Final Report

Pacific Gas and Electric Company's 1996 Agricultural Sector EMS Program Market Effects Study

April 28, 1998

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Preface

In reading this report it is very important to remember the context. Pacific Gas & Electric Company first offered pump test services to their customers in 1923. They have offered these services virtually continuously since that time. This has created an extremely complex historical trail of reasons for customers' attitudes about pump tests and makes assessment of market effects associated with the current AEMS pump test program difficult.

This study quantifies, for the first time, market barriers and the estimated effect of the AEMS pump test program on those market barriers. It does this by recording and modeling customers current perceptions of their attitudes about pump tests, and the reasons for those attitudes. The data used for the analysis was collected through a 12 minute telephone survey of the agricultural customers.

Needless to say, it would be impossible to untangle the complex historical reasons for the customers' current attitudes in a structured 12 minute survey. In many cases the customers' attitudes could be affected by generations of exposure to the information provided by PG&E's pump test services. The current customer may not even be aware of the input. Parental and peer attitudes may have affected their perceptions subtly over the years.

The study reports what appear to be small effects of the current AEMS program on the studied market barriers. The evaluation team believes that these results are a low estimate of the cumulative effect that the PG&E pump test program has contributed over the years. However, because the study concentrates on current perceptions, and was limited in scope, it cannot offer explicit evidence to support this contention.

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EXECUTIVE SUMMARY

This report presents findings from a market effects analysis of Pacific Gas & Electric's (PG&E's) Agricultural Energy Management Services (AEMS) Program's pump test element. The California DSM Measurement Advisory Committee (CADMAC) included an option in the 1996 Agricultural sector evaluation retroactive waiver that allowed PG&E to conduct a market effects analysis instead of conducting a net-to-gross analysis for the 1996 AEMS program. The retroactive waiver allowed PG&E to use a default value of 0.75 as the net-to-gross ratio for the AEMS program in the impact evaluation. The CADMAC retroactive waiver was specifically designed to assess the usefulness of Discrete Choice Analysis (DCA) as a tool for analyzing participant purchase decisions. Although not required, the subsequent inclusion of a comparison group was essential to the meaningful use of discrete choice analysis.

The AEMS program provides information and pump testing services to agricultural customers at no cost to customers. In this study, the perceptions of 200 pump test participants and a comparison group of 202 PG&E agricultural customers are combined in a DCA approach. This analysis identifies and assesses the level of each of five market barriers and estimates the extent to which the AEMS pump test program affected those market barriers. In order to evaluate the market effects of PG&E's AEMS pump test program, each of the five market barriers was analyzed. Exhibit ES.1 lists the five market barriers assessed and summarizes the estimated effects.

Exhibit ES.1
Market Effects Attributable to the AEMS Pump Test Program

***Market Barrier* – Responses by Customers**	**Current Market Condition**	**Market Effects Attributable to the AEMS Program***	**90% Confidence Interval**
1: *Motivation* – Very interested to know about efficiency in general	49%	19%	5% -- 37%
2: *Efficiency Importance* – Very important to know efficiency of pumps in particular	72%	13%	5% -- 20%
3: *Performance Uncertainty* – If customer has had a pump test, customer certain about benefits from a pump repair	79%	9%	0.7% -- 16%
4: *Asymmetric Information* – If customer has had a pump test, confident about pump test results even if not done by PG&E	76%	Unable to Determine	
5: *Bounded Rationality* – Consistency in belief and actions	51%	(-24%)	(-30%) -- (-9%)

*This estimate is conservative since it only accounts for the effects on the participants.

In a broad sense, the higher the percentage in the Current Market Condition column, the lower is the extent of the market barrier. Thus, motivation and bounded rationality are considered significant as market barriers, since the survey results indicated that one out of two customers did not take action because they were not motivated to or because they were not willing pay for a pump test despite the

fact that they considered it important. The other three market barriers are much less important because three quarters of the customers already consider it very important to know the efficiency of their pumps and believe the results of the pump tests independent of who conducts the test and supplies the recommendations.

The third column in Exhibit ES.1 presents the DCA estimates of the market effects attributable to the AEMS pump test program as a percent of Current Market Condition. When these results are combined with the Current Market Condition results, the analysis indicates that:

- The program appears to have played only a small part in creating the motivation to seek information regarding efficient technologies, and in making customers feel interested in knowing the efficiency of their pumps. It should be remembered that, because of the long history of the program, customers may not currently correctly perceive the reasons for their actions.
- PG&E, via the AEMS pump test program, has successfully assured some of the customers that the pump test results are believable. But in the present context, when a majority of agricultural customers are motivated, interested and convinced and are going to remain motivated, interested and convinced in the future, PG&E's program plays a minor role.
- The survey results indicate that the level of awareness, attitude and behavior among agricultural customers is and is perceived to remain in favor of efficiency in the future. In order to be more effective, future pump test programs should target the customers that are not motivated, not interested, and not convinced. PG&E may need to investigate how to best target these customers.
- About three-quarters of the customers would trust pump test results from either a pump dealer or an independent pump tester. Since the factors that influence the customer's confidence about pump test results are not clear, we were unable to separate program effects from other factors. As a result the program effect of this barrier remain undetermined.
- A competitive market for pump tests is emerging, as indicated by dealers and independents pump testers offering pump test services. The demand for these services results from the motivation and awareness about the importance of knowing efficiency, and performance certainty developed by the program and other market forces. However, by providing pump tests at no cost, the program discourages customers from using the pump test services offered by agencies other than PG&E (indicated by the negatively bounded rationality effect).

It must be added that the extremely long history of PG&E pump testing services has almost certainly played a role in these results. The results are based on customers' perceptions of their reasons for being motivated, interested, or convinced. However, since no cost PG&E pump tests have been available to agricultural customers for three quarters of a century, it may well be that customers' perceptions have been influenced by a long history of experiences with the PG&E programs that have been indirectly passed on to them. It is extremely difficult to extract such chains of events during a short, structured, telephone interview.

The DCA approach used here was able to quantify the levels of individual market barriers and estimate the program contributions to the levels of each market barriers. Since the approach employed participant and intra-territorial comparison groups as the sources of information, it does not account for direct or indirect effects of the existence of the program on the comparison group. In addition, the method employed was not able to study, check, or compensate for interactions between the market barriers.

1. INTRODUCTION

This report presents findings from a market effects analysis associated with Pacific Gas & Electric's (PG&E's) Agricultural Energy Management Services (AEMS) Program. The California DSM Measurement Advisory Committee (CADMAC) approved an option in the 1996 Agricultural (Ag) sector evaluation retroactive waiver that allowed PG&E to conduct a market effects analysis instead of conducting a net-to-gross analysis for the 1996 AEMS program. The evaluation retroactive waiver allowed PG&E to use a default value of 0.75 as the net-to-gross ratio for the AEMS program in the impact evaluation.

The AEMS program provides information to agricultural customers and pump testing services of pumps at no cost to customers. In this study, the perceptions of customers' (participants and an intra-territory comparison group) are used to state the level of each of the market barriers (whether or not the market barrier is perceived to exist) and to evaluate the extent to which the program affected the market. In order to evaluate the market effects of PG&E's AEMS pump test program, five market barriers were analyzed. The extent to which the AEMS pump test program affected each of these barriers was measured.

The objectives and scope of the study are discussed next.

1.1 Study Objectives

The focus of this study is to develop a broad understanding of how the AEMS program affects the market for energy efficient pumping equipment and services. It is important to note that the AEMS program was not explicitly designed to cause or otherwise affect market transformation. Therefore, it is more appropriate to view this study as both an assessment the nature of the services offered by the AEMS program and the effects of those services on the AEMS market. That information is then used to identify the barriers that discourage the market actors from taking actions towards adopting efficient technologies/practices. These analyses help us to identify hypothetical market barriers affected by the AEMS Program.

The specific study objectives are:

1. Study the existing market condition and the nature of the services offered by the AEMS Program.
2. Identify a set of barriers that may discourage customers from installing energy efficient technologies/practices.
3. Set up hypotheses regarding possible market effects due to the AEMS program and test them using discrete choice modeling, the existing data, and additional data collected via telephone surveys.
4. Summarize the program's effectiveness in terms of each of the market barriers identified in Objective 2 and tested in Objective 3.
5. A specific objective identified in the waiver authorizing this study is to "conduct a survey based discrete choice analysis of the key purchase decisions for participant in the program." The subsequent inclusion of a comparison group was essential to the use of discrete choice analysis.

1.2 Scope of the Study

PG&E's AEMS program was originally designed as a marketing and customer assistance program and later recognized as an information program to help promote energy efficient technologies/practices. It was not designed to permanently transform markets for energy efficient products and services. Nonetheless, there is interest in finding out whether it has had market transformation effects. There is also an even greater interest in assessing the program's suitability to serve as a vehicle for future market interventions which may be more directly oriented toward the goal of market transformation.

Two different services are offered under PG&E's AEMS program: 1) an audit of the whole facility and 2) pump tests. Both of these services are offered to agricultural customers at no cost to the customer. This study focused on the second service (the pump test) due to the number of participants in that service. There were 25 times more pump test participants than audit participants. In this report, the term "the AEMS pump test program" (or pump test program) refers to only the pump test services offered as a part of AEMS program.

There are two important points to keep in mind while reviewing this market effects study of the AEMS pump test program:

(1) The AEMS pump test program market effects should really be observed over time. PG&E pump testing has been offered since 1923. Long running programs like the AEMS pump test program affect both the demand and supply side of the market. A comprehensive study of market effects should include the behaviors of all relevant market actors – customers, dealers, distributors, and manufacturers – as related to energy efficient equipment. However, due to fiscal limitations of this study, it was beyond the scope of the study to observe all the changes in the behaviors of all the market actors. Therefore, this study focuses on analyzing behavior of one of the market actors, the customer.

    Customers are the largest group of market actors. The AEMS pump test program directly affects agricultural customers. Since customers affect the demand side of the market, this study focuses on analyzing effects of the AEMS pump test program on the demand side of the market.

(2) To determine if a market has been transformed, it is necessary to test whether changes in behavior and attitude of all the market actors remain the same even after the program is withdrawn. When a program has been in place for 75 years, as the AEMS program has, this is a difficult hypothesis to test. This could be done by developing a set of indicators in PG&E's service territory that reflect the changes in market conditions and then comparing these indicators with a group outside of PG&E's service territory. Again, the fiscal and time limitations of this study did not allow the use of a comparison group outside PG&E's service territory.

    However, a contrast of the attitudes and perceptions of the market barriers between participants and a comparison group can be used to separate the market effects attributable to the AEMS program. Therefore, we selected a group of customers from PG&E's service territory who had not participated in the AEMS pump test program since 1994 as our comparison group.

To reiterate, this study focuses on estimation of demand side market effects attributable to the AEMS pump test program. In pursuing this estimation, a broad understanding of the program effects on markets for energy efficient pumping equipment and services will be developed.

The funds and resources for this study were limited to approximately those funds and resources freed up by the elimination of the AEMS net-to-gross analysis. This had direct implication on the scope of the study and sample sizes.

1.3 Overview of Theoretical Framework

The basis for this study is the market transformation model presented by Eto, Prahl and Schlegel in their study "A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs, July 1996"(Eto et al). Certain terms developed and used in the Eto et al. study are used within this report. These key terms are shown in Exhibit 1.1.

Exhibit 1.1
Key Terms in Report

Market Barrier: – any characteristic of the market for an energy related product, service, or practice that helps to explain the gap between the actual level of investment in or practice of energy efficiency and an increased level that would appear to be cost beneficial.

Market Intervention: – a deliberate effort by government or utilities to reduce market barriers and thereby change the level of investment in (or practice of) energy efficiency.

Market Effect: – a change in the structure of a market or the behavior of participants in a market that is reflective of an increase in the adoption of energy-efficient products, services, or practices and is causally related to market intervention.

Market Transformation: – a reduction in market barriers resulting from a market intervention, as evidenced by a set of market effects, that lasts after the intervention has been withdrawn, reduced or changed.

In a competitive producers' society (i.e., where the producers believe that supply creates its own demand) sales promotion could be a major goal. Any factor that becomes an obstacle in achieving this sales promotion goal can be perceived as a barrier. Though this study uses the term market barrier for convenience, it is not used to mean an obstacle to sales promotion. This is because it does not appear that PG&E is trying to achieve a sales promotion goal via the AEMS program. The program implementation clearly encourages a pump repair only if it is cost beneficial to the customer in particular and to society in general. In other words, information dissemination via the AEMS program motivates the customer to learn about efficient technologies/practices. This implies that motivation, while encouraged by the program, is not expected to exist before intervention. This interpretation perceives existing conditions in the market in a more positive manner than the market barrier approach and correlates better with the modeling approach used in this study.

Although the basis for this study is the Eto et al. market transformation model, some of the issues are viewed differently in this study. For example:

- We think that it is possible to determine the extent to which the intervention has reduced the severity of the barriers that discourage the market actors from investing in efficient technology and practices. Or to turn the double negatives into a positive, it is possible to find out the extent to which the intervention has encouraged the market actors to invest in efficient technology and practices. This extent of change can be determined through statistical modeling of specific barriers and can be represented as a percentage change.
- In this study, it is considered more appropriate to identify all the market barriers that affect the market players in their decision to install efficient technologies/practices. Those barriers may be very similar to the market barriers identified by Eto et al. However, since PG&E's AEMS program was not designed to permanently transform markets for energy efficient products, it is not appropriate to use only identified market barriers and try to relate them to the AEMS program.

Therefore, the market barriers identified in this study may not be identical to those identified in the Eto et al. study.

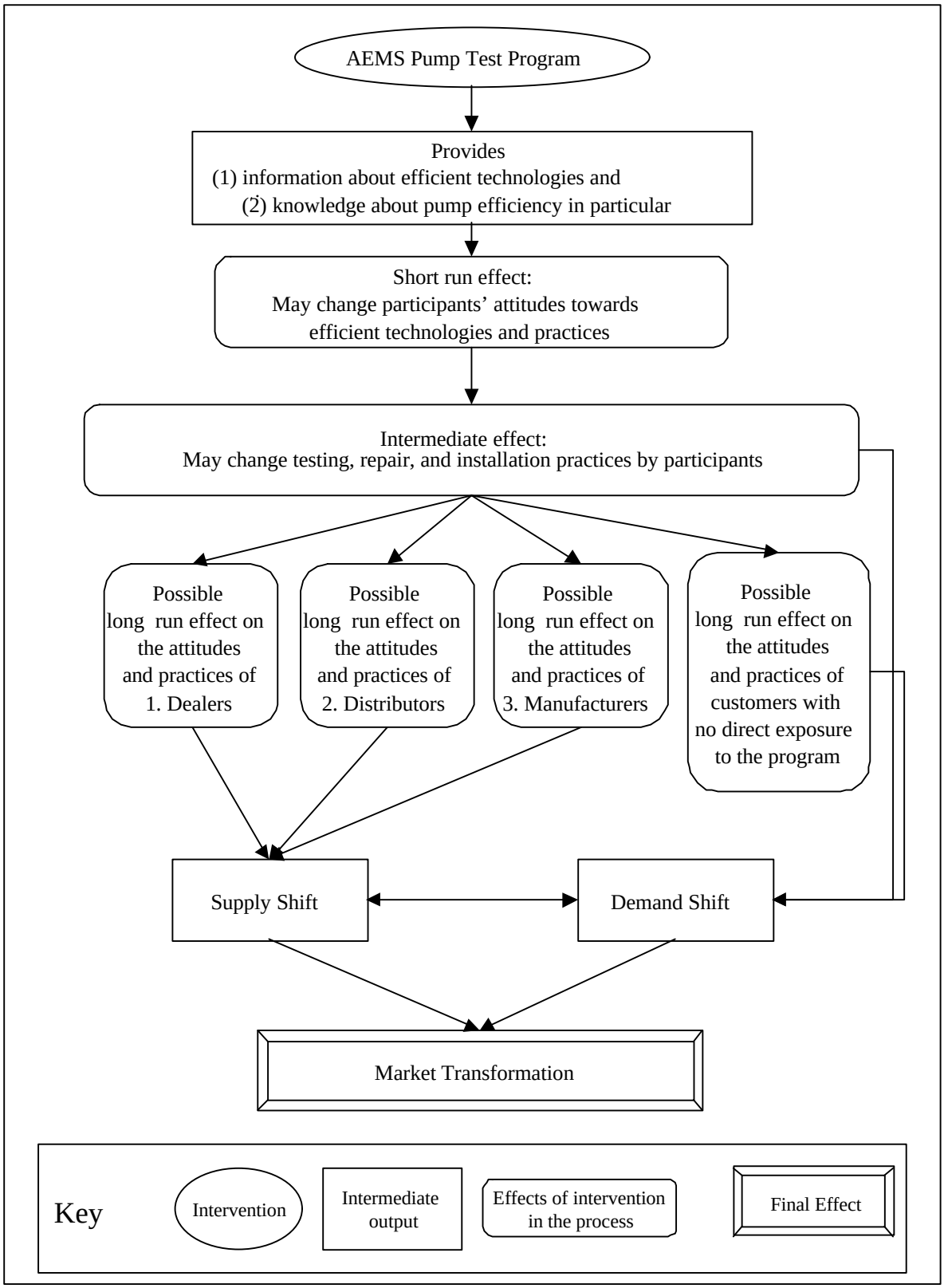
- The market barriers identified in this study are perceived to affect the market actors to a different extent at different stages in the process of transformation. For example, when a new concept of efficiency is introduced, the barriers that the market actors perceive are different than when the concept of efficiency is already accepted and understood by a majority of the market actors. Therefore, market barriers may not affect market actors at the same time or to the same extent.

The theoretical framework for the market effects of the pump test program is summarized in Exhibit 1.2. The primary market actors exposed to efficient technologies via PG&E's AEMS pump test program are the agricultural customers. The pump test program provides both information regarding efficient technologies/practices and knowledge about efficiency of their specific pump(s). This higher level of knowledge and awareness may lead to changes in attitudes towards efficient technologies/practices. Thus, changes in attitudes towards efficient technologies/practices could be the program effects in the short run. Such a change in attitude may or may not result in changes in testing/repair practices. Testing/repair practice changes are considered intermediate effects of the program.

If the testing/repair practice changes are retained long term, and are transferred to other growers not in direct contact with the program, resulting in broader market changes, then the pump test program can be deemed as having had a long-term effect on the market.

In the broader picture, if the information element leads to installation practices change for other equipment and then these practices remain consistent over time, they will affect the stocking practices by the dealers and distributors that in turn affect the production practices of manufacturers. It is only in the long run that the AEMS pump test program information element can affect the dealers, distributors and manufacturers attitude and stocking practice. These changes represent a supply shift towards efficient technology. Eventually, there will be effects on those customers who are not in direct contact with the program. Thus, due to communication between customers and the information available through the program, a shift occurs in the demand side of the market that changes the supply side. Together, the demand and supply shifts transform the market.

Exhibit 1.2
Theoretical Framework Overview



This study is restricted to the analysis of market barriers that may occur in the short and intermediate phases of market transformation. This means that the study includes the analysis of demand side of the market and therefore focuses on the effects on the customers. Within this study, the short run and intermediate market effects attributable to the AEMS pump test program are the difference between the extent to which market changed with the program in place and the changes in the market that would have occurred if the AEMS pump test program were not offered. In reality, changes in the market that would have occurred without the program are not observed and estimating market effects is difficult. However, this study presents an approach to overcoming this dilemma and to estimating the market effects that may have occurred with and without the AEMS pump test program.

1.4 Report Organization

Chapter 2 describes how the study is carried out, the sources of data, and the sample design for additional data.

