PG&E National Energy Group

Call Options for Energy: A Market Based Alternative to ICAP

Introduction

There are at least two distinct approaches for ensuring generation adequacy that have been adopted by ISOs. The first approach currently in use in PJM involves setting Installed Capacity (ICAP) obligations for Load Serving Entities (LSEs). An alternative approach relies primarily on spot price signals in the energy market coupled with products such as replacement reserves to ensure generation adequacy. Neither approach has proved to be perfect. A new approach is proposed that combines elements of both paradigms and relies on call options for energy. The call option approach allows LSEs to select their own price caps in exchange for a premium that serves as a substitute for the price signals generated by ICAP.

The Role of ICAP

ICAP is intended to ensure generation adequacy. Historically, ICAP served as a way to track and exchange obligations over a planning horizon. Today's ICAP "market" requires LSEs to "buy" a *social* good, i.e., adequate *pool* capacity. The LSEs do not get any *private* rights to the capacity in the key peak hours, so ICAP is not particularly valuable to them. On the other hand, suppliers don't always get paid much for ICAP. Yet by selling it, they limit their energy sale options through acceptance of recall rights by the control area. By its very nature, the ICAP market is bi-modal - either there is adequate capacity, or not. All these factors combine to create an ICAP market that is not sufficiently effective.

From a reliability perspective, the problems with the existing ICAP market arising from sales into other control areas are fairly well understood. Reasonable solutions to fixing these problems are inevitably assessed in terms of the effect they will have on the cost of ICAP. There is a general reluctance to accept proposals that are likely to increase this cost as long as LSEs do not see a value for ICAP.

At the same time, everyone is concerned about price volatility - either suffering from it, or having caps imposed. The recent price spikes in San Diego illustrate the challenges posed by sudden changes in paradigm, i.e., from a rate freeze to a volatile energy market. Even though the energy market in California had price caps in place, the sudden exposure to volatility was unsustainable. The response of regulators and politicians in such situations is to introduce price caps or lower existing price caps. Price caps are in the short term a free call option to Load Serving Entities (LSEs) that could not (by virtue of state regulatory restriction) or would not purchase market based price hedges. It is only free in the short run though. In the long run, the impact of trimming price spikes, lowering volatility and inhibiting the ability of generators to collect scarcity rents reduces generation adequacy and requires the LSEs of tomorrow to pay more for all services.

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A Market Based Approach to Generation Adequacy

Given the shortcomings of ICAP and the energy only paradigm, a new approach is needed that provides incentives for generation adequacy and provides the opportunity for market buyers to protect their own price risk. To rely solely on energy price spikes maybe naïve given the experiences in California this past summer. One approach that is market based and can avoid price shocks for consumers, involves establishing mandatory call options for energy.

Under this approach, generators receive a capacity payment in the form of an *option premium* and guarantee the availability of capacity to provide energy at a pre-determined *strike price*. Load Serving Entities (LSEs) pay a market determined *option premium* in exchange for price certainty in the spot market. In essence, this approach gives each LSE an ability to get price insurance by choosing its own "personal price cap". Unlike ICAP, this approach bundles generation adequacy with price insurance for LSEs. It also provides greater reliability to the system operator since it includes financial incentives to maintain generator availability, an element missing from current ICAP markets.

A call option is equivalent to a one- way Contract for Differences (CFD). The difference between one-way and two-way CFDs is illustrated in Figure 1.

