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A Primer on Capacity Mechanisms

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In this paper, I build a simple model to shed light on some of the questions at the center of the regulatory debate about the need, effect and design of capacity payments in the electricity sector. In particular, the model is used to address the following questions: can we rely on scarcity pricing to promote efficient investments in generation capacity, or should we rather combine price caps and capacity payments to ensure security of supply at least cost? What is the impact of capacity payments on the performance of energy markets? How much capacity should be procured and how does this depend on the level of the price cap or the degree of market power? Does it matter whether all plants, or only the new ones, receive capacity payments? What are the effects of market power in the capacity market and how could these be mitigated through market design? Finally, should capacity payments be bundled with financial commitments, and if so, which are the optimal ones?

A common thread of this paper is the idea that investment incentives and firms' ability to exercise market power cannot be analyzed in isolation. Understanding their interaction is key both when diagnosing the source of market failures, as well as when designing the regulatory instruments needed to address them. The energy-only market paradigm, which has been highly influential in the policy arena, advocates for the removal of price caps as a way to restore investment incentives with no need to resort to capacity payments. However, this recommendation is a direct consequence of ruling out market power by assumption – in perfectly competitive markets, price caps simply have no role to play in mitigating market power. In contrast, by endogenously allowing for market power, this paper shows that the removal of price caps triggers capacity expansions but it does so at the cost of strengthening market power. Accordingly, scarcity pricing is not an efficient solution for promoting investment.

Providing adequate investment incentives while at the same time mitigating market power requires the use of capacity payments in conjunction with price caps since price caps alone would mitigate market power but would result in poor investment incentives. In line with this view, this paper analyzes the role of capacity payments in imperfectly competitive markets.

Capacity markets are one commonly used instrument to determine capacity payments. The regulator (or the System Operator) sets the volume of capacity to be procured, investors submit the prices at which they are willing to make their capacities available, and the capacity price is set through market clearing. If the capacity market is competitive, the capacity price will cover the investment costs net of the scarcity rents that firms receive in the energy market. This links capacity payments with the level of the price cap: the more stringent it is, the lower the

scarcity rents and the higher the resulting capacity payments. Despite the increase in capacity payments, a stringent price cap policy saves consumers more than it costs as it is more effective in reducing market power rents.

This conclusion must be qualified if there is market power in the capacity market. First, market power in the capacity market makes it more costly for the regulator to procure a given amount of capacity (as firms retain the market power rents that arise both in the energy market as well as in the capacity market); and second, this might in turn induce the regulator to procure less capacity than would otherwise be optimal. Hence, continued efforts must be devoted to preventing market power in capacity markets, both through good market design as well as through close market supervision. In the same vein, capacity payments are more efficient when paid to the new plants only (i.e., so-called targeted mechanisms): for a given capacity price, aggregate investment is the same as when all plants receive capacity payments (market-wide mechanisms), but since it is less costly to induce investment under targeted mechanisms, the regulator optimally decides to procure more capacity. Thus, in equilibrium, aggregate investment is closer to the first-best when only new plants receive capacity payments, making consumers better off. Paying for the old plant's capacity would over-compensate firms beyond their lost profits.

Another controversial aspect of capacity payments is that they do not incentivize firms for making their capacities available other than through explicit penalties. This is one of the reasons why regulators are increasingly resorting to so-called reliability options, which embody an endogenous penalty for not being available. Since such a penalty is more costly the higher the market price, firms have stronger incentives for being available during periods of scarcity. Additionally, reliability options help mitigate market power in the energy market.

Similar to capacity markets, reliability options involve quantity regulation. However, the two regulatory solutions differ in two key aspects. First, reliability options allow for plant-specific price caps, in contrast to capacity markets that rely on market-wide price caps. Thus, auctioning reliability options is a more effective tool for preventing market power, particularly in the presence of several generation technologies. Furthermore, whereas reliability options are backed by a contract, market-wide price caps and capacity payments are subject to greater regulatory uncertainty.

Regulators play an important task when designing reliability options, as their potential for preventing market power depends on how close the strike price is to the plants' marginal costs. Setting strike prices that are too high would lead to reliability options rarely being exercised, and firms would obtain capacity payments with only weak disciplining effects. In turn, this has implications regarding the suitability of technology-neutral auctions for reliability options: if the strike price is set high enough so as to make room for even the most expensive technologies (e.g., demand response at the VOLL), the disciplining effects of reliability options on the lower cost technologies would be undermined.

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