The DSM Bidding Experience: Auctions and Implementation

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Pacific Gas and Electric Company (PG&E) has conducted two Bidding Auctions over the past three years: a Demand-Side only auction and an Integrated Bidding Auction. As a result of winning bids in both auctions, PG&E has contracted for over 57 MW in DSM Bidding. The twenty winning contracts cover a variety of measures in all PG&E market sectors: residential, commercial, industrial and agricultural.

This paper will cover several aspects of the bidding process. The first issue to be discussed will be the evaluation of bids received by the utility and how to predict projects and programs that will be successful for customers, bidders and the utility. The second issue will be the problems and challenges of implementation including the issue of a level playing field, start-up time and tracking and reporting. Finally the paper will cover measurement and verification (M&V) issues for DSM bidding including covering the purpose of M&V, Types of M&V and examples of measured kW and kWh savings for a variety of projects installed in a west coast utility territory.

BACKGROUND

By Decision (D.) 92-03-038, the CPUC approved a DSM-only bidding pilot for PG&E, consistent with the mandate of Public Utilities (PU) Code 747. By Decision (D.) 92-09-072, the CPUC approved the compliance filing of Pacific Gas and Electric Company (PG&E) for its DSM bidding pilot program and directed PG&E to proceed with the pilot.

PG&E proceeded with the issuance of an Request for Proposal (RFP), receipt of proposals and an announcement of a short list of winning bidders in April 1993. PG&E then negotiated contracts with 11 of the 13 winning bidders (two bidders withdrew their proposals) and filed these contracts for approval with the CPUC in three separate filings.

PG&E's bidding pilot represents the first of several to be conducted by the investor-owned utilities and evaluated by the CPUC. These eleven negotiated contracts represent a total of 18.5 MW of load reduction. The average Total Resource Cost (TRC) test is 2.29 and the average Utility Cost (UC) test is 2.48.

An Integrated Bidding Pilot was ordered by the Commission in D.93-06-040 (1993), and PG&E was ordered to conduct the pilot in D.93-10-040. PG&E's goals were to comply with the Commission's mandate ''to solicit megawatts under an integrated bidding program, where supply- and demand-side bidders compete to fill a common block of resource needs'', and ensure that the resources acquired would not compromise PG&E's price competitiveness in the future deregulated environment or burden ratepayers with expensive electric resources.

In December of 1994, PG&E issued a Request for Proposals. At the close of the auction, nine supply-side and thirty-one demand-side entities participated in the auction. PG&E conducted an extensive evaluation of these bids, including two screening phases and a negotiation phase.

For demand-side bids, evaluation criteria included realistic projected savings, reasonable marketing plan, qualifications, schedule, financing and customer contribution. In September of 1995, PG&E announced the short-list of thirteen winning DSM bids. Nine contracts were successfully negotiated with winning firms and PG&E is awaiting Commission pre-approval of the contracts. These contracts will provide 34 MW of energy savings with an annual savings of almost 247 gigawatt hours (gWh). The average Total Resource Cost (TRC) test for the group is 1.45.

Combining the two auctions for a total of 20 contracts, the winning bids represent 52.5 MW of energy savings to customers in the residential, commercial, industrial and agricultural sectors. One-fourth of the winning contracts are with customer bidders, with the remaining contracts executed with a variety of energy service companies (ESCO's), both large and small, local and national. There are a variety of measures covered in all proposals including lighting, lighting controls, motors, adjustable speed drives (ASD's), HVAC efficiency improvements, energy management systems, duct repair and heat pump efficiency upgrades.

All the contracts are pay-for-performance agreements which required program completion security and liquidated damages and include detailed measurement and verification (M&V) plans. All contracts have an implementation period of 36 months with specific reporting requirements. Payments

are based on savings projections and then reconciled based upon actual verified savings after one year. If savings are not achieved, payments are modified and savings projections reduced. A method for collecting overpayments, should they occur, is contained in each contract. All of the contracts include detailed measurement and verification plans to ensure that savings claims are accurate.

