Owen Evans, Financial Analyst and IEEFA Guest Contributor
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How Electricity Prices Are Determined and Why It's Important

Marginal Changes to Regulation of Distribution Assets Are Likely More Impactful Than $10bn on New Government-Owned Power Stations

Executive Summary

Electricity prices in Australia's national electricity market (NEM), excluding West Australia which has its own market, are made up of the following components:

- **Around 50% of the electricity price is the cost of grid transmission and distribution (T&D).**

  These are legislated monopoly industries which are heavily regulated by the Australian Energy Regulator (AER), a department of the Commonwealth government. Pricing is determined by a formula that depends primarily on the cost of debt and equity and the value of the asset base. The formula is agnostic with respect to ownership. Distribution in South Australia is owned by a Hong Kong-based billionaire In Brisbane it is owned by the state government. They both get the same deal.

- **About 33% is the cost of wholesale power.**

  Generation assets are generally privately owned, and this is a largely competitive market thanks to the increased competition of distributed rooftop solar and new utility scale wind and solar entrants. The interstate market is operated by the Commonwealth-owned Australian Energy Market Operator (AEMO). Regulation revolves around safety, security of supply, and access to market to ensure a free and fair market rather than pricing.

- **About 10% of the cost is the retailer.**

  Retail has historically been regulated by the states, with the retailer putting together the power, transmission, distribution, meter reading and billing, while taking the counterparty risk. Some states have chosen to deregulate retail entirely making it relatively easy for new entrants.

- **About 7% relates to Commonwealth government imposts.**

  This includes fees to run AEMO, green taxes and the like.

These regulatory structures have been in place for nearly a quarter of a century, having initially been designed by the Keating government (1991 - 1996) and honed during the Howard and Costello years (1996 - 2007). Once policy makers

understand the basics of how they work sensible policies can be implemented. Ignoring these basics results in wasteful policies that do not achieve their aims.

Over the past decade retail prices in Australia have risen by less than inflation. The components have not moved in sync. Wholesale prices have risen by 1.66% pa while transmission, distribution and other charges have risen by 1.25% pa. In total prices have risen by 1.33% pa.

The Commonwealth government for some time has been behaving as though prices in Australia are too high, which may well be the case however stable and high are not mutually exclusive. As a consequence, it has committed billions to new gas-fired power stations and associated peaking power. Typically, this has been done inefficiently. The trophy project in this is Snowy Hydro 2.0.

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Initially planned to be online by 2021 to prevent a perceived imminent collapse of the electricity system, at a cost of $2.1bn Snowy 2.0 is now progressing at a leisurely pace with a 2027 scheduled opening. It has an uncertain price tag (more than $5bn but less than $10bn) plus a requirement to build transmission lines at $2bn to Sydney.[1]

To make matters worse, the Commonwealth has committed publicly-owned Snowy Hydro to spend a further $1bn on a 600 megawatt (MW) peaking plant at Kurri Kurri in New South Wales that will likely run once a month or so with the primary fuel being diesel for the first six months.

If one believes that prices are too high in Australia, and the Commonwealth government clearly does, the component to attack is the cost of T&D, which it has done nothing about.

T&D is the largest single cost and it is the area where the Commonwealth has the greatest power.

Decisions like Snowy 2.0 should not take a decade to implement and mistakes made here are unlikely to cause chaos by shutting out private capital spending, as is happening in the generation sector.

In addition, there are levers in place that can be pulled.

The AER, which regulates assets, does so by use of a relatively rigid formula applied to all assets. It estimates an acceptable return (WACC), multiplies this by the regulated asset base (RAB) adds agreed costs and out falls allowable revenue. Divide

[1] Guardian. Snowy Hydro 2.0 will cost more and deliver less than promised, 30 experts say. 28 March 2020.

by units and a unit price is determined. These determinations have a five year term to allow sensible capex decisions to be taken.

All recent determinations, which cover $58bn of assets, result in a decline in nominal pricing driven by the impact of lower interest rates and inflation on the WACC and RAB. They continue, however, to allow for a very high equity risk premium component to the WACC. This does not appear consistent with market valuations of infrastructure assets. This is an area where the Commonwealth at the very least could offer an opinion during the public submissions process.