Chapter 3 describes the design of the study and discusses the existing market conditions, the nature of the services offered by the AEMS pump test program, and identifies the market barriers that may affect the market actors. The objective of this chapter is to identify the market barriers to be studied. The description of the program and the current market condition broadens the understanding of the role that the program may be playing in the market.

Chapter 4 discusses the approach used, the sample design, and the sample sizes.

Chapter 5 presents the results of the analysis using the approach described in Chapter 3.

Chapter 6 summarizes the AEMS pump test program's effectiveness with respect to each market barrier identified in Chapter 2 and analyzed in Chapter 4.

Chapter 7 presents a retrospective assessment of the method used in this study and develops recommendations towards optimizing the AEMS pump test program's future market effects.

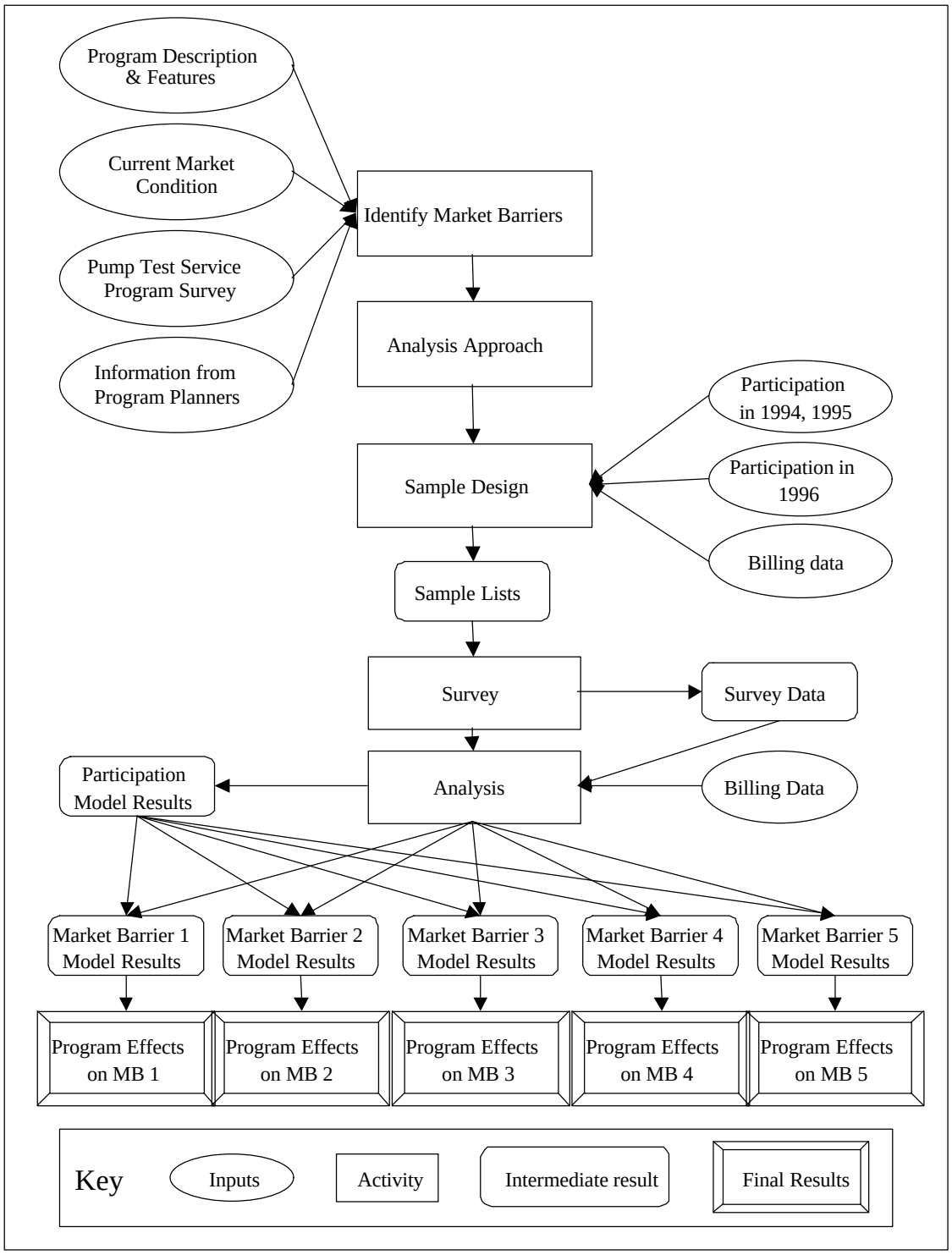
2. OVERVIEW OF THE STUDY AND DATA SOURCES

The purpose of this Section is to present an overview of the study and discuss the sources of information used in the study.

2.1 Study Overview

Exhibit 2.1 illustrates how the different sources of information were used within the study. As much information as possible was gathered in order to broaden our understanding of the market and the program prior to identifying potential market barriers. Hypothetical market barriers were then identified and an analysis approach was developed to suit the program design and implementation. In order to use the approach, more information from participating customers and a comparison group was required. The sample design was planned and sample lists were produced. Telephone surveys gathered information from those customers on the sample lists. This survey information was combined with appropriate billing data to create the analysis dataset. Barrier-specific market effects attributable to the program were estimated from the analysis.

Exhibit 2.1
Overview of the Study



2.2 Data Sources

The key element to obtaining high accuracy in any evaluation is maximum use of all available data sources. The evaluation team assessed all applicable data available from PG&E and industry sources.

2.2.1 Existing Data

The primary existing data sources were:

- The Marketing Decision Support System (MDSS) database for 1994, 1995, and 1996 - This database contained information on the programs for all sectors. The agricultural sector information was used for this study.
- Pump Test Database for 1994, 1995, 1996 - This database contained information on pump tests conducted as part of the AEMS pump test program.
- PG&E program design documentation.
- PG&E billing data for 1995 and 1996.
- Pump Test Service Program Survey.

2.2.2 Collected Data

Additionally, information was gathered from the following data sources and data collection tasks.

- 200 telephone surveys from a sample of AEMS participants.
- 202 telephone surveys from a sample of a comparison group customers.

2.3 Sample Design

Data were collected via a telephone interview from a sample of program participants and a comparison group. The data collected from these samples provided the information needed for the market effects evaluation models. The sampling plan for this study, based on 1994-1996 program participation data and experiences in the past evaluations, is presented in this section.

2.3.1 Population, Sample Frame, and Data Screening Criteria

The population includes all of the agricultural customers in PG&E's service territory. A sample of participants or a comparison group is not drawn from the population of agricultural customers. Rather, it is drawn from a sample frame. The sample frame for participants included only those customers who participated in the 1996 AEMS program. The sample frame for the comparison group included only those customers who had not participated in PG&E's AEMS program since 1994. Though it is desirable to select a comparison group from those agricultural customers who are not exposed to the program at all[1]; fiscal and practical limitations did not allow us to do so. Instead, program participants since 1994 were excluded from the population while creating the sample frame for the comparison group, since program participation data were readily available for the years 1994-1996. For developing a sample frame, the sample unit was a unique premise (site). The criteria for developing a sample frame for (1) AEMS participants, and (2) a comparison group, are discussed below. It is important to note that in both cases, the same exclusion criteria are applied. However, since they are applied sequentially, if accounts were excluded for one reason already, then those accounts do not qualify to be tested for another criteria.

[1] E.g., customers from a reference area outside of the PG&E service territory who were not exposed to a pump test program.

2.3.2 Sample Allocation, Sample Sizes and Sample Selection

Sample allocations designate the number of elements to select in each group (participant and comparison group) and from each cell (stratum) within each group. Allocation is influenced by the project objectives, sampling error, and expected response rate. A sample designer would also direct more sample points to cells with lower expected response rates or higher variance, other considerations being equal.

Strata are mutually exclusive and collectively exhaustive cells from which the sample is drawn, allowing different sampling rates for different cells. The objective of stratification is to improve the overall reliability of the estimates by reducing sampling error, controlling non-response bias, and providing larger sample sizes for the sub-populations of most interest to the study. Stratification allows the sample to emphasize certain parts of the population over other parts. For the AEMS program participant sample, four strata were defined using pre-program (i.e. 1995) kWh usage of AEMS participants included in the sample frame. Likewise, four strata were defined using pre-program kWh usage of the customers in the comparison group. A sample was selected randomly from each stratum.

The annual kWh usage categories were defined by employing the Dalenius and Hodges procedure for determining optimal stratum boundaries. That procedure defines the stratum boundaries that produce the greatest reduction in sampling error for a given number of strata. It divides the cumulative square root of frequencies from an equal interval recorded distribution of usage into as many equal parts as there are strata.

2.3.2.1 Sample Frame for Participants

The population of AEMS participants includes 4,765 unique control numbers. Out of this total, 1,355 unique control numbers were included in the sample frame. The reasons for excluding the remaining 3,410 control numbers are:

- There were 137 control numbers that participated in PG&E's AEEI program and in PG&E's AEMS program. These participants were excluded from the AEMS sample frame to avoid multiple contacts and potential customer annoyance.
- Missing or bad values for key billing data variables made it impossible to construct a reliable billing history for a customer. 755 control numbers were excluded because the service address and or the contact phone number changed between 1995 and 1996.
- After excluding customers with unreliable phone numbers or changes in phone numbers and/or addresses, an additional 104 control numbers were excluded due to changes in their corporate identification, electric meter number, first date the meter started, or premise number between 1995 and 1996. Any such changes make it difficult to identify the customer who made the decision to participate and implement changes. Hence, they were excluded from the analysis.
- A further 316 control numbers were excluded because the annual usage in 1995 was found to be zero or less than 50 kWh.
- An additional 169 control numbers were excluded because the SIC codes were missing. In addition, for 7 control numbers, the SIC codes did not indicate that the control number was associated with an agricultural account, (i.e., either the SIC code is less than 100 or 3561, or 4221, or 4222, or 4941, or 4970). Therefore these 7 control numbers were also excluded.
- After excluding control numbers for above reasons, there were 3,277 AEMS program participants that should have been included in the sample frame. However, in order to avoid multiple contacts

with the same customer, we excluded accounts with duplicate phone numbers. That left 1,355 unique phone numbers associated with the 3,277 AEMS participant control numbers. To obtain the required number of completed telephone surveys (200), the AEMS sample frame included all 1,355 control numbers.

2.3.2.2 Sample Frame for Comparison Group

The population of PG&E agricultural customers includes 94,010 unique control numbers representing 68,986 premises (sites). Out of this population, 20,154 control numbers were excluded since they represented the premises that participated in either AEEI or the AEMS program in the year 1994, 1995, or 1996. Thus the population for the comparison group included 73,856 unique control numbers. Out of a total of for 73,856 unique control numbers, 20,293 were included in the sample frame for the comparison group. The reasons for excluding the remaining 53,563 control numbers are:

- Missing or bad values for key billing data variables made it impossible to construct a reliable billing history for a customer. 13,458 control numbers were excluded since the service address and/or the contact phone changed between 1995 and 1996.
- After excluding customers with unreliable phone numbers or changes in phone numbers and/or addresses, an additional 6,338 control numbers were excluded since their electricity consumption in 1995 and 1996 was less than 50 kWh.
- An additional 11,704 control numbers were excluded because their address did not indicate that they used pumps at their business. (This was based on the first character of the address – if it was numerical, it was assumed to be a 'regular' account, if it was a letter, the address was assumed to be for a pump.)
- An additional 4,533 control numbers were excluded since the SIC codes were missing or did not indicate that the control number is associated with agricultural account (i.e., either less than 100 or 3561, or 4221, or 4222, or 4941, or 4970).
- After excluding control numbers for reasons mentioned above, there were 37,823 nonparticipating accounts that should have been included in the sample frame. However, in order to get accounts from unique sites or premises, a representative account was selected from the premises of these 37,823 accounts that had the same addresses. 7,204 accounts were excluded since they represented the same premise.
- The phone numbers of 30,619 unique premises were checked in order to avoid contacting the same customer more than once. Additional 10,326 accounts were excluded since the phone numbers were duplicated.

The exclusion criteria did not bias the randomness or the sample. The remaining 20,293 accounts representing unique premises were included in the sample frame for the comparison group.

2.3.2.3 Sample Sizes for Participant and Comparison Groups

Sample Sizes for Participant and Comparison Groups

The main consideration in designing the sample size within each group was the budget. The budget allowed a telephone survey sample of 400 customers. The total number of surveys collected within the evaluation is shown in Exhibit 2.2. Since the comparison group is selected to represent the population of all those customers who did not participate during the last three years, the strata boundaries are based on the population of customers who did not participate in last three years. The participant sample is selected to reflect the population of participants, and hence the strata boundaries are based on the annual kWh consumption of the participants. For both the groups, customers were randomly selected from each stratum for the telephone survey.

Exhibit 2.2
Collected Data

Strata	kWh Boundaries for Participants	AEMS Program Participants	kWh Boundaries for Comparison Group	Comparison Group
Stratum 1	55<1995 annual kWh <14,000	66	55<1995 annual kWh <25,000	50
Stratum 2	14,000<1995 annual kWh <51,000	56	25,000<1995 annual kWh <69,000	51
Stratum 3	51,000<1995 annual kWh <147,000	42	69,000<1995 annual kWh <150,000	51
Stratum 4	147,000<1995 annual kWh <4,470,000	36	150,000<1995 annual kWh <1,425,000	50
Total	**-**	**200**	**-**	**202**

3. IDENTIFICATION OF MARKET BARRIERS

The methodology used for this study reflects the fact that PG&E's AEMS pump test program was not explicitly designed to cause market transformation. If the program had been designed to achieve market transformation, then the analysis would have focused on assessing the extent to which the program succeeded in achieving the pre-determined objectives. However, in the absence of explicit goals or objectives of the program with respect to market effects, the most appropriate way to proceed is to understand what the AEMS pump test program offers and observe the current market conditions. The next step is to identify the important factors in the market that are affected by PG&E's AEMS pump test program directly or indirectly.

3.1 Description of AEMS Program

PG&E began offering free pump test services in 1923. The pump test measures the relationship between energy consumed and water flow rate at a given pumping pressure. The result is a report containing the estimate of overall efficiency of the pumping plant, which includes the motor, pump assembly and applicable distribution system. If replacement or upgrading of equipment is warranted, then the customer is issued a cost analysis letter, which includes estimates of capital and operating cost impacts for a new system. After assessing the overall plant efficiency, if no change in equipment is warranted, then the customer gets a 'congratulatory' letter.

After getting the feedback from PG&E's service representative, the customer decides whether or not to get the pump repaired. A pump repair can be expensive. However, a pump repair is advised only if the predicted long-term benefits from getting the pump repair outweigh the cost of the repair. Even when the economic advantages are made apparent through the pump test results, some customers get their pumps repaired and some do not.

The program is delivered on demand - i.e., customers request a pump test from PG&E. There is no effort to recruit customers for pump testing. After analyzing the exchange of information as a part of the program, the program has two complimentary components.

- It provides *information regarding energy efficient technologies/practices* via a pump test. An exposure to one energy-efficient practice can lead to interest in other efficient technologies/practices. Thus, directly or indirectly, PG&E's AEMS pump test program can develop customer motivation to know about efficient technologies/practices. At a minimum, it creates relatively higher level of awareness amongst participants regarding efficient technologies/practices.
- In order to convince the customer about the possible long-term benefits of a pump repair, it supplies participants *knowledge about the efficiency of their pump(s)* at no cost to the customer. In the absence of the pump test services available via the AEMS pump test program, there would almost certainly be some cost for the customer to determine the efficiency of their pump.

These two elements, while complimentary, are different in how long the effects of the information may last. The first one is educational and can permanently change the process of looking for information. For example, after participating, a customer may be more interested in knowing the long- and/or short-term benefits of efficient technologies/practices. Exposure to the program may direct the customer towards thinking and seeking information about efficient technologies in general.

The second element (the pump test), though educational, cannot be considered permanent. For example, since PG&E gives the information about efficiency of the pump via a pump test at one point in time, the cost to obtain the information is zero only at that time. However, the customer needs to know the

efficiency of their pumps periodically. In fact, ideally the customers should get their pumps tested every year at the same time of the year. Though the customer may be convinced of the importance of knowing efficiency of the pumps as a result of the program, the information cost of finding the efficiency is not zero unless the customer participates in the pump test program again.

Both elements of the pump test program directly or indirectly lead the customer towards changing testing/repair/installation practices. Though the AEMS pump test program was not originally designed to cause market transformation, it affects the market for efficient technologies/practices for agricultural customers by affecting one of the market actors, in this case the customers. In fact, PG&E performed a survey of the AEMS pump test program participants in 1996. The results of that survey show some indications of how the customers are affected. It indicated that:

- Approximately 81% of participants thought that PG&E agricultural representative was knowledgeable (i.e., considered the knowledge 'excellent' or 'very good' or 'good').
- Approximately 79% of participants thought that the PG&E agricultural representative provided sufficient explanation and information to guide their energy-efficiency decisions.
- 47% of the participants mentioned that they plan to implement some/all of the recommendations in their report.

These three points indicate greater possibility of information dissemination about efficient technologies/practices for a majority of the participants. The last bullet suggests that the PG&E's AEMS pump test program may have influenced the decisions of 47% of participants. However, some of the participants may have been willing to implement recommendations for various other reasons and not just because of the PG&E's agricultural representative recommendation. The approach described in this section addresses this issue. However, as the information from the survey shows, the current nature of implementation allows for a high level of information dissemination amongst the participants.

3.2 Market Conditions

The current market conditions need to be thoroughly understood to better ascertain possible market effects due to the AEMS program. In order to improve the efficiency of a pump, it is not necessary to find out the current efficiency of the pump. However, in order to make an accurate determination as to whether it is cost effective to improve the pump efficiency, then the only way is via a pump test. There is no alternative technique available. Thus, pump tests are important and inevitable if a customer is interested in implementing cost effective efficient technologies/practices.

However, the pump test itself is expensive, and a pump repair to improve efficiency is even more expensive. In the current market, a customer can choose one of three agencies to get a pump tested.

(1) *Participation in PG&E's pump test program*: This choice has three advantages: a) it is offered to all, b) it does not cost anything to the customer, and c) the customer gets technically reliable and unbiased pump test results since PG&E does not have any vested interest in recommending a pump repair since a pump repair does not increase PG&E sales.

(2) *Pump test by an independent pump tester:* This choice has two advantages: a) it is offered to all, and b) the customer gets technically reliable and unbiased pump test results since the independent tester is not involved in a pump repair. But the cost can range from $150-$250 to get a pump tested.

(3) *Dealer/distributor*. Though it is free of charge, it is not offered by pump dealers/distributors or to all the customers. The pump dealers/distributors also offer services for a pump repair and may have a vested interest in the results of the test.

Besides the cost, the timing for a pump test is equally important. A pump test can be done only when the pump is running. Ideally, the pumps should get tested every year at the same time of the year so one can compare similar results (i.e., when the water table levels are similar). Since PG&E gets many requests for pump tests, sometimes customers have to wait to get a pump tested. The wait can be too long for the customer or the timing may not be suitable to the customer, depending upon the crop and when the pump is used. In such a case, the customer may review other alternatives to get a pump tested.

3.3 Identification of Market Barriers

As mentioned earlier, the AEMS pump test program was designed as a marketing and customer assistance program and has been around in one form or another for 75 years. Therefore there are no specific market transformation objectives in terms of how or to what extent it is expected to affect the market. After studying the program and understanding current market conditions, hypotheses were developed concerning market effects that may have resulted from the pump test program. These hypotheses were used to identify the kind of barriers that may have discouraged the customers from using efficient technologies/practices.

