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# Key Issues in Developing Demand-Side Bidding Programs

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# KEY ISSUES IN DEVELOPING DEMAND-SIDE BIDDING PROGRAMS

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**Abstract**

Several utilities in New England have conducted pilot bidding programs for demand-side resources, while integrated bidding processes, which include DSM resources, are currently being planned or implemented by utilities in New York, New Jersey, and Washington. In this study, we examine several resource planning and program implementation issues that are raised by competitive bidding programs for DSM resources: the choice of combined or separate bidding for demand and supply resources, the criteria used to rank and select projects proposed by bidders, the value of DSM resources, the role of non-price factors, and issues that arise in measuring the impact of DSM programs. We compare the bid evaluation systems used by four utilities that are conducting integrated bidding programs and examine the nominal weights assigned to various features (e.g., price, project status/viability, system optimization, environmental factors) by each utility. We conclude that bidding may have a limited role in a utility's overall DSM strategy because bidding mechanisms are inappropriate for various types of programs and because of the relative immaturity of the energy services industry.

## INTRODUCTION

Many utilities and PUCs have begun experimenting with the use of competitive bidding procedures to secure new electric capacity. A few utilities in New England have conducted pilot bidding programs for demand-side resources, while integrated bidding processes, which include DSM resources, are currently being planning or implemented by utilities in New York, New Jersey, and Washington. These programs are the subject of a study being conducted by researchers at Lawrence Berkeley Laboratory (LBL) and Oak Ridge National Laboratory (ORNL), as part of the Department of Energy's Least-Cost Utility Planning Program. Our approach included a review of recent reports on bidding and we also interviewed PUCs and utilities in New England. In this paper, we describe the innovative features of DSM bidding programs and discuss several key design and implementation issues. These include: the choice of auction format, the procedures used by utilities to evaluate bids (e.g., ranking and selecting projects), determination of the ceiling price and payment options for DSM bids, and measurement of the savings from DSM bids.

## DSM BIDDING VS. CONVENTIONAL UTILITY DSM PROGRAMS

There are three key features that distinguish DSM bidding programs from conventional utility DSM programs. First, in a bidding program, the supply and cost of DSM resources depends on the price competitiveness of projects offered by individual customers and third party bidders [energy service companies (ESCOs) and equipment vendors]. In contrast, the size of a conventional utility DSM program (and its associated expected energy savings) is usually determined administratively as part of a utility planning process which looks at the size and costs of DSM resources. Second, DSM bidders often assume some of the performance risk and marketing costs; in a conventional utility DSM program these risks and costs are borne fully by the utility. Third, in a bidding program, financial incentives to promote DSM options are not always front-loaded and are often tied to measured performance over time. Most conventional utility DSM programs rely upon one-time, upfront rebates to stimulate participation by customers, and the rebate level is unaffected by actual performance.

## "ALL-SOURCE BIDDING" VS. SEPARATE AUCTION

Choice of auction format (e.g., inclusion of supply and demand resources in one auction) is a major issue that utilities must confront in designing a bidding process. A few PUCs (New York, Washington) have embraced "all-source" bidding, in part because of its theoretical appeal. All projects offered by private producers can be evaluated by the utility at one time in a consistent fashion and can be compared against the utility's resource needs and its own projects. Thus, "all-source" bidding can help further integrated resource planning objectives (e.g., assure that supply and demand resources are assessed in a consistent fashion). Proponents of integrated bidding argue that for the purposes of meeting new system demand, a kWh saved by efficiency improvements is indistinguishable from a kWh delivered to customers by a new plant ( 1 ).

However, the inherent differences between generation and demand-side resources may be more important than the fact that they can ultimately be substituted at the level of utility system requirements. Utilities and others have expressed concerns that integrated supply/demand bidding programs will not provide sufficient flexibility in planning and resource procurement ( 2 ).

