

Structure, Dynamics and Evolution of the Australian Electricity Market

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This paper analyses the structure and dynamics of the Australian National Electricity Market (NEM). Using data from 1998-2004, it presents evidence that the inter-day price series over short (weekly) and long (yearly) periods exhibit leptokurtosis, volatility clustering and long-range dependence. The paper presents a multi-agent model of spot-market electricity trading that is able to replicate the statistical properties derived from the NEM data set. The model is calibrated by simple behavioural rules inferred from interviews with key market players and analysis of historical market behaviour. The baseline model is modified to explore three policy-relevant scenarios:

- (i) A secondary market in forward contracts is introduced to reflect the 'over-the-counter' market currently operational in the NEM. Extant regulatory rules on hedging are used to initialize agent trading behaviour. Simulated relaxation of the risk-averse trading rules demonstrate positive outcomes for price volatility in the primary spot market.
- (ii) An auxiliary market in carbon emissions (CE) trading is introduced, based on the extant European emissions trading market. Implications for price dynamics in the primary electricity market are explored, as are full-cost pricing methods for coal-based electricity generation.
- (iii) Full competition in the transmission network is simulated in order to demonstrate the non-natural-monopoly character of electricity transmission systems. By simulating both off-peak and peak loads and their effect on spot-price dynamics, it is demonstrated that sufficient price differentials would exist in peak periods to justify free entry in the transmission sub-market.

At its current state of evolution, the NEM fails to provide both adequate risk-management opportunities for industry incumbents and the long run incentives required to induce private investment in energy generation and distribution. In light of the results presented, the paper makes several recommendations for policy changes as well as further research initiatives.