As was also discussed earlier, this study actually studied and modeled the inverse of the market barrier, or what we term the market condition. Throughout the remainder of this report the terms “market barriers” and “market conditions” are used interchangeably depending on the perspective at the time.

The data collection instruments were targeted towards gathering the information to determine if the following market barriers/conditions exist and, if so, to what extent they exist.

1. *Motivation* - Only if customers are aware of, and interested in, energy efficient technologies/practices, are they likely to seek information regarding energy efficient technologies/practices. Such motivation among customers is a precondition to changes in the installation/repair/retrofit practices of the customers. In a market, if customers are not interested in seeking information regarding new equipment and/or efficient technologies/practices, then it can become a barrier to adoption of new equipment and/or efficient technologies/practices.

   Since PG&E’s AEMS pump test program provides information regarding energy efficient technologies/practices via a pump test, the program can be considered to be instrumental in developing the motivation. Or, in other words, the AEMS pump test program could have been instrumental in affecting the market by reducing the motivation barrier. Whether the AEMS pump test program actually affected the motivation is tested in the analysis.

2. *Importance of Knowing Pump Efficiency* – Without knowing the pump efficiency, it is difficult for a customer to decide whether or not he/she can make it more efficient. Even if the customer is motivated to learn about efficiency, seek information regarding efficient technologies/practices, and make changes to increase efficiency, the customer can not make any decisions regarding the changes to increase the efficiency of the pump without knowing it’s efficiency. Thus, the knowledge of pump efficiency is a precondition to any decisions regarding changes. We think that those customers who consider the knowledge regarding pump efficiency important, are more likely to make changes to increase efficiency. If the program has been able to affect the customer’s perception of the importance of knowledge regarding pump efficiency, then there is evidence that the program has affected the market by making customers think that knowledge regarding the

pump efficiency is important. If more customers think that knowledge of pump efficiency is important, then more customers are likely to get their pump tested. Whether or not PG&E's AEMS pump test program has successfully convinced the customers regarding the importance of knowing pump efficiency is the second hypothesis tested in the analysis.

3. *Performance Uncertainty* - If customers are motivated and convinced regarding the importance of knowing their pump efficiency, then another barrier that may discourage them from getting their pump repaired is performance uncertainty. Performance uncertainty, in this case, is not believing that the energy savings predicted by the pump test will actually result from the pump repair. The pump test encourages customers to know whether or not a pump repair would help them save energy. Initially, customers may not believe savings from a pump repair predicted via a pump test. However, after their experience with PG&E pump test program, they may start believing in the pump test results and recommendations. Thus, whether or not customers believe in energy savings predicted via pump tests and whether they would continue to believe in energy savings even after the program is withdrawn is the third hypothesis tested in the analysis.

4. *Asymmetric Information* - Another related factor that may discourage customers from getting the pumps tested and repaired is the source of information. It is possible that customers trust one agency more than others for their prediction of savings. If a particular agency is also involved in repairing the pump along with pump testing, then customers may think that the agency has an incentive to provide misleading information. Alternately, customers may perceive PG&E as an independent institution providing them information about pump efficiency. Customers may think that PG&E does not have any incentive in misleading the customer. Thus, PG&E may have increased the level of confidence in the predicted savings by providing customers an independent estimate of energy savings via pump tests under the AEMS pump test program. PG&E may have been able to earn customers' confidence. However, this would mean that in the absence of PG&E's intervention, the possibility that another agency may give them a biased opinion might exist in the customers' mind. If PG&E has been able to create a competitive market for pump tests such that customers have choice and could be confident about other agencies has PG&E successfully affected this barrier via the AEMS pump test program. The hypothesis regarding whether or not the AEMS pump test program has made customers feel confident about information from other sources is also tested in the analysis.

5. *Bounded Rationality* - It is possible that even if customers have completely overcome all other barriers, that they will not willingly take the necessary steps to improve the pump's efficiency. The behavior of an individual during the decision making process that may seem inconsistent with the individual's goals is described as bounded rationality by Eto et al. In this study, such inconsistency is observed if the customers are convinced of the importance of the knowledge regarding pump efficiency but are not willing to pay for it. PG&E, via the AEMS pump test program, offers its customers pump tests at no cost to customers. Thus, the current information cost of finding pump efficiency for PG&E's agricultural customers is effectively zero. However, as mentioned earlier, the real societal cost of a pump test is definitely greater than zero. If the customer has to bear that cost, it is possible that the high information and search cost may discourage the customers from considering efficient technologies/practices as an option. If the AEMS pump test program has successfully changed the market towards efficiency, then customers would be convinced of the importance of knowledge regarding pump efficiency and would continue to get their pump tested even if they had to pay for it. In other words, program has reduced the information and search cost barrier that is faced by most markets in the initial stages. Thus, the effect of reducing the information search cost to zero and the rationality of the customer are tested at the same time.

Whether not or PG&E's AEMS program has successfully created the market and whether customers are consistent in what they think and what they are willing to do is tested in this study.

4. ANALYSIS APPROACH

After identifying potential market barriers, it is important to establish a causal link between program participation and changes in the market barriers (if any) in order to find out the extent to which these barriers were affected by the program. This causal link consists of:

1. Stating the level of the hypothesized market barriers: (i) motivation, (ii) importance of knowing pump efficiency, (iii) performance certainty, (iv) confidence in the source of information, and (v) rationality –i.e., consistency between stated goals and willingness to act to achieve those goals.
2. Testing whether or not the existing level of the market barrier is a result of the program.

In this study, customers' perceptions are used to state the level of each of the market barriers (whether or not the market barrier is perceived to exist) and to evaluate the extent to which the program affected the market. In order to evaluate the market effects of PG&E's AEMS pump test program, each of the five market barriers was analyzed. The extent to which the AEMS pump test program affected each of these barriers was measured.

4.1 Issues Surrounding Evaluation of Market Effects of DSM Programs

Ideally it would be desirable to evaluate overall market effects of all DSM programs at one time in one service territory. However, the following issues forced us to evaluate program-specific and equipment type-specific market effects in terms of each market barrier separately.

1. *Importance of evaluating program-specific market effects*. In reality, a combination of DSM programs affects the market. Therefore, in theory, it is desirable to study the overall effects of all of these DSM programs in a particular territory. However, such an overall evaluation of market effects is confounded due to the unique features of each program's design and implementation. The challenge faced in evaluating program-specific market effects is that the interactive effect of two or more programs is ignored. For example, incentive or informational programs separately may not have significant effects on different actors, but together both the programs may succeed in changing the level of awareness, behavior, and attitude of market actors.

2. *Importance of evaluating equipment-specific market effects attributable to a DSM program*. As a part of a particular program, market actors may have been offered information about more than one equipment type. If the program is offered by the utility over an extended period, market actors (e.g., customers) may have participated in the program in the past. From their previous participation, some customers may have been more aware of one equipment type (e.g., pump repair) than others (e.g., low-pressure sprinkler nozzles). They may have been convinced about the performance of a pump repair more than other equipment types. This may result in a lower extent of perceived existence of the market barrier for pump repairs than other equipment types. Thus, market effect attributable to a single program can be different for different equipment types and they must be evaluated separately.

3. *Importance of evaluating market effects in terms of each market barrier*. The extent of perceived existence of a market barrier may differ from one barrier to another. For a given equipment type (e.g., pump repair) the perceived existence of one market barrier (e.g., lack of motivation) may be higher than the perceived existence of another market barrier (e.g., performance uncertainty). Thus, the market effects should be analyzed separately in terms of reduction in each of the identified market barriers. The unavoidable downside of market barrier specific analyses is that different market barriers may appear to be independent from one another when, in reality, they are not. This risk must be accepted.

Together these factors defined that this evaluation would be conducted as a program specific, measures specific, market barrier specific study to define program market effects. Fiscal/scope restrictions mandated the use of an intra-territory comparison group**.**

4.2 Discrete Choice Analysis - Overview

For estimation purposes, market effects attributable to a DSM program can be defined as the extent to which the program has been able to reduce market barriers. As such, market effects attributable to a DSM program are the difference between the extent to which the identified market barriers would have prevailed if the program had not been offered and the extent to which market barriers exist in the presence of the program. For any given market barrier, the extent to which that barrier exists or not can be determined by selecting an appropriate indicator. The perception of market actors regarding the extent to which a market barrier exists is an appropriate indicator. In this study, market effects attributable to a DSM program are defined as the difference between the perceived existence of market barriers if the program is not available and the perceived existence of market barriers with the program in place. The perceived existence of market barriers is based on agricultural customers' perception of market condition.

Using an example of one market condition, e.g., performance certainty, the analysis tries to answer the question of whether or not a customer's perception of performance certainty (which is equivalent to one minus perception of performance uncertainty) is a result of the program (by creating that certainty). It does not compare participants and comparison group customers with respect to their implementation or purchase of equipment. In order to observe the cumulative effect of the perceptions of market barriers translating into purchase decisions, customers need to be observed for a longer period than is possible in this evaluation. As described in the Section 1.2, this study did not estimate long-term transformation effects. This quantitative method of analysis (called discrete choice analysis) is based on a simultaneous equations system, which Train (1994) originally proposed for free ridership. In Parikh, Kandel & Brown (1995), it was applied to estimate indirect effects of an electric utility's conservation education efforts.

The analysis untangles the pattern of causation between program participation and the perceived existence of market barriers. It attempts to determine reasons for the differences in the perceptions of participants and the comparison group.

The advantages of this approach are:

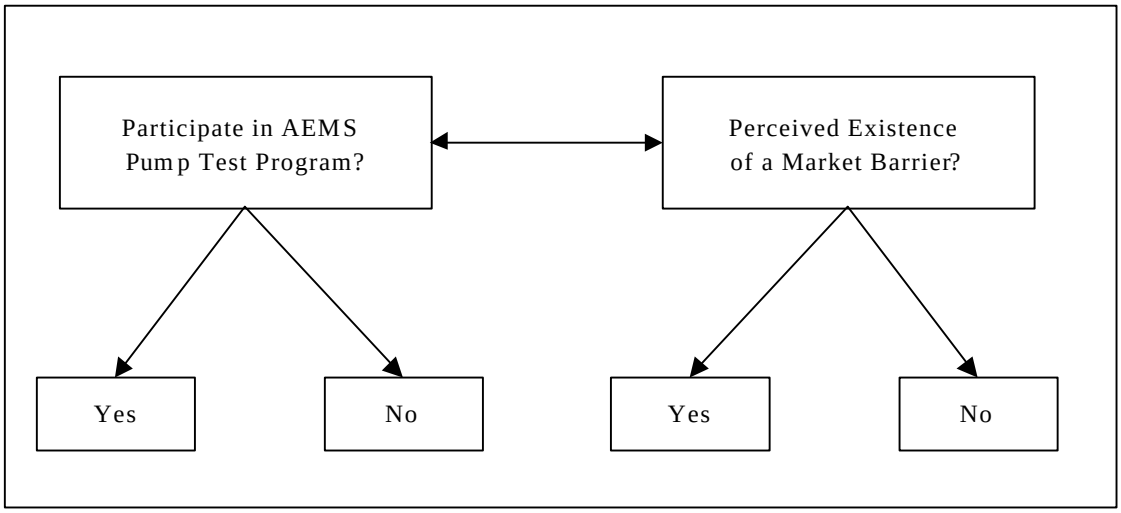
(i) *Needs information only from customers within the service territory.* This approach requires information on customer characteristics and the factors that affect their perception of market barriers for a sample of participants and for a comparison group within PG&E's service territory. As mentioned earlier, to get information on a comparison group outside the service territory was beyond the resources available for this project.

(ii) *Quantifies market effects of DSM program.* It is generally believed that the issue of market transformation is too complex and that quantifying the effects of a DSM program is almost impossible. It is true that the market transformation issue is complex with many factors that are interrelated. Therefore, quantifying any effect in terms of kWh savings for an earnings claim would be highly questionable. However, this approach demonstrates a method of quantifying market effects in terms of percentages, i.e., to what extent the program has been able to reduce possible market barriers.

4.3 Discrete Choice Analysis - Modeling System

Discrete Choice Analysis views decisions made by a customer in distinct logical steps. The customer decides whether or not to participate in the AEMS program. This decision is expected to depend, at least partially, on the customer's perception of the market barrier. For example, if the customer perceives that high information/search costs inhibit adoption of efficient equipment or practices, the customer may participate in the AEMS pump test program (which is free to the customer) to reduce the extent of that barrier. In addition to the decision to participate, the customer also has a preconceived idea about what stops him from adopting the measure (i.e., perception of the market barrier). This perception of the market barrier is in turn affected by the participation status of the customer. The relationship between participation and perception of market barrier for adoption is represented in Exhibit 4.1.

Exhibit 4.1
AEMS Pump Test Program Participation and Perception of Market Barrier Relationship



A carefully designed questionnaire was used to collect the information on customers' perceptions of each market barrier. This information was then modeled using a set of two standard logit models, one for participation and the other for perceived existence of each market barrier. These model results where then used to assess the extent to which the AEMS pump test program reduced the extent of a market barrier.

The customer's probability of participating in the program (i.e., obtaining a pump test) is described by a logit function with the following form:

$$Ppi = \left(\frac{e^{bZi}}{\left(1 + e^{bZi}\right)} \right)$$

Where:

Ppi (p=1) = the probability that the customer participates,

Z = a vector of customer characteristics that relate to the customer's decision to participate, and

β = a vector of parameters indicating how the characteristics Z relate to participation.

This model can be estimated by standard logit routines (e.g., the Logistic Procedure in SAS). The probability that the customer is not a participant is necessarily (1-P). It is expected that the decision to participate in the program is related to the customer's perception of a market barrier.

The customer has an idea (perception) about whether or not a particular market barrier exists. For example, a customer may be certain that, if recommended after a pump test, a pump repair will yield energy savings. In such a case, performance uncertainty may not be a barrier for that customer. Thus, perceived existence or absence of a market barrier can also be binary discrete choice (yes or no) that can be represented by a logit model. It takes the form:

$$Pbi = \left(\frac{e^{(aXi+dDi)}}{\left(1 + e^{(aXi+dDi)}\right)} \right)$$

Where:

Pbi (b=0) = the probability that the customer perceives the market barrier as not a barrier,

X = a list of characteristics of the customer and features of the measure that affect perception, and

D = a dummy variable that identifies whether the customer participated in the program.

The impact of the program is captured by δ, the coefficient of this participation dummy. This coefficient reflects the extent to which the program increased the customer's probability of perceiving the market barrier not as a barrier. Estimation of this model is complicated by the fact that the critical explanatory variable, the participation dummy D, depends upon the customer's perception of the market barrier. Since the customer's perception of market barrier affects the customer's decision to participate, causation in this case also runs from the dependent variable to the participation dummy.

Such bi-directionality of causation is dealt with the in a substitution procedure as used by Hartman (1988) and Train (1993). In this procedure, along with other explanatory variables, the probability of participation instead of the participation dummy, is included as one of the explanatory variables. Technically, in a nonlinear model, replacing the participation dummy with the probability of participation does not provide consistent estimate of the coefficient but the inconsistency is small.

The final logit model then takes the following form:

$$Pbi = \left(\frac{e^{(aXi+dprob(Di))}}{\left(1+e^{(aXi+dprob(Di))}\right)} \right)$$

Where δ still captures the effect of the program and prob(Di) is the probability of participation for the i^{th} customer.

The market effect of the program in terms of one market barrier is determined by estimating the effect that would occur with the program in place and the effect without the program in place, and then comparing the two.

4.4 Model Diagnostics

As in estimation of any statistical models, a coefficient is estimated for each explanatory variable. A positive coefficient in the participation model indicates that the factor represented by the variable increases the probability that the customer is a participant. A negative coefficient for a variable in the participation model indicates that the factor represented by the variable decreases the probability that the customer is a participant. Similarly, the signs of the coefficients in the market barrier model indicate whether the barriers represented by the variable increase (if positive) or decrease (if negative) the probability that the customer considers the market barrier as a barrier.

Wald Chi-square - As an indication of the explanatory power of each variable, a Wald-statistic was also produced for each coefficient. Wald Chi-square is computed as the square of the value obtained by dividing the parameter estimate by its standard error. As a general rule, the larger the magnitude of the Wald-statistic (Chi-square distribution), the greater the explanatory power of the variable. In particular, if the Wald-statistic has a magnitude exceeding 1.32, then the hypothesis that the coefficient is zero can be rejected at the seventy-five percent significance level.

Percentage of Probabilities Correctly Predicted - To assess the quality of the logistic model SAS provides (as a part of logistic procedures) the percentage of probabilities correctly predicted (concordant). In a relative sense, a model with higher values for a concordant index has a better predictive ability than a model with lower values for the concordant.

Log Likelihood at zero and at convergence - Generally, it is expected that a binary choice model without any explanatory variables has less explanatory power than a model with an appropriate combination of explanatory variables reflecting the customer's characteristics. Hence, it is expected, that for any model, Log Likelihood at convergence (that model with parameter estimates that maximize the likelihood function) will be higher than the Log Likelihood at zero (that model with all parameter estimates set to zero). As a result, we can judge how well a particular combination of explanatory variables describes the customers' choices by comparing the Log Likelihood at convergence with Log Likelihood at zero. The difference between these values indicates the explanatory power of the model - a higher difference suggests higher explanatory power.

The model results presented in Section 5 were compared with the results of the many other alternative model specifications on the basis of the above mentioned criteria. The possibility of serious collinearity among any explanatory variables in all the models was also explored by examining the correlation matrix of the explanatory variables. The sensitivity of the results was tested for any possible collinearity. Variables with high correlation affected the estimated coefficients and the resultant percentages. Of any two variables with high correlation, one of the two variables was selected primarily on the basis of the explanatory power of the variable as determined by the correlation with the dependent variable and contribution to the predictive power of the model as measured by the percentage correctly predicted. Out of two highly correlated variables, the variable with higher

explanatory power is preferred. If the contribution to the explanatory power is comparable, then the variable that contributes more to the predictive power as measured by the concordant is preferred.

5. RESULTS

In this section, the results of the Discrete Choice Analysis (DCA) are discussed. As explained in the Section 4, a participation model was estimated first. Next the probability of participation was estimated so that it can be included in each of the market barrier-specific models as an explanatory variable to estimate the effect of the program. Five separate models, one for each of the five market barriers, were estimated. It is required to estimate the probability that a customer perceives the market barrier not as a barrier (or in other words probability of perceived absence of a market barrier). However, we prefer to present the market barrier model results as probability of perceived absence of market barrier rather than probability of perceived existence of market barrier.

5.1 Participation Model

A logit model was estimated for the customers' decisions to participate in PG&E's AEMS pump test program. Before selecting the model specification presented here, many alternative specifications were considered with fewer/more variables. Exclusion of a variable from the model is due to one of the following reasons: (1) to avoid the loss of observations, (2) insignificant influence on the dependent variable, (3) to eliminate multicollinearity, or (4) deterioration in the predictive power of the model as measured by a concordant ratio.

This model is estimated using the choices made by all the surveyed customers. There was a pool of 402 total customers that were surveyed (200 participants and 202 customers from a comparison group). Information on some of the explanatory variable was missing for 6 customers; so they were eliminated from the analysis. Thus the participation model was estimated using the actual choices made by 396 customer decisions. The results of the participation model are presented in Exhibit 5.1.

