Capacity Demand Pricing Mechanism: Bringing Clarity out of Ambiguity

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- We've been plagued by an inability to offer clear answers or consensus about capacity remuneration mechanisms (CRMs) and the IEM
- The following proposal would provide the basis for affirmatively answering the question – yes, a capacity mechanism to pay for security of supply – without the significant downsides of most existing CRM concepts based on fixed payments to owners of capacity. It offers member states the latitude to set their own security of supply standards; if absolutely necessary, it would even be possible to include a fixed payment component without fundamentally undermining the market.
- It proposes a CRM that operates as an administrative price adder to energy market prices based on the value of capacity needed to meet expressly formulated security of supply standards (where they exist).
- We know that the market needs to deliver/sustain both the quantity of investment in system resources required to meet reliability expectations and investment in a portfolio of resource capabilities that can integrate a growing share of variable production (and, where applicable, a growing share of inflexible nuclear) at least cost to consumers
- It is often said there is "missing money" in the energy market, money that should be available to support investment but for various reasons is not. Various causes of the alleged "missing money" are cited, including barriers to exit that artificially depress prices; explicit and implicit price caps; and non-transparent or out-of-market procurement and deployment of balancing services by system operators
- This last category of causes is associated with fact that, absent the opportunity for customers to express their own "value of lost load" (VoLL), market authorities impose reliability standards that impute or imply a VoLL. System operators operationalize these reliability standards through the procurement of various reserves and other services in the balancing mechanism. In any given interval these balancing services have a cost and a value relative to the imputed VoLL, and the decision to draw down capacity that could otherwise be available to provide these services to instead generate a kWh of energy has a related opportunity cost that varies from one interval to the next. To the extent energy market prices are insulated from this opportunity cost they fail to reflect fully the time-varying value of energy. (See endnote 2.)
- Regardless of the particular causes of "missing money" – of inadequate energy market price formation – a number of systems have adopted or proposed capacity mechanisms (or "markets") designed to set fixed capacity-denominated payments for specified periods of time. They are designed to replace the value that is "missing" from the energy and balancing services markets – a value that, as described above, varies from one scheduling interval to the next – with flat payments to all "firm" capacity deemed to be needed to meet generation adequacy standards. (Determining just how much capacity is actually needed is a whole different discussion.)

- Proponents of these capacity markets overwhelmingly agree that they should value capacity alone, as an undifferentiated product. All efforts to differentiate between capacity resources based on their operational capabilities have failed, with the exception of a few very simple & modest requirements for operational flexibility imposed in some mechanisms. (This orthodoxy extends to such factors as new vs. old, high-carbon vs. low-carbon, etc., but the focus here is on operational capabilities.)
- Yet most capacity markets in operation for more than a few years have experienced the limitations of "counting MWs" and are exploring ways to augment risk and reward during system stress events for resources receiving fixed capacity payments. Recently adopted or proposed reforms in some leading capacity markets will severely penalize capacity resources for failing to deliver energy during specified system events regardless of whether or not they've complied with their annual or seasonal availability obligations and will commensurately reward those resources that fill the breach. Such schemes create a virtual "scarcity pricing" mechanism that begins to mimic what one expects to happen in energy markets. Indeed it is noteworthy that one market, rather than creating a capacity bonus-penalty scheme, has chosen instead to boost the scarcity pricing signals in its energy and balancing services markets.
- The prevailing orthodoxy about capacity as an undifferentiated product still reigns, however. The recent reforms specifically target availability to produce during the event while largely retaining long-standing provisions to compensate inflexible generators for uneconomic operating decisions pre-notified as being required prior to or following such events in order to deliver energy at the appointed hour. (In appeals filed against the FERC decision approving PJM's "Capacity Performance" proposal objectors noted that FERC stripped it of even those few modest reforms put forward by PJM that would have favored more flexible resources and thus saved consumers some of the costs of protecting less flexible resources.)
- An oft-stated assumption behind the single-product capacity market orthodoxy is that the value of flexibility should be earned in the energy and balancing services markets, but as explained above the true value of flexibility is expressed in these markets only to the extent that prices fully reflect the time-varying value of energy and balancing services, including the time-varying opportunity cost of using capacity to produce a kWh of energy rather than provide system reserves. By using fixed capacity revenues to make up for or replace payments for shortage value in the energy and balancing services markets the ability of these markets to express the full value of flexibility is directly and unavoidably impaired. The more strongly a market relies on single-product, fixed-payment capacity mechanisms, the less it can count on the very instrument (energy and balancing services market pricing) capacity market proponents insist should be used to value different operational capabilities.
- There have been suggestions, and even some attempts to create discrete markets for "flexibility" but flexibility is not something that can be easily measured or defined except in a very generic way, especially as the demand for flexibility is expected to grow and evolve; where this has been attempted it has encountered the same problems that capacity market proponents seek to avoid: problems with product design, product proliferation, illiquidity, and market rules that are either excessively complex or that end up needlessly favoring certain types of resources over others.

