Roundtable "Market design and competition in electricity"

Some remarks

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1. Introduction : the major issues for market design might be on investment decision-making

(i) The debates over the last few years brought two major facts to light :

- Introducing competition in the electricity sector, where it has not been so natural so far, requires a careful attention to the consistency of its market design; hence the need for regulators with full expertize;
- Two cases make market power a matter of great concern, even with regard to generators with small market share : the case of load pockets constrained on their imports by transmission congestion ; the case of regional tight supply-demand balance, notably during "extreme" peak-load periods. Those 2 cases are linked to specific features of electricity, such as the demand inelasticity in real time or the variability of network capacity.

  Economists and experts of the sector have dedicated most of their work on the design of short term markets, in order to monitor the market power held by all the players in these situations, and to solve inconsistencies between the day-ahead energy market, the energy balance market and the operating reserve market.

(ii) These concerns are relevant but raise two problems :

- The chosen solutions often lead to a very intrusive regulation, for instance to be able to implement cost-based bids during tight and congested situations. Some authors call it market-oriented regulation. But this regulation could be much more cumbersome and complex than the previous regulation of franchised utilities and can give way to inconsistencies.
- More significantly, those solutions don't deal with one of the major elements that explain the recent crises in California, New-York, Italy and elsewhere : I am referring to the lack of incentives for generators and transmission owners to invest on time and in a mutually consistent way (and the lack of coordination between ISOs and Transcos…). In some cases, the proposed solutions might even have the opposite result, for instance if price-caps on short term markets are too low.

(iii) So, it may be helpful to come back to three of the ideas that motivated the introduction of competition in the electricity sector :

- the possibility of an effective competition between generation companies over large areas like continental Europe, thanks to the existence of well-developed networks, with no major congestions (given the fact that the cost of the network is low

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relatively to the cost of generation for consumers directly connected to the high-voltage network);

- the belief that competition for generation investment could easily discipline the players' behaviors because of the lack of entry barrier, and would prevent the system from being tight.
- trust in the natural development of forward and futures markets, which, among other things, reduce market power on spot markets.

So, we should try to implement market designs coherent with these objectives (if possible with a light regulation) if we want competition to be more efficient than the previous regulation of utilities.

(iv) Given these specifications, we should prioritize work on investment decision-making issues (and also coordination between ISOs or RTOs), using multidisciplinary approach : from economics and operational research to electrical engineering.

(v) I would like to illustrate this, with the aim of opening the debate, by focusing on generation and supply-demand balance. I will leave aside the network for a short moment.

2. Generation investment and supply-demand balance

2.1 What does the ideal model of a perfect electricity market with no network constraint look like ?

(i) This model assumes that all the market players can meet their expectations on demand-supply balance over the next 4 or 5 years through forward and futures markets. Their self-interest incites them to contract commitments on these markets, in order to provide insurance for investments involved on both sides of supply and demand.

(ii) These terms are similar to the construction lead-times of investment in power plants. Thus the market can be fully competitive between the different players – even on areas where the market structure is concentrated-, given the fact that it is easy to enter into the power generation activity (if there is no barrier linked to a burdensome and lengthy administrative process for plant siting approval, as it was the case in California for instance).

(iii) If most transactions are covered by forward and futures contracts, short term market power on spot markets is mostly mitigated.

(In such a model, the market power is understood in relation to investment issues, so the relevant Lerner index would probably use long run marginal costs instead of short run fuel marginal costs)

2.2 Three shortcomings that need to be discussed and lead us to suggest some paths for research

(i) First, for transaction costs reasons, notably metering, and considering the non storability of electricity, short term demand curve is quite inelastic. So, when supply curve is tight in extreme peak periods, supply-demand balance cannot be achieved through a market-clearing-price.

This basic fact should be clearly discussed and analyzed. In the next few years, everything must be done to favor price-responsive demand contracts. But given the existing transaction costs, the results might well be relatively limited and only displace the difficulty. Consequently, the quality of service – namely the expected number of hours of power rationing (using controlled rolling blackouts)-, has some of the attributes of a public good.

The visible hand of the regulator is thus needed here to ensure efficient and fair power rationing implementation and avoid blackouts. The visible hand is also needed to fix the price-settlement used by market buyers and sellers during these events and to provide the right-signal to invest in peaking units.

