	
	Expenditures		40	386
VIC	Regulations:	FiT, VEU	215	
	Expenditures		166	381
QLD	Regulations:	SBS	270	
	Expenditures		113	383
SA	Regulations:	FiT, REES	81	
	Expenditures		111	192
ACT	Regulations:	EEIS, FiT	39	
	Expenditures		27	66
Total				**1,408**

(CCF is the Climate Change Fund; ESS is the Energy Savings Scheme; FiT is the Feed-in Tariff; SBS is the Solar Bonus Scheme; REES is Retailer Energy Efficiency Scheme; EEIS is the Energy Efficiency Improvement Scheme).

State and Commonwealth schemes therefore cost taxpayers and electricity consumers **$6,913 million per annum**.

Not included are other state supports for industry that have been made necessary by the renewable programs. Significant among these is the $300 million committed by the Victorian government to support the Alcoa smelter that has become unprofitable as a result of electricity price boosts brought about by renewable subsidies that forced the Hazelwood power station's closure.

1.3 Wholesale Price Increases Caused by Renewable Subsidies

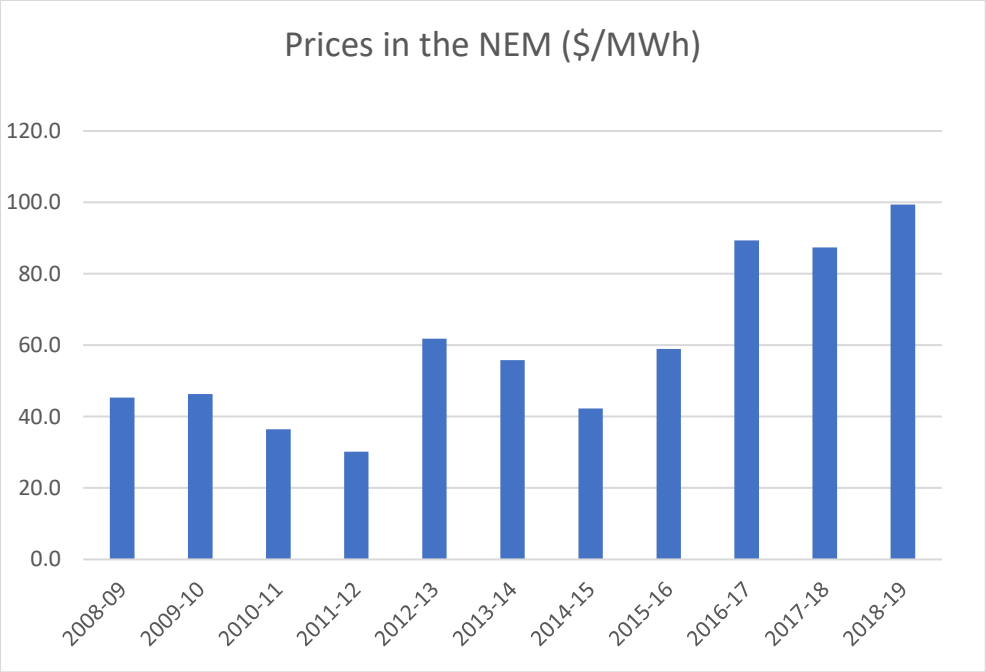
A case was made, including to the 2014 Warburton Review, that the subsidies to renewable energy would place downward pressure on all prices since the renewables would bid into the electricity market at or near to zero, forcing other generators more frequently to match this bid.

While this might have had plausibility at that time, the collapse of the Northern and Hazelwood power stations in 2016-2017 demonstrated the fallacy that subsidies to some producers could bring about a sustained fall in general prices. The subsidies to renewables may have suppressed prices but their more important effect was to reduce the output of the highest cost coal power stations, thereby reducing overhead contributions, and causing enforced stop start operations bringing about increased wear-and-tear costs. In addition, the general hostility of governments to coal generation created a further risk factor that deters expenditure on maintenance and reduces incentives to invest in new plant.

Average prices in the NEM rose rapidly with the closure of the Northern and Hazelwood power stations. Though prices have collapsed due to the COVID-19 pandemic, in the longer run, prices are determined by new entrants' costs. The cheapest available renewable, wind, with firming contracts to counter its volatility costs over $90 per MWh **(see Appendix 1).**

The average wholesale price for the years 2008/09 - 2014/15 was $45.4 per MWh and more than doubled to over $92.5 per MWh in 2018/19. This increase is purely because of the effect of climate policies and renewables. The cost of coal is not a factor: the limitless supply of Victorian brown coal is not transportable and is priced at its mining cost plus the state tax, which is incorrectly called a royalty and was trebled in 2016, imposing a cost of $2-3 per MWh; black coal of the quality required for domestic generators is also abundant and its price is not markedly influenced by international trends.

Chart 2: Average wholesale electricity prices



With a market of 215 GWh, at a price of $92.5 per MWh, turnover is just under $20 billion. Added to this are other costs including for contracts and ancillary services.

Some estimate of what the wholesale price might have become in a market undistorted by government regulations and subsidies can be gained from assessing the price of new coal generation in Australia. A market-oriented electricity supply sector would likely be similar to that prevailing 20 years ago – it would comprise 85 per cent black and brown coal with about 15 per cent gas and hydro mainly to supply peak and fast start balancing needs.

The International Renewable Energy Agency (IRENA) estimates the cost of electricity from new coal plant at between US$50 per MWh and US$177 per MWh. The cost of plant itself is internationally standard but the cost of transmission and fuel is highly variable, as is construction cost. For Australia, rigorous analysis by GHD/Solstice for the Minerals Council estimated a new High Efficiency Low Emissions black coal generator would be profitable at an energy price as low as A$40 per MWh. Australian coal's locational advantages were the key to this low cost, offset somewhat by a "CFMMEU" union loading disability (bringing labour costs 25 per cent above the level prevailing without unionised rigidities). Wind means these facilities must operate at much less, increasing the overhead costs and with high maintenance costs due to stop-start operations. **See Appendix 1** for generator cost details.

An average cost of $55 per MWh would provide good returns on investment. A new coal generator at Kogan Creek was commissioned in 2007 when the market price was significantly below this.