Exhibit 5.1
Results of Participation Model

Explanatory Variables	Parameter Estimates	Wald Chi-Square
Intercept	4.55	4.2
Dummy=1 if either a winery, a packing plant or a dairy farm.	-1.08	9.2
Dummy=1 if business/organization owns the property.	-0.53	3.7
Dummy=1 if company/organization has been operating at the same location for more than 10 years.	-1.17	11.3
Dummy=1 if lighting represent over 10% of the electric use.	-0.62	4.6
Number of pumps	0.04	9.6
Dummy=1 if annual electricity consumption is less than 12,535kWh	0.8	8.2
Dummy=1 if lowest first cost is used to evaluate energy-efficiency improvements.	0.6	3.4
Dummy=1 if customers are aware of PG&E's AEMS pump test program.	1.68	27.9
Number of times participated in PG&E's AEMS pump test program prior to 1996.	0.19	3.1
Importance of maintenance costs in decision to install high-efficiency equipment.	0.20	1.9
Number of observations	396	
Number of participants	195	
Number of customers in a comparison group	201	
Percentage of probabilities correctly predicted (Concordant)	79%	
-2(LLR-LLU)	115.7	

All the coefficients are statistically different from zero at 99% significance level.

Results of the participation model indicate that the model predicts the probability of participating correctly for 79% of the customers.

- If the customer's (or decision maker's) business is a packing plant, a winery, or a dairy farm, (i.e., agricultural processing), they were less likely to participate in the program. If lighting at the

business/organization consumes more than 10 percent of the total electricity consumption, the customer is less likely to participate in the program. If the property is owned by the business/organization or if the customer has been operating at the same location for more than 10 years, then they are less likely to participate in the program.

- If the customers typically used the lowest first cost to evaluate energy-efficiency improvements, they are more likely to participate in the pump test program. Customers with a larger number of pumps are more likely to participate in the AEMS pump test program. Customers with more pumps also need to get more pumps repaired. More pump repairs require greater investments. Customer may find it necessary to verify whether that investment in pump repair would yield enough benefits to recover the investment in the pump repair. A pump test via the AEMS pump test program is one way to verify the expected savings prior to investing in pump repairs.
- If the maintenance costs of the current equipment is important to the customer, the customer is more likely to be aware of different ways to maintain the high reliability of the equipment for a longer period at the least possible cost. This may result in getting pump tested via the AEMS pump test program participation.
- The customers with low electricity consumption (lower than 12,535 kWh per year) are more likely to participate in the program. The results indicate that customers that have had previous exposure to the AEMS pump test program, or if they have participated in the program prior to 1996, they are more likely to participate. This suggests that repeat participation is more prevalent and that the customers that are not aware of a free pump test offered by PG&E via the AEMS pump test program, or have not participated in previous years, remain unaware of such a program.

5.2 Market Barrier 1: Motivation

As discussed in Section 3.3, customer motivation to seek information regarding efficient technologies/practices is a precondition to changes in installation/repair practices of the customers. In order to evaluate the effect of the program, it is necessary to find out the extent to which the program reduced the motivation barrier. Or in a more positive manner, the market effect of the program can be estimated in terms of the extent to which PG&E's pump test program motivated the customers to take an interest in efficient technologies/practices.

A logit model for the perceived existence of motivation was estimated. The dependent variable of this model is derived using the survey question 18 (How interested are you in acquiring information about efficient equipment or the latest technology?). Out of a total of 402 customers interviewed, 390 customers gave useful responses to this question. Only if the customers responded that they were 'very interested' in acquiring information about efficient equipment or the latest technology, is motivation perceived to exist. The probability of perceived existence of motivation is likely to be affected by a customer's participation in the program. At the same time, a customer's decision to participate is affected by the level of motivation. As explained in the Section 4 such bi-directionality of causation is dealt with through the substitution procedure as used by Hartman (1988) and Train (1993). In this procedure, along with other explanatory variables, the probability of participation instead of the participation dummy, is included as one of the explanatory variables. The results are presented in Exhibit 5.2.

Exhibit 5.2
Results of Market Barrier 1: Motivation Model

Explanatory Variables	Parameter Estimates	Wald Chi-Square
Intercept	20.9	32.1
Importance of potential energy or bill savings in any decision to install high efficiency equipment.	0.83	13.7
Importance of pump test results in the decision to repair a pump.	0.73	13.8
Amount of time willing to wait for a pump test.	-0.37	6.2
Dummy=1 if pumps are in use all year round.	0.32	1.9
Dummy=1 1 if company/organization has been operating at the same location for less than 3 years.	-0.77	2.5
Dummy=1 if complex financial methods are used to evaluate energy-efficiency improvements.	0.79	9.2
Dummy=1 if the customer categorizes the business as large.	0.45	2.4
Probability of participation.	0.96	4.6
Number of observations	390	
Percentage of probabilities correctly predicted (Concordant)	74%	
-2(LLR-LLU)	63.6	

All the coefficients are statistically different from zero at 99% significance level.

Results of the motivation model indicate that the model predicts the probability of the customer being motivated correctly for 74% of the customers. The key points emanating from this model are:

- If the customer considers the business large compared to other similar businesses, then the customer is more likely to be motivated to seek information regarding efficient technologies/practices. If the customer has been operating the business at the same location for less than three years, it is less likely that the customer is motivated to seek information regarding efficient technologies/practices. These finding make sense because it is likely that at comparatively new location, the challenges of running the business successfully or relatively new set of equipment does not motivate customers to seek information regarding efficient technologies/practices. Customers who typically use a more complex financial analysis to evaluate energy-efficiency improvements are more likely to be motivated to seek information regarding efficient technologies.
- Those customers who use their pumps year-round are more likely to be motivated to seek information regarding efficient technologies/practices. This is logical since higher use leading to

greater electricity consumption induces motivation to seek information regarding efficient technologies/practices.

- Those customers who think that the potential energy or bill savings are important in any decision to install high-efficiency equipment, are more likely to be motivated. Similarly, customers are motivated if pump test results are important in their decision to repair the pump. The longer the customers are willing to wait for the pump test, lower the level of motivation to seek information regarding efficient technologies/practices.
- The coefficient of the most important variable, 'probability of participation', is positive, indicating that overall, customers with a high probability of participation are more likely to be motivated to seek information regarding efficient technologies/practices.

5.3 Market Barrier 2: Efficiency Importance

As mentioned earlier, once the customers are motivated to look for information, they decide whether they want to incur the cost of finding out more about energy efficient technologies/practices. The market conditions show that there are multiple avenues open to an agricultural customer if they want to pay for the information costs. However, before they decide whether they want to incur the cost of finding out the efficiency of their pump, customers need to be convinced of the importance of gaining this knowledge. The hypothesis reported on in this section is: "To what extent has PG&E's AEMS pump test program successfully convinced the customers about the importance of knowing the efficiency of their pumps?"

A logit model for the 'perceived importance of knowing pump efficiency' was estimated. The dependent variable of this model is derived using the survey question 24 (How important do you think it is to know the efficiency of the pumps?) Out of a total of 402 customers interviewed, 393 customers gave useful responses to this question. Only if the customers responded that it is 'very important' to them to know the efficiency of their pumps is the importance of knowing efficiency of the pump perceived to exist. In order to observe the effect of the program, the probability of participation is used as one of the independent variables. The results are presented in Exhibit 5.3.

Exhibit 5.3
Results of Market Barrier 2: Efficiency Importance Model

Explanatory Variables	Parameter Estimates	Wald Chi-Square
Intercept	17.5*	26.9
Importance of potential energy or bill savings in any decision to install high efficiency equipment.	0.6*	10.3
Importance of pump test results in the decision to repair a pump.	0.86*	20.3
Importance of general health of the economy in the decision to install high efficiency equipment.	0.14	1.2
Dummy=1 1 if company/organization has been operating at the same location for less than 3 years.	-1.76*	12.6
Dummy=1 if customer is willing to pay in future if not offered at no cost to customer.	0.37*	2.0
Average age of the pumps owned by the business/organization.	0.62*	3.7
Dummy=1 if customer located in Southern San Joaquin Valley.	0.67*	4.9
Electricity consumption strata of the customer. (defined using pre-participation (1995) annual kWh usage)	0.14	1.4
Probability of participation.	1.1*	5.1
Number of observations	393	
Percentage of probabilities correctly predicted (Concordant)	77%	
-2(LLR-LLU)	75.8	

All the coefficients are statistically different from zero at 95% significance level. Those marked * are statistically different from zero at 99% significance level.

Results of the efficiency importance model indicate that the model predicts the probability of efficiency as important correctly for 77% of the customers. The key points emanating from this model are:

- If the customer has been operating the business at the same location for less than three years, then the customer is less likely to be convinced about the importance of knowing pump efficiency. A short period at any location could be associated with relatively new equipment. The customer is less likely to realize the value of knowing pump efficiency for a relatively new pump over a relatively short period of use. This is also reconfirmed when the age of the pump is positively correlated with the level of importance of knowing pump efficiency. The positive coefficient

indicates that older the pump in use, greater is the importance of finding out the efficiency of the pump.

- Customers in higher electricity consumption strata (defined using pre-program year annual usage) consider knowledge about pump efficiency more important than those in lower electricity consumption strata. Similarly, customers located in Southern San Joaquin Valley find that knowing pump efficiency is very important. This makes sense since wells are deepest in this part of the valley. Customers who are willing to pay for a pump test find that the knowledge about pump efficiency is very important.
- Those customers, who think that the potential energy or bill savings are important in any decision to install high-efficiency equipment, are more likely to consider knowledge about pump efficiency important. Similarly, customers are interested in knowing pump efficiency when pump test results are important in their decision to repair the pump.
- Again, the positive coefficient of the most important variable, 'probability of participation', indicates that overall, customers with a high probability of participation consider knowledge about pump efficiency important.

5.4 Market Barrier 3: Performance Uncertainty

As mentioned earlier, PG&E may have tried to build up confidence in predicted savings from pump tests via the AEMS pump test program. As a part of the AEMS pump test program, PG&E may encourage customers to find out whether or not a pump repair would help them save energy. Initially, customers may not believe savings predicted by a pump test for the pump repair. However, after their experience with PG&E, they may start believing in the pump test results and recommendations. To evaluate the extent to which the program could build confidence amongst customers regarding predicted energy savings, a performance certainty model was estimated. The dependent variable of this model was derived using the survey question 32 (Do you believe the benefits of a pump repair as projected by a pump test?) If the answer to this question is affirmative, then performance certainty is perceived to exist. This question was asked to only those customers who indicated that they had pump tested at least once before. Out of a total of 402 customers interviewed, 338 customers responded to this question. Out of 338 respondents, information was missing for 22 customers and hence they were eliminated from the analysis. This resulted in a final analysis dataset of 316 observations for this market barrier. In order to observe the effect of the program, probability of participation is used as one of the independent variables. The results are presented in Exhibit 5.4.

Exhibit 5.4
Results of Market Barrier 3: Performance Certainty Model

Explanatory Variables	Parameter Estimates	Wald Chi-Square
Intercept	17.5	21.1
Importance of pump test results in the decision to repair a pump.	0.75	8.6
Dummy=1 if company/organization is operated by a family.	-0.84	3.3
Dummy=1 if decision to install energy-efficiency improvements are taken by an Ag Engineer or a consultant.	-1.58	2.7
Dummy=1 if HVAC represent over 10% of the electric use.	1.49	8.2
Amount of time willing to wait for a pump test.	-0.23	1.3
Number of pumps with less than 20 horsepower.	-0.15	9.4
Dummy=1 if customer is willing to pay in future if not offered at no cost to customer.	0.45	1.9
1995 Annual electricity usage in kWh.	-0.00000104	4.92
Based on past experiences, the level of benefits experienced compared to the estimated benefits from a pump test.	0.45	11.8
Probability of participation.	0.98	2.0
Number of observations	316	
Percentage of probabilities correctly predicted (Concordant)	79%	
-2(LLR-LLU)	63	

All the coefficients are statistically different from zero at 99% significance level.

Results of the performance certainty model indicate that the model predicts the probability of being certain of pump repair savings correctly for 79% of the customers. One of the most important variables included in the model is previous experience regarding predicted savings. If customers obtained the predicted benefits in the past then they are more likely to be certain about the predicted savings this year. The key points emanating from this model are:

- A family run business is less likely to be certain about the savings predicted via a pump test. Likewise if an agricultural engineer or consultant is the decision-maker regarding installation of energy efficient equipment, then the customer is less likely to be certain about the predicted savings

from a pump repair. Also customers with more number of pumps of 20 horsepower or less are less likely to be certain about the predicted benefits.

- Customers with greater annual electricity usage are less likely to be certain about predicted energy savings.
- Customers who think that pump test results are important in their decision to repair the pump, are more likely to be certain about the predicted savings. The longer the customers are willing to wait for a pump test, the less likely they are to be certain about the predicted savings. Whereas if customers are willing to pay for a pump test, then they are more likely to be certain about the predicted savings.
- Again, the positive coefficient of the most important variable, 'probability of participation', indicates that overall, customers with a high probability of participation are more likely to be certain about the savings predicted via a pump test.

5.5 Market Barrier 4: Asymmetric Information

Another related factor that may discourage customers from getting their pumps tested and repaired is the source of the information. It is possible that customers have more confidence in one agency for their prediction of savings than in others. In this case, PG&E may have provided a technically reliable and professionally unbiased estimate of pump repair benefits projected via a pump test. However, only if PG&E has successfully created a situation where customers feel as confident in other agencies as they are about PG&E, can the program be considered to have reduced the asymmetric information market barrier. In order to find out whether or not the pump test program had affected this market barrier, it is important to know whether customers have any confidence in the benefits projected by any other agencies besides PG&E.

Q35 and Q36 in the telephone survey, specifically ask customers to rate their confidence in the benefits projected by the pump test if it were done by (a) PG&E, (b) a pump dealer, and (c) an independent pump tester. The responses to Q36 indicate that 76% of 370 respondents feel equally or more confident about the pump test results if it were done by a pump dealer or an independent pump tester. The next question is how much of this is due to the pump test program.

A logit model was used to estimate the effect of the pump test program. The dependent variable was defined using the responses to Q35 and Q36 in the survey. If the customers are equally or more confident about the pump test results by non-PG&E pump tester as they are about pump test results by PG&E, then the confidence was perceived to exist.

Out of a total of 402 customer surveys, 370 responded to this question. Out of those 370 respondents, 21 respondents were eliminated from the analysis since information for independent variables was missing. This resulted in a final analysis dataset of 349 observations for this market barrier. In order to observe the effect of the program, probability of participation is used as one of the independent variables. The results are presented in Exhibit 5.5.

Exhibit 5.5
Results of Market Barrier 4: Confidence Model

Explanatory Variables	Parameter Estimates	Wald Chi-Square
Intercept	8.1*	7.2
Importance of pump test results in the decision to repair a pump.	0.22*	1.3
Importance of general health of the economy in the decision to install high efficiency equipment. .	0.19*	2.2
Dummy=1 if lowest first cost is used to evaluate energy-efficiency improvements.	-0.75*	5.1
Dummy=1 if customer initiated the search for information regarding efficient equipment.	-0.38*	2.1
Amount of time willing to wait for a pump test.	-0.16	1.08
Probability of participation.	0.27	0.25
Number of observations	349	
Percentage of probabilities correctly predicted (Concordant)	61%	
-2(LLR-LLU)	13	

All the coefficients marked * are statistically different from zero at 95% significance level.

Results of the confidence model indicate that the model predicts the probability of being confident in a pump test recommendation correctly for 61% of the customers. The key points emanating from this model are:

- If customers typically used the lowest first cost to evaluate energy-efficiency improvements, they are less likely to be confident about pump test results by any agency other than PG&E.
- Customers who think that pump test results are important in their decision to repair the pump, or that general health of the economy is important when deciding to install energy efficient equipment, are more likely to be confident about pump test results if it were done by non-PG&E agencies.
- The longer the customers are willing to wait for a pump test, the less likely they are confident about pump test results if it were done by agencies other than PG&E. If customers themselves have initiated the search for information regarding the energy-efficiency options, then they are less likely to be confident about pump test results if it were done by any agency other than PG&E.
- Though the coefficient of the most important variable 'probability of participation' is positive indicating that overall, customers with a high probability of participation are more likely to be confident about pump test results by non-PG&E agencies, the coefficient is not proved to be significantly different from zero. This does not allow us to determine the program effects. Rather it would mean that program effects are not significantly different from zero.

5.6 Market Barrier 5: Bounded Rationality

It is possible that even if customers are highly motivated, convinced about the importance of knowing efficiency, and certain about the projected benefits by a pump test, that they are still not willing to pay for a pump test. The behavior of an individual during the decision making process that may seem inconsistent with the individual's goals is described as bounded rationality by Eto et al.

Whether a customer is 'rational' or 'consistent' is determined using responses to three different questions in the survey. Q24 in the survey asks customers to rate the importance of knowing efficiency of their pumps. Q37 asks customers whether they would be willing to pay for a pump test if PG&E did not offer a pump test at no cost to the customers. Q38 asks customers specific amounts they would be willing to pay for a test. A customer is 'consistent' if he is both not willing pay for a pump test and does not consider the knowledge of pump efficiency important. A customer is 'rational' if he considers that the knowledge of pump efficiency is important and is willing to pay a reasonable price for a pump test. The analysis of current market condition in Section 2.2 indicates that the pump test normally costs $150-$250. If PG&E did not offer pump tests at no cost to customers via the AEMS pump test program, then in a competitive market the price for a pump test would go down. Assuming that it may go down to around $100, customers who considered knowing efficiency important and are willing to pay $100 or more for a pump test are considered rational for the purposes of analysis in this section. In order to estimate the extent to which the pump test program made the customers realize the value of a pump test, or helped them to be 'rational', a logit model was estimated. Information on independent variables was missing for 15 out of 402 customers. Therefore, this rationality model is estimated using responses of 387 customers. The results are presented in Exhibit 5.6.

Exhibit 5.6
Results of Market Barrier 5: Rationality Model

Explanatory Variables	Parameter Estimates	Wald Chi-Square
Intercept	-3.98*	3.6
Importance of pump test results in the decision to repair a pump.	0.52*	9.7
Importance of reliability of the new equipment in the decision to install high efficiency equipment.	1.36*	2.9
Dummy=1 if decision to install energy-efficiency improvements are taken by an ag. engineer or a consultant.	-1.26*	2.2
Dummy=1 1 if company/organization has been operating at the same location for less than 3 years.	0.99*	3.7
Dummy=1 if company/organization is operated by a company.	-0.54*	3.0
Average age of the pumps owned by the business/organization.	-0.29	1.3
Dummy=1 if annual electricity consumption is less than 123,380 kWh	0.85*	10.1
Probability of participation.	-0.8*	3.5
Number of observations	387	
Percentage of probabilities correctly predicted (Concordant)	68%	
-2(LLR-LLU)	36	

All the coefficients are statistically different from zero at 95% significance level. Those marked * are statistically different from zero at 99% significance level.

Results of the rationality model indicate that the model predicts the probability of acting rationally correctly for 68% of the customers. The key points emanating from this model are:

- Customers who think that pump test results are important in their decision to repair the pump are more likely to be rational/consistent in their thinking and behavior. This indicates that customers who realize the value of a pump test are more likely to be 'rational'. Also if customers consider reliability of the equipment as an important factor in their decision to install high efficiency equipment, they are likely to be 'rational'. If reliability is important they are more likely to realize the value of tools that help them to know the reliability of their equipment.
- If decisions to install efficient equipment or employ efficient practices in a business are taken by an engineer or agricultural consultant, then the customer is less likely to be rational. Or if the business

/organization is run by a company, then the customer is less likely to be rational. Similarly if the average age of the pumps is higher than the overall average, then the customer is less likely to be rational.

