

THE OBSERVED IMPACT OF INCREASING VRE PENETRATION ON SPOT PRICE VOLATILITY: THE EXPERIENCE OF SOUTH AUSTRALIA

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Overview

Past research has argued that in energy-only electricity markets, such as Australia's National Electricity Market (NEM), an increasing penetration of negligible short-run marginal cost variable renewable energy (VRE) generation is likely to have two effects: (i) increasing spot price volatility, and (ii) an increase in the market price cap (MPC) and related price signals for reliability.

This paper tests the validity of both of these price effects, using actual spot pricing outcomes in South Australia. South Australia has one of the highest penetrations of VRE generation worldwide.

Methods

Quantitative and descriptive analysis

Results

Between 2008 and 2019, the penetration of VRE generation in S.A. increased from 8 per cent to over 50 per cent, yet spot price volatility was broadly unchanged. Furthermore, reliability in S.A. has remained high despite the MPC (and other key price settings) remaining constant in real terms.

Conclusions

We provide four reasons why spot price volatility and the MPC need not dramatically increase as VRE penetration increases: (i) the role of volatility-dampening technologies like storage and interconnectors; (ii) the role of contract cover on generator bidding behaviour and in turn on spot prices (iii) the role of more price-responsive demand; (iii) and (iv) the emergence of additional ancillary service revenue streams

References

- Australian Energy Market Commission (AEMC) (2017). *Reliability Frameworks Review – interim report*. Staff Report.
- AEMO (2019). *Load shedding in Victoria on 24 and 25 January 2019*. Staff report, 16 April.
- AEMO (2018). *Initial operation of the Hornsdale Power Reserve battery energy storage system*. Staff report, April.
- Bell, W. P., Wild, P., Foster, J., and M. Hewson (2015). “Wind speed and electricity demand correlation analysis in the Australian national electricity market: Determining wind turbine generators’ ability to meet electricity demand without energy storage”, *Economic Analysis and Policy*, **48**(1), pp. 182–191.
- Billimoria, F., and R. Poudineh. (2018). *Electricity sector transition in the NEM: managing reliability and security in an energy-only market*, Oxford Institute of Energy Studies, article in press.
- BloombergNEF (2018). *New Energy Outlook 2018*. Staff Report.
- Cutler, N., Boerema, N., MacGill, I., and H. Outhred (2011). “High penetration wind generation impacts on spot prices in the Australian National Electricity Market”, *Energy Policy*, **39**(10): 5939-5949.
- ElectraNet (2019). *Addressing the system strength gap in S.A.: economic evaluation report*, 18 February.
- Lund, P.D., Lindgren, J., Mikkola, J., and J. Salpakari (2015), “Review of energy system flexibility measures to enable high levels of variable renewable electricity”, *Renewable and Sustainable Energy Reviews*, **45**, pp. 785-807.
- Obersteiner, C. (2012). “The influence of interconnection capacity on the market value of wind power”, *Energy and Environment*, **1**(2), pp. 225-232.
- Rai, A., and T. Nelson (2019). *The National Electricity Market after twenty years*, article in press.
- Riesz, J., Gilmore, J., and I. MacGill (2016). “Assessing the viability of energy-only markets with 100% Renewables: an Australian National Electricity Market case study”, *Economics of Energy & Environmental Policy*, **5**(1): 105-130.
- Simshauser, P. (2019). *The strengths and weaknesses of Australia’s national electricity market*, article in press.
- Simshauser, P. (2018). “On intermittent renewable generation & the stability of Australia's National Electricity Market”, *Energy Economics*, **72**(1): 1-19.
- Stoft, S. (2002). *Power system economics: designing markets for electricity*, John Wiley & Sons, New York.