For example, successful DSM programs often evolve quickly and are iterative: programs are implemented, an evaluation is conducted which may identify problems and suggest improvements, new marketing approaches are tested to improve customer acceptance rates, and new DSM technologies are included as they enter the market or become economic. This process may be difficult to incorporate in a formal bidding procedure. In addition, utilities that include DSM in a supply bidding process have to consider the characteristics and level of development of DSM markets and firms (e.g., DSM projects are much smaller, marketing of services compared to development of a capital-intensive good, immature energy services industry), differences in evaluating the economics of each option (e.g., inclusion of DSM customer costs), as well as various management problems unique to DSM resources (e.g., measurement of savings, relation to existing utility DSM programs, assuring customer acceptance of DSM delivered by third party). Several utilities have addressed these concerns by conducting separate auctions for supply and DSM resources (e.g., New England Electric System, Boston Edison); other companies have proposed parallel RFP processes in which demand-side resources will compete directly against supply options as part of an integrated bidding program.

Clearly, the auction design and implementation process is simplified if separate auctions are conducted. A separate auction also prevents DSM bidders from adopting a strategy in which they offer relatively inexpensive conservation resources at prices that are just below the costs of supply-side capacity ( 3 ). However, a separate auction requires that the utility develop a process to reconcile the supply and demand offers. Several options have been either used or proposed, including specifying demand and supply targets in advance for each auction based on the results of an integrated resource planning process or holding the demand-side auction prior to the supply-side auction, using a pre-determined avoided cost price ceiling ( 4 ).

## BID EVALUATION CRITERIA FOR DSM PROJECTS

Utilities have extensive experience evaluating the multiple attributes of many supply resource options (e.g., power plants they may build, negotiating purchase contracts with other utilities); and judgment has always played an important role in the planning process. However, bidding adds a new dimension because the attributes must be unbundled, valued explicitly and independently, and traded off in arms-length transactions. In addition, the practical demands of workability impose limits on the complexity of bid evaluation systems. Determining the economic value of non-price factors is a particularly difficult problem.

Most utilities evaluate DSM projects as part of a multi-stage process. Bidders must prepare a detailed description of their project which includes an engineering analysis (e.g., installed measures, estimates of savings and costs, prior experience with this technology), project milestones and schedule, technical and financial capabilities of the project development team (e.g., key participants, prior experience, financing plan), approach for handling operations and maintenance requirements, a marketing plan for third party bidders as well as a measurement plan to verify the savings. Utilities use this information to determine if a DSM project satisfies the basic eligibility requirements, which defines a serious project. Utilities typically specify a minimum bid size (i.e., savings that must be achieved by a DSM project), a minimum lifetime for retrofit measures, and may even require payment of an entry fee (e.g., Jersey Central requires a $5000 administrative fee). Bidding systems that establish very high threshold requirements or result in excessive transaction costs for bidders may be establishing unrealistic barriers to entry. Table 1 lists some key design features of the DSM bidding programs of four utilities that are implementing an integrated supply and demand auction: Jersey Central Power Light (JCPL), Orange and Rockland Utilities - New York (ORU), Puget Power, and Central Maine Power (CMP). These design features help to define the scope and content of DSM bids (e.g., restricted to certain customer classes such as large commercial/industrial), the selection process to be used by the utility, and the utility's responsibilities and concerns (e.g., customers are not eligible for other utility DSM programs, performance security requirements that are used as liquidated damages in the event that savings goals are not achieved). ORU's bidding program includes several features that should be particularly attractive to ESCOs: one-time, upfront payment of the total bid price after measures are installed, demand reduction goals bid for a specified geographic region coupled with the utility's provision of limited marketing assistance for large commercial/industrial customers.

After initial screening, utilities then rank DSM projects to select an initial award group of winning bidders. Table 2 lists the price and non-price factors that the four utilities consider in evaluating DSM bids. We have aggregated non-price factors into broader categories; numerical scores are expressed in terms of their relative weight, normalized in terms of percent. The bidding systems used by JCPL, ORU and CMP have a maximum possible score, which means that the implicit trade-offs among various factors can be calculated. The scoring system used by JCPL and ORU are also linear in the sense that the score for each category is additive, yielding a total project score, while CMP multiplies point values for various features in its ranking system. We have translated CMP's scoring system into a linear framework and calculated percent ranges for the relative weights of various attributes (see Table 2).

