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On entry cost dynamics in Australia's National Electricity Market

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Historically spot prices in Australia's National Electricity Market (NEM) have exhibited considerable volatility within, and across, reporting periods. Along with short run variations associated with weather and anthropogenic patterns, medium-run supply-imbalances drive this volatility. Over the long run, given aggregate demand growth, or more relevantly in the current environment with flat final demand – the exit of aging coal plant "*at-scale*" – average spot prices will gravitate towards the cost of the relevant new entrant technology (or technology set). That is, higher prices on average, or during certain periods, will create incentives for targeted new entrant plant which in turn has the effect of capping longer-dated average spot price expectations at the estimated cost of the relevant new entrant technologies.

Over time, prices on average or during certain periods also regulate the plant mix as defined by the rich blend of fixed and variable costs associated with various generating technologies (i.e. base, intermediate, peak, variable renewables). Security-constrained power system simulation models reinforce this view. At their core, such models are based on equilibrium analysis.

Of course, in practice energy markets are frequently off-equilibrium. Near-term spot and forward contract prices can and do fall well below, or substantially exceed the relevant entry cost benchmarks and sometimes for extended periods due to transient structural imbalances within the plant stock. That structural imbalances exist in the first place means the cure to rising prices is not always more base plant. Understanding these principles is quite essential to understanding the fundamentals of power system planning, likely investment commitments and the long run marginal cost of power generation. Central to the task of power system modelling and investment analysis is therefore defining the equilibrium price of power, and for expediency we refer to as the new entrant cost.

In this article, we trace entry cost benchmarks for new generation plant and their relationship to spot price outcomes in Australia's National Electricity Market over the 20-year period to 2018. Over this period of time, the new entrant benchmark has shifted through a number of distinct phases involving transitions from coal, to natural gas, and more recently to "variable renewables plus firming".

In the current phase, "variable renewables" means wind or solar PV, and "firming" is *notionally* (or shadow-) priced at the carrying cost of an Open Cycle Gas Turbine plant – either physically or financially through derivative instruments. Over the medium term this benchmark appears sound enough.

But over the long run, important implicit assumptions underpinning this particular (and notional) new entrant technology set may not hold if low marginal running cost coal plant continue to exit *at-scale*. The reason for this is that this benchmark relies critically on the gains from exchange in the NEM mandatory gross pool, efficiently utilising spare capacity. As aging coal plant exit, gains from exchange may gradually diminish with 'notional firming' increasingly and necessarily being met by physical firming. At this point, the benchmark must once again move to a new technology set.

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