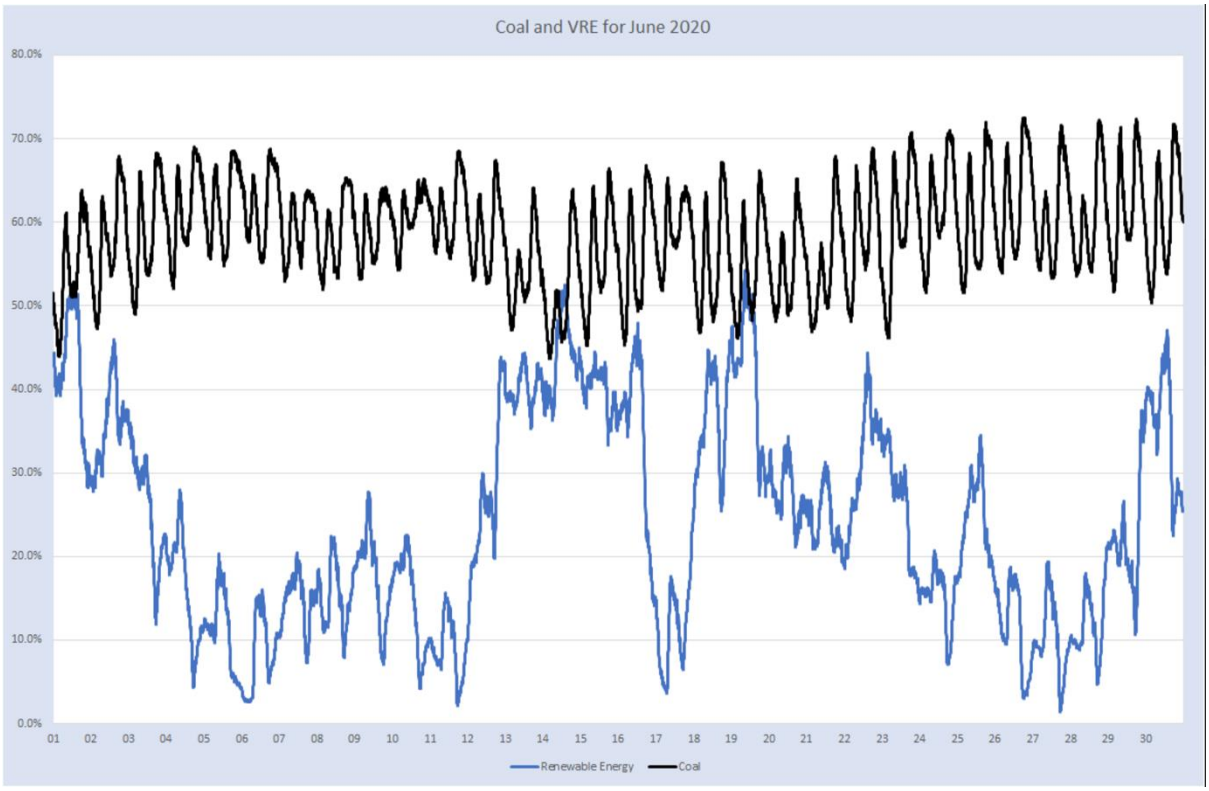
It follows that the price prevailing in the 'COVID-19 normal' market of $92.5 per MWh is $37.5 per MWh (68 per cent) in excess of what we would see in the absence of the government induced market distortions.

1.4 Increased Costs Due to Reduced Reliability of Renewables

1.4.1 Volatility and Unpredictability of Wind and Solar Supplies

The volatility of wind and solar - variable renewable energy (VRE) - is illustrated by the energy supplied by renewables in the typical month of June 2020 as compiled from AEMO data by Mike O'Ceirin. For coal, the black line, supply as a proportion of capacity is fundamentally determined by the station operators. The volatility of the wind supply is purely as a result of its availability.

Chart 3: Daily coal and wind/grid solar supply June 2020

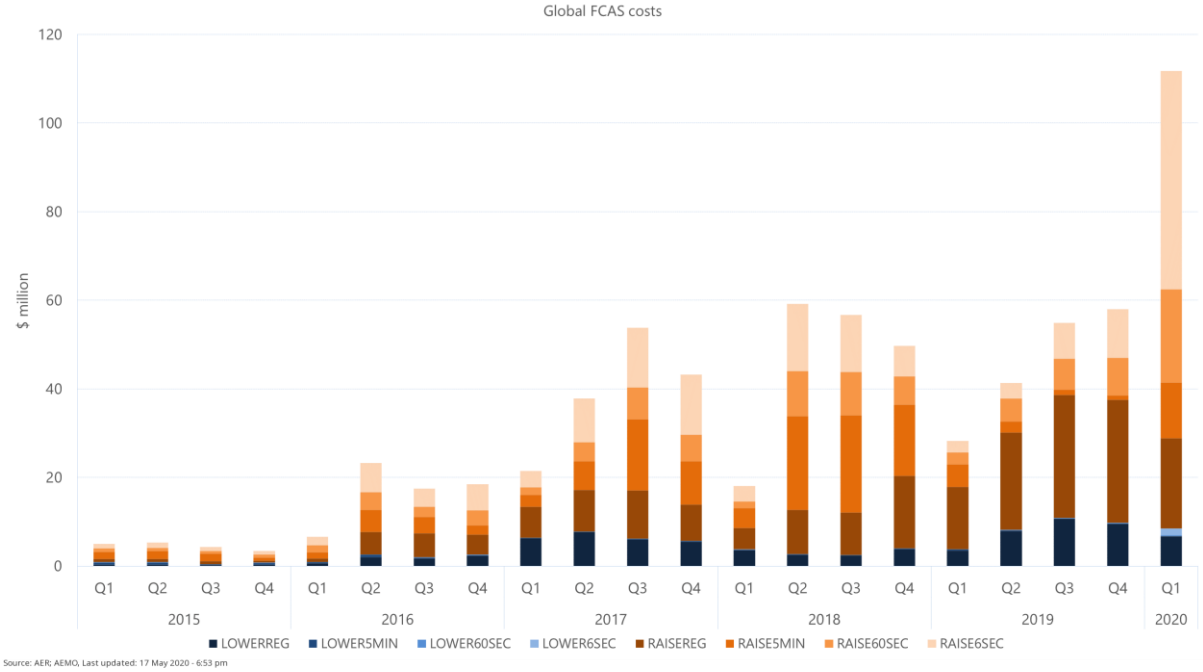


Policy expenditures to offset the irregularity of increasing wind and solar supplies are discussed below.

1.4.2 Increased Operating Costs

Frequency control, a major part of ancillary service costs required to balance supply and demand have risen markedly. Once comprising some $10-15 million per annum, the latest year saw them at over $110 million

Chart 4: AEMO market management costs



Increased ancillary costs to allow the safe operations of a wind/solar rich system have increased by $90-100 million per annum.

1.4.3 Costs of Adapting Hydro Plant to Become Firming Plant for Renewables

Snowy 2.0

The Snowy Hydro expansion is designed to smooth out the bumps in electricity supply in Australia's "transition" to renewables. The Snowy 2.0 project is supposed to allow a solution storing renewable energy for when it is needed.

The project's cost and time estimates have blown out massively. One estimate puts the likely costs of Snowy 2.0, including the transmission upgrades, at no less than A$10 billion with the scheme unlikely to be finished before 2027. In its conversion to a pumped hydro facility, Snowy 2.0 loses 30 per cent of its current gross energy deliverables. And Bruce Mountain's analysis suggests that less than half of the extra pumped hydro capacity promised by the project can be delivered.

Another estimate notes the cost of the project itself is $5.1 billion. The National Parks and Wildlife (NPWS) submission puts the transmission costs at over $2 billion and the pumped storage and associated costs at $8 billion.

Marinus Line

The conversion of Tas Hydro into a system that would balance the renewable rich mainland supply is being called the Battery of the Nation. One reason for this is because the scheme under NEM rules would require Tasmania to pay half of the costs. Not only would the state be unable to accommodate such an investment, but the state would also lose its current ability to ensure that its own consumers usually get electricity at a discount from those in Victoria. (The existing Basslink facility is controlled by Tas Hydro).

Matthew Warren estimates that rolling out two new 750MW cables alongside the existing Basslink line will cost about $3.5 billion. AEMO (ISP p.90) puts the likely cost at $5 billion.

1.4.3 Other Increased Transmission Costs

The Issues

Twenty years ago, at the outset of the National Market, the intention was for generators which gained benefits from new links to finance the transmission augmentations. Except for the shallow connections to the main grid, that sound approach has since been discarded.