JCPL and ORU rely on a self-scoring point system. Bidders are provided with explicit evaluation sheets where each relevant feature receives a specified number of points depending on the project characteristics. Bidders add up their own scores and the utility verifies the data and selects winners based principally on the highest scores. One unique feature of ORU's scoring system is its explicit recognition and incorporation of environmental benefits in the evaluation of demand and supply options (15% of the total points). ORU's scoring system also assures DSM

**TABLE 1**

**DESIGN FEATURES OF FOUR DSM BIDDING PROGRAMS**

| Category | Jersey Central Power & Light | Orange & Rockland Utilities (NY) | Puget Power | Central Maine Power |
|---|---|---|---|---|
| Capacity Block (MW) | 270 | 100 | 100 | 150-300 MW by mid-1990's |
| Demand/Supply Integration | Parallel RFP | Parallel RFP | Single RFP | Parallel RFP |
| Bid Selection Process | Point system | Point system is primary but not sole basis | Qualitative evaluation | Point system helps determine negotiating order |
| Min. Project Size (Savings) | 400 kW | 100 kW | 100,000 kWh | 100,000 kWh or 100 kW |
| Market Coverage | All Sectors | All Sectors | Large C/I | All Sectors |
| Minimum Lifetime (yrs) | 3 | Not specified | 10 | 5 |
| Double Dipping Prohibited | Yes | Yes | Yes | Yes |
| Performance Security | $18/kW | $18/kW | Termination option if project doesn't meet milestones | $52/kW |
| Eligibility Requirements[a] | High | Average | Low | Average |
| Transaction Costs[b] | High | Moderate | Low | Moderate |
| Geographic Franchise[c] | No | Yes (2 areas up to 3 bidders) | No | No |
| Utility Information[c] | No | Limited marketing assistance for large customers | No | No |
| Payment Schedule | Installments | One-time | Installments | Installments |

[a] Subjective assessment of relative severity of initial entry level requirements for all projects.

[b] Subjective assessment of transaction costs incurred by customers or third party firms in developing DSM project bid (e.g., bid preparation costs, upfront marketing costs, entry fees).

[c] Features that relate specifically to third party firms.

TABLE 2

## BID EVALUATION CRITERIA FOR DSM PROJECTS

| Category | Jersey Central Power & Light | Orange & Rockland Utilities (NY) | Puget Power | Central Maine Power |
|---|---|---|---|---|
| **Economic Factors** | | | | |
| Price | 53 | 50 | X | X |
| Front-load Security | 2 | | X | 16-23 |
| **Project Status/Viability** | | | | 35 |
| Developer Experience | 6 | 4 | X | |
| Tech/Market Assessment | 9 | 8 | X | |
| Longevity (O&M) | 3 | 2 | | |
| Financial Viability/Security | 7 | 6 | X | 4-10 |
| Metered Savings | X | X | X | 17-28 |
| Supply-related Factors | | 8.5 | | |
| **System Optimization** | | | | |
| Load Shaping Need | 10 | | X | 7-17 |
| Dispatchability | | 1.5 | | |
| Other (e.g., bid size, location) | 10 | 3 | | 2-5 |
| **Environmental Factors** | | 15 | | |
| **Fuel Choice** | | 2 | | |

Notes: X indicates that the factor will be assessed qualitatively.

Sources: 1) Jersey Central Power and Light Company, "Request for Proposal for Demand Management: 1989 Solicitation," Vols. 5-6. 2) Orange and Rockland Utilities, "Demand-Side Bid Solicitation: New York," Vol. 2, June 1989. 3) Puget Sound Power & Light Company, "Request for Proposals: Long-term Purcahse of Resources from Commercial and Industrial Conservation and Generating Facilities," June 1989. 4) Central Maine Power Company, "Power Partners Program: Energy Management Request for Proposals," May 26, 1989.

projects of receiving 26 more points than fossil-fuel options because of more favorable non-price attributes of DSM projects.