All recent government determinations, covering $58bn of assets, continue to allow for a very high equity risk premium component.

The impact on prices of lower allowable returns would be greater than the claimed impact of Commonwealth investment in new firming power capacity. The cost would be the writing of a letter rather than $10bn. The impact would be immediate rather than in the never never.

As is often the case, it is easier to get somewhere if you have a map and a plan when you begin. It is time for the Commonwealth to buy a map.

Getting to the Bottom of Electricity Prices

One of the curious aspects of public policy towards electricity in Australia over the past quarter century, and particularly the last five years, is how much of it revolves around ownership and price without understanding the implications of ownership and the derivation of prices.

Because the derivation of pricing and the impact of ownership is poorly understood and articulated we have situations in which the Commonwealth attempts to impact pricing in possibly the most expensive and least productive fashion. Witness Kurri Kurri.

Fortunately, the information is readily to hand and easily explained. The implications, as we shall demonstrate, are also quite straight forward.

The Australian Energy Regulator (AER), which is tasked with regulating electricity and gas, publishes a document entitled About Energy Bills.[2] The AER also publishes, as part of each determination it issues, a brief summary of who regulates what with respect to electricity. When we put the AER pieces together there are two obvious conclusions:

1. **If one wishes to impact price, the greatest leverage lies in grid transmission and distribution (T&D),** as they are by far the largest

[2] AER. About Energy Bills. 2015.

component of pricing;

2. If the Commonwealth wishes to intervene in markets to achieve a political objective, the obvious place to intervene is in transmission and distribution, where they have had the power to regulate pricing for 25 years.

Table 1: What Makes Up an Electricity Bill

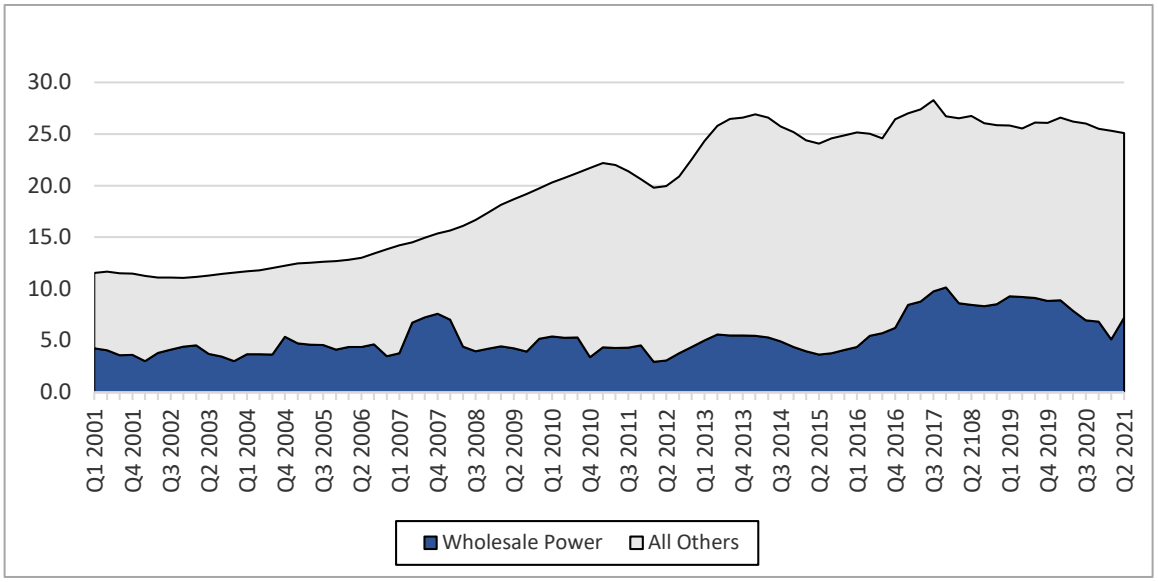
Stage of Operations	% of Price	Regulator
Wholesale production	33	Unregulated
Transmission & Distribution	50	Commonwealth (AER)
Retail	10	State option
Government charges	7	Commonwealth
	100	

Source: AER.