This is especially relevant to grids designed specifically for renewable supplies. In a 2015 PNAS article, Jacobson et al claimed that with appropriate care electricity grids could operate with 100 per cent renewables. A study also published in PNAS by Clack et al, found that the "analysis involves errors, inappropriate methods, and implausible assumptions." Jacobson sued for $10 million in damages. A court and subsequent appeal found there were no grounds for doing so and that the lawsuit was purely to silence debate. The defendants (the journal and Clack) have now filed for $600,000 damages under anti-SLAPP — for "Strategic Lawsuit Against Public Participation".

To allow the delivery of dispersed renewable energy supplies to customers, four major transmission projects are underway. These will require customers, not the supplier businesses, to provide the finance. In addition, there are Renewable Energy Zones (REZs) that are receiving government funding for their evaluations.

The logic behind requiring customers, not the supplier, to pay for transmission augmentations is that the resultant increase in supplies will bring price reductions, both from the lower cost supplies that become available and, as a result of this, from lower prices forced upon existing suppliers. Justification for the imposition of the costs on customers is on the grounds that there are many suppliers using the new facility and they would find it impossible to form alliances to collectively finance the augmentation. In addition, the claim is made that the existing links were not financed by the suppliers benefitting from them.

Regardless of the merits of these claims, it is unlikely that the authorities would agree to requiring customers to finance new transmission lines to service politically incorrect electricity supplies – coal, gas or nuclear - even if these were to service multiple suppliers.

Project EnergyConnect

Project EnergyConnect is to connect South Australia and New South Wales. The project will supplement the two existing links from Victoria and allow the export of surplus power from wind in South Australia and the import of NSW power into South Australia when wind and solar supplies are low.

Construction of the new interconnector is expected to cost A$1.52 billion. It will be 900 kilometres long, from Robertstown, SA to Wagga Wagga, New South Wales. It is proposed to have a spur from Buronga to Red Cliffs in Victoria. Assessment of the Regulatory Investment Test for Transmission (RIT-T) began in June 2019.

Victoria to New South Wales Interconnector West (VNI West)
The options for this extension are costed at **Appendix 2**, together with the various alternative routes. The likely selection will cost $1,675 million (comprising VNI 6 plus expansions A and B of the alternatives).

Victorian Battery Proposal
The *National Electricity (Victoria) Act 2005* (Vic) (**NEVA**) has been amended to give the Minister for Energy, Environment and Climate Change certain powers to modify or disapply sections of the National Electricity Law (NEL) and the National Electricity Rules (NER) as they relate to specified augmentations, specified augmentation services or specified non-network services in respect of the Victorian Transmission Network. Under section 16X of the NEVA, AEMO is also conferred additional functions.

The Victorian Government's "System Integrity Protection Scheme" (SIPS 2020) is a procurement process that AEMO is undertaking at the request of the Victorian Government. The intention behind this scheme is to allow additional import of electricity over the Victoria to New South Wales Interconnector (VNI) of up to 250MW at peak times.

The Minister has made an order under section 16Y of the NEVA in relation to the Victorian Government SIPS 2020 procurement process. This is separate to the procurement processes that AEMO is currently undertaking for transmission augmentation projects under the National Electricity Rules. Costs are not yet known.

Western Victoria Transmission
Working through the normal procedures used to justify transmission expenditures charged to consumers, this proposal is estimated to cost $370 million and deliver gross market benefits of $670 million and net market benefits of $300 million (all figures in present value). This net market benefit is said to be achieved through:

- Significant reductions in the capital and dispatch cost of generation.
- Facilitation of future transmission network expansion.
- Improvements to the Victoria to New South Wales interconnector transfer limit.

The justification is premised on Western Victoria experiencing significant committed renewable generation development, with large amounts of additional generation expected to be operational. Around 2,000 megawatts (MW) of committed new renewable generation will be built, or is undergoing commissioning, in the Western Victoria region by 2020.

Generators connecting to the 220 kv transmission system in Western Victoria are expected to be heavily constrained by the thermal capacity of the existing transmission network. AEMO says it expects that these limitations, if not addressed, may result in:

- Inefficient development of new generation – new generation is likely to be developed in areas with lower quality resources but higher transmission network capacity.
- Inefficient generation dispatch – generation in Western Victoria is likely to be constrained due to limited transmission network capacity, requiring more expensive generation to be dispatched at a higher price. These inefficiencies are expected to lead to higher costs to consumers.

Appendix 3 illustrates the route proposed.

Expansion of Queensland New South Wales Interconnector (QNI)
The AER approved the Regulatory Investment Test for Transmission (RIT-T) on 30 March 2020. This determination supports the options assessment, costs and net benefits of the QNI project. Costs are put at $230 million.

Renewable Energy Zones (REZ)
AEMO has identified 34 Renewable Energy Zones, which it is evaluating with a view to forcing consumers to embark on yet another spending spree to augment the vast subsidies that the dispersed natures and high cost of renewable wind and solar require.

Those given Immediate Priority include:

REZ 6 – Darling Downs 3000 MW
REZ 9 – Central NSW Tablelands 1000 MW
REZ 15 – Moyne (VIC) 2000 MW
REZ 21 – Northern SA 1000 MW
REZ 29 – Tasmania Midlands 300 MW

High priority includes:

REZ 5 – Fitzroy 2000 MW
REZ 13 – Murray River 2,200 MW
REZ 19 – Mid-North SA 250 MW
REZ 28 – North-West Tasmania zero

All of these have their own set of promoters, relating tales of vast new investment and jobs resulting from the subsidy measures, the cost of which are not revealed. In principle these REZs are simply plans that the generators would pay for collectively. But already Ministers are fronting sums for their preliminary assessment and will clearly explore means of having the costs loaded onto consumers.

As the Energy Council has said, if any of these designated zones are able to attract sufficient collaborative investment from the renewable firms that are the beneficiaries of new transmission, "it will be a very successful outcome, and possibly worth the $78.9 million of taxpayer's funds" that have been earmarked. Given political statements and loss of face from failures, it is however unlikely that governments will simply write off their initial subsidies to exploring the viability of REZs.

Thus, the Central West scheme, Centred on Orange, has received $45 million in state and ARENA money for evaluation. Central West has received a "phenomenal" response, attracting 113 registrations of interest for projects totalling a massive 27 gigawatts and valued at $38 billion. According to NSW Energy Minister, Matt Keen, it is expected to generate $4.4 billion in investment, create 450 construction jobs and help put downward pressure on electricity prices. In reality, the expenditure proposals are simply expressions of interest and would be activated only if transmission were to be freely provided.

Queensland's Fitzroy REZ claims to be attracting 2 GW of solar, wind, energy storage and transmission infrastructure are now in the works under the moniker of the Central Queensland Power Project (CQP) thanks to the partnership of Energy Estate and RES.

Annualised Costs of the Required Renewable Induced Capital Expenditure

The Australian Energy Regulator's allowed return on investment is:

$$kt = k\ e\ (1 - G) + kt\ d \cdot G$$

Where: (a) kt is the rate of return in regulatory year t (the allowed rate of return)
(b) $k\ e$ is the allowed return on equity for the regulatory control period
(c) $kt\ d$ is the allowed return on debt for the regulatory year t,
(d) G is the gearing ratio and is set at a value of 0.6.