The seven contracts all utilize rigorous ex-post measurement plans to verify the level of savings achieved. These ex-post measurement plans are consistent with the CPUC adopted measurement and evaluation protocols. For contracts with simple lighting efficiency measures, a table of standard wattages is used to develop the baseline. Once the lighting measures are installed, all of the contracts use metering to determine a facility's hours of operation. The period of metering required may vary by market segment and is set forth in each contract. The sample size required for metering is set by an equation requiring 90% confidence and 10% precision level. For other measures with variable load and variable hours, such as lighting controls, or motors, metering is required before the installation of the measure to determine the baseline, as well as after the installation of the measure to determine the savings. The same sample size requirements are used, as are required for the hours of operation metering.

PILOT PROGRAM

With the approval of the first seven contracts in late 1993 (November 23, 1993), PG&E and the PSP partners began implementation in 1994. The elements of this pilot program are as follows: (1) Pay-for-performance over contract life of 10 years; (2) Winning bidder performs the Measurement and Verification (M&V); and (3) Savings are verified annually. As was stated by the CPUC in D.92-02-075, ''These bidding experiments will help us learn more about alternative DSM delivery mechanisms, and assess the role of DSM bidding to provide least-cost DSM services to ratepayers.'' The implementation issues that arose in the first year of implementation included the difficulties of customer recruitment for long-term contracts, the actual on-site measurement and verification and the requirement for metered first year savings.

During 1994, as implementation for PSP began, PG&E worked with the bidders who were installing and proceeded to inspect all sites for pre- and post-conditions. In addition, PG&E set up a database to track all projects for 10 years, and a standardized reporting and invoicing system.

In the context of the contracts PG&E has with the customer-bidders or the ESCO's, the most important purpose of M&V is to determine how much PG&E pays the ESCO or customer. In addition, the M&V can provide important information to the customer, help determine how well the project is working and if the investment is paying off, and help operate the facility more efficiently.

MEASUREMENT AND VERIFICATION

During the first few months of implementation of the first ten contracts, PG&E developed the PowerSaving Partners Standard DSM Measurement and Verification Procedures Manual. This manual was developed by PG&E and its consultant, Schiller Associates, over a period of six months for use in the implementation of the first ten PowerSaving Partners contracts. It was adopted in its entirety for the PSP contract with the State of California as well as the for the nine contracts resulting from the Integrated Bid Auction. The manual covers all aspects of measurement and verification of savings. For example, for lighting efficiency projects, the manual covers project definition, metering and calculation of baseline demand, post-installation demand, metering of operating hours, sample size for metering operating hours, metering frequency and duration, and the requirements for pre- and post-installation submittals and annual reporting. Similar detail is included in the manual for other energy efficiency measures, such as lighting controls projects, motors projects, and variable load projects, such as HVAC improvements. The partners are required to measure and verify each program as specified in the approved Measurement and Verification Procedures Manual.

Portions of the Measurement and Verification Procedures Manual are based on the concepts and methods defined in: National Association of Energy Service Companies (NAESCO) Standard for Measurement of Energy Savings for Electric Utility Demand Side Management (DSM) Projects, Revision 1.1; Measurement and Verification Protocols Approve by the NJ Board of Regulatory Commissioners (NUBRC); Procedures for the Verification of Costs, Benefits, and Shareholder Earnings from Demand-Side Management Programs (M&E Protocols) as adopted by the CPUC Decision 93-05-063, revised July 21, 1994. This procedures manual actually goes beyond the NAESCO protocols mandated in Appendix H of the M&E Protocols governing shareholder earnings claims for site-specific M&E or M&E for ESCO-installed measures. This procedures manual is the implementation tool both parties use to verify savings.