In contrast, other utilities reveal bid evaluation criteria in more general terms. In these systems, the utility possesses information about the evaluation process that bidders do not and the selection criteria are not transparent to bidders prior to bid preparation. We call the first approach an "open" system and the second approach "closed". Open systems emphasize the perception of fairness in the evaluation; closed systems emphasize flexibility for the utility. For example, CMP considers both price and non-price factors in its evaluation of projects but has retained more discretion to determine the most suitable projects. Bidders' price offers will be compared against each other but the utility has not provided information to bidders on its ceiling price; so the relative weight can not be specified in advance (shown by X in Table 2). Moreover, CMP uses the ranking of projects from its scoring system as a guide to a negotiating order for contracts, although this ranking is not the sole consideration for determining which projects will be selected for negotiation. However, it is not meaningful to compare the relative weights for CMP's system with the other two utilities because CMP's treatment of bidders' price proposals precludes specification of the relative importance of price prior to the auction. CMP's approach is thus a hybrid between the "closed" and "open" system.

In its initial RFP, Puget provided bidders with information on evaluation criteria in qualitative terms only (shown by an X). After bids are received and evaluated, Puget will explain its rationale for selecting winning projects. Puget's RFP does provide a bid ceiling price and is clear on the non-price factors that will be considered in the project evaluation process, but the relative value of attributes is not specified explicitly. In addition to the flexibility that the utility retains, Puget's RFP also provides attractive options for bidders. The RFP is quite short (17 pages) and thus the hassle factor is low; bid preparation time and costs appear to be low, and bidders do not have to provide performance security. Puget also proposes to use an arbitration procedure to resolve disputes if the specified energy savings are not achieved because of a change in conditions (e.g., material failure of equipment or major change in operation or condition of host facility), prior to reducing payments to the bidder.

Finally, we note that our comparison of utility bid evaluation systems addresses the "nominal" weights for each feature. However, the "real" weight of an attribute (i.e., how much the weighted feature actually influences the outcome of the bidding) depends on the distribution of bids in an auction. For example, assume two non-price factors are assigned equal weights in a scoring system (e.g., each factor is worth 5% of the total points). The bids for one factor are tightly clustered with little variation, while scores for the other attribute vary widely. If these were the only two factors, the outcome would be determined by the factor with scattered bids. Thus, the real weight is determined by the actual distribution of bids and cannot be known before bids are submitted.

## DETERMINING THE VALUE OF DSM RESOURCES: SETTING THE BID CEILING PRICE

Although DSM bidding is in its infancy, issues related to determining the value of DSM options have been hotly debated before the Federal Energy Regulatory Commission (FERC), state public utility commissions (PUCs) and in the utility trade press. In one sense, these debates continue the ongoing discussion among policymakers on the appropriate cost-effectiveness tests to use in evaluating DSM resources. For example, PUCs that have endorsed least-cost planning often require that DSM programs be cost-effective from a total resource perspective: the sum of utility costs plus direct participant costs should not exceed the utility's long-term avoided cost of supplying electricity. In the bidding context, this concern translates into the issue of whether the customers' financial contribution to the total cost of the measure should be considered in setting the ceiling price for DSM bids? The applicability and usefulness of the "no-losers" test finds its analog in DSM bidding programs in debates over the inclusion of utility "lost revenues" in the determination of ceiling prices for DSM measures.