- If the business has been at the same location for less than three years, or if the customer's annual electricity consumption is greater than 123,380 kWh in 1995, customers are more likely to be rational.
- Though the coefficient of the most important variable 'probability of participation' is significantly different from zero, it is negative. This indicates that, instead of causing reduction in this barrier, the AEMS pump test program is increasing the extent to which the barrier exists. Or in other words, instead of making customers rational, PG&E's AEMS pump test program is inducing inconsistent behavior. Since the program has been in place for so long that, though customers are motivated and convinced of the importance of knowing pump efficiency, they are not willing to pay for a pump test. In a way, the customer is acting rationally. If PG&E is offering a pump test at no cost, why should anyone be willing to pay for it? Despite the findings that PG&E's AEMS pump test program does not help customers to act rationally, the fact is that 51% of customers are perceived to be rational.

5.7 Estimating Market Effects and Confidence Intervals

Using these results; i.e., the probability of participation and the probability that a customer does not consider a market barrier as a barrier with the program in place, the overall effect of the AEMS pump test program was estimated. In the absence of the program, the participation dummy (or to be precise, the probability of participation) as an explanatory variable was assumed to be zero. The probability that a customer would not consider the barrier as a barrier was forecasted using the model results of each market barrier. The difference between the perceived existence of market barrier in absence of the program and with the program in place is then estimated for each market barrier.

In order to make use of the market effects attributable to the AEMS pump test program in an informed manner, one must also have at least approximate knowledge of the uncertainty associated with the estimated ratios. Estimation of uncertainty is complicated by the fact that the functional relationship between the market effects and the model coefficients is nonlinear. For this study, a confidence interval around the effect is estimated using one of the explanatory variables. The method involves taking the standard error of the estimated coefficient of the most important variable in all five models for each market barrier, then calculating the maximum and minimum market effects at 90% significance level. In this approach the choice of the one explanatory variable is critical. The estimated coefficient and the standard error of the probability of participation variable was used because the probability of participation is a function of all the variables in the participation model, and its parameter is estimated in the market barrier model.

The results indicated the effects attributable to the program. These results are discussed in the next section.

6. MARKET EFFECTS ATTRIBUTABLE TO THE AEMS PUMP TEST PROGRAM

The purpose of this section is to discuss the market effects in terms of each of the five market barriers attributable to PG&E's AEMS pump test program. The estimated effects using the model results presented in Section 5 are presented in Exhibit 6.1. These effects reflect current perceptions and may underestimate the actual long-term contribution of the program to those perceptions.

Exhibit 6.1
Market Effects Attributable to the AEMS Pump Test Program

Market Barrier – *Responses by Customers*	**Current Market Condition**	**Market Effects Attributable to the Program***	**90% Confidence Interval**
1: *Motivation* – Very interested to know about efficiency in general	49%	19%	5% -- 37%
2: *Efficiency Importance* – Very important to know efficiency of pumps in particular	72%	13%	5% -- 20%
3: *Performance Uncertainty* – If customer has had a pump test, customer certain about benefits from a pump repair	79%	9%	0.7% -- 16%
4: *Asymmetric Information* – If customer has had a pump test, confident about pump test results even if not done by PG&E	76%	Unable to Determine	
5: *Bounded Rationality* – Consistency in belief and actions	51%	(-24%)	(-30%) -- (-9%)

*This estimate is conservative since it only accounts for the effects on the participants.

6.2 Motivation - Efficiency In General

In the initial stages of introducing an efficiency concept, it is important to motivate customers to take interest in finding out more about the efficient technologies/practices. Since the inception of PG&E pump testing in 1923, customers have experienced electricity price increases and vast improvements in the speed at which information travels within the marketplace. From the survey responses it is observed that:

- 49% of the agricultural customers are 'very interested' in acquiring information about efficient equipment or the latest technology. In other words, 5 out of 10 customers are keen to know about efficient technologies/practices. 57% of the agricultural customers think that they will be 'very interested' in seeking information about efficient technologies in the future. This indicates the high level of motivation to seek information regarding efficient technologies/practices will increase in the future.
- 38% of the agricultural customers are 'somewhat interested' in acquiring information about efficient equipment or the latest technology. This means that 4 out of 10 customers have started taking interest in efficient technologies/practices. 35% of the agricultural customers think that they will be 'somewhat interested' in seeking information about efficient technologies in the future.

- Together, 87% of the agricultural customers are at least somewhat motivated to learn about efficient technologies at present and 92% of agricultural customers think they will take interest in the future. The hypothesis of whether those 86% will continue to be motivated in the future or not was also tested. It was found that 99% of 86% (or 342 out of 347) think that they will continue to be motivated in the future. This indicates that in the market for efficient technologies/practices for agricultural customers, motivation has improved and will remain constant in the future.

The next question is how much of the observed motivation is attributable to the program. Out of the sample of 402 customers interviewed, 400 answered the question used in the analysis of this barrier. The survey indicated that 49% of the customers (195 out of 400) are perceived to be motivated. Of the 195 motivated customers, 112 are participants. The DCA indicates that 34% of the motivation observed amongst participant agricultural customers (38 of the 112 motivated participants) is attributable to PG&E's AEMS pump test program. If no program spillover is assumed, then 19% of the motivation (38 of 195 customers) is a result of the program. In other words, two out of ten customers are motivated as a result of participation in PG&E's AEMS pump test program. The remaining eight out of ten motivated customers are motivated not as a result of the pump test program but are most likely motivated due to high electricity prices or by communication with other growers. As discussed earlier, customers' current perceptions could well be under estimating credit for the long-term effects of the presence of the program. The confidence interval indicates that, out of 100 customers, the number of customers motivated as a result of the program ranges from 5 to 37.

The survey responses indicate that lack of motivation is a significant market barrier in today's context. The DCA indicates 19% of the motivation in the market is attributable to the program. Therefore, unless future program efforts focus on those customers who are not motivated, the program effect on motivation may decrease. It is possible that the program, as currently offered, is not targeted to those non-motivated customers. It is beyond the scope of this study to identify what kind of customers are not motivated and what kind of changes in the program will help them to be motivated.

6.3 Importance of Pump Efficiency Knowledge

In the initial stages of product introduction, it is important to make customers take interest in finding out more about the new product. In this case, when the program started, pump tests as a tool to learn about pump efficiency may have been a new product and getting customers take an interest in knowing the efficiency of their pumps may have been a challenge. However, the program has been offered for many years and customers may have already realized the value of knowing the efficiency of their pumps. This could be the result of experiences such as crop loss due to insufficient water supply or a pump breakdown. From the survey responses it is observed that:

- 72% of the agricultural customers consider that knowledge of pump efficiency is 'very important'. In other words, over seven out of ten customers are very interested in knowing efficiency of their pumps.
- 23% or 2 out of 10 of the agricultural customers consider that knowledge of pump efficiency is 'somewhat important'.
- Together, 95% of the agricultural customers are at least somewhat interested in knowing the efficiency of their pumps. This 95% is higher than the 86% of the agricultural customers who are perceived to be motivated to find out about the efficient technologies/practices in general. This indicates that in the market for pump tests (i.e., a tool to know pump efficiency), virtually all customers are interested to some extent in knowing the efficiency of their pumps. Since it affects

their bills directly, more customers are interested to know the efficiency of their pumps compared to those motivated to find out about efficient technologies/practices in general.

Out of the sample of 402 customers interviewed, 400 answered the question used in the analysis of this barrier. The survey indicates that 72% of customers (288 out of 400) are interested in knowing the pump efficiency. Of those 288 customers, 157 are participants. The DCA indicates that 23% (36 customers out of 157 participants) are interested due to the program. If the effect of the program is assumed to be only on the participants, then 13% (36 out of 288) of total interested customers are taking an interest as a result of the program. Thus, 13 out of 100 customers consider knowledge of pump efficiency important as a result of participation in PG&E's AEMS pump test program. The remaining 87 customers consider the knowledge about pump efficiency important probably due to their own experiences or experience passed on from their mentors or peers. These mentors or peers may well have been directly or indirectly influenced by PG&E's pump test program. Untangling this trail of causality was well beyond the scope attempted by this study. The confidence interval indicates that, out of 100 customers, the number of customers interested in pump efficiency as a result of the program ranges from 5 to 20.

The survey responses indicate that the perceived interest in knowing pump efficiency is quite high, implying that the market barrier is low. The DCA indicates that the contribution of the program to this high perceived interest in knowing about pump efficiency is low. It is important to remember that the DCA based on current customer perception cannot account for indirect long-term influences that may have resulted from the existence of PG&E's program.

6.4 Performance Uncertainty - Certainty About Benefits Projected by a Pump Test

In the second stage of product introduction, when presumably, the customers are motivated and interested in knowing specific efficiency levels, unless the customers are certain about the usefulness of pump test as a tool, they may not be interested in using the tool. In the survey the question regarding certainty about benefits projected by a pump test was asked to those who had at least one experience with pump test. Out of a total of 402 customers interviewed, 338 had at least one experience with a pump test. From the survey responses it is observed that:

- 79% of agricultural customers that have had a pump test in the past believed in the benefits of a pump repair as projected by a pump test. Therefore these customers perceive themselves to be certain about benefits projected by a pump repair. 82% of these particular customers are sure that they would continue to believe in projected benefits in the future. Thus, a fairly large proportion of customers believed in the savings projected by a pump test at present and will continue to believe in the future.
- This indicates that in the market for pump test, (i.e., a tool to know pump efficiency), eight out of ten customers are perceived to be certain about benefits projected by a pump test.

The relevant question is how much of the perceived certainty in the savings projected by a pump test is attributable to the program. The survey indicates that 79% of customers (266 out of 338 respondents) are perceived to be certain about the benefits projected by a pump test. Of the 266 customers who are certain, 152 are participants. The DCA indicates that 15% of the participants (23 of 152) who perceive themselves to be certain of the pump test results are certain as a result of the PG&E's AEMS pump test program. If the effect of the program is assumed to be only of the participants, then 9% (23 of 266 customers) became certain due to their participation in PG&E's AEMS pump test program. This suggests that 19% (i.e. 51 out of 266) of customers with certainty about pump test results are certain about pump test results as a result of the program. So out of 100 customers who believe in pump test

results, only nine customers believe in pump test results due to their participation in PG&E's AEMS pump test program. The remaining 91 customers believe in pump test results due to their past experiences or experiences of other growers. These experiences may well have been indirectly effected by the PG&E pump test program. This analysis cannot account for such indirect effects. The confidence interval indicates that, out a 100 customers, the number of customers who are certain about pump test results as a result of the program ranges from 1 to 16.

The survey responses indicate that the perceived certainty regarding pump test results is quite high, indicating that the performance uncertainty market barrier is low. The DCA indicates that the program contribution to the performance certainty is low. It is important to remember that the DCA based on current customer perception cannot account for indirect long-term influences that may have resulted from the existence of PG&E's program.

6.5 Asymmetric Information - Level of Confidence in Pump Test Results If Not Done By PG&E

The hypothesis tested for this barrier is whether or not the AEMS program educated the customers to the point where they feel confident about information from sources other than PG&E. All agencies may be capable of providing technically reliable estimates of pump efficiency, though customers may perceive that some agencies are more likely to be biased than others.

Out of a total of 402 customers interviewed, 370 customers responded to the question aimed at analyzing this hypothesis. The responses indicate that 76% would trust either a pump dealer or an independent pump tester as much or more than they trust PG&E now. This indicates that at least seven out of ten customers would be confident in pump test results if it were done by non-PG&E pump testers. The finding suggests that while PG&E is perceived to be professionally unbiased, customers are also confident about pump test results that they receive from agencies other than PG&E.

The DCA could not determine whether the PG&E's pump test program induces any of this confidence in other agencies. Since the factors that influence the confidence level of customers are not definite or clear, it was difficult to separate the effects of these other factors from the program effects. However, what appears clear is that asymmetric information with respect to who supplies the pump test does not appear to be a significant market barrier in terms of customer's confidence in the results of pump tests.

6.6 Bounded Rationality

If agricultural customers realize the value of the information provided via a pump test, would they be willing to pay for a pump test to get that information? In this analysis, if they both believed in the value of a pump test and would be willing to pay for it, the customer was considered 'rational'.

Out of the sample of 402 customers interviewed, 400 answered the questions used in the analysis of this barrier. The survey responses indicate that 51% (204 of 400) are 'rational'. Out of the 204 'rational' customers, 135 consider the information from a pump test important and, in the absence of a cost free PG&E program, are willing to pay $100 or more for a pump test. The remaining 69 customers do not consider the information from a pump test as important and hence are not willing pay for it. These responses indicate that there may be a market for a pump test service in which the customers pay for the service.

Whether PG&E's AEMS pump test program has successfully made customers realize the value of a pump test, as expressed in terms of their willingness to pay for the information, was analyzed next. The DCA indicated that PG&E's AEMS pump test program actually discourages customers from

understanding the cost of a pump test. Not one of the 204 'rational' customers behaved as such due to the program.

If the customer believed in the information provided by a pump test, but was unwilling to pay for it, they were considered not 'rational'. Therefore, with 204 of 400 customers considered 'rational', there were 196 customers determined to be not 'rational'. Of those 196, 111 were participants. The negative DCA result indicates that 24% (27 of the 111 participants who are not 'rational') would have been willing to pay for a test if the program was not offered. The fact that there is no qualifying requirement to get a pump tested by PG&E has discouraged customers from being 'rational'. Agricultural customer are so used to getting a pump tested by PG&E without paying anything, that now they are not prepared to pay for it. The confidence interval indicates that a minimum of 9 or a maximum of 30 participants (out of a 100) who are currently not 'rational', would have been 'rational' if the program was not in place. Thus, the analysis indicates that the program discouraged customers to pay for the services.

6.7 Customer Profiles

In the ideal situation, customers would know whether their pumps are running at optimum efficiency or not. However, the reality is that not all customers know the efficiency of their pumps. Customers can be grouped in to three categories; *alert customers* (those who keep themselves up-to-date with information regarding the latest efficient technologies/practices, the sources of information, and its advantages and disadvantages), *cautious customers* (those who may be willing to change their attitude and thinking towards efficient technologies/practices but need some encouragement), and *unaware/unexposed customers* (those who are either not exposed or not concerned at all about energy efficiency).

Without any information about the proportion of customers in these categories from the past, it is difficult to identify which groups have been affected by PG&E's AEMS pump test program. However, the present composition of customers in these three categories would inform us about which group should be the target of the future program and for that chosen target, how the program should be implemented. The survey indicates that:

- Approximately 57% of all customers interviewed believe that they know the efficiency of their pumps because they have had their pumps tested or the equipment is new. These customers probably fall into the category of alert customers.
- 11% of all customers interviewed think that they know their pump is efficient by observing the flow or pressure and/or they know that checking the pump's efficiency is expensive. These customers need some encouragement to check the efficiency; that is, they can be considered cautious customers.
- The remaining 32% of the customers have not given thought to learning about their pump efficiency, they do not consider it worthwhile, they do not know/understand, or they are ignorant about how to get it done. These customers need some education/ guidance regarding pump testing and its importance. They should be considered unaware or unexposed customers.

The next section summarizes the overall conclusions that can be drawn about market effects as measured by the five market barriers assessed and adds conclusions about the evaluation technique attempted in this study.

7. CONCLUSIONS

This section summarizes the affects of the five individual market barriers on the pump test market as a whole and draws conclusions about the evaluation method employed in this study

7.1 Market Effects Summary

In terms of the five hypotheses presented in section 3.3, the analysis indicates that the barriers of pump efficiency knowledge, performance uncertainty, and asymmetric information are low in the current market. The program appears to have played only a small part in reducing these hypothesized barriers. In the current market, lack of motivation appears to be the largest market barrier. While this ties in with an apparently comparable level for the market barrier of bounded rationality, this market barrier is offset somewhat by the inhibiting effect of the current program. The program, by providing pump tests at no cost to the customer, motivated customers to learn about energy efficiency but inhibits them from being willing to pay for the pump tests. Thus the customers would appear to be acting consistently upon their beliefs. Given this offsetting effect, motivation is the single largest market barrier for the AEMS pump test program.

It is important to note that the program has had its largest effect in motivating customers to have an interest in efficient technologies and practices. The primary indicator that this is true is that the program had the largest effect on this market barrier (19%). This is important since, as an information program, motivation is one of the primary targets of the program.

It is clear that so far, the program has contributed a fair share in creating the motivation to seek information regarding efficient technologies/practices, and in making customers feel interested in knowing the efficiency of their pumps. PG&E has successfully assured some of the customers that the pump test results are believable. But in the present context, when a majority of agricultural customers are motivated, interested and convinced and are going to remain motivated, interested and convinced in the future, PG&E's program has minor role to play. PG&E will need to investigate how to target the specific group of customers that are not motivated, not interested, and not convinced.

A competitive market for pump tests is emerging as a result of the effects of the program and other market forces. The survey results indicate that the level of awareness, attitude and behavior amongst agricultural customers is and is perceived to remain positive towards efficiency in the future.

It must be added that the extremely long history of PG&E pump testing services has probably played a role in these results. The results are based on customers' perceptions of their reasons for being motivated, interested, or convinced. However, since no cost PG&E pump tests have been available to agricultural customers for three quarters of a century, it probable that some portion became motivated, interested, or convinced as a result of their parents', or even more indirectly, their grandparents' experiences with the PG&E programs. They may also have been affected by the long-term effects of the strong word of mouth network that exists amongst growers. Data supporting each of these means of affecting their perception would have been extremely difficult to extract during a short structured telephone interview.

7.2 Analysis Method Conclusions

The following conclusions can be drawn concerning the analysis approach used in this study:

1. The Discrete Choice Analysis approach shows substantial promise as a tool for quantitatively identifying the existence of individual market barriers.

2. The DCA model shows substantial promise in identifying program contributions to changes in market barriers.
3. The approach employed participant interviews in conjunction with an intra-territorial comparison group. This approach ignores any direct or indirect effects of the existence of the program on the comparison group. The analysis would be strengthened substantially if a comparison group that had experienced no program exposure could be identified and used in the study.
4. The method employed was not able to study, check, or compensate for interactions between the market barriers.
5. The evaluation team believes that DCA modeling approach has demonstrated its usefulness for assessing market effects. We believe that given a differently focused survey it could be used to untangle the historical issues surrounding the AEMS program. Additionally we believe that it could prove to be even more effective when used to analyze programs with less history. For example, for many of the DSM programs that have only a five- year history, the person responding to the questionnaire may well be able to opine on the state of the market condition/barrier prior to the existence of the program.

A more detailed critical analysis of the strengths and weaknesses of the modeling approach used in this study in included in Appendix D.

APPENDIX A - AEMS PROGRAM WAIVER

This appendix attaches, for completeness, the CADMAC waiver for PG&E's Agricultural Sector Energy Management Services Program. The original waiver was approved by CADMAC on July 22, 1997 and is presented first, in it's final form. A modification to the original waiver extending the filing deadline for the final report to April 30, 1998 was approved November 21, 1997. The request for extension of the filing data is presented after the final waiver.

The waiver and extension approve the following deviations from the Protocols for PG&E's 1996 AEMS Evaluation:

1. PG&E may estimate gross impacts using telephone surveys collection to determine installation rates, then multiply these rates by the average EEI impact for the same measures,
2. PG&E may either:
    a. use discrete choice analysis including participants and nonparticipants, backed up with self-report analysis, to estimate net-to-gross effects.

    or

    b. use of a default net-to-gross ratio of 0.75, subject to the condition that PG&E conduct a survey based discrete choice analysis of the key energy purchase decisions for participants in the program.
3. PG&E may extend the submission date for the final report on the market effects study study to April 30, 1998.

