

The Effects of Utility Scale Solar Generation on Australian Electricity Wholesale Market Pricing

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In the past 18 months, the amount of large scale photovoltaic (PV) generation has increased from less than 350MW to over 2850MW, representing the beginnings of a substantial shift in the composition of utility scale generation in the Australian National Electricity Market (NEM). With over 2.2GW of additional utility solar generation committed for construction in the next 24 months and more to follow, it is worth examining how this large scale PV is affecting wholesale market dispatch pricing.

The long-held expectation has been that wind and solar generation would deliver lower wholesale market prices, due to their extremely low short run marginal cost. However, due to a wide range of factors, the average wholesale market price does not appear to have declined much. Does solar therefore have no depressive effect on wholesale prices?

This work first investigates the progressive influence of small scale PV on the day to day wholesale market price, and observes that as PV levels have continued to increase, so too has the day to day volatility in pricing. The difference between the average maximum and minimum wholesale market prices continues to increase as more PV is installed. The net effect is that while minimum prices appear to decline with greater proportions of PV, as has been forecast, the higher peak prices offset the reductions that PV creates.

This outcome informs the second investigation of this work: to investigate whether different technology types are typically dispatched at prices that indirectly reflect their flexibility and dispatchability. This work examines the half-hourly generation mix and dispatch pricing from the last 3 years in the NEM for all states with utility scale PV. From this, the typical dispatch price range of each generation technology is established, with outputs reflective of the technological characteristics of each type. Intermittent generation such as wind and solar is most often dispatched at below the market average price, reflecting the limitations of these technologies. Coal generation is most often dispatched at the market average; a sign of its central role in generation at present, as well as its moderate flexibility. The most flexible dispatchable generation types, gas and hydro generation, command a premium above the average market price that demonstrates the value of their unique traits. This work therefore suggests that the addition of utility storage to add substantially to the value of large scale renewable energy projects, by reducing the amount of energy dispatched at lower prices and maximising the generation to be dispatched at times of high demand.