- So how to craft a CRM that allows market authorities to set a value for investments in the *capacity* needed to meet established adequacy standards, while at the same time ensuring that the market adequately captures the value of *resource flexibility* (from all possible sources)?
- The answer lies in leveraging the way system operators already operationalize security standards and have done for decades – through their algorithms for deciding how much of the various balancing services (reserves, etc.) they need for any given set of scheduling intervals.
- In markets including ERCOT, PJM, NYISO and GB, system operators have begun implementing what are sometimes called Operating Reserve Demand Curves, administrative mechanisms that set the value of an incremental unit of reserves that rises gradually up to full VoLL (or to a very high price cap) as the supply of reserves falls below requirements. This "co-optimization mechanism" is then used to create a price adder that is added to the clearing price for energy, closing the gap between where the energy market price is set through trading and a price that reflects a fuller value of energy, including the value of security of supply.
- ***THIS IS A CAPACITY REMUNERATION MECHANISM***, but it works by topping up and "routinizing" the shortage price signal. Importantly, it is indifferent to the causes of the shortfall in pricing – market implementation flaws, out-of-market provision of balancing services, above-market security standards etc. That said, because it operates by boosting the market price for energy it counteracts a wide range of distortions in energy market pricing and thereby bolsters the case for eliminating those distortions.
- This approach – call it a Capacity Demand Pricing Mechanism ("CDPM") – offers market authorities the essence of what they seek from a fixed payment mechanism – an administrative price for the value of investment needed for security of supply. Some might object that it eliminates the benefit of a flat fixed payment that insulates investors from the need to capitalize on (and avoid the risk of) shortage price spikes. But as noted above, market authorities with experience have come to recognize the need to re-introduce just such a risk-reward dynamic in order to realize fully the reliability benefits they thought they were getting with their capacity markets. Rather than incurring years of unsatisfactory experience with a standard fixed-payment CRM to reach that conclusion a CDPM addresses the issue efficiently from the outset. (Obviously a CDPM doesn't offer the same thing as a government-backed long-term contract, but neither do most of the most oft-cited CRMs in operation today; if that's what's at issue we're into a very different discussion about central planning vs. markets – see Endnote 1.) And the CDPM approach can transform shortage pricing from the popular image of a carnival thrill ride into a more investable and actionable market phenomenon.
- Results can be seen in practice in several markets where a comparable mechanism has been applied, with "modest" shortage pricing emerging with some frequency while average price remains at familiar levels. This effectively responds to concerns about price "spikes" being too infrequent to be useful to investors and too extreme to be acceptable to politicians. And it should be reiterated that investors are not expected to rely on short-term price volatility alone but rather on the resulting incentives for market participants to mitigate their exposure to price and volume risk.

- This approach provides ample incentives for generators and suppliers (and large customers) to hedge their exposure to price and volume risk through contracts and other instruments of various durations, giving customers access to affordable prices and risk management while at the same time maintaining the full range of pricing in the energy market.
- It creates a virtuous cycle – as more and more customer loads acquire the ability to express their own VoLL, the less we'll have to rely on centrally administered reliability via system operator procurement of balancing services, and over time this CRM will simply disappear. (See Endnote 2.)
- This stands in contrast to the vicious cycle created by fixed payment CRM schemes – by redirecting revenues from the energy market into fixed payments they obscure the value for demand to respond to conditions of tight or loose supply and retard the evolution of market-responsive demand. Even if and when we reach the point where the fixed CRM is no longer needed a conscious decision will have to be taken to eliminate it, and we all know how hard that will be.
- Some member states may still fail to appreciate that a CDPM replaces the need for – and indeed improves upon – fixed payment CRM schemes (especially as such schemes inevitably confront the need to incorporate bonus-penalty schemes or equivalent risk-reward schemes for specific performance during system stress events). One could imagine adopting a guideline that permits member states to adopt some limited for of "traditional" capacity mechanism *on the condition* that they first adopt a CDPM and raise or remove price caps to allow it to operate as intended.
- We often find experts – even many of those endorsing various fixed CRMs – insisting that effective energy market price formation should be addressed as a priority before adopting capacity mechanisms, but just as often they offer little or nothing in the way of concrete recommendations as means to ensure this actually happens and, if we're honest in most cases the decision to adopt a fixed CRM goes hand in hand with an explicit or implicit decision not to do so. This CDPM approach offers policy makers a specific, actionable measure they can take to ensure that improved energy market price formation actually happens.
- To make even clearer the inherent coherence of this approach one could also require that any fixed payment portion of capacity remuneration incorporate significant risk and reward associated with specific performance during defined system stress events, as has now been done in PJM and ISO New England after years of experience. Not only does this ensure that the mechanism does what it's ostensibly intended to do, but it better aligns the incentives in the fixed payment mechanism with the resource capabilities needed to do so at least cost to consumers. The fixed portion of capacity remuneration can thus be marginalized into a subordinate role at the outset and, over time, should become redundant.

