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Merchant renewables and the valuation of peaking plant in energy-only markets

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Over the course of 2017-2019, Australia's National Electricity Market (NEM) experienced a cyclical boom in Variable Renewable Energy (VRE) investment commitments, driven in part by Australia's 20% Renewable Portfolio Standard. One of the striking features of the cycle was the number of VRE investment commitments made on a *merchant* basis – that is, without any form of long-term, run-of-plant Power Purchase Agreement (PPA). In all, 18 utility-scale solar PV Projects (~1500MW) and 5 wind projects (~870MW) reached financial close without a PPA. Adding to this emerging merchant fleet are older incumbent wind generators whose inaugural PPAs have run their full term. Furthermore, many new entrant plants with PPAs have deliberately oversized their investment commitment in order to acquire some merchant exposure.

With historically high cost structures and low wholesale prices associated with merit order effects, continuity of VRE entry was critically reliant on Renewable Portfolio Standards or other policy initiatives such as government-initiated Contracts-for-Differences (CfDs). But in Australia's NEM, sharply falling costs of renewables and volatile wholesale market conditions from coal plant exit seemed to create ideal conditions for merchant entry.

As far as I am aware, *merchant renewables*, that is, plant selling their output into spot and short term forward markets and without any long-dated contract, represents an entirely new asset class. Yet ultimately such plant will need to engage in the market for forward contracts (i.e. Swaps or 2-way CfDs, and $300 Caps) in order to stabilise revenues and meet debt covenants if any commercial level of debt is envisaged.

How might such plant commit to forward contracts this when output is intermittent? Although wind generators can invariably commit to some level of fixed forward contracts with spot output priority allocated against those transactions, integrating with firming capacity, such as Open Cycle Gas Turbine (OCGT) plant undertaking peaking duties, provides an obvious possibility. After all, the vertical integration of Retail Supply with OCGT plant has been an important development in industrial organisation in energy-only, deregulated electricity markets. This vertical model has been essential vis-à-vis delivering an adequate reserve plant margin (ie. Resource Adequacy) in Australia's NEM. In theory, the same transaction cost gains from integrating stochastic loads with OCGT plant should be available from integrating stochastic generators with OCGT plant.

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In this article, a merchant OCGT plant, merchant wind plant, and an integrated portfolio comprising both plants are valued in the NEM's South Australian region. Rather than use a structural model, in this article 100 years of stochastic spot price data at 30-minute resolution has been generated from historic South Australian NEM region data (2010-2019). The benefit of using South Australian spot (and forward) data over the 10-year period 2010-2019 as a base is that this price series captures a complete energy market business cycle comprising over-capacity and well documented merit order effects arising from cumulative wind and solar PV entry to world-record market shares of 50+%, and severe supply-side shocks (i.e. rebound effects) arising from cumulative thermal plant exit. 100 years' worth of production and spot price earnings from the OCGT and wind plant are then transposed into annual results for use in a Stochastic Discounted Cash Flow Valuation Model (DCF Valuation Model). The DCF Valuation Model is a conventional nominal, post-tax, unlevered DCF model, but populates each of the 25 years plant useful life through a random sampling process from the 100 years of stochastic spot price data, then iterates this process 500 times to produce a valuation distribution.

Asset valuations reveal striking results. The modelling sequence shows the stand-alone OCGT valuation metrics suffer from modest levels of *missing money* (i.e. insufficient net revenues), that *Merchant Wind* can commit to some level of forward (fixed volume) swap contracts in-spite of intermittent production, but the combined Portfolio tightens overall valuation metrics significantly. Above all, the combined portfolio is financially tractable and seems to *find the missing money* for the OCGT plant undertaking peaking duties. In a NEM region where intermittent renewable market share exceeds 50%, this suggests the energy-only, real-time gross pool design may yet be deemed suitable vis-à-vis meeting environmental objectives and Resource Adequacy.

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