Should an LDC procure electricity hedge products using an Internet-based auction?

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1. Introduction

As part of their regulatory mandate, local distribution companies (LDCs) are required to supply electricity, upon demand, to their customers. An LDC has three basic options for acquiring that electricity: (1) generation through its own plants; (2) spot-market purchases; and (3) fixed-price forward contracts and call options. The LDC can satisfy some of its anticipated future requirements through forward contracts and call options in order to help it better manage the electricity *procurement*-cost risk that stems from spot-price volatility. By buying forwards and options, an LDC may be able to avoid the potentially disastrous financial consequences of over-reliance on volatile spot markets, which were so dramatically evidenced by the April 2001 bankruptcy of the Pacific Gas and Electric Company, one of the largest utilities in the United States.

The idea of using forward contracts and call options to manage procurement-cost risk is intuitively appealing and economically reasonable. Knowing what to buy, however, does not guarantee least-cost implementation, because the forward-contract price or option premium quoted by a prospective seller may not be the "best deal" that the LDC could have obtained.

If the LDC's desired purchase is a standardized forward contract with delivery at a major hub, the LDC can simply buy from the actively traded forward market with many competing sellers. The forward contract of the LDC's interest, however, often deviates from a standardized contract. Common deviations include: (a) a delivery point different from a major hub; (b) a contract period longer than the next month; (c) daily delivery pattern different from the standard (6x16) specification; (d) a less-than-100% delivery rate for a given MW size; and (e) a MW size not a multiple of 50 MW. Trading for non-standardized contracts is thin to non-existent. As a result, the LDC may not easily receive a competitive price quote for non-standardized contracts without using an auction. The same holds true for other inactively traded products such as call options.

We propose that the LDC should use an Internet-based auction to procure inactively traded products because the auction is a superior alternative to common procurement methods such as bilateral negotiation and request for offers (RFO). Supporting our proposal is the empirical evidence from two auctions recently held by a municipal utility in Florida. The auction results show that an Internet-based auction can yield competitive price offers from prospective sellers, achieve cost savings when compared to the LDC's benchmark for price reasonableness, reduce the time required for transaction consummation, and provide documentation that can withstand close scrutiny by the LDC's management and regulators.

2. Commonly used procurement methods for inactively traded products

An LDC can procure actively traded standardized products with confidence from brokers and electronic exchanges (e.g., Automatic Power Exchange and Intercontinental Exchange). Possibly with broker assistance, the LDC may rely on bilateral negotiation to procure inactively traded products. However, it is unlikely that bilateral negotiation will yield the "best deal" for the buyer because "the value of negotiation skill is small relative to the value of additional competition" (Bulow and Klemperer, 1996, p. 180). Even if the LDC can contact many prospective sellers, the negotiation process is time consuming with a non-transparent outcome. Furthermore, it is difficult to document every detail in a negotiation. As a result, the LDC may find itself defending a forward contract with an *ex ante* fixed price which turns out to be much higher than the *ex post* spot price.

Realizing the potential shortcomings of bilateral negotiations, the LDC may issue a request for offers (RFO) to solicit sealed offers from suppliers, followed by final negotiations. Commonly used by utilities for buying energy and capacity, this kind of RFO process is equivalent to a single-round sealed-offer auction.

A single-round sealed-offer auction, however, has many potential shortcomings (Cameron *et al*., 1997). First, it may not inform the LDC of the "best deal" available from the auction participants. While negotiation improves the final offer, its outcome may still not be the result of the fierce head-to-head competition exemplified by an open-offer auction where sellers can continuously submit price quotes to outbid competitors.

Second, it does not afford each seller an immediate opportunity to revise its price offer to beat the offers from other sellers as each seller must await the LDC's notification for negotiation. However, the notification may be a rejection of seller's offer from further consideration by the LDC, without providing an opportunity to revise its price.

Third, a seller may be excessively cautious to avoid the "winner's curse" because it is unaware of other sellers' offers that reflect independent valuations of the forward contract in question. This is especially true for a non-standardized contract for which reliable market-price data do not exist due to thin or no trading.

Fourth, the final negotiation and its outcome have limited transparency and are subject to "second guessing" by an LDC's management and regulators. It is difficult to document every detail in a negotiation. As a result, the LDC may find itself defending a forward contract with an *ex ante* fixed price which turns out to be much higher than the *ex post* spot price.

Finally, the offer evaluation and final negotiation of the RFO process can be time consuming, making its frequent use difficult for contracts with delivery beginning in the immediate future (e.g., one to two months from now). The time-consuming nature of an RFO also often results in a cost premium in the sellers' sealed offers to hold prices "open" for a relatively long period (e.g., ten days), while an LDC evaluates proposals and conducts negotiations.