PACIFIC GAS & ELECTRIC COMPANY
REQUEST FOR RETROACTIVE WAIVER FOR
1996 AGRICULTURAL SECTOR
ENERGY MANAGEMENT SERVICES (EMS) PROGRAM

Study ID: 360

Date Approved: July 22, 1997

Final Report Submittal Date Modification: Approved November 21, 1997

Summary of PG&E Request

This waiver requests deviations from, or clarifications of, the Protocols[2] by PG&E for the 1996 Agricultural Sector Energy Management Services (EMS) Evaluation[3]. PG&E seeks approval to: (1) estimate gross impacts using telephone surveys collection to determine installation rates, then multiply these rates by the average EEI impact for the same measures, and (2) use discrete choice analysis including participants and nonparticipants, backed up with self-report analysis, to estimate net-to-gross effects.

Each of these requests result from the findings of the evaluation of the 1994 Agricultural EMS program, the reviews of that program evaluation and the limited size of the PG&E agricultural sector in general.

Proposed Waiver

PG&E seek CADMAC approval to: (see Table A for Summary)

(1) Allow the telephone survey data collection combined with transfer of measure impacts from the PG&E EEI Programs evaluation to estimate gross impacts for pumping and other agricultural EMS program end-uses.

Parameters and Protocol Requirements

Table C-11, point 2, requires the use of "…a load impact regression model, CE (Calibrated Engineering model), or regression model, supplemented by engineering models…". Additionally, Table C-11, point 3, requires the use of on-sites to determine usage levels.

Rationale

This is a small program. The savings per measure will be established in the EEI program using engineering algorithms supported by telephone and on-site data. The telephone surveys conducted as part of the EMS evaluation will collect data on usage patterns and the number of measures installed. This information, combined with the transferred EEI per unit estimates will result in appropriate estimates of savings. This is the same approach that was applied in PG&E's 1994 EMS evaluation.

(2) Instead of a regression based billing analysis approach to net-to-gross, allow either (1) the use of discrete choice analysis including participants and nonparticipants, backed up by a self-report analysis, or (2) use of a default net-to-gross ratio of 0.75, subject to the condition that

[2] Protocols and Procedures for the Verification of Costs, Benefits, and Shareholder Earnings for Demand-Side Management Programs

[3] The first year earnings claim for the 1996 Agricultural Sector is slightly under $63,000.

PG&E conduct a survey based discrete choice analysis of the key energy purchase decisions for participants in the program.

Parameters and Protocol Requirements

Table 5, item B.1. states that "the primary purpose of the comparison group is to represent what would have happened in the absence of the program." Comparison group customers appear in load impact regression models to provide the data used for calculating net load impacts.

Rationale

This is a program with small and highly variable per participant savings. It was realized from the 1994 evaluation for this program, that small savings per participant, high variability in kWh consumption and impossibility to collect precise information to explain this high variability in kWh consumption, does not allow an LIRM approach to yield a stable model.

PG&E's Agricultural sector population is relatively small (approximately 60,000 accounts). Data collection efforts required to locate retrofitting comparison group members and measure their impacts accurately through a billing analysis would place undue burden on the customer population, resulting in adverse customer impacts. We will survey a nonparticipant sample to obtain self-report information on nonparticipant spillover.

Self-report net-to-gross estimates will also be developed. At a minimum these results will be compared and contrasted to the discrete choice estimates. Should the discrete choice approach not result in a stable model the self-report values will be used as the best estimate of net-to-gross adjustments.

The net-to-gross estimate for the past evaluation of PG&E's agricultural EMS sector was based on analysis of self-reports.

As an alternative, PG&E may choose to use a default net-to-gross ratio of 0.75 in combination with PG&E conducting an analysis of customer self-reported market transformation effects, and reporting those results to the Market Effects Subcommittee.

(3) Change in Submittal Date from March 1, 1998 to April 30, 1998

PG&E requests permission to submit the market effects study report by April 30, 1998. The results of the study are not necessary for the AEAP filing and PG&E believes that the market effects study would benefit from the additional sixty days to assess results.

Conclusion

PG&E is seeking retroactive waivers to clearly define, in advance, acceptable methods for performing the 1996 impact evaluation of the Agricultural EMS program. Recommendations in this waiver are designed to maximize the quality and value of evaluation results. The proposed waiver allowing transfer of the EEI per unit engineering values for use with telephone response data will result in reasonable estimations of gross program impacts. The waiver allowing the use of discrete choice backed up by self-report net-to-gross analysis reflects a realization that agricultural sector variability and sample sizes do not support other proposed approaches.

TABLE A

IMPACT MEASUREMENT REQUIREMENTS – TABLE C-6 AND TABLE 5			
Parameters	**Protocol Requirements**	**Waiver Alternative**	**Rationale**
End Use Consumption and Load Impact Model	LIRM or CE (calibrated engineering) Model based upon on-site data. Table C-11, item 2 and 3	Allow the use of transferred EEI per unit impacts combined with EMS customer telephone responses to estimate the gross impacts for EMS measures.	This is a small program. Use of estimates computed using telephone and on-site data for the EEI program will result in acceptable estimates of savings and is an appropriate use of resources.
Net Load Impacts	Comparison Group used in LIRM Table 5, Item B.1	Discrete choice model backed up by Participant Self-Report or default NTG of 0.75 with study of market transformation effects reported to Market Effects Subcommittee.	Data collection efforts required place undue burden on customer population, resulting in adverse customer impacts. LIRM effort unlikely to produce usable result based upon 1994 Ag EMS evaluation. The alternative market transformation study would concentrate on future issues rather that historical issue.

Request for Approval

Submission of Supporting Study

PG&E's 1996 Agricultural EMS Market Effects Study

November 20, 1997

Earlier this year, CADMAC approved a waiver which allowed the substitution of market effects study for the net-to-gross (NTG) evaluation for PG&E's 1996 Agricultural Energy Management Services (EMS) Program Evaluation. A default NTG ratio of 0.75 is to be used if a market effects study was conducted instead of the NTG evaluation. PG&E has chosen to conduct a market effects study rather than a NTG evaluation for the agricultural EMS program. This market effects study is not tied to the overall market effects studies being conducted through the CADMAC Market Effects Subcommittee.

PG&E requests permission to submit the market effects study report by April 30, 1998. The results of the study are not necessary for the AEAP filing and PG&E believes that the market effects study would benefit from the additions 60 days to assess results.

APPENDIX B – FINAL MARKET EFFECTS PARTICIPANT TELEPHONE SURVEY AND RESPONSE FREQUENCIES.

START OF SURVEY

TIME STARTED: _____ **C109-116**

1. Have your pumps been in use within the past three years? **C208-209**

Yes.....11 (ASK Q2)
No.....12 (THANK AND TERM)
Don't Know.....77 (THANK AND TERM)
Refused.....88 (THANK AND TERM)

Q1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	200	100.0	200	100.0

2. In your estimation, which of the following equipment types represent over 10% of your electric energy use in your business or organization? (READ ITEMS ONE AT A TIME AND RECORD RESPONSE FOR EACH)

	Yes	No	Don't Know	Refused	
a. Pumping	11	12	77	88	**C210-211**
b. Refrigeration	11	12	77	88	**C212-213**
c. Heating and air conditioning	11	12	77	88	**C214-215**
d. Lighting	11	12	77	88	**C216-217**

Q2A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	181	90.5	181	90.5
12	15	7.5	196	98.0
77	4	2.0	200	100.0

Q2B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	18	9.0	18	9.0
12	179	89.5	197	98.5
77	3	1.5	200	100.0

Q2C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	37	18.5	37	18.5
12	158	79.0	195	97.5
77	5	2.5	200	100.0

Q2D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	31	15.5	31	15.5
12	166	83.0	197	98.5
77	3	1.5	200	100.0

3. Did your business or organization install or replace any equipment other than pumps during the past three years? **C218-219**

Yes.....11 (ASK Q4)
No.....12 (GO TO Q5)
Don't Know.....77 (GO TO Q5)
Refused.....88 (GO TO Q5)

Q3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	67	33.5	67	33.5
12	132	66.0	199	99.5
77	1	0.5	200	100.0

IF Q3 = YES, ASK:

4. Was the installed equipment identified as energy-efficient equipment? **C220-221**

Yes.....11
No.....12
Some equipment was/Some equipment was not.....13
Don't Know.....77
Refused.....88

Q4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	39	58.2	39	58.2
12	17	25.4	56	83.6
13	6	9.0	62	92.5
77	5	7.5	67	100.0

Frequency Missing = 133

ASK EVERYONE:

5. Does your business or organization own this property? **C222-223**

Yes.....11
No.....12
Don't Know.....77
Refused.....88

Q5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	177	88.5	177	88.5
12	23	11.5	200	100.0

ASK EVERYONE:

6. Would you consider your business or organization operated by a family or a company?

C224-225

Family.....11
Company.....12
Not applicable.....13
Don't know.....77
Refused.....88

Q6	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	154	77.0	154	77.0
12	30	15.0	184	92.0
13	15	7.5	199	99.5
77	1	0.5	200	100.0

7. How would you classify your business or organization? (READ LIST)
(ENTER ALL THAT APPLY) **"Yes" to item denoted by "1" in column. "No" denoted by "0" in column.**

a. General farm.....11 **C226**
b. Ranch.....12 **C227**
c. Ornamental nursery.....13 **C228**
d. Indoor crops.....14 **C229**
e. Packing plant.....15 **C230**
f. Winery.....16 **C231**
g. Dairy farm.....17 **C232**
h. Water district.....18 **C233**
i. Other (Specify) _____.....19 **C234**
j. Don't Know (DO NOT READ).....77 **C235**
k. Refused (DO NOT READ).....88 **C236**

Q7A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	78	39.0	78	39.0
1	122	61.0	200	100.0

Q7B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	158	79.0	158	79.0
1	42	21.0	200	100.0

Q7C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	190	95.0	190	95.0
1	10	5.0	200	100.0

Q7D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	198	99.0	198	99.0
1	2	1.0	200	100.0

Q7E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	194	97.0	194	97.0
1	6	3.0	200	100.0

Q7F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	196	98.0	196	98.0
1	4	2.0	200	100.0

Q7G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	190	95.0	190	95.0
1	10	5.0	200	100.0

Q7H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	188	94.0	188	94.0
1	12	6.0	200	100.0

Q7I	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	189	94.5	189	94.5
1	11	5.5	200	100.0

Q7J	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	200	100.0	200	100.0

Q7K	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	200	100.0	200	100.0

Responses specified in ‘other’

Q07	30004	Rebuild and install pumps.
Q07	30016	Home business.
Q07	30146	Trucking, testing service.
Q07	30399	Vineyard.
Q07	30515	Management company for absent land owners.
Q07	30643	Vineyard.

Q07	30976	Women's correctional facility and farm.
Q07	31048	Service repair.
Q07	31121	Development company.
Q07	31196	Seed company.
Q07	31236	Vineyard.

8. Compared to other businesses or organizations similar to yours, would you categorize this business or organization as small, medium or large? **C247-248**

Small.....11
Medium.....12
Large.....13
Don't Know.....77
Refused.....88

Q8	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	88	44.0	88	44.0
12	69	34.5	157	78.5
13	41	20.5	198	99.0
77	2	1.0	200	100.0

9. How long has your company or organization been operating at this location? (READ LIST) **C249-250**

1 to 3 years.....11
4 to 10 years.....12
More than 10 years.....13
Don't Know (DO NOT READ).....77
Refused (DO NOT READ).....88

Q9	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	16	8.0	16	8.0
12	25	12.5	41	20.5
13	159	79.5	200	100.0

ASK EVERYONE:

10. Please rate the following factors in any decision to install high-efficiency equipment. How important would (ITEM) be in your decision to install high-efficiency equipment? (READ LIST)

					(DO NOT READ)		
	Very Important	Somewhat Important	Not too Important	Not at all Important	Don't Know	Refused	
a. Initial cost	11	12	13	14	77	88	**C251-252**
b. Maintenance costs	11	12	13	14	77	88	**C253-254**
c. The potential energy or bill savings	11	12	13	14	77	88	**C255-256**
d. The reliability of the new equipment	11	12	13	14	77	88	**C257-258**
e. The general health of the economy	11	12	13	14	77	88	**C259-260**

Q10A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	130	65.0	130	65.0
12	49	24.5	179	89.5
13	10	5.0	189	94.5
14	7	3.5	196	98.0
77	4	2.0	200	100.0

Q10B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	120	60.0	120	60.0
12	61	30.5	181	90.5
13	6	3.0	187	93.5
14	9	4.5	196	98.0
77	4	2.0	200	100.0

Q10C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	160	80.0	160	80.0
12	27	13.5	187	93.5
13	3	1.5	190	95.0
14	5	2.5	195	97.5
77	5	2.5	200	100.0

Q10D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	171	85.5	171	85.5
12	17	8.5	188	94.0
13	3	1.5	191	95.5
14	3	1.5	194	97.0
77	6	3.0	200	100.0

Q10E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	64	32.0	64	32.0
12	64	32.0	128	64.0
13	37	18.5	165	82.5
14	25	12.5	190	95.0
77	10	5.0	200	100.0

11. Typically, who decides to install energy-efficiency improvements? (READ LIST) (ENTER ALL THAT APPLY) **"Yes" to item denoted by "1" in column. "No" denoted by "0" in column.**

a. The owner(s).....11 **C261**
b. A partner or partners.....12 **C262**
c. The farm manager.....13 **C263**
d. An Ag Engineer or a consultant.....14 **C264**
e. It's a group decision process.....15 **C265**
f. Other (DO NOT READ)_____.....16 **C266**
Specify
g. Don't Know (DO NOT READ).....77 **C267**
h. Refused (DO NOT READ).....88 **C268**

Q11A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	75	37.5	75	37.5
1	125	62.5	200	100.0

Q11B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	187	93.5	187	93.5
1	13	6.5	200	100.0

Q11C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	182	91.0	182	91.0
1	18	9.0	200	100.0

Q11D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	194	97.0	194	97.0
1	6	3.0	200	100.0

Q11E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	158	79.0	158	79.0
1	42	21.0	200	100.0

Q11F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	197	98.5	197	98.5
1	3	1.5	200	100.0

Q11G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	200	100.0	200	100.0

Q11H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	200	100.0	200	100.0

Responses specified in 'other'

Q11	30183	Water district manager.
Q11	30976	Also subject to state government decisions, etc.
Q11	31263	Board of directors.

12. Which of these financial methods do you typically use to evaluate energy-efficiency improvements? (READ LIST)

Simple payback 11 **C308-309**
Lowest First Cost 12
A more complex financial analysis 13
Don't Know (DO NOT READ) 77
Refused (DO NOT READ) 88

Q12	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	94	47.0	94	47.0
12	36	18.0	130	65.0
13	50	25.0	180	90.0
77	18	9.0	198	99.0
88	2	1.0	200	100.0

13. How familiar are you with PG&E's energy-efficiency programs? Would you say you are: (READ LIST)? **C310-311**

Very familiar 11
Somewhat familiar 12
Not too familiar 13
Not at all familiar 14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ) 88

Q13	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	39	19.5	39	19.5
12	94	47.0	133	66.5
13	47	23.5	180	90.0
14	20	10.0	200	100.0

ASK EVERYONE:

14. Prior to 1996, how many total times did you participate in PG&E energy-efficiency programs? (READ LIST) **C312-313**

Once 11
Twice 12
Several times 13
Never 14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ) 88

Q14	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	38	19.0	38	19.0
12	26	13.0	64	32.0
13	63	31.5	127	63.5
14	64	32.0	191	95.5
77	9	4.5	200	100.0

15. Prior to 1996, how many times did the PG&E service representative contact you? (READ LIST) **C314-315**

Once 11
Twice 12
Several times 13
Never 14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ) 88

Q15	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	27	13.5	27	13.5
12	21	10.5	48	24.0
13	69	34.5	117	58.5
14	74	37.0	191	95.5
77	8	4.0	199	99.5
88	1	0.5	200	100.0

16. Are you aware that PG&E has a free pump test program? **C316-317**

Yes.....11
No.....12
Don't Know.....77
Refused.....88

Q16	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	178	89.0	178	89.0
12	19	9.5	197	98.5
77	3	1.5	200	100.0

17. How do you usually <u>first</u> learn about energy-efficiency options? Is it: (READ LIST)

C318-319

Through contact by PG&E.....11
Through contact by a vendor.....12
You contact someone.....13
Through general media contact.....14
Word of mouth.....15
Other (DO NOT READ) _____ 16
Specify
Don't Know (DO NOT READ).....77
Refused (DO NOT READ).....88

Q17	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	79	39.5	79	39.5
12	23	11.5	102	51.0
13	29	14.5	131	65.5
14	10	5.0	141	70.5
15	49	24.5	190	95.0
16	4	2.0	194	97.0
77	6	3.0	200	100.0

Responses specified in 'other'

Q17	30489	From campus plant operations.
Q17	30976	Through energy management committee out of Sacramento.
Q17	31227	Person who used to work for PG&E.
Q17	31362	All of the above.

18. How interested are you in acquiring information about efficient equipment or the latest technology? (READ LIST – IF RESPONDENT ASKS, SAY: "From any source, not just PG&E.")