For the purposes of simplifying the M&V Procedures Manual that PG&E developed for use in PSP, DSM projects were categorized into four types: Lighting Efficiency Projects, Lighting Controls Projects, Constant Load Motor Efficiency Projects, and Variable Load DSM Projects. For Variable Load DSM projects, both end-use metering and billing analysis approaches to measurement are discussed.

The M&V Procedures Manual includes the following elements:

- Common requirements and definitions;
- Submittal requirements for each project;
- M&V procedures for lighting efficiency and controls measures;
- M&V procedures for constant load motors;
- M&V procedures for variable load measures;
- Maintenance and management plans; and
- Sample forms and report outlines.

Starting with the most basic lighting efficiency retrofits, the verification strategy would be as follows. The partner would survey the existing (baseline) and new (post-installation) conditions to included exact fixture count, lamps and ballast types and the identification of usage areas. Usage areas must be defined in a way that groups together areas that have similar lighting requirements (i.e., areas of comparable average operating hours as determined by the proportion of lights in operation during each of PG&E's five costing periods). PG&E inspects both the existing and the new conditions for accuracy of fixture count and type and identification of usage areas. The measurement techniques employed for this measure after installation would be to use a table of standard wattages to determine the kW per fixture for the pre- and post-installation conditions, as well as the determination of operating hours. The operating hours are determined by short term metering of on-time in the various costing periods. The short-term metering length is determined by market segment and ranges from one month to four months. This is either stipulated in the partner's contract or in the Procedures Manual. The sample sizes for the metering are for 90% confidence and 10% precision. The majority of the measures installed by PSP partners in 1994 and 1995 were lighting efficiency retrofits and the M&V followed by each and every partner is as described above.

The next category of projects are controls-type projects, constant load, variable hour projects, such as lighting controls or motor efficiency retrofits. The verification strategies involve the survey of the existing measure for the load served, kW or horsepower measurement and a typical operating schedule. This verification survey includes a spot-metering to determine actual demand, and possibly short-term metering of a sample to verify constant load and to normalize the spot-metering. The post-installation verification includes spot-metering to determine demand. The on-going measurement activities for these types of measures include short-term metering for demand and run-hours. Again, the short-term metering length is determined by market segment and ranges form one month to four months.

The last type of projects, are those that have variable loads and variable operating hours, including seasonal variation. For both verification and measurement, a comprehensive approach is necessary for variable load measures, multiple measures or measures that interact. In these cases, end-use measurements are difficult to isolate or cost-prohibitive. A project specific approach is necessary, including a variety of acceptable approaches from continuous metering to billing analysis. The Procedures Manual outlines both a continuous metering approach as well as pre- and post-installation billing analysis. Projects of this type under PowerSaving Partners will be installed in 1996.

PSP IMPACTS

For 1994 and 1995, program accomplishments have reached 8.1 kW and over 46,500,000 kWh of annual energy savings. These accomplishments were included in the PG&E's residential and commercial portfolios.

The PSP partners who had installations in 1994 and 1995 are as follows:

- NORESCO
- City of San Jose
- EUA/CCS
- County of Alameda
- Princeton Development Corp.
- Proven Alternatives Inc. and
- Tamal Energy Services, Inc.

Three partners from the first DSM-only auction did not have installations in 1994 or 1995: Envirotech, UC Davis, and the National Park Service projects at the Presidio.. Envirotech's contracts does not provide for any payments until the end of the three year implementation period. UC Davis and the Presidio are beginning installations in early 1996.

As mentioned earlier, most of the PSP projects installed in 1994 and 1995 were lighting efficiency retrofits at commercial facilities, with a number of lighting controls projects installed by the County of Alameda, and refrigeration controls and HVAC measures installed in grocery stores. To verify savings at each facility, random locations are selected and monitored for operating hours. A ''usage group'' is

assigned to each location and the operating hours are averaged by usage group. The results from this sample are applied to the project as a whole so that annual savings can be calculated.

The variance within each usage group is calculated to ensure that sufficient samples are used to meet specified accuracy and confidence intervals. Groups with large variances in operating hours will require more samples to capture the true behavior of that group than one with consistent behavior.