Not surprisingly, utilities and PUCs in various states have adopted different approaches to this issue. In Maine, the PUC adopted rules in 1987 that authorized the state's utilities to implement conservation programs which met the "all-ratepayers" test without prior approval. This test is comparable to the total resource cost test (i.e., cost contributions from customers are included and "lost revenues" to utilities from reduced sales are not considered). Thus, in its December 1987 RFP for the Power Partners Program, Central Maine Power set the ceiling price for DSM bidders equal to avoided supply costs, and required ESCOs to provide information on the fees that customers would be obligated to pay for the installation of energy management measures. CMP revised its approach somewhat in its June 1989 RFP. DSM projects must still be cost-effective such that the total cost per unit to the utility and the participant does not exceed the total per unit cost of the power supply avoided. However, CMP stated that proposed projects would not be measured against standard avoided cost rates, instead CMP will evaluate projects against all other options based on the utility's specified needs. CMP's approach is designed to overcome the perceived problem that bidder's price offers tend to cluster slightly below the utility's announced avoided cost; the absence of a posted price may reveal a broader distribution of market prices for supply and demand projects.

Puget Power set the ceiling price for conservation resources equal to the present value of the utility's avoided supply costs minus the present dollar value of the anticipated savings from the installed measures during the first two years in its initial bidding RFP. Puget argued that this approach was reasonable and consistent with the financial incentives offered to customers through the utility's current DSM programs.[1]

In contrast, Orange and Rockland Utilities (ORU) initially proposed that the the ceiling price for DSM measures should be determined by subtracting revenues lost to conservation from the utility's avoided costs. ORU then added an environmental bonus of about 0.4 cents/kWh and a "market incentive" bonus to derive ceiling prices that varied by measure ($150-400/kW) ( 5 ). The New York Public Service Commission rejected ORU's approach of including "lost revenues" as well as the approach used initially in Maine of setting DSM ceiling prices equal to its avoided supply costs. The PSC set a ceiling price of $550/kW for DSM measures with an

[1] For eligible cost-effective measures, Puget pays a "market-adjusted" avoided cost. Customers pay a share of the total costs of the retrofit, which is calculated as the ratio of the dollar value of estimated savings during the first two years to the Company's full avoided cost over the lifetime of the measure.

expected 10-year lifetime, which reflected the PSC's balancing of the benefits and costs to consumers, the utility, the externality benefits of DSM, and bid prices necessary to elicit an adequate market response ( 6 ).

Ultimately, this notion of setting bid prices at levels that are adequate to induce a sufficient market response (subject to passing the societal cost test) might be the most productive approach. In one sense, this market-based approach is used in the most successful conventional utility DSM programs. In these programs, utilities often attempt to establish the minimum payment that is required to overcome the barriers that consumers have towards conservation investments. Rebate levels for the same measure/program may change over time depending on retail rates, the market penetration of the measure, and the value to the utility of acquiring the demand-side resource.

## MEASURING THE SAVINGS

Because the utility purchases energy and capacity resources via the DSM options installed by ESCOs and customers, careful measurement of actual electricity savings is essential. Unfortunately, such measurements involve difficult tradeoffs between cost and complexity vs. accuracy. The simplest methods of measuring electricity savings include engineering calculations or use of simulation models to predict savings due to installation of various DSM options. More reliable methods include analysis of monthly electricity-billing data; special short-term (e.g., one month) metering of electricity demand and hours of operation for affected equipment; and long-term, end-use load-research (which may collect demand data on electricity use for individual circuits for a year or more).

New England Electric System's (NEES) Performance Contracting Program relied on engineering calculations in measuring savings. NEES calculated the expected reductions in "adjusted" kW for 29 different options. Contractor bids included their price per kW for each option. Thus, the NEES approach involves verification only of the options installed, no measurements of electricity use or savings, and full payment to the ESCO upon completion of installation.

The approach adopted by BECo falls in the middle of the spectrum of methods ( 7 ). A typical contract requires measurements of electricity use and hours of operation for the affected systems (e.g., lighting circuits, water heating) before installation of DSM options. Similar measurements are taken after installation of options. The difference in kW demand is multiplied by the annual hours of operation to estimate the annual savings. For weather-related options such as space-heating controls, the measurements are adjusted on the basis of official heating-degree-day data; savings are then based on the 40-year average of annual heating degree days. The post-installation measurements are repeated every year because payments to the ESCO are spread over several years.