In looking at how this might impact residential electricity prices we can look at our energy bills, which according to the AER, are representative.

Figure 1 shows that the level and volatility of wholesale prices are far from the prime determinant of pricing. Over the past decade, wholesale prices have risen by 1.66% per annum. Everything else, which is 80-85% regulated transmission and distribution, has risen by 1.25% pa or roughly half the cost of inflation. Total prices have risen by 1.33% pa.

Figure 1: Residential Electricity Prices Sydney 2001-2021 c/kWh (MAT)



Source: Company quarterly billings, AER.

From this, one can argue persuasively that consistent intervention in wholesale markets by the Commonwealth government has been counterproductive, causing

domestic prices to be higher than they ought to be. However, **one cannot reasonably argue that prices have been rising at a rate in excess of the Consumer Price Index (CPI)** or that the rate of growth of prices ought to be a concern for the government. For the prior decade, certainly, price inflation was a key issue, but not so in the last decade.

If the government were to focus on transmission and distribution, which it regulates, it would see a modestly positive trend and a potentially large lever.

Consistent intervention in wholesale markets by the Commonwealth government has been counterproductive.

The AER regulates all systems bar West Australia. All are legislated monopolies. One cannot simply decide to enter, say, the northern Sydney market for power distribution, as it is not legal to do so. In order to give companies some certainty, AER issues pricing determinations that cover 5-6 years. At any point in time, half the industry has recently been issued a determination and half is working towards a new one.

There are two key inputs the AER uses. **An allowable rate of return**, or WACC, and an agreed **regulatory asset base or RAB**. It multiplies the rate of return (say 5%) times the asset base (say $10bn) and that means asset owners are entitled to make $500m pa.

For those who have never struggled through a lecture on CAPM (the capital asset pricing model), the WACC is estimated by taking a risk-free rate of return (a government bond) and adding an equity risk premium which is multiplied by an industry risk beta factor. For a low risk industry such as transmission or distribution, 0.6 is a typical beta. Add the cost of debt, weight each by their share of funding (60% debt for AER) and out pops the weighted average cost of capital. While simple, it is the foundational research for multiple Nobel Prizes.

The AER then looks at actual historic costs, compares that figure to peer businesses, and says the asset owner is allowed $500m in operating costs. Add this to the profit allocation and the owner is entitled to $1000m in annual revenues. Divide by units and price per unit falls out.

In looking at AER determinations over the past few years[3] there is some good news on the horizon for consumers. This is a real lever for the government.

[3] AER. Determinations & Access Arrangements. Updated September 2020.

Table 2: AER Determinations 2018-2021

Company	Date	% of Bill	WACC	RFR	ERP	Beta	Rd	D/E	RAB
ElectraNet	Apr-18	7	5.69	3.74	6.1	0.6	4.56	60	2,617
Transgrid	May-18	10	6.54	3.74	6.1	0.6	5.97	60	6,494
Ausgrid	Apr-19	33	5.72	2.04	6.1	0.6	5.74	60	14,273
Energex	Jun-20	35	4.73	1.03	6.1	0.6	4.76	60	13,145
Ergon	Jun-20	35	4.73	1.03	6.1	0.6	4.76	60	10,226
SA Power	Jun-20	30	4.75	0.9	6.1	0.6	4.87	60	3,885
United Energy	Apr-21	22	4.78	1.38	6.1	0.6	4.57	60	2,153
CitiPower	Apr-21	20	4.73	1.38	6.1	0.6	4.52	60	2,023
Ausnet	Jun-21	5.5	4.76	1.68	6.1	0.6	4.36	60	3,697
			5.22						58,513

Source: AER.

The good news is unambiguous. **WACC is falling**. Since 2018 WACC has fallen by more than 100 basis points (bps), driven by falling interest rates. On average a 100bps decline reduces allowable revenue by around 10%. These are material declines which will result in flat to declining prices for the coming five years. In the context of forecast CPI of between 2.00-2.27% pa for the next five years, **AER is expecting absolute pricing declines across the above determinations**.