C323-324

Very interested.....11
Somewhat interested.....12

Not too interested.....13
Not at all interested.....14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ).....88

Q18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	112	56.0	112	56.0
12	69	34.5	181	90.5
13	9	4.5	190	95.0
14	9	4.5	199	99.5
77	1	0.5	200	100.0

ASK EVERYONE:

19. How interested do you think you will be in the future in information about efficient equipment? (READ LIST) **C325-326**

Very interested.....11
Somewhat interested 12
Not too interested.....13
Not at all interested.....14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ).....88

Q19	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	124	62.0	124	62.0
12	67	33.5	191	95.5
13	4	2.0	195	97.5
14	3	1.5	198	99.0
77	2	1.0	200	100.0

20. How many deep well pumps are used in your operation?

C327-330 (NUMBER OF PUMPS)

Q20	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	5	2.5	5	2.5
1	40	20.0	45	22.5
2	32	16.0	77	38.5
3	22	11.0	99	49.5
4	13	6.5	112	56.0
5	7	3.5	119	59.5
6	8	4.0	127	63.5
7	7	3.5	134	67.0
8	7	3.5	141	70.5
9	8	4.0	149	74.5
10	5	2.5	154	77.0
11	1	0.5	155	77.5
12	5	2.5	160	80.0
13	1	0.5	161	80.5

14	2	1.0	163	81.5
15	1	0.5	164	82.0
16	2	1.0	166	83.0
17	1	0.5	167	83.5
18	2	1.0	169	84.5
20	5	2.5	174	87.0
25	2	1.0	176	88.0
26	2	1.0	178	89.0
27	1	0.5	179	89.5
29	1	0.5	180	90.0
30	6	3.0	186	93.0
40	2	1.0	188	94.0
44	1	0.5	189	94.5
50	4	2.0	193	96.5
53	1	0.5	194	97.0
60	1	0.5	195	97.5
75	2	1.0	197	98.5
76	1	0.5	198	99.0
78	1	0.5	199	99.5
100	1	0.5	200	100.0

IF Q20 = AT LEAST ONE, ASK:

21. Of these deep well pumps, how many are/Is this pump: (READ LIST)

a. less than 20 horsepower **C331-334** (NUMBER OF PUMPS)

b. 20 HP to 75 horsepower **C335-338** (NUMBER OF PUMPS)

c. 76 HP to 200 horsepower **C339-342** (NUMBER OF PUMPS)

d. over 200 horsepower **C343-346** (NUMBER OF PUMPS)

(TOTAL SHOULD ADD TO NUMBER IN Q20)

Q21A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
&	10	5.1	10	5.1
0000	104	53.3	114	58.5
0001	31	15.9	145	74.4
0002	23	11.8	168	86.2
0003	5	2.6	173	88.7
0004	4	2.1	177	90.8
0005	5	2.6	182	93.3
0006	1	0.5	183	93.8
0008	1	0.5	184	94.4
0010	5	2.6	189	96.9
0012	1	0.5	190	97.4
0015	2	1.0	192	98.5
0016	1	0.5	193	99.0
0025	2	1.0	195	100.0

Frequency Missing = 5

Q21B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
&	14	7.7	14	7.7

0000	36	19.9	50	27.6
0001	32	17.7	82	45.3
0002	21	11.6	103	56.9
0003	14	7.7	117	64.6
0004	14	7.7	131	72.4
0005	4	2.2	135	74.6
0006	6	3.3	141	77.9
0007	3	1.7	144	79.6
0008	4	2.2	148	81.8
0009	1	0.6	149	82.3
0010	5	2.8	154	85.1
0011	1	0.6	155	85.6
0012	2	1.1	157	86.7
0013	2	1.1	159	87.8
0014	1	0.6	160	88.4
0015	2	1.1	162	89.5
0018	1	0.6	163	90.1
0020	3	1.7	166	91.7
0023	1	0.6	167	92.3
0024	1	0.6	168	92.8
0025	3	1.7	171	94.5
0028	1	0.6	172	95.0
0029	1	0.6	173	95.6
0030	2	1.1	175	96.7
0040	2	1.1	177	97.8
0045	1	0.6	178	98.3
0050	1	0.6	179	98.9
0060	1	0.6	180	99.4
0063	1	0.6	181	100.0

Frequency Missing = 19

Q21C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
&	13	7.9	13	7.9
0000	89	54.3	102	62.2
0001	17	10.4	119	72.6
0002	9	5.5	128	78.0
0003	4	2.4	132	80.5
0004	5	3.0	137	83.5
0005	1	0.6	138	84.1
0006	4	2.4	142	86.6
0007	3	1.8	145	88.4
0008	3	1.8	148	90.2
0009	2	1.2	150	91.5
0010	3	1.8	153	93.3
0012	1	0.6	154	93.9
0013	1	0.6	155	94.5
0017	2	1.2	157	95.7
0020	1	0.6	158	96.3
0026	1	0.6	159	97.0
0027	1	0.6	160	97.6
0030	1	0.6	161	98.2
0040	2	1.2	163	99.4
0041	1	0.6	164	100.0

Frequency Missing = 36

Q21D	Frequency	Percent	Cumulative Frequency	Cumulative Percent

&	14	8.8	14	8.8
0000	143	89.4	157	98.1
0002	1	0.6	158	98.8
0006	1	0.6	159	99.4
0010	1	0.6	160	100.0

Frequency Missing = 40

22. What is your estimate of the average age of the pumps under your control?

C347 = 1 denotes average given. C347 = 2 denotes range given.

C348-350 (AVERAGE AGE)/ (RANGING FROM **C351-353** TO **C354-356** YEARS OLD)

Q22A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	147	73.5	147	73.5
2	53	26.5	200	100.0

Q22B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	7	4.8	7	4.8
1	4	2.7	11	7.5
2	2	1.4	13	8.8
3	5	3.4	18	12.2
4	2	1.4	20	13.6
5	9	6.1	29	19.7
6	2	1.4	31	21.1
7	3	2.0	34	23.1
8	3	2.0	37	25.2
10	18	12.2	55	37.4
11	1	0.7	56	38.1
12	2	1.4	58	39.5
13	2	1.4	60	40.8
15	19	12.9	79	53.7
16	1	0.7	80	54.4
18	2	1.4	82	55.8
19	1	0.7	83	56.5
20	27	18.4	110	74.8
25	9	6.1	119	81.0
30	17	11.6	136	92.5
35	1	0.7	137	93.2
40	7	4.8	144	98.0
50	3	2.0	147	100.0

Frequency Missing = 53

Q22C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	3.8	2	3.8
1	6	11.3	8	15.1
2	5	9.4	13	24.5
3	2	3.8	15	28.3
5	8	15.1	23	43.4
7	3	5.7	26	49.1
8	1	1.9	27	50.9
10	8	15.1	35	66.0
15	8	15.1	43	81.1
20	8	15.1	51	96.2
35	1	1.9	52	98.1
50	1	1.9	53	100.0

Frequency Missing = 147

Q22D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	1.9	1	1.9
4	2	3.8	3	5.7
5	1	1.9	4	7.5
8	2	3.8	6	11.3
10	7	13.2	13	24.5
12	2	3.8	15	28.3
15	4	7.5	19	35.8
18	1	1.9	20	37.7
20	13	24.5	33	62.3
25	3	5.7	36	67.9
30	7	13.2	43	81.1
34	1	1.9	44	83.0
35	1	1.9	45	84.9
40	3	5.7	48	90.6
50	1	1.9	49	92.5
55	1	1.9	50	94.3
60	3	5.7	53	100.0

Frequency Missing = 147

23. On average, how many months are the pumps in use for any period of time? (READ LIST)

C357-358

Less than 3 months 11
3-6 months.....12
7-9 months.....13
Year round 14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ).....88

Q23	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	9	4.5	9	4.5
12	79	39.5	88	44.0
13	72	36.0	160	80.0
14	39	19.5	199	99.5

77	1	0.5	200	100.0

24. How important do you think it is to know the efficiency of the pumps? (READ LIST)

C359-360

Very important 11
Somewhat important 12
Not too important 13
Not at all important.....14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ).....88

Q24	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	157	78.5	157	78.5
12	40	20.0	197	98.5
13	1	0.5	198	99.0
14	2	1.0	200	100.0

ASK EVERYONE:

25. Do you believe that the pumps in your operation are running at optimum efficiency?

C361-362

Yes.....11 (ASK Q26a)
No.....12 (ASK Q26b)
Some are/Some are not.....13 (ASK Q26b)
Don't Know.....77 (GO TO Q27)
Refused .....88 (GO TO Q27)

Q25	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	97	48.5	97	48.5
12	59	29.5	156	78.0
13	37	18.5	193	96.5
77	7	3.5	200	100.0

IF Q25 = YES, ASK:

26a. How do you know? Is it: (READ LIST)

C363-364

Because you have had the pumps tested..... 11 (GO TO Q28)
The age of the pumps..... 12 (ASK Q27)
You get the needed water..... 13 (ASK Q27)
Or some other reason? (specify) _____..... 14 (ASK Q27)
Don't Know (DO NOT READ)..... 77 (ASK Q27)
Refused (DO NOT READ) ..... 88 (ASK Q27)

Q26A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	73	75.3	73	75.3
12	8	8.2	81	83.5

13	11	11.3	92	94.8
14	4	4.1	96	99.0
77	1	1.0	97	100.0

Frequency Missing = 103

Responses specified in 'other'

Q26A	30004	Just knowing the pumps and the sizing.
Q26A	30509	Pump has just been reworked.
Q26A	31362	All of the above.
Q26A	30657	The bills have been very low.

IF Q25 = "NO" OR "SOME ARE/SOME ARE NOT", ASK:

26b. How do you know? Is it: (READ LIST) **C368-369**

Because you have had the pumps tested	11	(GO TO Q28)
The age of the pumps	12	(ASK Q27)
You don't get the needed water	13	(ASK Q27)
Or some other reason? (specify) _____	14	(ASK Q27)
Don't Know (DO NOT READ)	77	(ASK Q27)
Refused (DO NOT READ)	88	(ASK Q27)

Q26B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	71	74.0	71	74.0
12	10	10.4	81	84.4
13	11	11.5	92	95.8
14	3	3.1	95	99.0
77	1	1.0	96	100.0

Frequency Missing = 104

Responses specified in 'other'

Q26B	30331	Pumping costs have gone up this summer.
Q26B	30976	We track from when they were new.
Q26B	30331	Pumping costs have gone up this summer.

ASK Q27 UNLESS RESPONDENT SAID "HAD PUMPS TESTED" IN Q26A OR B:

27. What keeps you from finding out the efficiency of the pumps? Is it because: (READ LIST) **C373-374**

It costs too much	11
It's not worth the effort	12
You don't need to know the efficiency	13
Or some other reason? _____	14

Don't Know (DO NOT READ)..... 77
Refused (DO NOT READ)..... 88
By observation, the flow or pressure is OK..... 15
Inconvenient/lack of time/haven't gotten to it 16
Equipment is new..... 17
Haven't thought about it..... 18
I/We know their efficiency..... 19

Q27	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	7	12.5	7	12.5
12	4	7.1	11	19.6
13	12	21.4	23	41.1
14	12	21.4	35	62.5
15	1	1.8	36	64.3
16	3	5.4	39	69.6
17	2	3.6	41	73.2
19	1	1.8	42	75.0
77	13	23.2	55	98.2
88	1	1.8	56	100.0

Frequency Missing = 144

Responses specified in 'other'

Q27	30391	We check efficiency every two years.
Q27	30432	I never got information from PG&E about a previous pump test.
Q27	30498	I know by the cost of PG&E bill.
Q27	30604	We just have not started on tests and repairs yet. But we will within the month.
Q27	30622	Actually I do have them tested periodically.
Q27	30751	Its a secondary well.
Q27	30945	We need to know the efficiency by testing.
Q27	30972	We do our own.
Q27	30976	A lack of communication within our system.
Q27	31053	I'm not aware of it.
Q27	31212	It's too difficult to check the efficiency and it's cost prohibitive.

ASK EVERYONE:

Now I'm going to ask you some questions regarding pump repairs and pump tests.

28. Did your business or organization repair any deep well pumps since January 1996?
C378-379

Yes.....11 (ASK Q29 and Q30)
No.....12 (GO TO Q31)
Don't Know.....77 (GO TO Q31)
Refused.....88 (GO TO Q31)

Q28	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	99	49.5	99	49.5
12	100	50.0	199	99.5
77	1	0.5	200	100.0

IF Q28 = YES, ASK:

29. How many? **C408-411** (# REPAIRED SINCE JAN. 1996)

30. How many of these pumps were/Was this pump repaired simply as a result of equipment breakdown? **C412-415** (# REPAIRED DUE TO BREAKDOWN)

Q29	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	46	46.5	46	46.5
2	20	20.2	66	66.7
3	7	7.1	73	73.7
4	11	11.1	84	84.8
5	5	5.1	89	89.9
6	5	5.1	94	94.9
7	2	2.0	96	97.0
12	1	1.0	97	98.0
15	1	1.0	98	99.0
100	1	1.0	99	100.0

Frequency Missing = 101

Q30	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	23	23.2	23	23.2
1	40	40.4	63	63.6
2	16	16.2	79	79.8
3	3	3.0	82	82.8
4	6	6.1	88	88.9
5	5	5.1	93	93.9
6	3	3.0	96	97.0
7	1	1.0	97	98.0
15	1	1.0	98	99.0
50	1	1.0	99	100.0

Frequency Missing = 101

(IF HAD PUMPS TESTED IN Q26A OR B, SKIP Q31 AND ASK Q32-Q34)

31. Have you ever had a pump tested? **C416-417**

Yes.....11 (ASK Q32)
No.....12 (GO TO Q35)
Don't Know.....77 (GO TO Q35)
Refused.....88 (GO TO Q35)

Q31	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	43	76.8	43	76.8
12	11	19.6	54	96.4
77	2	3.6	56	100.0

Frequency Missing = 144

IF Q31=YES OR IF "HAD PUMPS TESTED" IN Q26A OR B, ASK:

32. Do you <u>believe</u> the benefits of a pump repair as projected by a pump test? **C418-419**

Yes.....11
No.....12
Don't Know.....77
Refused.....88

C420-421

33. From your past experiences with pump repairs, have you obtained the benefits that were estimated from the pump test?

Yes.....11
No.....12
Some.....13
No past experience.....14 **C422-423**
Don't Know.....77
Refused.....88

34. Do you believe that you would get similar benefits in the future?

Yes.....11
No.....12
Maybe.....13
Don't Know.....77
Refused.....88

Q32	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	152	81.3	152	81.3
12	15	8.0	167	89.3
77	20	10.7	187	100.0

Frequency Missing = 13

Q33	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	113	60.4	113	60.4
12	15	8.0	128	68.4
13	25	13.4	153	81.8

14	20	10.7	173	92.5
77	14	7.5	187	100.0

Frequency Missing = 13

Q34	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	147	78.6	147	78.6
12	3	1.6	150	80.2
13	22	11.8	172	92.0
77	15	8.0	187	100.0

Frequency Missing = 13

35. As you may know, a pump test provides you with information about flow rate and overall plant efficiency of your pump. Currently, how would you rate your confidence in the benefits projected by the pump test if were done by: (ITEM)? Would you be: (READ

					(DO NOT READ)		
	Very Confident	Somewhat Confident	Not too Confident	Not at all Confident	Don't Know	Refused	
a. PG&E	11	12	13	14	77	88	**C424-425**
b. A pump dealer	11	12	13	14	77	88	**C426-427**
c. An independent pump tester	11	12	13	14	77	88	**C428-429**

Q35A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	132	66.0	132	66.0
12	58	29.0	190	95.0
13	5	2.5	195	97.5
14	1	0.5	196	98.0
77	4	2.0	200	100.0

Q35B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	63	31.5	63	31.5
12	97	48.5	160	80.0
13	23	11.5	183	91.5
14	6	3.0	189	94.5
77	11	5.5	200	100.0

Q35C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	85	42.5	85	42.5
12	81	40.5	166	83.0
13	15	7.5	181	90.5
14	3	1.5	184	92.0
77	16	8.0	200	100.0

36. Now, suppose PG&E did not offer pump tests in the future and you had to choose between a pump dealer and an independent pump tester. What would your level of confidence be in tests performed by (ITEM)? (READ SCALE IF NECESSARY)

					(DO NOT READ)		
	Very Confident	Somewhat Confident	Not too Confident	Not at all Confident	Don't Know	Refused	
a. A pump dealer	11	12	13	14	77	88	**C430-431**
b. An independent pump tester	11	12	13	14	77	88	**C432-433**

Q36A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	52	26.0	52	26.0
12	102	51.0	154	77.0
13	30	15.0	184	92.0
14	8	4.0	192	96.0
77	8	4.0	200	100.0

Q36B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	92	46.0	92	46.0
12	85	42.5	177	88.5
13	7	3.5	184	92.0
14	3	1.5	187	93.5
77	13	6.5	200	100.0

37. Would you be willing to pay for a pump test in the future if it is not offered to you free of charge? **C434-435**

Yes.....11 (ASK Q38)
No.....12 (GO TO Q39)

Don't Know/Maybe .....77 (GO TO Q39)
Refused .....88 (GO TO Q39)

Q37	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	113	56.5	113	56.5
12	39	19.5	152	76.0
13	48	24.0	200	100.0

IF Q37 = YES, ASK:

38. How much would you be willing to pay? (IF THE RESPONDENT ASKS, SAY: "The normal cost to run a pump test is about 150 dollars.") (ALLOW A RANGE OF DOLLARS IF THEY GIVE THAT)

C436 = 1 denotes average given. C436 = 2 denotes range given.

$ **C437-439** (DOLLARS)/ WILLING TO PAY FROM $ **C440-442** TO $ **C443-445**

Q38A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	105	92.9	105	92.9
2	8	7.1	113	100.0

Frequency Missing = 87

Q38B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	20	19.0	20	19.0
2	1	1.0	21	20.0
20	4	3.8	25	23.8
25	1	1.0	26	24.8
45	1	1.0	27	25.7
50	10	9.5	37	35.2
75	4	3.8	41	39.0
100	19	18.1	60	57.1
150	45	42.9	105	100.0

Frequency Missing = 95

Q38C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	12.5	1	12.5
50	2	25.0	3	37.5
75	1	12.5	4	50.0
100	3	37.5	7	87.5
150	1	12.5	8	100.0

Frequency Missing = 192

Q38D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
60	1	12.5	1	12.5
70	1	12.5	2	25.0
125	2	25.0	4	50.0
150	2	25.0	6	75.0
200	2	25.0	8	100.0

Frequency Missing = 192

39. Would you say you get your pumps tested: (READ LIST AND ENTER ALL THAT APPLY)

"Yes" to item denoted by "1" in column. "No" denoted by "0" in column.

a.	When they don't supply the needed water 11	**C446**
b.	When it seems like the bill is high.....12	**C447**
c.	At regular intervals 13	**C448**
d.	When it is recommended by your pump dealer 14	**C449**
e.	When it is recommended by your PG&E rep.....15	**C450**
f.	Any other reason? (Specify)_____.....16	**C451**
g.	Don't Know (DO NOT READ) 77	**C452**
h.	Refused (DO NOT READ).....88	**C453**
i.	**Never.....17**	**C454**
j.	**When equipment breaks down/when there is a problem 18**	**C455**

Q39A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	112	56.0	112	56.0
1	88	44.0	200	100.0

Q39B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	157	78.5	157	78.5
1	43	21.5	200	100.0

Q39C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	128	64.0	128	64.0
1	72	36.0	200	100.0

Q39D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	175	87.5	175	87.5
1	25	12.5	200	100.0

Q39E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	157	78.5	157	78.5
1	43	21.5	200	100.0

Q39F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	191	95.5	191	95.5
1	9	4.5	200	100.0

Q39G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	194	97.0	194	97.0
1	6	3.0	200	100.0

Q39H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	200	100.0	200	100.0

Q39I	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	197	98.5	197	98.5
1	3	1.5	200	100.0

Q39J	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	199	99.5	199	99.5
1	1	0.5	200	100.0

Responses specified in 'other'

Q39	30049	A change in irrigation use or patterns would prompt a test to see if it could handle the change.
Q39	30145	When governed by water conservation board.
Q39	30159	Self evaluation and analysis.
Q39	30383	Curiosity. To see if the pump is actually delivering what it should.
Q39	30490	When changing from flood to sprinkler.
Q39	30578	When thinking of changing from flood to sprinkler.
Q39	30870	For financing, lender requests.

Q39	31312	I just look to know the flow of the water.
Q39	31348	To consider options.

40. Which of the following commonly triggers your decision to repair a pump? (READ LIST AND ENTER ALL THAT APPLY) **"Yes" to item denoted by "1" in column. "No" denoted by "0" in column.**

a.	The equipment is broken	11	**C464**
b.	The low performance of the pump	12	**C465**
c.	You question the equipment reliability	13	**C466**
d.	Your previous experience with pump repairs	14	**C467**
e.	PG&E service rep recommendation.	15	**C468**
f.	Pump dealer recommendation.	16	**C469**
g.	Information from a pump test.	17	**C470**
h.	Any other reason? (Specify) _____	18	**C471**
i.	Don't Know (DO NOT READ)	77	**C472**
j.	Refused (DO NOT READ)	88	**C473**
k.	**If the bill went up**	**19**	**C474**

Q40A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	70	35.0	70	35.0
1	130	65.0	200	100.0

Q40B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	67	33.5	67	33.5
1	133	66.5	200	100.0

Q40C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	142	71.0	142	71.0
1	58	29.0	200	100.0

Q40D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	145	72.5	145	72.5
1	55	27.5	200	100.0

Q40E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	126	63.0	126	63.0
1	74	37.0	200	100.0

Q40F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	144	72.0	144	72.0
1	56	28.0	200	100.0

Q40G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	114	57.0	114	57.0
1	86	43.0	200	100.0

Q40H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	195	97.5	195	97.5
1	5	2.5	200	100.0

Q40I	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	199	99.5	199	99.5
1	1	0.5	200	100.0

Q40J	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	200	100.0	200	100.0

Q40K	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	198	99.0	198	99.0
1	2	1.0	200	100.0

Responses specified in 'other'

Q40	30050	I don't repair pumps.
Q40	30659	Pumping demands and not being able to meet them.
Q40	30272	Also required by the county water board.
Q40	30976	Rebate incentive.
Q40	31196	If we were to have a surplus of capital money.