Most of the partners used portable data loggers to record operating hours. The Pacific Science and Technology loggers can download their data to laptop computers for analysis. Two companies used hardwired loggers that communicate with a central computer via phone lines. Reports are then generated from these observations and are checked against the contractors claimed operating hours. PG&E checked the partners' submittals to verify that the submittals are accurate, and to verify that the documentation is complete.

NORESCO is monitoring a large number of supermarkets for operating hours. They have installed a number of data recorders with points hardwired throughout the store. These data loggers record when a space is illuminated or not in 15 minute intervals. Data is transferred over phone lines by an automated system and recorded. NORESCO is sampling operating hours for seven different usage groups for two different customers.

The City of San Jose performed its own lighting retrofits and verification program at several city-owned facilities. For the project completed in late 1994, the City has metered operating hours for one month in 1994 and one month in 1995.

EUA/CCS monitored lighting conversions made at five different residential group homes in 1994. Thirteen usage groups have been identified and monitored using over 108 loggers. Three of the groups shoed discrepancies greater than 10%, all of the others were within 3% of our results. Two of the loggers showed evidence of tampering, so the data was edited to include untampered results only.

The County of Alameda is working as its own contractor and has installed photocells and motion sensors, and well as efficient ballasts and lamps as part of its lighting retrofit. The measures were installed at the County Jail, as well as other county facilities, such as offices and courts. Nine locations and 8 usage groups have been identified for this project and monitoring of the hours of operation for all the groups is on-going.

Proven Alternatives, Inc. (PAI) installed energy efficiency ballasts and lamps at hospital and medical offices. The medical facilities in twelve different cities are being monitored by PAI. Twenty-two usage groups have been identified and almost 400 data loggers are being used to monitor this project.

Tamal Energy Services, Inc. has installed a number of adjustable speed drives at industrial customer sites and has conducted pre-metering to establish the baseline for these motor retrofits. Tamal is continuously metering the post-retrofit motor energy use in these particular applications to establish project savings.

PERFORMANCE RISKS

Performance risks are largely born by the contracting ESCOs, as payment from the utility to them are based on measured savings. Bidders are responsible for M&V of savings for the term of the contract in accordance with their contract terms (which are as stringent as the adopted DSM measurement protocols). Annual reports are required which describe maintenance and operation inspections as well as the true-up of measured savings.

In addition, payments for savings are bounded. If savings fall below 85% of contracted power savings, the bidder is in default and can incur liquidated damages. In addition, payments will not be made for more than 115% or 125% of contracted power savings, depending on the contract. Contracts where there is variation in annual performance due to extreme conditions, such as weather or rainfall, were negotiated to the upper limit of 125% of the bound. These bounds are designed to ensure the proposals, both supply side and DSM, are comparable. Since typically supply-side contracts are for a discrete amount of energy resource, PG&E wanted the DSM contracts to be equally bounded.

Customer satisfaction is another significant risk shared by both PG&E and contractors. PG&E will need to review and approve the marketing plans, engineering estimates of savings and the host energy service agreements that customers enter into with ESCOs.

PG&E also carries the risk of meeting overall CPUC savings goals associated with the shareholder incentive mechanism. This is a performance risk similar to the performance risk born by the bidders. The shareholders are only paid based upon verified savings. Ratepayers are protected since the actual payments to bidders and shareholders only happen when the energy savings is delivered.

TRANSITION TO COMPETITIVE MARKETS

PG&E and the other utilities in California are transitioning to retail wheeling on a rapid timeline. It is most likely that

competitive DSM bidding will continue in the short-term future. PG&E is very pleased with the success of the program, and expects Partners to be fully subscribed by the end of 1996. The nine new contracts should be approved during the summer of 1996, so the new partnerships would continue for another three years. The success of the program makes it a model for discussion by all interested parties in the restructuring debate of delivery mechanisms for Demand-Side Management.