3. Internet-based Multi-round Auction

To remedy the potential shortcomings of the typical RFO process, we propose an internet-based multi-round auction design following a form of the Anglo-Dutch auction that "combines the best of both the [open-] and the sealed-bid worlds" (Klemperer, 2002, p. 182). The design allows for a time extension that eliminates the potential advantage of last-minute bidding by a seller under an eBay-style auction with a fixed time deadline. "Bid sniping" is a likely cause of non-competitive quotes due to (a) inadequate time for other sellers to respond, (b) winning without revealing lower prices, and (c) avoidance of a price war with other auction participants (Roth and Ockenfels, 2002).

The auction aims to effect price minimization, transparency, and price discovery. Price minimization requires fierce head-to-head competition among a reasonably large number of sellers (e.g., 6 to 20). This degree of competition may not occur when the LDC transacts with a seller via one-on-one negotiation. Even if the LDC can contact and negotiate with many sellers, the process is time consuming and may not overcome the asymmetric information advantage enjoyed by sellers who transact more frequently than the LDC. Furthermore, sellers are less inclined to lower offer prices in bilateral negotiation than when directly faced with lower binding prices in an auction.

Active and aggressive bidding by sellers cannot occur without the transparency achieved when the auction rules are fixed in advance and applied to all sellers. An opaque design reduces the number of participating sellers and induces conservative bidding. An example of a transparent design is one that has the following properties: (a) clearly defined non-price terms of a forward contract (e.g., size, delivery point, delivery rate, contract period, etc.); (b) auction rules that govern offer submission, auction duration, and auction close; and (c) a simple selection rule such as "Subject to the LDC's benchmark for price reasonableness, the lowest price-offer wins."

A transparent design eliminates the post-auction allegation of biased winner selection. It also leads to transparent results with a detailed record that can withstand close scrutiny by a third party. For example, a regulator may audit the procurement decisions of LDCs. The regulatory audit includes a review of the procurement process and an examination of the procurement results.

Price discovery is important to both sellers and the LDC. When sellers can see the evolution of price offers, they can better infer the common price expectation relative to their own private costs. The availability of price information makes the sellers less inclined to bid conservatively so as to avoid the "winner's curse", thus promoting price competition. From the LDC's perspective, the auction helps uncover forward-contract prices that are otherwise unavailable or unreliable due to thin trading and other market imperfections (e.g., asymmetric information). This aids the LDC in making a better-informed purchase decision.

To achieve the objectives of forward-price minimization, transparency, and price discovery, an independent auctioneer (www.genenergy.com), not affiliated with the auction participants, performs a number of key preparatory steps prior to the auction date:

- The auctioneer assists the LDC in clearly defining the product, including the characteristics of electricity to be delivered and the relevant terms and conditions. The auctioneer can solicit seller feedback as to the reasonableness or clarity of terms and conditions. Contract ambiguity can have two undesirable effects: (a) it can cause potential sellers to shade their offers; and (b) it can hinder contract enforcement by the LDC in case of seller non-performance.
- The auctioneer assists the LDC in pre-qualifying sellers, so as to only include credit-worthy sellers that have a strong interest in the auction. As part of the pre-qualification, the auctioneer requires sellers to contractually commit to the offers that they make in the auction. Binding offers inform all participating sellers that a price offer observed in the auction is "real," an important input to each seller's own assessment of how low its offer must go to win the auction. Similarly, binding offers provide the buyer with the confidence that the winning offer is indeed obtainable at the conclusion of the auction.
- The auctioneer assists the LDC in setting an objective price benchmark, undisclosed to auction participants, against which all offers may be considered.

- The auctioneer discloses the upfront and clear criteria for selecting a winning offer. If sellers know the criteria, they can control their fate and are likely to make their best offers.

Having completed the key preparatory steps, the auctioneer assists the LDC in implementing an internet-based multi-round auction:

Round 1: Initial offering (i.e. 30 minutes). In Round 1, all pre-qualified sellers submit their initial anonymous offers on the auctioneer's auction website. Only the lowest prevailing offer is observable, thereby allowing the participants to assess the extent of price competition. During Round 1, pre-qualified sellers may revise their initial offers. Revised offers must be lower than that seller's previous offer but do not have to beat the lowest prevailing offer. The revised offers are not required to beat the lowest prevailing offer so as to ensure multiple offers and seller participation. Receiving multiple offers approximates the results from an RFO process, and the range of offers informs the LDC if the auction is in fact superior to the RFO. The *lowest* offer at the conclusion of Round 1 sets the *prevailing best* offer at the beginning of Round 2.

