Design of Capacity Remuneration Mechanisms: Evolutions and Convergences over Time and Space

Charlotte Scouflaire
Université Paris Dauphine, PSL Research University, LEDa
Chair European Electricity Markets
Place du Marechal de Lattre de Tassigny, Paris, France
charlotte.scouflaire@dauphine.fr

Overview

The history of capacity remuneration mechanisms (CRMs) is closely related to liberalization. Indeed, under a public or regulated monopoly, security of supply is only one of the missions of the monopoly. It only becomes a problem in liberalized markets with marginal pricing when investments become driven by solely by market revenues. A wide range of CRMs have been implemented so far, all with very specific designs. Many features have been applied and tested out, that the analysis cannot be carried within the framework developed in the 2000s anymore. And yet, those last years have seen a regain of interest towards CRMs, especially in Europe where the Commission is taking position on the topic. To evaluate designs currently discussed and implemented, the dynamics of CRM since the 90s are assessed and their features caracterized.

Newberry (1998) showed evidence of such behavior and the England and Wales power pool was reformed in 2001 from scratch. From this moment on, no other system have had implemented a full ex post payment. In the meantime, some US systems as well as Spain and Colombia decided to take measures to ensure security of supply. Spain and Colombia decided to implement capacity payments while the eastern US states implemented a CRM based on installed capacity (ICAP) with a short term procurement. This last option did not turn out so well and ICAP based designs were removed once and for all from all regulators' toolbox, being replaced in all newly carried out CRM by explicit incentives to be available or to produce at peak. Similarly, daily capacity mechanisms are now out of fashion for not giving the long term signal needed for investors. Capacity payments are also in trough.

The dynamics of CRM regulation might appear erratic at first, but once put in context, a clear convergence of norms stands out. Some design features have been dropped for being inefficient and others have been more broadly adopted. For instance, it is noticeable that all the new CRMs have enforced capacity, ex ante clearing, volume based mechanisms and a forward period in common. As for the future, the regulatory toolbox is also getting narrower in terms of contract duration (which are getting longer) and demand response integration in capacity mechanisms.

Methods

The availability of information on past experiences obviously depends on the existence of such experiences, meaning that the first system to implement a CRM could only rely on the theoretical framework in addition to their knowledge about their own power system specificities. The later in time the decision to implement a CRM is taken, the more information is available to make an enlightened decision. The regulator can then rely on past experiences as well.

An historical assessment of capacity remuneration mechanisms designs sets out the forces at stake and the key design elements for the success of mechanism. Over time, some features have been dropped, reflecting their relative inefficiency compared to others which have been more broadly adopted. Some features clearly dominate others. A third category of features can be defined: those that are neither discarded nor democratized. Time and implementation have not permitted to set out a dominance, meaning that these can be considered as system specific. Based on this typology as well as past and current CRM design, features can be ranked and assessed as a usefool instrument for CRM design.

Results

When the pure and perfect competition hypothesis is dropped, some features naturally emerge as more efficient. This is what happens in the 2000s. For instance, payments based on plain installed capacity were replaced by more elaborated schemes accounting for security of supply participation or incentive to be available at peak. The sloped demand curve is an innovation in order to reduce price volatility in capacity markets, this feature coexists with the old fashion as long as it has not proven itself more efficient. The same can be said regarding the length of the contract (longer) and the forward period. It also seems that capacity mechanisms are more and more though as complementary to the energy market. Where the energy market is nodal, the capacity market is turned into a nodal one as well. From this analysis, some high level characteristics do seem to converge amongst all systems:

- Enforced capacity: No system pay for installed capacity .
- Ex ante clearing: ex post is theoretically more accurate, but leaves too much space to strategic behaviour. Knowing the payment ex ante also reduces the risk.
- Volume based: ensures the reliability target with certainty.
- Forward period: reduces the risk for investors that are already granted some revenues before the plant is running.

All those elements respond to the original aim of CRMs: ensure that enough capacity is built and available to supply peak demand (internalization of the externality). Risk reduction favor investments for the long term signal, while the enforced capacity and ex ante clearing create an obligation for the generators and gives visibility to the grid operator on the state of security of supply. It can take the needed measure accordingly

Conclusions

Although the debate on CRM need remains unsettled, so is the one on its optimal design. However, it is possible to set out key features by looking at past decisions made by the regulators. The design elements relating to investment incentive have been identified and are converging across most CRMs currently in place. Moreover, the current convergence phase seems to focus on demand side management. And this might as well be the last regulatory learning round for CRMs which will likely become irrelevant as soon as demand is flexible enough for individual VoLL to be revealed. Security of supply would then not to be a hot topic anymore.

References

Capacity Mechanisms in the EU Energy Market Law, Policy, and Economics, Oxford University Press Edited by Leigh Hancher, Adrien de Hauteclocque, and Malgorzata Sadowska

Competitive Electricity Markets Design, Implementation, Performance 1st Edition, Elsevier Science Edited by Fereidoon Sioshansi

A critical assessment of the different approached aimes to secure generation supply. *Energy Policy*, Battle, C., & Rodilla, P. (2010).

Capacity Market Fundamentals. *Economics of Energy and Environmental Policy (Vol. 2 No. 2)*, Cramton, P., Ockenfels, A., & Stoft, S. (2013).

The regulator's review of the English Electricity Pool, *Utilities Policy*, David M. Newbery (1998)