The AER's indicative nominal rate of return at August 2019 was 3.84 per cent. A conservative assumption is that these assets are amortised or refurbished over 40 years at 2.6 per cent. AER puts operational costs of transmission lines (p.126) at about 40 per cent of the capital and depreciation cost but this was when interest rates and hence allowable returns on capital were lower than at present. Hence it is assumed that operational costs bring the total annualised costs to 9 per cent.

The identified expenditures (Energy Connect, VNI West, Western Victoria, QNI expansion plus the Snowy conversion and links and Marinus) are $16,795 million. At 9 per cent these mean an annual cost of $1,511 million.

This is a conservative estimate. AEMO, in its Integrated System Plan for the National Electricity Market (NEM), identifies $17.4 billion of transmission investments by 2040 that would be needed to accommodate its projections involving a doubling or trebling of rooftop solar together with more than 26 gigawatts of new grid-scale renewables. AEMO's estimate excludes most of the Snowy 2.0 costs. Its identified projects are shown below.

Table 6: AEMO optimal development path for transmission

Project	Cost ($M)	Completion
VNI Minor	105	2022-23
EnergyConnect	1990	2024-25
Humelink	2100	2025-26
Orana	650	2024-25
VNI West	1730	2027-28
Marinus	5000	2028-36
QNI	1145	2032-36
Central-South Qld	432	2025-35
Gladstone	432	2026-33
New England REZ	1345	2031-36
NW NSW REZ	880	2035
Far N. Qld	975	2035
Mid N. SA	595	2035
SE SA	50	2039
Total	**17,429**	

Source: AEMO p.88-91

The Clean Energy Finance Corporation's CEO says it is examining support to the Marinus Link, investments to connect Renewable Energy Zones and privately funded transmission.

The AEMO forecasts (p.20) of supply by energy source are as follows

Table 7: AEMO forecast supply by energy source

	2021/22 MWh	share	2039/40 MWh	share
Coal	129,384	63%	58,109	24%
Gas	3,255	2%	3,790	2%
Hydro	15,999	8%	15,837	7%
Wind	29,309	14%	83,786	35%
Solar grid	12,775	6%	45,814	19%
PV	15,453	7%	31,082	13%
Total	**206,175**	**100%**	**238,418**	**100%**

(The actual share of wind/solar in 2019 was 15.6 % compared with the AEMO 27% forecast for 2021/22)

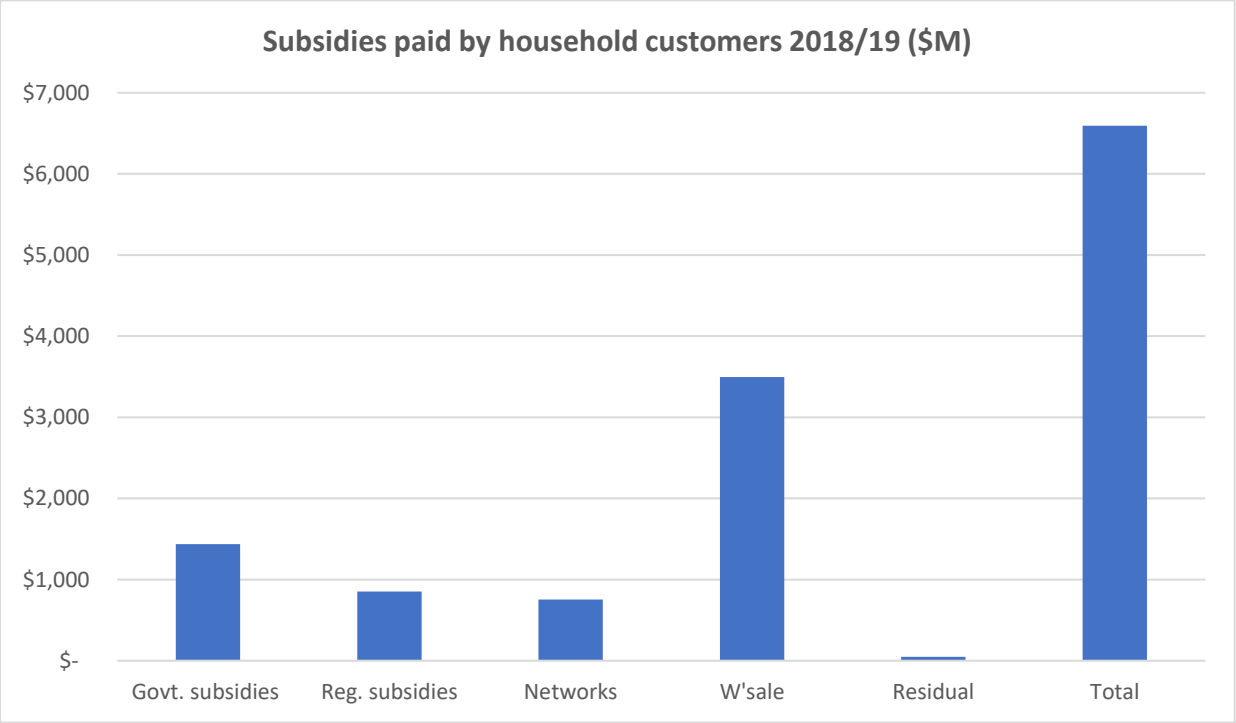
1.5 Overall Cost Increases

1.5.1 Cost Increases on Households

Households' savings from the removal of regulatory measures, excluding those from REZ schemes and in lower costs to retailers and regulatory agencies, amount to $5.7 billion, equivalent to $598 annually per household. In line with their share in aggregate demand, half of the estimated costs of budget support and networks are assigned to households.

Savings are summarised in the chart below.

Chart 5: Households' savings with no subsidies

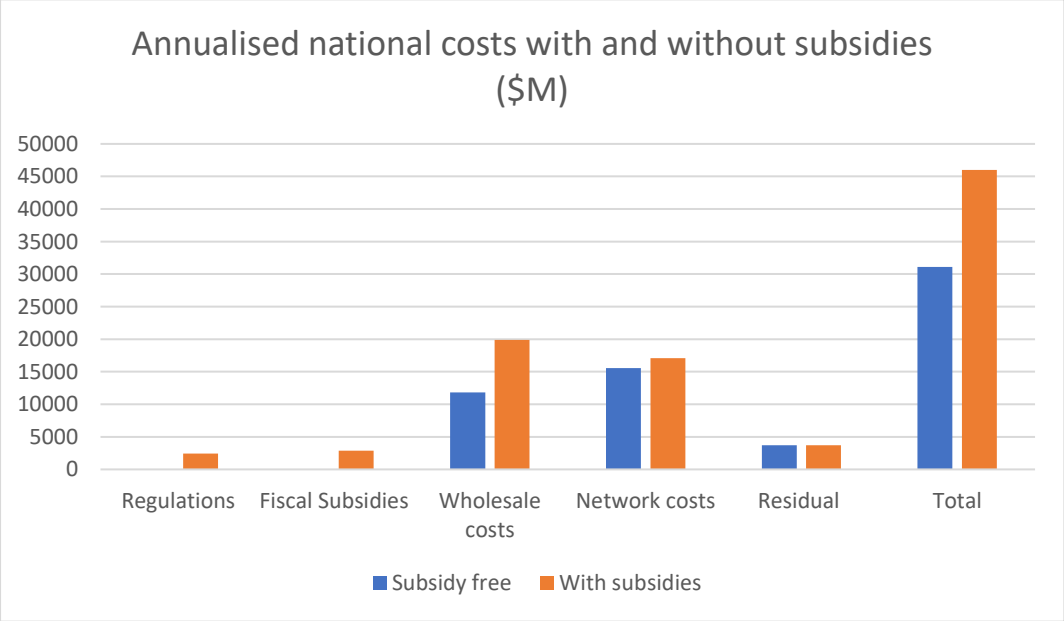


1.5.2 Cost Increases Incurred by the Economy as a Whole

Chart 5 is based on the known estimates of government regulatory subsidies estimated by AEMC, which are increased by other costs in accordance with the AEMC's assignment of cost shares as environmental regulatory policies, networks and wholesale. Direct subsidies and the consequent cost increases, due to higher wholesale costs and network costs, are added to these in accordance with the household share of total electricity market turnover. Given household demand accounts for half of the total this infers annual national costs at $11-12 billion.