Round 2: Open offering (i.e. 15 minutes with possible 5 minute extensions). In Round 2, each seller can see the prevailing best offer and submit new price offers. A new price offer must improve on the prevailing best offer to be valid. The auctioneer updates and posts the prevailing best offer in real time as newly submitted valid offers arrive. A valid offer arriving in the last remaining five minutes automatically extends Round 2 by five minutes. Round 2 closes at the later of the scheduled time or after five minutes of no bidding activity. The auctioneer then identifies the sellers with the lowest price offers as the finalists for Round 3.

Round 3: Best and final sealed offering. In Round 3, the auctioneer invites the three sellers with the lowest offer prices in Round 2 to submit their best and final offers. Each seller's offer is "sealed," unobservable to the other two sellers. Each seller's sealed offer must not exceed the seller's own prior offers in Round 2. By not requiring each seller's sealed offer to beat the lowest offer found at the end of Round 2, the LDC has two "backup" offers in the unlikely event that the winner with the lowest sealed offer in Round 3 withdraws (despite the risk of legal actions by the LDC). As Round 3 creates uncertainty of losing, it mitigates collusion and induces further price reductions.

4. Results from two recently held auctions

The auctions were held on the behalf of the Utilities Commission, City of New Smyrna Beach (UCNSB), a municipal utility located on Florida's north/central east coast. Interconnected to Florida Power & Light Company (FPL) and Florida Power Corporation (FPC), UCNSB has 64 MW of its own relatively inefficient generation. With an annual peak of approximately 91 MW, the UCNSB had historically been buying partial requirements service from FPL or FPC and the remainder of its requirements from the spot market.

Table 1 describes the two non-standardized hedge products desired by UCNSB: (1) 1-month non-firm fixed price forward energy with varying MW-size, and (2) 3-month 10-MW call option with a $150/MWh strike price and a limited number of exercisable calls. The call option in (2) is substantially out-of-the-money based on an estimate of marginal generation cost of below \$45/MWh (= forward gas price (~\$4.5/MMBtu) x marginal heat rate (~10 MMBtu/MWh) ≈ \$45/MWh).

The two auctions were conducted shortly before delivery. This ensures that UCNSB was buying at prices that were reflective of the most recent market conditions and expectations.

Table 1 shows that both auctions produced final price offers below the buyers' price benchmarks and yielded net cost savings.

Figure 1 portrays the time path of the price offers received in the forward non-firm energy auction. It shows a rapid decline in price offers in Rounds 1 and 2, with further price-cutting in Round 3.

Figure 2 is the time path of the auction's price offers for the call option. It shows more active bidding than the time-path in Figure 1. We attribute the high bidding activity to the almost certain profitability of selling a covered call option by sellers with surplus generation. If the option is not exercised, the seller earns the premium. Even if the option is exercised, the strike price of \$150/MWh is sufficiently high such that it should still exceed the seller's marginal generation cost.

Both figures indicate the absence of last-minute bidding whose strategic value was largely eliminated by the time extension feature of the auctions. They also provide time-stamped transparent records that can withstand close scrutiny by a third party (e.g., a Board of Directors, an industrial firm's senior management or LDC's regulators).

5. Conclusion

Given the attractive price offers, UCNSB signed the forward non-firm energy contract and the call option contract. Both took under four hours from the first offer submitted in Round 1 to UCNSB's contract execution. This is much shorter than the 7-10 days required when using the typical RFO process. This shows the time-efficiency of an internet-based auction for procuring a non-standardized forward contract.

The auctions' cost-effectiveness and time-efficiency is acknowledged by an UCNSB official who opined, after the first auction, that "the auction resulted in a savings of about 10%, compared with what the muni[cipal utility] normally pays…" (MegaWatt Daily, 09/17/02, p.2). The same official further remarked "[t]he process worked tremendously for us. I see this as something that is going to catch on. … It's very good for competition. It's unmasking the prices and will save us between $500,000 and $1 million annually" (Daytona Beach News Journal, 09/17/02). Hence we conclude that an Internet-based auction can yield competitive price offers from prospective sellers, achieve cost savings when compared to the LDC's benchmark for price reasonableness, reduce the time required for transaction consummation, and provide the documentation that can withstand close scrutiny by the LDC's management and regulator.

