Assuring Generation Adequacy through Call Option Obligations

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Restructuring of the electricity industry was a means to an end. The goal was improved efficiency in investments and operations, and improved customer satisfaction from lower rates and expanded service options. The means included regional wholesale markets managed by regulated transmission system operators and competitive markets for retail service, including open access to transmission for independent power producers and their industrial customers. Incentives were strengthened by requiring non-utility generators to bear investment and operating risks, and by requiring retailers and/or their customers to bear price risks. These risks were to be moderated by long-term procurement contracts and financial hedges. This restructuring paradigm was guided by the notion of an ideal competitive energy market.

In an ideal competitive energy market, generators always offer supply at marginal cost but inframarginal profits (from scarcity rents resulting from clearing prices set by peaking units and demand-side bids) produce sufficient income to cover generators' fixed costs. This provides sufficient incentive for investment when needed. In such an ideal market, generators bear all the investment risks and load bears the price risk. But financial instruments and long-term contracts between sellers and buyers enable them to manage their risk exposures. Unfortunately actual performance falls short of the original goals. Market imperfections – including technological barriers to demand response, local market power, and price caps due to political aversion to price volatility – interfere with the ability of an energy-only market to attract adequate levels of investment to meet socially desirable reliability levels. Consequently, new mandates are now imposed to ensure adequate investments in transmission and generation facilities sufficient to meet peak loads plus a reserve margin. Greater financial risks have raised the cost of capital amid financial distress of all power traders, many generators, and some utilities. Non-utility retailers have made slight inroads and service differentiation remains primitive.

The central difficulty is that imperfect markets for contracts and financial hedges hinder efficient allocation of risk bearing. Except for industrial firms, retail customers continue to rely primarily on utilities that offer basic service at nearly level, regulated rates that recover the cost-of-service over time. To overcome such difficulties, various capacity mechanisms have been proposed and implemented in the U.S. and around the world whose primary objective is to stabilize generators' income and to create incentives for investment in generation capacity. All of the capacity mechanisms effectively abandon the notion of letting the market determine the socially desirable level of generation capacity in favor of a central planning criterion for reserves based on technical and social considerations. Such treatment is often justified by the view that supply reliability of electricity is a public good. The various capacity mechanisms vary, however, with respect to how explicit is the regulator in prescribing the level of generation capacity as opposed to providing financial incentives and relying on market forces to provide the desired

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level. The capacity mechanisms currently implemented or proposed in the U.S. and worldwide fall into five general categories: Capacity Payments, Capacity obligations, Strategic reserves procurement by the system operator, Operating reserve pricing, Contracting obligations and energy call options. While the latter approach has not been implemented yet and requires further research, it is the most promising one because it employs the same type of instruments that an ideal market would use, while rectifying the market's failure to provide proper risk sharing between generators and load through a mandatory hedging requirement. Unlike the other approaches that rely on introducing artificial products with no intrinsic value, or various forms of subsidy and price support, the contracting obligation minimizes distortions to the energy market. Furthermore, the intrinsic value of the mandatory hedges makes them amenable to eventual privatization and a smooth transition as the market matures to a normal market with risk management driven by customer choice rather than regulatory intervention.

Contracting obligations imposed on load serving entities (LSE), like any other capacity mechanism, must be designed to minimize interference in the energy market and in the voluntary risk management practices of market participants. This objective can be achieved by restricting contracting obligations to call options with a strike price that is sufficiently high to provide a backstop hedge – rather than replacing the bilateral contracts that LSEs would otherwise use for risk management. A high strike price also ensures that the option will be "out of the money" most of the time and hence its cost will be relatively low. Further reduction in the cost of the call option can be achieved by defining the call option in terms of the spark spread (that is the spread between the electricity spot price and the heat rate adjusted fuel spot price) so that the generator does not bear the fuel cost risk.

Because a call option provides a right but not an obligation for the LSEs to buy the contracted amount of energy, it can be used to secure reserve capacity in excess of forecasted peak demand. In particular, any wholesale customer or LSE should be required to carry call options that will cover its peak load forecast within the covered delivery period, plus adequate reserves as set by the regulator. In order to insure deliverability, the call options must be backed by existing generation capacity, or by a commitment to invest in generation capacity that will be available by delivery time, or by verifiable interruptible load contracts. Bilateral contracts held by an LSE or a wholesale customer for the covered period, provided the contract's energy price is below the mandated backstop strike price, can be used to meet the call option obligation.