An alternative approach would take aggregate spending levels and their increases from the known and estimated costs. The estimated costs in this case use the same data as in **Chart 5** for budget disbursements and for network costs (doubled to reflect the full market) and an estimated increase in the underlying present wholesale costs of $92.5 per MWh from a subsidy-free level set at $55 per MWh. This indicates national costs of $15 billion.

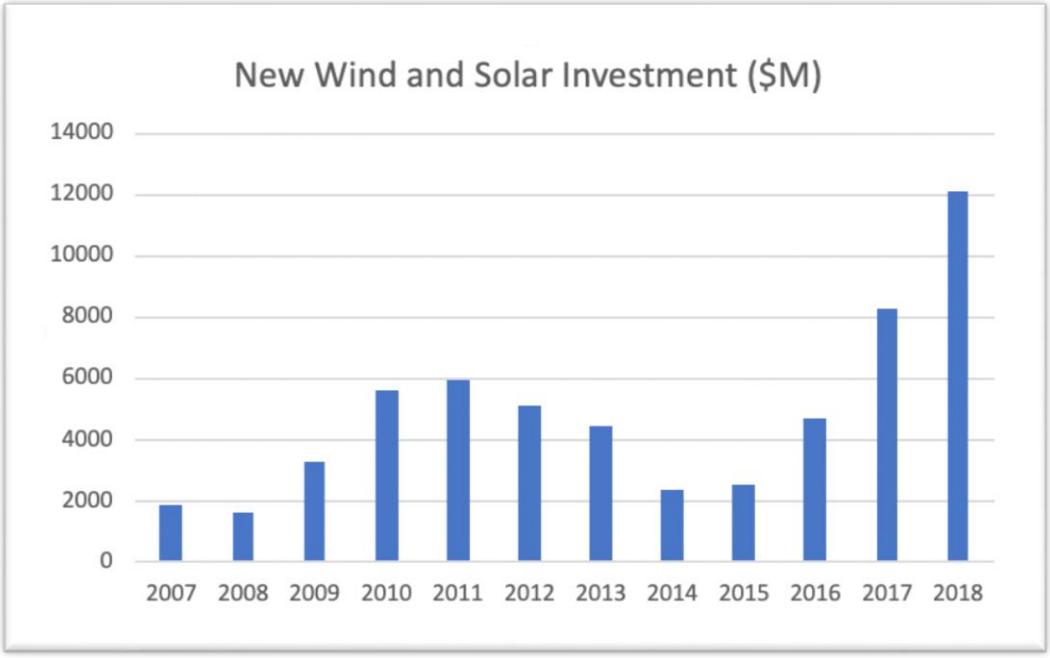
Chart 6: National costs of energy subsidies



1.6 Wasted Investment Capital

Electricity supply investment has been dominated by renewables in recent years. Bloomberg New Energy Finance estimates Australian spending on wind and solar at $58 billion ($US51 billion) 2007-2018. None of this would have occurred without the cross subsidies from consumers, support from state and federal budgets, or soft loans from Clean Energy Bank.

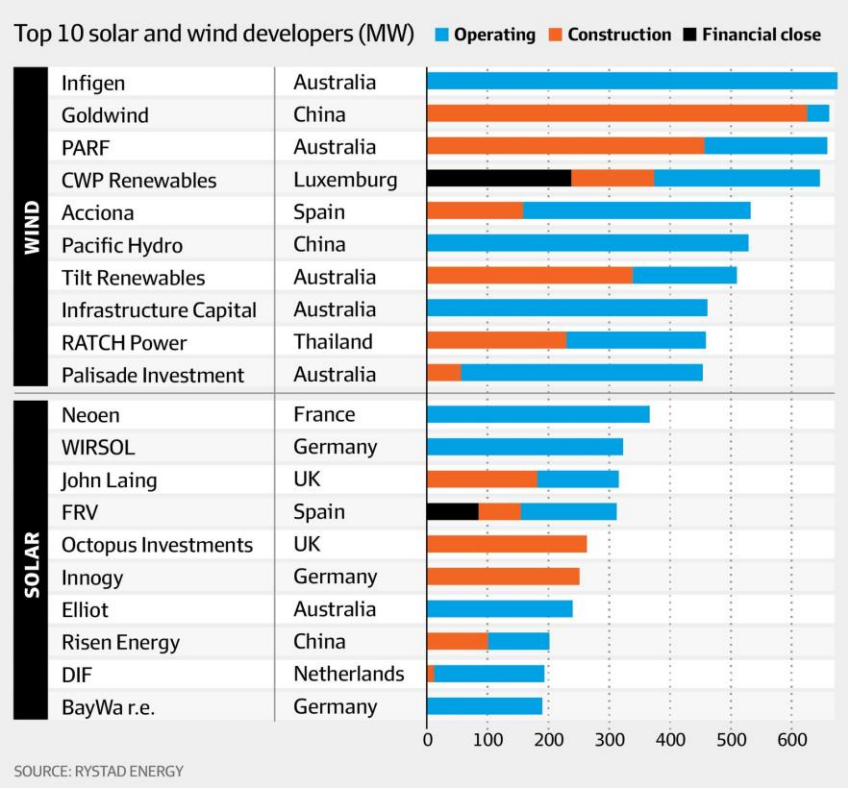
Chart 7: New wind and solar investments



Sources: 2007-16, BNEF; 2017-8, REN+B12=B12=B1221 https://www.ren21.net/gsr-2019/chapters/chapter_05/chapter_05/

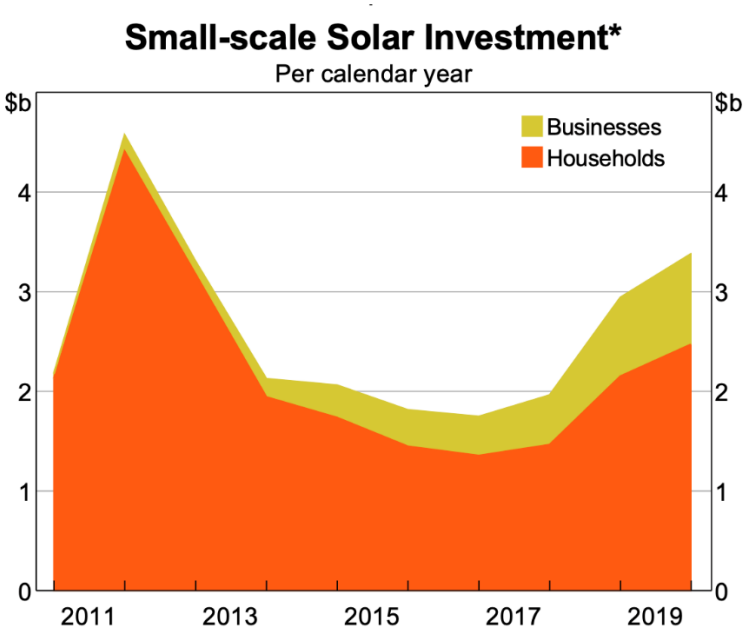
The wind towers and associated generating sets are fully imported, costing about $700 million per annum in 2018/19 and 2017/18. About half of the imports are from China. Infigen, the largest operator, is being acquired by an overseas firm, meaning that of the major developers 15 of the top 20 were overseas owned.