Table 1: Description of two Internet-based multi-round auctions

Descriptor	Auction 1	Auction 2	Remarks
Product	1-month (Oct. 2002) forward non-firm energy contract: 20-MW for 12:00-20:00 and 15-MW for 07:00 – 12:00 and 20:00-23:00.	3-month (Dec. 2002-Feb.2003) 10-MW capacity call option with strike price = $150/MWh; min. hours per exercised call: 8 per day; max. energy take by the buyer: 480 MWh per month	1) The forward energy's delivery is curtailable if transmission unavailable, plant outage, or fuel supply disruption. 2) The call option provides reserve margin to the buyer.
Type: total MWh size	Must-take: 8,680 MWh	Optional-take: not more than 1440 MWh	The buyer of the forward contracts must take delivery. The buyer of the option has the right but not the obligation to take delivery.
Auction date	September 13, 2002	November 14, 2002	Both auctions took place shortly before actual delivery to capture the most recent market conditions.
Buyer's benchmark for price reasonable-ness	Price estimate based on cross-hedging (Woo, et al, 2001)	Lowest premium paid by the buyer in the last three years	The benchmarks represent the buyer's willingness-to-pay. The buyer will not buy if the final price exceeds the benchmark.
Final price as % of the benchmark	90.6%	39.6%	Each auction yields a Round 3 winning price offer below the benchmark.

Figure 1: September Non-Firm Energy Auction Results

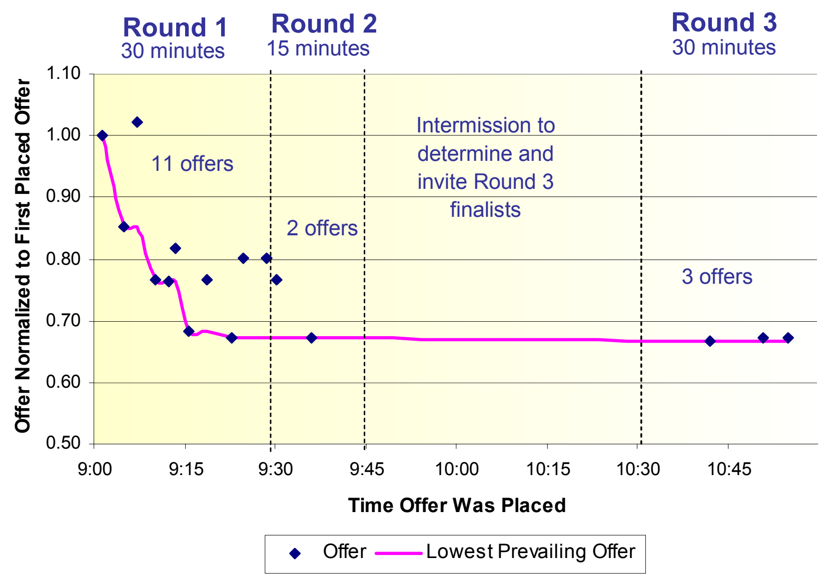
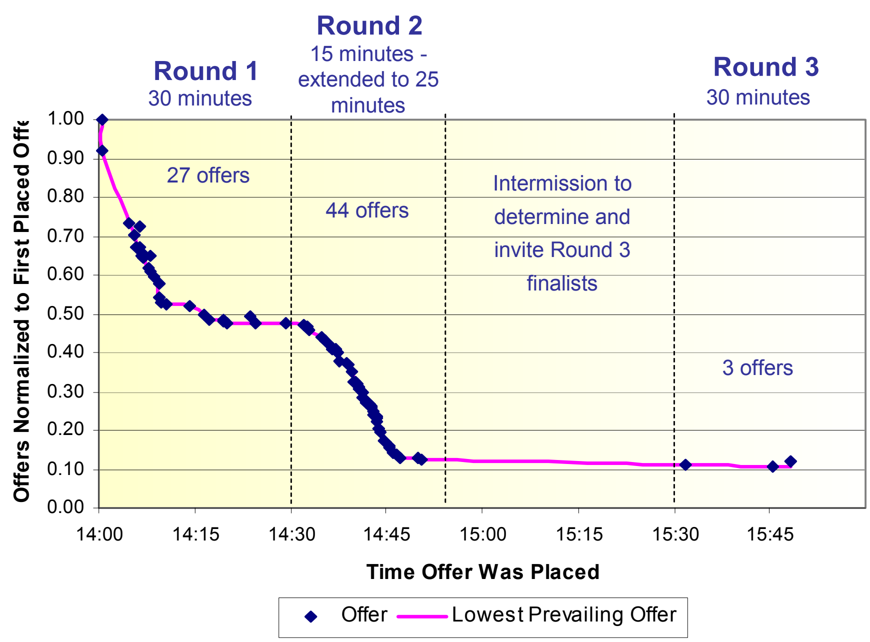


Figure 2: November Capacity Call Option Results



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