It is well known in the electricity sector that getting a level of quality of service equivalent to only one or two days of controlled rolling blackouts in every 10 years, as is often the case in the USA or in Europe, requires a level of contingent price as high as 10 000 or 15 000 €/MWh (which is signicantly higher than the 1000 €/MWh existing price-caps in some regions). That obviously raises some questions.

(ii) Second difficulty : the present lack of (new) forward contracts beyond one or two years, and the difficult convergence of expectations concerning future supply-demand equilibria.

New investments in peak-load units have to be decided 3 years before the expected annual length of power rationing exceeds 2 or 3 hours. This expectation is extremely sensitive to the representation and modelling of the likelihood of events that affect the system. Thus it is particularly difficult for the market players to build convergent objective expectations, to avoid markovian behaviors, and then to acquire trust into the value of contract commitment over several years.

It seems to me that these facts have a real significance and should trigger further empirical as well as theoretical work.

(iii) Third shortcoming : the previous difficulty to get market-clearing prices in tight situations, in both spot and forward markets, can favour strategic behavior from all the players.

- from the generators and traders, who can exercise their short term market power during tight supply-demand conditions, whatever their market share;
- from the consumers and their suppliers, who can opportunistically overbet on the low probability of tight situations and thus feel no need to enter into contract commitment over several years;
- from the regulator, who may intervene inconsistently (with a proper functioning of the wholesale markets), for instance in capping short term energy prices at a too low level in order to avoid price-spikes, or in organizing bidding procedures for new peaking units at the wrong time.

2.3 Issues should be handled so as to avoid apparently attractive but uncertain solutions ("what seems good today may prove to be wrong tomorrow")

Given the importance of all these three shortcomings, it seems to me that when we look for remedy exclusively on strategic behavior of the players, we deal only with the symptoms of the disease and miss the importance that should be attached to the first two shortcomings.

Let me give three short examples :

1) Price-caps and bid-caps on the spot markets can discourage the players from long term contract commitment and from investment in generation plants.
2) Bidding procedures for peaking units can result in persistent low market prices and deterrence of investments in all types of units, baseload included.
3) Using the micro-design of the day-ahead operating reserves market as a tool for investment could be inappropriate and deserves a precise analysis.

   In relying on existing non-running units that can be quickly started in real time, operating and spinning reserves prevent usual balance from turning into tight or power rationing situations. These reserves also prevent power rationing situations from turning into a general blackout. In most electrical systems, their contribution is sized at around 2 or 4 % of the daily power consumption. So it is a short term tool. It should not be very effective to help the players to build their long term expectations or to assess 3 years in advance the right amount of annual peak-load capacity required, that is usually around 15 or 20% of expected annual peak load demand.

2.4 Incentive to invest : here is the major task to work on

The task should be to help the market-players to build convergent expectations on prices and quantities over the future supply-demand equilibria. This should help also to restrain players from free-riding.

(One could argue that this is mainly a learning process issue; in this case, one crucial question is linked to the political acceptability of what may be a lengthy path)

Two possible approaches :

(i) The decentralization of decisions through prices, inspired from the British former capacity payment mechanism.

   Here, the price of the expected annual peak-load period could be announced 3 years in advance and used every year to pay all the generators, baseload plants included, in due proportion of their actual contribution during the tightest situations, when the probability of loss of load is above zero.

(ii) The mechanisms of capacity obligations and capacity market, that can be compared to a decentralization of decisions partly through quantities, and that is inspired from the model of PJM.

   Here each Load Serving Entity could be assigned a capacity obligation in due proportion of its expected future peak-load demand 3 years in advance. The penalty for defaulting this obligation should be at least as high as the total cost of a peak-load combustion turbine and should be also enforced 3 years in advance. Of course, consumers switching over to different suppliers with short notice must be taken into account. But that could be workable.

Conclusion

To conclude, I focused my attention on generation and supply-demand balance. But the same types of analysis can be developed on the network issues, and on the market interactions between electricity, gas, NOx and CO2.

I think that we need to step back from the experience of the past ten years on the European and US electricity markets. I would suggest that we draw up a list of key issues, as comprehensive as we possibly can, and do roadmapping for research. That roadmapping should allow us to transcend sterile ideological oppositions and help us overcome traditionnal disciplinary barriers.

While it is easy to criticize the politicians for their lack of consistency in market design, how can we apportion blame if the community of experts and academics cannot reach clear and appropriate assessments of the terms of debate ?