Chart 8: Ownership of major Australian wind and solar developments



Small scale facilities' panels are similarly sourced from overseas and their installations have been growing rapidly in recent years.

Chart 9: Recent investment outlays on small scale solar



Hence, in addition to the direct costs, there is a waste averaging over $8 billion a year in the diversion of investment capital towards economically harmful electricity supply sources.

2. Green Energy Jobs Created and Consequent Job Losses

2.1 Job Creation from Government Policies

Job creation is often claimed to emanate from Government policy changes and expenditures. However, the conditions under which such outcomes might emerge depend on a great many considerations.

It is, for example, facile to maintain that government expenditure creates demand and therefore, to the extent that the money is spent domestically, this means more jobs. If that was the case, then increased public spending would solve all our concerns about unemployment and would be the key to increased national income.

Spending unsupported by matched tax collections are at the heart of policy prescriptions in what is termed Keynesian economics. But even the most ardent proponents of this, largely discredited, branch of economic theory would never make sweeping claims of its policy relevance. They would, instead, particularise it to some very narrow sets of circumstances, where they claim a demand deficiency had suddenly arisen.

Others dispute that such a situation could ever endure. If demand is reduced generally, this means people are making greater savings. Those savings are housed in financial intermediaries. The higher level of savings means lower interest rates and more attractive investment opportunities, which both restores aggregate demand and increases the economy's productivity.

Demand/supply imbalances do occur in situations, including those like the present where goods being produced in major sectors like travel and hospitality no longer correspond to consumers' demands. In the current situation the reduction in demand is amplified by government bans on expenditures that consumers would seek to make.

At least outside of a major dislocating economic crisis, where government spending creates jobs it can only do so either at the expense of other jobs or because foreign debt has been increased. Generally, government spending must be financed by government taxation, so the net effect in terms of national spending is zero.

Spending by government means taking money from taxpayers and reallocating it. While Keynes, the father of such spending proposals, advocated this under certain conditions, he drew the line at any possibility this might be the case once the government share of GDP amounted to more than 25 per cent. Very few such countries exist today (in Australia the government share is 38 per cent). In practice a government spending injection cannibalises other spending and reduces investment.

2.2 Job Creation Through Green Energy Subsidies

2.2.1 Spain

One of the most complete analyses of the effects of renewable energy spending on jobs was conducted by Gabriel Alvarez in analysing the Spanish economy. His work, the findings of which are summarised here, is based on:

> *"Investment in green jobs will only prove worthwhile if the expense by the public sector is more efficient at generating wealth than the private sector. This would only be possible if public investment were able to be self-financing without having to resort to subsidies, i.e., without needing to absorb wealth generated by the rest of the economy in order to support a production that cannot be justified through the incurred incomes and costs."*

By examining the subsidy for different forms of green power he also finds that:

> *"although solar energy may on paper appear to employ many workers (essentially in the plant's construction), the reality is that for the plant to work, it requires consumption of great amounts of capital that would have instead created many more jobs in other parts of the economy. Inversely, wind power wastes far fewer resources per megawatt of installed capacity and thus does not destroy as many jobs in the rest of the economy."*

Green jobs created by government subsidy are more than offset by jobs lost because of the higher costs the subsidies entail. Alvarez calculated green job gains and losses by first estimating the gains (some 50,000 in Spain at the time) then estimating how many private sector (unsubsidised) jobs would be created for the same expenditure. By examining the subsidy per worker against the average capital per private sector employee, Alvarez estimates that for every green subsidised job created, some 2.2 jobs are lost. He also estimated, "Each 'green' megawatt installed on average destroyed 5.39 jobs elsewhere in the economy, and in the case of solar photovoltaics, the number reaches 8.99 jobs per megawatt hour installed." There is no reason to suppose Australia's experience has been better.

If the subsidy is paid for by higher prices for electricity, jobs will be lost most readily in the industries hardest hit - the energy intensive ones. If, as happened in Spain (and in Australia), government regulations shelter those industries, the upshot is lost jobs elsewhere.

2.2.2 Australia

Using the BAEGEM Computable General Equilibrium (CGE) Model which had been developed by the Bureau of Agricultural Economics, its former Director, Brian Fisher, estimated the cumulative GNP losses from raising the Paris Accord's 26-28 per cent emissions reduction by 2030 (relative to 2005) to the 45 per cent emissions reduction sought by the ALP. Fisher used the cost subsidy effect to estimate the loss in output that would follow from the increased costs of energy that would be required in order to meet the goals.

His approach focusses on aggregate income levels and the change in these from an increase in costs by requiring subsidised energy to be used. His estimate of the costs involved depended on whether less or more stringent abatement targets are adopted and whether policy flexibility is allowed in meeting the targets.

Fisher used conservative assumptions about the underlying increase in electricity prices. Under the reference case the wholesale electricity price in Australia was projected to increase from $69 per MWh in 2016 to around $81 per MWh by 2030. This represents an increase of about 1.5 per cent a year in real terms, whereas the price in the previous 20 years had actually fallen in real terms. (The conservative nature of this price assumption is evident since, as has been noted, the wholesale price of electricity in the absence of regulations would be around $55 per MWh).

In his main estimate of the ALP plans (Scenario 4: 45% greenhouse gas reduction from 2005 by 2030 and 50% renewables, with no Kyoto carryover and no international trading of permits), the lost income amounted to $1.2 trillion over the period to 2030. This is more than half of this year's GDP. To achieve this would require an electricity price of $157 per MWh, rather more than twice that of 2016.

The real wage and employment outcome in Fisher's analysis is necessarily somewhat arbitrary. He assumes that there will be some reduction in employment as wages are sticky downward but also some reduction in wages. Under this Scenario 4, the outcome of Fisher's BAEGEM models is a fall in real wages by 23 per cent below what they would have been and with 568,000 fewer jobs.

Aside from coal oil and gas, energy intensive industries see the biggest falls in output.

2.2.3 New South Wales

These considerations are also apposite to the NSW announcement that it is to spend $40 million in strengthening grid connections to accommodate increased renewable energy supplies in the Central West Orana zone. This is said to create 450 construction jobs, but such an outcome cannot emerge in terms of net job creation. It is not even likely to be a net positive overall effect. For that to occur requires the re-allocation of overall spending to investment goods and investment goods that are in accord with consumer needs and increase productivity. Increased productivity can mean higher employment levels and/or higher levels of income.

Arguably the $40 million spending, which is part of a $2 billion planned expenditure program, represents additional investment bringing about higher productivity and therefore more jobs or increased income levels. But for this to be the case, the investment must bring about lower costs, thereby facilitating higher levels of productivity. Unfortunately, additional support to renewable energy supplies, only adds to the government mandated cross subsidy that electricity customers are obliged to provide to wind/solar power. Hence, to the degree that the expenditure increases the subsidy to high cost supplies, it actually has a negative effect on productivity and therefore either reduces job numbers or reduces aggregate income levels.

