Cross-Border Effects of Capacity Remuneration Schemes in Interconnected Markets: Who is Free-Riding?

By Xavier Lambin and Thomas-Olivier Léautier

OVERVIEW

Since the liberalization process began in the early 90s, the European power sector has been increasingly exposed to market-based mechanisms, as opposed to national planning. Investments are increasingly market-driven, with prices supposed to give life to a socially optimal capacity mix and adequacy level. However, the power market still suffers from market imperfections and failures such as inelastic demand and the absence of liquid long term contract markets, leading to the implementation of regulatory firewalls such as price caps that may not be consistent with the security of supply targets. Many regulators have recently observed that the price signal alone no longer generated an "adequate" level of capacity according to their Security of Supply standards (that are set in some countries), a trend that was accentuated by fast renewables development. CRMs are seen as a solution to directly remunerate capacity (and not only energy) in some countries but without harmonization with their neighbors. The assessment of CRMs in a single market is very complex, so much so that all CRM designs ignore cross-border effects or at best take account of imports in an implicit manner. This research shows that a lack of harmonization might prove very costly in the long run, as capacity support schemes have a cross-border impact on prices and in turn, on investment.

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We first analyse the benchmark cases of isolated markets. In a second section we study interconnected markets with correlated demands, and limited or unlimited interconnexion capacity. This case provides the main insights while keeping the analytics very simple. The third part studies the more general case of non-correlated demands. Those results are then discussed and potential policy responses are considered.

METHODS

In a stylized analytical model, we study bilaterally interconnected markets with different market designs. The designs we considered are:

1. an energy-only market with no support scheme
2. a market with a payment for capacity. This payment could be a regulated amount, or the outcome of an auction.
3. a market with strategic reserve ("dormant" capacity, activated only in case of scarcity).

The transmission line may be congested. Demand is stochastic, can be correlated in the two countries or not. In a first stage, investors build capacity. There is free-entry. In a second stage, demand materializes in both markets and prices emerge.

RESULTS

The second stage, the spot market, is largely harmonized in Europe: markets are coupled, meaning prices are the same in all countries, up to technical limitations of transmission lines. However, this spot market relies heavily on the outcome of the first stage (How much capacity is available, and where?). With unilaterally implemented support schemes, the first stage does not emerge from a coordinated approach, paving the way to undesired effects of the support scheme on future price formation. In particular, promoting capacity in a given market (first stage) will mechanically depress market prices (second stage), not only in the local market, but also abroad if interconnection capacity is large enough. In turn, investors give a cold shoulder to the foreign market, and invest more in the local market where capacity is supported.

We show that with spot market integration and if transmission is large enough, rather than a *creation* of capacity, the long-run outcome is a shift of capacity from the market without capacity support to the market with support. If transmission system operators (TSOs) can't control exports (under the internal market rules) and if neighbours stick to an energy-only paradigm, a capacity payment is ineffective unless transmission capacity is small. If TSOs can limit exports to serve their local consumers in times of scarcity (in line with most national network codes), the security of supply in the neighbouring energy-only market shrinks while the security of supply in the market with capacity support increases

at low cost –a direct consequence of the capacity shift. A neighbouring energy-only or strategic reserve market will thus suffer in the long-run and may have to implement a capacity payment as well in order to meet its security of supply standard.

Table 1 summarizes the cross-border effects of CRMs, when price the cap is set at a (common) Value of Lost Load and TSOs are allowed to control exports:

CONCLUSIONS

Local scheme	Enjoys positive externality from	Endures negative externality from
Energy – Only	Strategic Reserve[1]	Capacity Payment[2]
Strategic Reserve	Energy Only	Capacity Payment
Capacity Payment	Strategic Reserve ~ Energy Only	-

Table 1: Externalities endured/enjoyed by a market with a given design, interconnected with another market

While the day-ahead market integration has made much progress in Europe, security of supply policies in Europe remain to a large extent in the hands of national governments –as opposed to the European level. The consequence is a patchwork of market designs that are assessed neglecting the potential spillover effects to neighboring countries. Our simple model proves that cross-border effects do exists, and they might be far from negligible. On top of that, the victim might not be the one who first crosses our mind: in the long-run, the problem does not lie so much in capacity free-riding (at the expense of the market with capacity support), but rather in unfair investment competition (at the benefit of the market with capacity support). Our conclusions urge for the harmonization of capacity remuneration schemes across Europe.

Footnotes

[1] EO is welfare-neutral, but gets improved Security of Supply
[2] EO is welfare-neutral, but gets degraded Security of Supply

References

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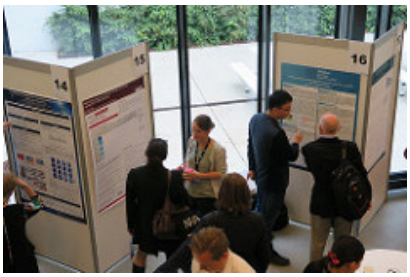
Bergen Conference Overview

The 39th IAEE 2016 International Conference in Bergen, at the Norwegian School of Economics (NHH), was filled with robust activities and events for an entire week. It was also the largest conference recorded in the IAEE history until now, in terms of registered attendees (605) and papers. (387, including 41 posters), presented in 71 concurrent sessions during three full conference days, in addition to three plenary and six dual plenary sessions.

It started with an IAEE/NHH Summer School on the Management of Energy Price Risk, organized and taught by NHH-Professor Petter Bjerksund, 16-18 June, and ended with two Technical Tours to, respectively, the Dale and Sima hydroelectric power plants and the Mongstad combined heat and power plant, on 23 June, all well attended.


Attendees enjoying sessions, the poster competition, and technical tours

continued on page 32