On the other hand, it is important that the backstop strike price of mandatory call options be significantly below the price cap for energy in the spot market. Maintaining such a gap serves several objectives. First, it provides a natural economic penalty for non-performance by the generator through the financial liability entailed by the option for the price difference between the energy clearing price and the strike price for undelivered energy. For a call option covered by interruptible load, the strike price of the option sets a penalty for interruptible load that wishes to override its curtailment. In such a case the load will be liable for the difference between the spot price and the strike price for the energy it uses. Such penalties can be imposed in addition to any other nonperformance penalties such as forfeiture of the option premium.

The gap between the backstop strike price and the energy price cap also enables differentiation between generators that sold call option on their capacity and those generators that did not. Generators that did not sell call options should be allowed to set energy prices up to the energy price cap and sell their energy above the backstop strike price if their energy is needed either due to unforeseen high demand or non-performance of call option sellers. These situations are particularly likely in regions with high hydro concentration that are prone to occasional dry years. Hydro generators that collect capacity payments through some capacity mechanism must have an incentive to reinsure their delivery obligation through contracts with thermal plants. Such incentives are provided by allowing thermal plants who did not receive capacity payments to set the price above the backstop strike price, and holding the hydro generators who received capacity payment liable for the price difference between the spot price and the backstop strike price. The differential energy caps (the global cap vs. the backstop strike price) between contracted capacity and un-contracted capacity allows one to maintain the aggregate call option obligation constant at the desired optimal capacity level (say Q^*) without compromising price elasticity for capacity. Any excess capacity beyond Q^* will either be contracted on a voluntary basis or be allowed to recoup the option value by selling on the spot market at the price cap rather than being limited by the strike price. In either case such excess capacity will lower the price-duration curve and reduce the intrinsic value and market price of the mandatory call options.

Contract duration is a key element in developing a capacity mechanism based on contract obligations. Proponents of short-term capacity products like ICAP argue that a stable income stream to incumbent generators for their installed capacity will provide the right price signals to new entrants to invest in capacity. According to this paradigm, potential entrants play a passive role. Alternatively, capacity products and call options with a long lead time enable direct participation by investors who may sell such products against investment commitments. The current wisdom advocate a three-year lead time for capacity products – long enough to enable new investors to participate in the market by offering ICAP products or contracts covered by generators in the planning stage. Enabling active participation by entrants will attract capital and mitigate market power in the capacity market

The main obstacle and source of opposition for long-term capacity products comes from LSEs and retail energy providers who argue that long-term contractual obligations are inconsistent with a competitive retail environment where customers are allowed to switch providers. In principle this should not be a problem since the call option obligations can be based on a three year forecasted peak but the obligation can be adjusted monthly based on current load. A secondary market for the three-year call options would allow their holders to trade them so as to adjust their holding according to their load. The prices of the call options in the secondary market would fluctuate in the same way as the prices of 30-year treasury bonds fluctuate on a daily basis to reflect supply and demand.

Unfortunately the above scheme does not solve the credit problem associated with holding a three-year contract for (100+x)% of the forecasted three-year peak load. Many LSEs and retail energy providers find the credit requirement associated with such an obligation prohibitive. The fundamental time step incompatibility between the need for long term capacity products or call options that will serve the need of new investors on the supply side vs. the short term commitments supported by the load side, creates the need for centralized procurement by the system operator. The Texas Market Oversight Division of the Public Utility Commission of Texas recently put forward a straw man proposal for centralized procurement of call options incorporating the ideas outlined above and stakeholders inputs. Under the proposed scheme ERCOT would procure in an annual centralized auction year-long call options for two-years forward. Call options must be backed by installed capacity, capacity that would be in place by delivery time, or by curtailable load resources. The procured quantity would be based on forecasted annual peak. While ERCOT would underwrite the procurement of the options, generators would receive payments that ERCOT would recover from the load during the performance period. The cost of procurement would be distributed over the year based on a LOLP calculation and would be allocated to the load on a *pro rata* basis. Holders of bilateral contracts could self-provide their call option obligation by offering call options into the central procurement auction against their bilateral contracts (assuming that the price, time period, and cover meet the call option criteria). This scheme works like an ancillary service market for a reserve with a three-year lead time.