Whether that negative effect is translated into reduced job numbers or lower living standards is crucially dependent on institutional arrangements. If wage levels rapidly adjust to a reduction in productivity, the net effect on employment is zero. If, however, wages are sticky in a downward direction, as they are in Australia due to a high minimum wage and many wage rates being set by a union dominated arbitration commission, an imbalance of employee remuneration and productivity follows. This results in some employees being priced out of their jobs.

2.2.4 Job Creation from Wind/Solar Subsidies

Bjorn Lomborg encapsulates the issue in a piece published in The Australian.

> *"In the US, it takes 39 solar workers to produce the same amount of electricity as produced by one worker in natural gas. Hence, generating more solar power will create many more jobs. But this is wasteful. Choosing to employ 39 people to do what one person can do means 38 people can't help elsewhere in the economy, providing elderly care, education, better infrastructure and the thousands of other needs for society's future.*
>
> *"Moreover, green spending works slowly and creates almost no jobs in the short run, when jobs are needed most.*
>
> *"Finally, subsidised jobs from green deals will have to be financed by higher taxes, leading to fewer jobs elsewhere."*

There is no silver bullet that allows government spending generally to lift income levels or create more jobs. Commonly such spending reduces income levels first by redirecting savings into more consumption and with less investment, and secondly by losses inevitably involved in collecting taxes.

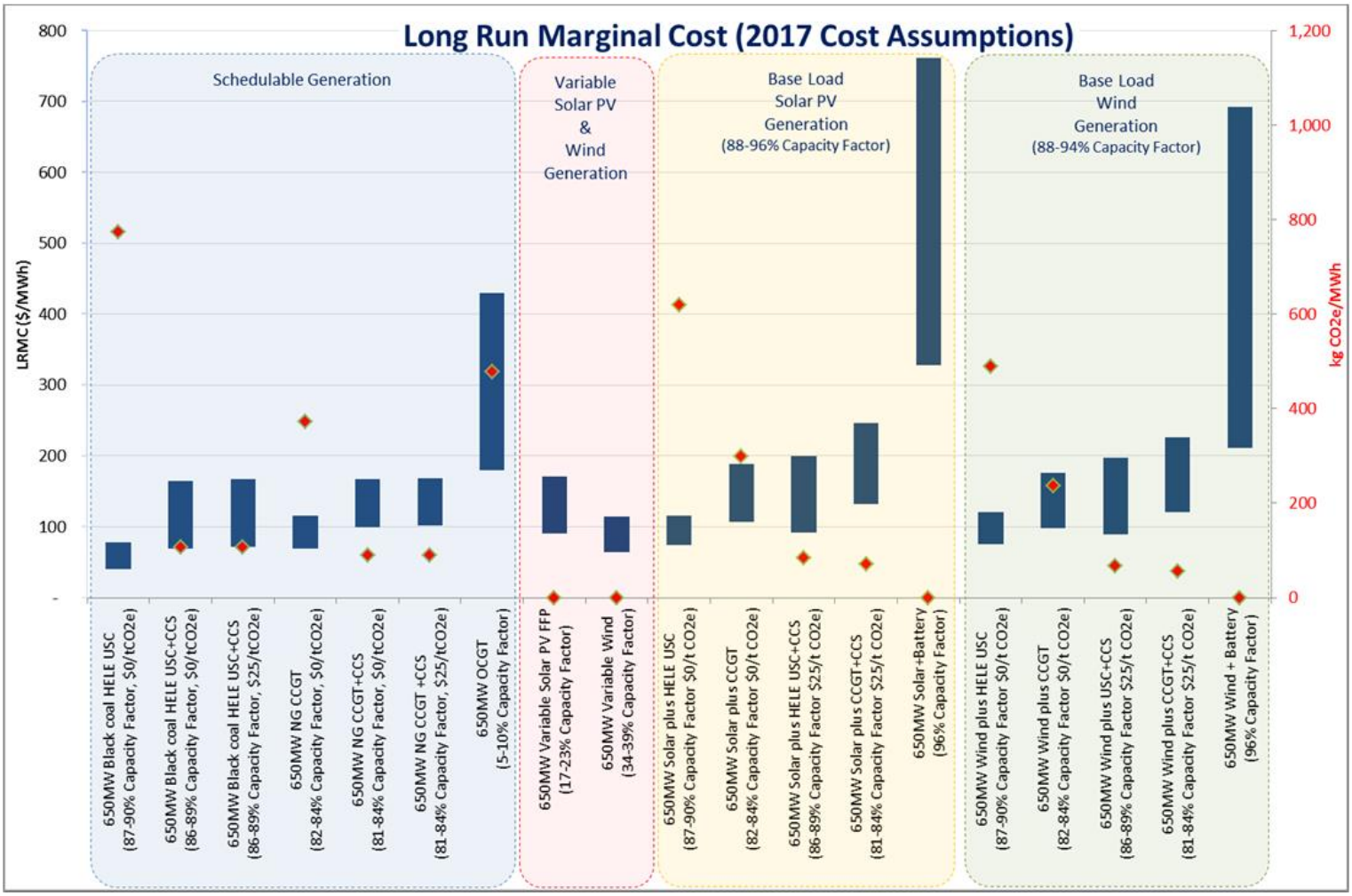
Even where money from tax collections is directed into investment, governments have a poor record in choosing appropriate avenues for such expenditure. This is especially evident in the area of renewable investments where, for example, subsidies to windfarms prompted the Victorian government to invest in a blade factory which collapsed within a few months.

But more generally, green energy displaces far more productive unsubsidised jobs in energy and elsewhere. Subsidising these renewable energy jobs is no more likely to create additional employment and income levels than would be the case if workers with shovels and wheelbarrows were to replace those with heavy machinery and trucks in road building.

Appendix 1: Costs of Different Electricity Sources

The most comprehensive recent study of different costs examined both from empirical and theoretical perspectives was by Solstice/GHD for the Minerals Council. The report estimates costs of coal and gas with and without carbon capture and storage or a carbon tax.

The results are illustrated below. A modern black coal unit (the first bar) produces electricity at between $40 and $78 per MWh if it is allowed to operate at its design capacity factor of 87-90 per cent; Gas operating at a capacity factor of 82-84 per cent (the fourth bar) produces at $69-115 per MWh; solar, the best capacity factor of which is 17-23 per cent, can produce electricity at $90-171 per MWh (the fifth bar); wind (the sixth bar) which can only achieve a 34-39 per cent capacity factor can produce at $64-115 per MWh.



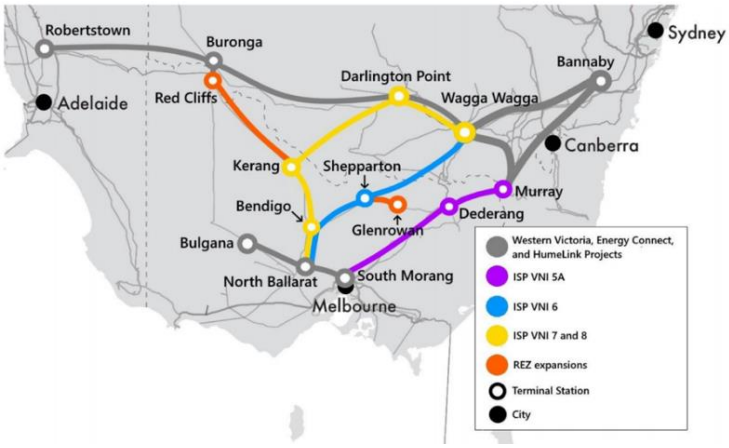
In practice, wind and solar would need to be 'firmed' because of their intrinsic unreliability and the costs of this, illustrated below, are high, especially if batteries are used.