The CMP Power Partners Program has signed six contracts with customers or ESCOs; the approach used to verify savings has been negotiated individually ( 8 ). One large industrial project involves replacement of a major electricity-using manufacturing process. Because the original process was metered separately, complete baseline data are available. Similar postinstallation data will also be available. Differences between pre- and post-installation electricity use will be adjusted on the basis of changes in manufacturing output. Payments will be based on the actual savings over the 15-year life of the project. Complete inventories of lighting equipment and electrical load will be taken for the two industrial lighting projects. Because these facilities operate during all three shifts, the connected loads, pre- and post-retrofit, will be multiplied by 8760 hours/year to compute annual electricity savings. In addition, a few lighting circuits will be test metered to verify overall savings.

CMP has also signed a contract with an ESCO that plans to retrofit 10,000 homes, focusing on shell insulations, water heating, and lighting. Payments will be based on analysis of monthly electricity bills for each house, for a year before retrofit and a year after retrofit. The analysis will adjust for incomplete data, participation in other CMP programs, heating degree days, and will be used to estimate savings and no data will be analyzed after the first postretrofit year. These examples from the NEES, BECo, and CMP bidding programs demonstrate the various approaches that utilities, ESCOs, and the customers are taking to measurement of energy savings. Differences occur because of differences in the options installed, utility confidence in different measurement systems, and the tradeoff between administrative simplicity and measurement accuracy.

Interestingly, all the approaches reviewed deal with total electricity savings but not with net savings. Total savings are the reductions in electricity use experienced by customers participating in the utility DSM-bidding program. Net savings are that portion of the total that can be directly attributed to the utility program. The difference between total and net savings is the savings that customers would have achieved on their own had the utility bidding program not existed. Typically, estimates of this market-induced savings are based on changes in electricity use for a comparison group, a group of nonparticipating customers similar to those that participated in the utility program. When electricity prices are rising rapidly or new energy- efficient technologies are entering the market place, the difference between net and total savings can be large. Under such conditions, utilities will pay for some DSM options that would have been installed without the program.

Most of the critical measurement issues are not unique to DSM bidding. Issues such as measuring the energy-saving and load-reduction effects of DSM options and estimating the net vs. total effects are important in all utility DSM programs.

## CONCLUSION

The increasing influence of competitive forces in the market for electricity supplies coupled with the search for alternative ways to deliver demand-side resources has encouraged PUCs and utilities to experiment with demand-side bidding programs. Actual experience with DSM bidding is quite limited, although bidding programs are proliferating rapidly. Initial experience suggests that DSM bidding programs may have a limited role in a utility's overall demand-side management strategy. This reflects the level of development of the energy services industry, the high transaction costs in certain sectors, and the inappropriateness of bidding mechanisms for various types of programs (e.g., informational, design assistance for new construction). We doubt few individual customers will find bidding attractive unless the transaction costs associated with partipating can be significantly reduced; the "hassle factor" seems significantly higher than with conventional utility DSM programs.

We are not convinced that the proper risk/reward balance has been achieved for either ESCOs or utilities. The rewards may be insufficient for an "infant" ESCO industry given the performance and financing risks that ESCOs are being asked to assume in most DSM bidding programs. For utilities that establish unregulated energy service companies, DSM bidding programs may represent a potential business opportunity. However, other interested parties have raised significant concerns to PUCs regarding utility self-dealing. This issue is an important barrier to the successful implementation of bidding programs because utilities may not be given sufficient flexibility to negotiate contracts with third parties and individual customers if they want to participate in auctions in their own service territory on an unregulated basis. PUCs may have to consider additional incentive mechanisms to reward utilities for operating successful bidding programs, particularly given utility concerns that these alternative delivery mechanisms for providing DSM programs can lessen contact between utilities and their customers in providing energy services. Finally, our analysis suggests that absent reliable and cost-effective ways to measure the savings provided by bidding programs, DSM bidding activities will not achieve their full potential. Although bidding for DSM resources will not always be a cost-effective way to meet customer energy-service needs, such programs are likely to play a role in utility planning and resource acquisition.

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