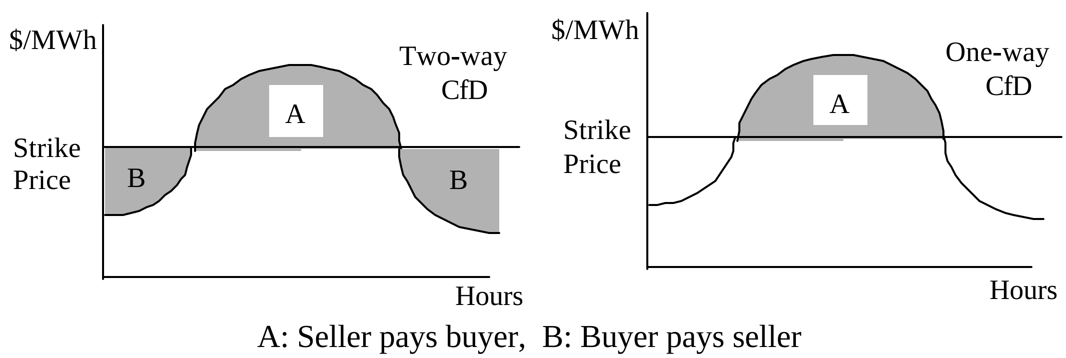

Figure 1: Two-way and one-way contract for differences

Under the one-way CFD or call option, the seller agrees to provide energy at a predetermined strike price to be delivered at a time in the future. If the spot price exceeds the strike price, the buyer exercises the call option and receives a pay-off equal to the difference between the spot price and strike price. On the other hand, if the spot price is lower than the strike price, the option expires without being exercised and its payoff to the buyer is zero. In return for this optionality, the buyer pays a premium that is a function of the strike price and volatility of the spot price among other factors.

Payoff for buyer in hour i = max {0, (Spot Price in hour i - Strike Price)}

Most call options available in the market today are defined with respect to on-off peak prices. The new call option product would be defined with respect to a set of hourly underlying prices. For a given day, it is appropriate to think of the new product as a bundle of hourly call options, each with the same strike price but a different underlying spot price.

From an LSE's perspective buying ICAP is like buying a call option with a floating strike price, i.e., generators get a capacity payment but LSEs do not get any price insurance. Under the new approach, they would get something more tangible but without compromising the reliability features of ICAP.

Choice of Strike Prices

LSEs must cover their entire load under the call option. However, they are free to select a strike price that suits their tolerance for risk. In general, a lower strike price implies a higher option premium. An LSE that does not want to pay any significant premium would select a high strike price. On the other hand, an LSE that prefers to reduce its exposure to spot price volatility would be able to choose a strike price that essentially gives it a price cap in exchange for a market-determined premium. Price responsive load may also be used to meet an LSE's call option obligations.

LSEs that do not purchase sufficient contract cover through call options will be covered under a default contract at a predetermined strike price. This strike price could be set at the prevailing price cap prior to the introduction of the call option approach (e.g., 1000 $/MWh). The premium for the default contract would be determined through an auction.

Contract Duration

Although, strike prices may vary among different contracts, some standardization in the contract duration may be useful. In general, longer-term contracts will tend to average out price volatility and provide more stable revenue streams for generators and stable energy prices for loads. Shorter-term contract would have higher volatility. In the limit, an hourly contract term will look like a spot market for short-term generation adequacy (e.g. the replacement reserves market in California). Possible choices for contract term might be (a) annual (b) seasonal or (c) monthly.

Reserve Margins

ICAP obligations usually involve a reserve margin to account for generator outages and load growth. In terms of the new call option product, the reserve margin for generator outages would appear to be redundant, as traditional operating reserves seem to capture this. This is particularly true if there is a workable market for operating reserves. In this sense operating reserves and the energy call options are complements in the overall goal of ensuring generation adequacy. Whether a component of reserve margin is needed to account for load growth is a design choice.

Physical vs. Financial Contracts

If the call option approach is viewed as a price insurance mechanism, it is quite natural to think of it as a financial rather than a physical product. On the other hand, if it viewed as a reliability product, it is convenient to think of it as a physical product. A physical approach would require a seller of a call option to designate the generating capacity that will be used to back up that sale. A financial product would make this unnecessary. In reality, the call option is both a reliability and price insurance mechanism.

In the event of an actual supply shortfall, load can be curtailed in the inverse order of strike prices. Although, such curtailments may be highly improbable, their threat should create an increased incentive for LSEs to sell reliability differentiated products that create demand responsiveness. The requirement that strike prices be submitted to the ISO will allow the ISO to determine what it can only guess today, i.e., the price demand curve.

If physical curtailments on the basis of strike prices are infeasible in the short term, a phased approach may be adopted where the product has a physical dimension until such curtailments can become feasible.

Summary

While energy call options and generation adequacy in the form of ICAP can be purchased separately today, it is the absence of direct linkage between the two that is problematic. The call option approach provides this linkage and serves as a price and reliability insurance mechanism. It retains or strengthens the reliability aspects of ICAP. In addition it provides the price insurance that LSEs desire. It seeks to combine elements of ICAP and energy only markets and is consistent with the "reliability through markets" principle as generation adequacy is facilitated through market mechanisms and not imposed administratively. It also encourages demand responsiveness that further helps reliability.