LRMC	UoM	650MW Solar + Battery (96% Capacity Factor)		650MW Wind + Battery (96% Capacity Factor)		650MW Solar plus HELE USC+CCS (86-89% Capacity Factor $25/t CO2e)		650MW Wind plus USC+CCS (86-89% Capacity Factor $0/t CO2e)	
		Low	High	Low	High	Low	High	Low	High
Total (2017 cost assumptions)	$/MWh	328	913	211	693	91	199	90	198

Appendix 2: Options for the Victoria to NSW Interconnector West

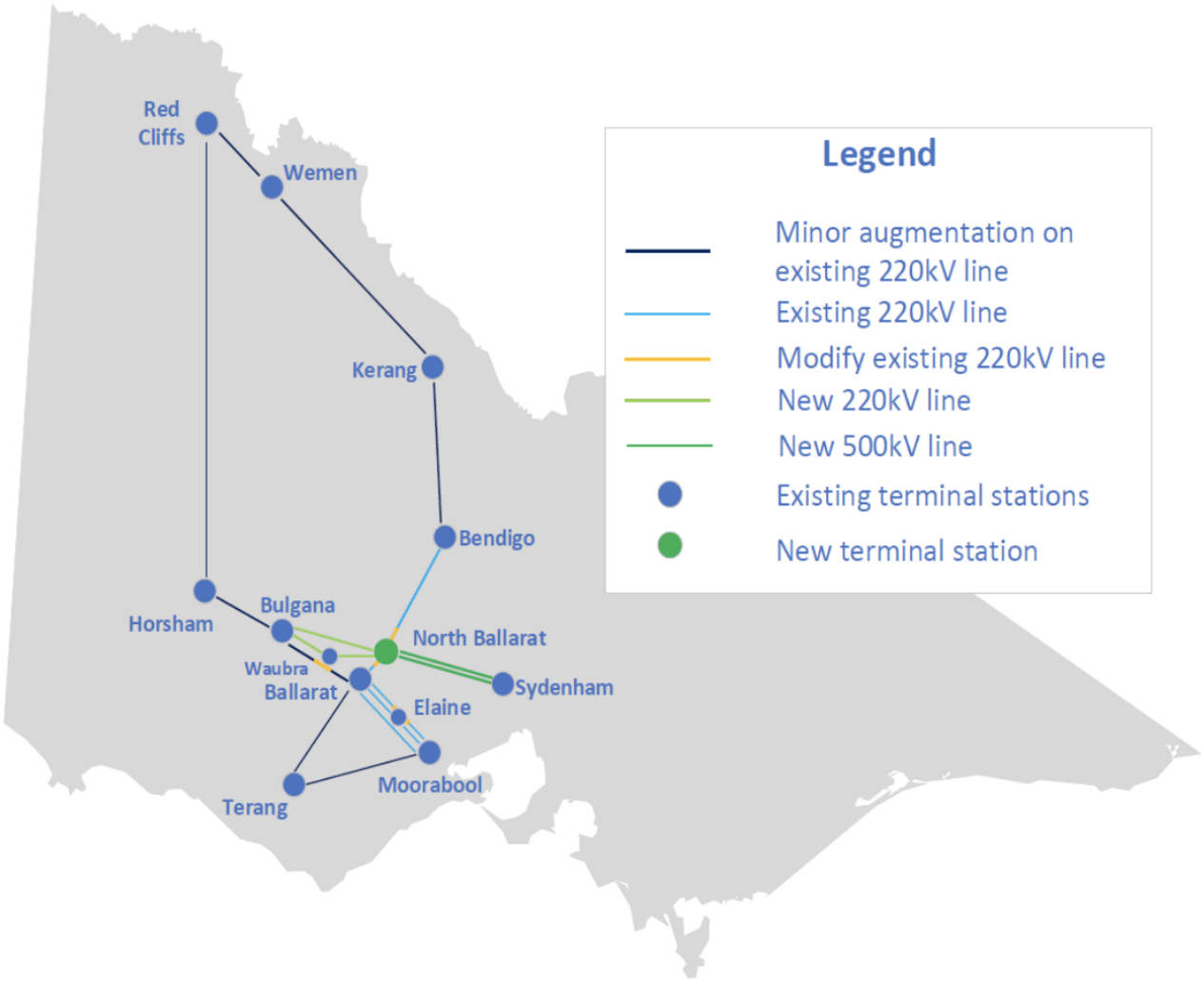
Table 9 Summary of credible network options

Option		Estimated cost ($M)[A]	Estimated lead time (years)[52]	Notional VNI export increase (MW)[B]	Notional VNI import increase (MW)[C]	Approximate Route Length[D] (km)
Augmentation to existing VNI corridor						
VNI 5A	New 330 kV transmission lines from South Morang to Dederang to Murray with New South Wales upgrades	815	6-8	380	1,000	350
Augmentation on new corridor via Bendigo/Shepparton						
VNI 6	New 500 kV transmission lines from North Ballarat – Shepparton – Wagga	1,335	6-8	1,930	1,800	440
VNI 6-V1	New 500 kV transmission lines from North Ballarat – Bendigo – Wagga	1,290	6-8	1,930	1,800	440
VNI 6-V2	New 500 kV transmission lines from North Ballarat – Bendigo – Shepparton – Wagga	1,455	6-8	1,930	1,800	440
Augmentation on new corridor via Kerang						
VNI 7	New 500 kV transmission lines from North Ballarat – Bendigo – Kerang – Darlington Point – Wagga	1,855	6-8	1,930	1,800	605
VNI 8	New 330 kV transmission lines from North Ballarat – Kerang – Darlington Point – Wagga	1,445	6-8	1,130	800	605
Option Expansions		**Estimated cost ($M)[A]**	**Estimated lead time (years)[52]**	**Generation capacity unlocked (MW)**		**Approximate Route Length[D] (km)**
Additional expansions to unlock REZs[E]						
A	New transmission lines to unlock generation capacity from Kerang – Wemen – Red Cliffs (REZ V2)	320[F]	6-7[F]	2000[G]		233[F]
B	New transmission lines to unlock generation capacity from Shepparton – Glenrowan (REZ V6)	100[F]	6-7[F]	2000[G]		71[F]



Appendix 3: Western Victoria Transmission

Figure 1 Preferred option for Western Victoria Renewable Integration RIT-T



Appendix 4: Industries Most Seriously Affected by Increased Costs of Electricity

The effect of cost increases on industry is the most serious facet for a country like Australia where the industry competitiveness has been built on low cost power.

Industries especially threatened can be seen in the chart below. They include basic metals (where electricity's share of costs is over 45 per cent), pulp and paper (where the electricity cost share exceeds 25 per cent), sugar and confectionery (where the electricity cost share exceeds 20 per cent).

Other industries with an electricity share of costs in excess of 10 per cent include knitted products and natural rubber products.

Australian industry: value added and electricity share of costs