Table 3: Weighted AER Estimated Pricing ($ pa)

Weighted	Base Yr	1	2	3	4	5
Retail	1524	1472	1474	1474	1476	1476
% change		-3.4	0.1	0.0	0.1	0.0
Business	3833	3729	3698	3732	3734	3734
% change		-2.7	-0.8	0.9	0.1	0.0

Source: AER.

We can also see that **the WACC is indiscriminate with respect to public vs private ownership**. Both SA Power Networks and CitiPower are controlled by a Hong Kong based billionaire. Energex and Ergon are owned by a state government. They are all entitled to the same WACC, the same level of gearing, approximately the same cost of debt and effectively the same unit pricing. Privatizing assets regulated by AER does not impact prices.

Finally, there are some real levers left for government. In calculating WACC, the **equity risk premium (ERP) is a key factor**. All of these assets ought to have the same ERP. However, the absolute level seems quite high. One suspects that fund managers who value unlisted infrastructure assets would be using an ERP well below 6.1%. One also suspects the Commonwealth would be in a position to find out.

Instead, using 5.1% as the ERP would see average WACC fall by 25bps. This would result in a roughly 5% decline in allowable profits or around a 2.5% decline in T&D

pricing. All AER determinations allow for public comment. We would suggest Treasury make a submission regarding the ERP, which it does not appear to have done of late, if ever.

The other lever available to government is sound economic management. Low interest rates, which are driven by low inflation, are foundational to the WACC and therefore pricing. Yet inflation is also a core component in the RAB.

Using the Ausgrid distribution network as an example shows how the RAB is influenced by CPI movements.

Table 4: AER Ausgrid Distribution RAB ($M)

	2020	2021	2022	2023	2024	Totals
Opening RAB	13779	14273	14678	15010	15315	
+ capex	587	525	479	477	476	2545
+ CPI	334	346	355	364	371	1771
- D & A	428	466	502	536	543	2475
= Closing RAB	14273	14678	15010	15315	15620	15620

Source: AER.

Over 5 years, inflation adds $1.8bn or 12.8% to the RAB. Net capex in the current forecast period adds almost nothing. The assumed CPI is 2.42%, which at the time this was done (April 2019) was likely a market consensus.

If consensus for CPI was now, say 1.42%, the RAB by the end of the period would be $14.8bn or nearly 5% lower. A 5% lower RAB means 5% less profit which means 2.5% lower T&D prices. This works equally powerfully in reverse of course.

In sum, we can conclude the following:

- The largest portion of electricity prices is the cost of transmission and distribution. Wholesale power prices are not nearly as important. Retail margins, green taxes, AEMO charges and the rest are individually immaterial.
- The Commonwealth is the sole regulator of grid T&D prices. On balance, since 2010 the regulatory structure has worked well. Between 2004 - 2010 it was gamed by asset owners, both public and private.
- Over the next five years, the cost to consumers of distribution and transmission services will fall marginally in nominal terms. In real terms, double digit falls are likely.
- The regulatory structure is agnostic with respect to ownership. Privatization of these assets does not impact prices.
- The key drivers of pricing include interest rates, inflation, and the equity risk premium.

If the Commonwealth wishes to influence power prices, as it says it does, it can stop wasting money on gas-fired peaking plants and begin focussing on transmission and distribution, the largest determinants of pricing and the area where it has sole regulatory authority.

There are further potential gains to be had from reassessing the ERP and continuing policies that result in lower or low inflation and interest rates. These would likely have significantly more impact than a $1bn gas-fired peaking plant at Kurri Kurri or the $5-10bn Snowy Hydro II trophy project.

About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. www.ieefa.org

About the Author

Owen Evans

Since 1985 Owen Evans has been a financial analyst covering a broad variety of Australian companies, primarily with UBS where he was an MD and Head of Emerging Companies research until 2010. He is presently on the board of MWBA, a not-for-profit sporting association and The Investment Collective, a Queensland-based financial planning group. owen.evans30@gmail.com