Spillover Effects Resulting from Technical Incidents – Implications for Policymakers and Rulemakers in the National Electricity Market

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Overview

The National Electricity Market (NEM) is the largest energy wholesale market worldwide concerning its aligned grid length combing five out of six individual states (New South Wales, Victoria, Queensland, South Australia and Tasmania) in Australia. Due to the country size, the power exchange provides one market (Ramiah/Thomas/Heaney/Mitchell, 2015) place per state. Within the whole market area of the NEM, each state provides grid connections to its surrounding states, but not to all of them. In case of an energy excess demand caused by technical incidents, the additional demand has to be balanced promptly by e.g. intraday transactions pursued by the NEM in order to maintain grid stability, leading to irregular price volatility or price levels at the associated market places. Nevertheless, market participants from regions originally not exposed to aforementioned incidents may be also affected by unforeseeable price spikes (Tulloch/Diaz-Rainey/Premachandra, 2017). In general, because of the stylized facts of energy spot prices, forecasting represents a particularly tough challenge for market participants on power exchanges. Next to (regular) volatility, mean reversion and seasonality, suddenly upcoming events impact price accuracy negatively (Eydeland & Wolyniec, 2003 and Ignatieva & Trück, 2016) increasing the probability that the associated market participants are exposed to additional market risks.

Methods

As energy price and volatility extrema are hardly predictable (Keles/Genoese/Möst/Fichtner, 2012), their single impact on all five market prices within the NEM bidding zone will be analyzed by a VAR (vector autoregression) model (Diebold & Yilmaz, 2014). Although the market places of each state operate independently, the connectedness across the regional markets may lead to volatility spillover effects (Apergis/Barunik/Keung Lau, 2017). Considering the intraday market design of the NEM in terms of their 5 minute price frequency, a customized VAR model should be eligible for investigating market connectedness and volatility spikes initiated by technical incidents. Abnormal volatility is expected even for market places physically unconnected to the regions where the incidents event occurred. In order to compile a sound sample, NEM spot market prices from all five regions covering a period from 2013 until 2018 are taken into account, the data is retrieved from the AEMO (Australian Energy Market Operator) platform. On top of that, incident reports considering technical outage events published 2014 until 2018 by AEMO will complete the database. Based hereupon, the regulatory framework is to be evaluated deriving recommendations for rulemakers and policymakers.

Results

Overall, a time-varying, but strong connectedness around technical incident events between the five bidding zones can be tracked leading to high price volatility and price spikes on the NEM in recent years, with emphasis on 2016. Therefore, market actors should pay attention to announcements of outages in order to avoid (further) market risk in short-term transactions. Furthermore, the results change over the investigation period and depend on the event initiating bidding zone in which the strongest effects on volatility were detected when technical incidents arose in New South Wales. Certain stress scenario tests will be pursued prospectively.

Conclusions

The connectedness between the five Australian bidding zones of the NEM lead to price effects when unforeseen events occur in single market regions, especially technical incidents. Price spikes are not only a consequence in the bidding zone(s) where the incidents appeared, but also in not primarily affected bidding zones. So far, market actors in not primarily affected bidding zones would not be protected against spikes by the institutional framework. Nevertheless, upcoming price spikes lead to both risk and chances for market actors.

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