Endnote 1 – Long-term government-backed contracts (no need to read this if you're already convinced!):

Capacity markets and centrally administered allocation of long-term government backed contracts are two different things. This proposal is meant to offer an alternative to the former, not the latter. As Prof. David Newbery has astutely observed, the "mission creep" of capacity mechanisms toward central planning is, as seen in the case of the ongoing evolution of the UK's capacity market, the result of governments asking investors what they need; what investors need and what they want are two different things, and their responses invariably represent what they want, not what they need. This is not to say investors don't need access to the opportunity to hedge risks through "long-term" contracts and other relevant instruments. They do. But the idea behind an energy market is that those arrangements will arise as a natural response of market participants on both sides of the generation/supplier divide seeking counterparties for such hedging arrangements. If one wants government to play that role, transferring to taxpayers the risks of investments in a naturally competitive industry sector over many years in the face of rapidly evolving technologies and customer behavior, then one should simply do that and be done with it. But as has been demonstrated in a number of markets (including the oft-cited US capacity markets) this is not required to support needed investment. There are some sectors (e.g., transmission and distribution) where this is largely unavoidable, but especially in the current environment the risk transfer can be substantial and, in the case of the generation sector avoidable (except for the policy-driven need to deploy low-carbon resources despite a lack of market demand for new investment). This risk is compounded by the ever-present risk of regulatory capture by powerful incumbent private companies with unequal access to resources and information. Too often the end result is a high risk of stranded assets, the privatization of profit and the socialization of loss, and the suppression of innovation and new entry. It would seem that the basic choice embedded in the market framework for the generation sector is that this will instead be driven primarily by market decisions, with responsibility for risk management, profit *and* loss borne by commercial companies, their investors and their lenders. Contrary to claims from many so-called experts, experience in a number of markets has demonstrated that this basic approach can be made to work and work well. Nor is the sometimes difficult experience with the intersection between wholesale power markets and policy-driven deployment of low-carbon resources an indication that this cannot work. In a mature, fully served market the policy-driven deployment of renewables and other low-carbon resources undoubtedly leads to stranded assets, but that is a matter that government can and should ensure is dealt with fairly and in a way that allows the market to function as it was intended to do. Supply and demand in competitive markets is routinely impacted by public policy regarding safety, competition, environmental regulation, land-use, and a wide range of other constraints, but markets are expected to, and routinely do absorb and respond to such external forcing factors just as they respond to non-governmental forcing factors. Legitimate government interests in such things as energy mix and new technology deployment can be handled through supplier obligations, but the risk and reward of investing in new businesses can and should be borne by investors, not taxpayers.

Endnote 2 – Truly missing money

In most current markets the VoLL imputed by market authorities is a somewhat arbitrary single value in what is in reality a wide range of values consumers of various types would place on uninterrupted service for various loads or end-use energy services. In most cases that have been analyzed these imputed point values exceed the likely VoLL for all but a small percentage of all loads, and in some cases the imputed VoLL is orders of magnitude higher than any reasonable mid-point estimate of VoLL. (There may be good reasons for market authorities to adopt an extra margin of conservatism when acting in proxy for consumers, but the magnitude of that margin in many markets seems difficult to justify.) One could argue that the only irreducible source of "missing money" is the money required to deliver this administratively inflated reliability standard, since complying with it calls for a level of investment that would not be sustained even in a market where all loads are able to express their actual VoLL. Over time, as consumers gradually acquire greater ability to express their own VoLLs – to set the price they're willing to pay for electricity to serve different loads – the role system operators play, or should play in setting the time-varying shortage value of energy should attenuate and any associated "over-provision" of security should attenuate as well. But that is likely to occur over a long timeline, and in the meantime this is likely to be the most persistent and common source of missing money (as has been noted by a number of experts). The good news is that the practice of co-optimizing reserves and energy markets is indifferent to whether or not the imputed VoLL is low, high or just right. By co-optimizing markets based on whatever VoLL is imputed by market authorities the value of the added layer of investment needed to serve an inflated reliability standard is captured in the same mechanism used to capture the value of the investment required to serve what one might refer to as "organic" demand for reliability. So while proponents of CRMs may, with some justification, point to this layer of missing money as being something an "energy-only market" would not deliver, a CDPM approach to intervening in such a market is a far more efficient and effective way to manage security of supply for as long as it is necessary for central authorities to do so on consumers' behalf.