41. How important are the results from a pump test in your decision to repair a pump? Are they: (READ LIST)? **C508-509**

Very important 11
Somewhat important 12
Not too important 13
Not at all important.....14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ) 88

Q41	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	136	68.0	136	68.0
12	51	25.5	187	93.5
13	10	5.0	197	98.5
14	2	1.0	199	99.5
77	1	0.5	200	100.0

42. Which of the following describes why you would keep a pump in service if a pump test showed you needed a repair? (READ LIST AND ENTER ALL THAT APPLY) **"Yes" to item denoted by "1" in column. "No" denoted by "0" in column.**

a. It wasn't worth the repair cost.....11 **C510**
b. You needed the pump in service 12 **C511**
c. You were too busy to get it repaired 13 **C512**
d. Other (Specify):_____.....14 **C513**
e. Don't Know (DO NOT READ) 77 **C514**
f. Refused (DO NOT READ) 88 **C515**
g. No reason to keep in service/Would repair the pump 15 **C516**
h. Could not afford the repair 16 **C517**

Q42A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	148	74.0	148	74.0
1	52	26.0	200	100.0

Q42B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	52	26.0	52	26.0
1	148	74.0	200	100.0

Q42C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	155	77.5	155	77.5
1	45	22.5	200	100.0

Q42D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	192	96.0	192	96.0
1	8	4.0	200	100.0

Q42E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	194	97.0	194	97.0
1	6	3.0	200	100.0

Q42F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	199	99.5	199	99.5
1	1	0.5	200	100.0

Q42G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	196	98.0	196	98.0
1	4	2.0	200	100.0

Q42H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	196	98.0	196	98.0
1	4	2.0	200	100.0

Responses specified in 'other'

Q42	30383	It would depend on how bad the efficiency was.
Q42	30384	If I don't see inefficiency.
Q42	30491	If it runs only a few hours or has little pay back then we'd let it go.
Q42	30756	Also the pump is tested to see if a problem is the pump or the well.
Q42	30799	Difficulty in scheduling appointment.
Q42	31147	The age of the well.
Q42	31219	It would depend on what point of time the crops needed water.

43. How likely are you to get a pump tested this year? (READ LIST) **C526-527**

Very likely.....11
Somewhat likely.....12
Not too likely.....13
Not at all likely.....14
Don't Know (DO NOT READ).....77
Refused (DO NOT READ).....88

Q43	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	82	41.0	82	41.0
12	18	9.0	100	50.0
13	26	13.0	126	63.0
14	69	34.5	195	97.5
77	5	2.5	200	100.0

44. How likely is it that you will be getting your pumps tested in the future? (READ LIST) **C528-529**

Very likely.....11
Somewhat likely.....12
Not too likely.....13
Not at all likely.....14
Don't Know (DO NOT READ).....77
Refused (DO NOT READ).....88

Q44	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	144	72.0	144	72.0
12	38	19.0	182	91.0
13	9	4.5	191	95.5
14	5	2.5	196	98.0
77	4	2.0	200	100.0

45. How long are you willing to wait for a pump test? (READ LIST) **C530-531**

A few weeks.....11
A few months.....12
Over 6 months.....13
Over a year.....14
Don't Know (DO NOT READ).....77
Refused (DO NOT READ).....88

Q45	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	149	74.5	149	74.5
12	28	14.0	177	88.5
13	6	3.0	183	91.5

14	6	3.0	189	94.5
77	8	4.0	197	98.5
88	3	1.5	200	100.0

Those are all my questions. On behalf of PG&E, I thank you very much for your time.

NOTE: IF RESPONDENT REQUESTED CONTACT INFORMATION FOR PG&E, CHECK BOX AT BOTTOM OF CONTACT RECORD SHEET.

NOTE: IF RESPONDENT WANTED COMMENTS FORWARDED TO PG&E, ENTER THEM HERE: see "comments.doc"

RESPONDENT NAME: _____

SAMPLE ID NUMBER: C137-142

INTERVIEWER ID: _____

TIME ENDED: C117-124

DATE: C125-130

APPENDIX C - FINAL MARKET EFFECTS COMPARISON GROUPTELEPHONE SURVEY AND RESPONSE FREQUENCIES.

START OF SURVEY

TIME STARTED: _____ **C109-116**

2. Have your pumps been in use within the past three years? **C208-209**

Yes.....11 (ASK Q2)
No.....12 (THANK AND TERM)
Don't Know.....77 (THANK AND TERM)
Refused.....88 (THANK AND TERM)

Q1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	202	100.0	202	100.0

2. In your estimation, which of the following equipment types represent over 10% of your electric energy use in your business or organization? (READ ITEMS ONE AT A TIME AND RECORD RESPONSE FOR EACH)

	Yes	No	Don't Know	Refused	
a. Pumping	11	12	77	88	**C210-211**
b. Refrigeration	11	12	77	88	**C212-213**
c. Heating and air conditioning	11	12	77	88	**C214-215**
d. Lighting	11	12	77	88	**C216-217**

Q2A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	180	89.1	180	89.1
12	19	9.4	199	98.5
77	3	1.5	202	100.0

Q2B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	60	29.7	60	29.7
12	141	69.8	201	99.5
77	1	0.5	202	100.0

Q2C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	52	25.7	52	25.7
12	147	72.8	199	98.5
77	3	1.5	202	100.0

Q2D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	73	36.1	73	36.1
12	126	62.4	199	98.5
77	3	1.5	202	100.0

3. Did your business or organization install or replace any equipment other than pumps during the past three years? **C218-219**

Yes.....11 (ASK Q4)
No.....12 (GO TO Q5)
Don't Know.....77 (GO TO Q5)
Refused.....88 (GO TO Q5)

Q3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	70	34.7	70	34.7
12	130	64.4	200	99.0
77	2	1.0	202	100.0

IF Q3 = YES, ASK:

4. Was the installed equipment identified as energy-efficient equipment? **C220-221**

Yes.....11
No.....12
Some equipment was/Some equipment was not.....13
Don't Know.....77
Refused.....88

Q4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	44	62.9	44	62.9
12	15	21.4	59	84.3
13	6	8.6	65	92.9
77	5	7.1	70	100.0

Frequency Missing = 132

ASK EVERYONE:

5. Does your business or organization own this property? **C222-223**

Yes.....11
No.....12
Don't Know.....77
Refused.....88

Q5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	176	87.1	176	87.1

12	23	11.4	199	98.5
77	3	1.5	202	100.0

ASK EVERYONE:

7. Would you consider your business or organization operated by a family or a company?

C224-225

Family.....11
Company.....12
Not applicable.....13
Don't know.....77
Refused.....88

Q6	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	160	79.2	160	79.2
12	30	14.9	190	94.1
13	11	5.4	201	99.5
77	1	0.5	202	100.0

7. How would you classify your business or organization? (READ LIST) (ENTER ALL THAT APPLY) **"Yes" to item denoted by "1" in column. "No" denoted by "0" in column.**

a. General farm.....11 **C226**
b. Ranch.....12 **C227**
c. Ornamental nursery.....13 **C228**
d. Indoor crops.....14 **C229**
e. Packing plant.....15 **C230**
f. Winery.....16 **C231**
g. Dairy farm.....17 **C232**
h. Water district.....18 **C233**
i. Other (Specify) _____.....19 **C234**
j. Don't Know (DO NOT READ).....77 **C235**
k. Refused (DO NOT READ).....88 **C236**

Q7A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	101	50.0	101	50.0
1	101	50.0	202	100.0

Q7B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	158	78.2	158	78.2
1	44	21.8	202	100.0

Q7C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	194	96.0	194	96.0
1	8	4.0	202	100.0

Q7D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	198	98.0	198	98.0
1	4	2.0	202	100.0

Q7E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	189	93.6	189	93.6
1	13	6.4	202	100.0

Q7F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	197	97.5	197	97.5
1	5	2.5	202	100.0

Q7G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	171	84.7	171	84.7
1	31	15.3	202	100.0

Q7H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	197	97.5	197	97.5
1	5	2.5	202	100.0

Q7I	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	189	93.6	189	93.6
1	13	6.4	202	100.0

Q7J	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	201	99.5	201	99.5
1	1	0.5	202	100.0

Q7K	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	202	100.0	202	100.0

Responses specified in 'other'

Q07	30071	Residence serving the neighborhood.
Q07	30182	Public gardens and nursery.
Q07	30360	Feed Mill.
Q07	30402	Dog training.
Q07	30431	Feed production.

Q07	30454	Vineyard.
Q07	30559	Right now it is just fallow ground.
Q07	30641	Green house devoted to research.
Q07	30828	Pasture land and some horse raising.
Q07	30926	Shipping.
Q07	31030	Truck farm.
Q07	31273	Resort.

8. Compared to other businesses or organizations similar to yours, would you categorize this business or organization as small, medium or large? **C247-248**

Small.....11
Medium.....12
Large.....13
Don't Know.....77
Refused.....88

Q8	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	97	48.0	97	48.0
12	68	33.7	165	81.7
13	35	17.3	200	99.0
77	2	1.0	202	100.0

9. How long has your company or organization been operating at this location? (READ LIST) **C249-250**

1 to 3 years.....11
4 to 10 years.....12
More than 10 years.....13
Don't Know (DO NOT READ).....77
Refused (DO NOT READ).....88

Q9	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	6	3.0	6	3.0
12	17	8.4	23	11.4
13	179	88.6	202	100.0

ASK EVERYONE:

10. Please rate the following factors in any decision to install high-efficiency equipment. How important would (ITEM) be in your decision to install high-efficiency equipment? (READ LIST)

					(DO NOT READ)	
	Very	Somewhat	Not too	Not at all	Don't	

	Important	Important	Important	Important	Know	Refused	
a. Initial cost	11	12	13	14	77	88	**C251-252**
b. Maintenance costs	11	12	13	14	77	88	**C253-254**
c. The potential energy or bill savings	11	12	13	14	77	88	**C255-256**
d. The reliability of the new equipment	11	12	13	14	77	88	**C257-258**
e. The general health of the economy	11	12	13	14	77	88	**C259-260**

Q10A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	125	61.9	125	61.9
12	58	28.7	183	90.6
13	8	4.0	191	94.6
14	8	4.0	199	98.5
77	3	1.5	202	100.0

Q10B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	114	56.4	114	56.4
12	65	32.2	179	88.6
13	10	5.0	189	93.6
14	13	6.4	202	100.0

Q10C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	148	73.3	148	73.3
12	39	19.3	187	92.6
13	5	2.5	192	95.0
14	7	3.5	199	98.5
77	3	1.5	202	100.0

Q10D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	173	85.6	173	85.6
12	23	11.4	196	97.0
13	2	1.0	198	98.0
14	3	1.5	201	99.5
77	1	0.5	202	100.0

Q10E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	77	38.1	77	38.1
12	70	34.7	147	72.8
13	26	12.9	173	85.6
14	25	12.4	198	98.0
77	4	2.0	202	100.0

11. Typically, who decides to install energy-efficiency improvements? (READ LIST)
(ENTER ALL THAT APPLY) **"Yes" to item denoted by "1" in column. "No" denoted by "0" in column.**

a. The owner(s).....11 **C261**
b. A partner or partners.....12 **C262**
c. The farm manager.....13 **C263**
d. An Ag Engineer or a consultant.....14 **C264**
e. It's a group decision process.....15 **C265**
f. Other (DO NOT READ)_____.....16 **C266**
Specify
g. Don't Know (DO NOT READ).....77 **C267**
h. Refused (DO NOT READ).....88 **C268**

Q11A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	61	30.2	61	30.2
1	141	69.8	202	100.0

Q11B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	180	89.1	180	89.1
1	22	10.9	202	100.0

Q11C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	189	93.6	189	93.6
1	13	6.4	202	100.0

Q11D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	199	98.5	199	98.5
1	3	1.5	202	100.0

Q11E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	172	85.1	172	85.1
1	30	14.9	202	100.0

Q11F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	201	99.5	201	99.5
1	1	0.5	202	100.0

Q11G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	202	100.0	202	100.0

Q11H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	202	100.0	202	100.0

Responses specified in 'other'

Q11	30034	The landlord.

12. Which of these financial methods do you typically use to evaluate energy-efficiency improvements? (READ LIST)

Simple payback 11 **C308-309**
Lowest First Cost 12
A more complex financial analysis 13
Don't Know (DO NOT READ) 77
Refused (DO NOT READ) 88

Q12	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	100	49.5	100	49.5
12	27	13.4	127	62.9
13	55	27.2	182	90.1
77	20	9.9	202	100.0

13. How familiar are you with PG&E's energy-efficiency programs? Would you say you are: (READ LIST)? **C310-311**

Very familiar 11
Somewhat familiar 12
Not too familiar 13
Not at all familiar 14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ) 88

Q13	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	30	14.9	30	14.9
12	94	46.5	124	61.4
13	54	26.7	178	88.1
14	23	11.4	201	99.5
77	1	0.5	202	100.0

ASK EVERYONE:

14. Prior to 1996, how many total times did you participate in PG&E energy-efficiency programs? (READ LIST) **C312-313**

Once 11
Twice 12
Several times 13
Never 14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ) 88

Q14	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	37	18.3	37	18.3
12	25	12.4	62	30.7
13	39	19.3	101	50.0
14	93	46.0	194	96.0
77	8	4.0	202	100.0

15. Prior to 1996, how many times did the PG&E service representative contact you? (READ LIST) **C314-315**

Once.....11
Twice.....12
Several times.....13
Never.....14
Don't Know (DO NOT READ).....77
Refused (DO NOT READ).....88

Q15	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	21	10.4	21	10.4
12	21	10.4	42	20.8
13	40	19.8	82	40.6
14	113	55.9	195	96.5
77	7	3.5	202	100.0

16. Are you aware that PG&E has a free pump test program? **C316-317**

Yes.....11
No.....12
Don't Know.....77
Refused.....88

Q16	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	120	59.4	120	59.4
12	81	40.1	201	99.5
77	1	0.5	202	100.0

17. How do you usually <u>first</u> learn about energy-efficiency options? Is it: (READ LIST)

C318-319

Through contact by PG&E.....11
Through contact by a vendor.....12
You contact someone.....13
Through general media contact.....14
Word of mouth.....15
Other (DO NOT READ) _____ 16
Specify
Don't Know (DO NOT READ).....77
Refused (DO NOT READ).....88

Q17	Frequency	Percent	Cumulative Frequency	Cumulative Percent

11	69	34.2	69	34.2
12	29	14.4	98	48.5
13	20	9.9	118	58.4
14	24	11.9	142	70.3
15	54	26.7	196	97.0
16	2	1.0	198	98.0
77	4	2.0	202	100.0

Responses specified in 'other'

Q17	30417	Through our engineering department.
Q17	31188	General knowledge and my own desire.

Market Barriers in general

18. How interested are you in acquiring information about efficient equipment or the latest technology? (READ LIST – IF RESPONDENT ASKS, SAY: "From any source, not just PG&E.")

C323-324

Very interested.....11
Somewhat interested 12
Not too interested.....13
Not at all interested.....14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ).....88

Q18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	83	41.1	83	41.1
12	83	41.1	166	82.2
13	16	7.9	182	90.1
14	19	9.4	201	99.5
77	1	0.5	202	100.0

ASK EVERYONE:

19. How interested do you think you will be in the future in information about efficient equipment? (READ LIST)

C325-326

Very interested.....11
Somewhat interested 12
Not too interested.....13
Not at all interested.....14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ).....88

Q19	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	104	51.5	104	51.5
12	75	37.1	179	88.6
13	10	5.0	189	93.6
14	13	6.4	202	100.0

20. How many deep well pumps are used in your operation?

C327-330 (NUMBER OF PUMPS)

Q20	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	9	4.5	9	4.5
1	57	28.2	66	32.7
2	35	17.3	101	50.0
3	16	7.9	117	57.9
4	25	12.4	142	70.3
5	10	5.0	152	75.2
6	8	4.0	160	79.2
7	9	4.5	169	83.7
8	2	1.0	171	84.7
9	6	3.0	177	87.6
10	4	2.0	181	89.6
11	1	0.5	182	90.1
12	5	2.5	187	92.6
13	1	0.5	188	93.1
14	1	0.5	189	93.6
15	2	1.0	191	94.6
18	3	1.5	194	96.0
19	1	0.5	195	96.5
20	2	1.0	197	97.5
25	1	0.5	198	98.0
30	2	1.0	200	99.0
40	1	0.5	201	99.5
50	1	0.5	202	100.0

IF Q20 = AT LEAST ONE, ASK:

21. Of these deep well pumps, how many are/Is this pump: (READ LIST)

a. less than 20 horsepower **C331-334** (NUMBER OF PUMPS)

b. 20 HP to 75 horsepower **C335-338** (NUMBER OF PUMPS)

c. 76 HP to 200 horsepower **C339-342** (NUMBER OF PUMPS)

d. over 200 horsepower **C343-346** (NUMBER OF PUMPS)

(TOTAL SHOULD ADD TO NUMBER IN Q20)

Q21A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
&	13	6.7	13	6.7
0000	75	38.9	88	45.6
0001	43	22.3	131	67.9
0002	29	15.0	160	82.9
0003	15	7.8	175	90.7
0004	6	3.1	181	93.8
0005	4	2.1	185	95.9
0007	3	1.6	188	97.4
0008	2	1.0	190	98.4
0010	2	1.0	192	99.5
0018	1	0.5	193	100.0

Frequency Missing = 9

Q21B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
&	13	8.1	13	8.1
0000	48	29.8	61	37.9
0001	28	17.4	89	55.3
0002	24	14.9	113	70.2
0003	6	3.7	119	73.9
0004	7	4.3	126	78.3
0005	6	3.7	132	82.0
0006	7	4.3	139	86.3
0007	5	3.1	144	89.4
0008	3	1.9	147	91.3
0009	1	0.6	148	91.9
0010	3	1.9	151	93.8
0011	2	1.2	153	95.0
0012	5	3.1	158	98.1
0015	1	0.6	159	98.8
0028	1	0.6	160	99.4
0040	1	0.6	161	100.0

Frequency Missing = 41

Q21C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
&	14	9.4	14	9.4
0000	94	63.1	108	72.5
0001	15	10.1	123	82.6
0002	4	2.7	127	85.2
0003	6	4.0	133	89.3
0004	5	3.4	138	92.6
0005	2	1.3	140	94.0
0007	1	0.7	141	94.6
0008	2	1.3	143	96.0
0010	3	2.0	146	98.0
0011	1	0.7	147	98.7
0025	1	0.7	148	99.3
0035	1	0.7	149	100.0

Frequency Missing = 53

Q21D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
&	14	9.7	14	9.7
0000	125	86.8	139	96.5
0001	1	0.7	140	97.2
0002	2	1.4	142	98.6
0003	1	0.7	143	99.3
0007	1	0.7	144	100.0

Frequency Missing = 58

22. What is your estimate of the average age of the pumps under your control?

C347 = 1 denotes average given. C347 = 2 denotes range given.

C348-350 (AVERAGE AGE)/ (RANGING FROM **C351-353** TO **C354-356** YEARS OLD)

Q22A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	158	78.2	158	78.2
2	44	21.8	202	100.0

Q22B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.6	1	0.6
1	5	3.2	6	3.8
2	3	1.9	9	5.7
3	3	1.9	12	7.6
4	4	2.5	16	10.1
5	18	11.4	34	21.5
6	6	3.8	40	25.3
7	3	1.9	43	27.2

8	4	2.5	47	29.7
9	1	0.6	48	30.4
10	26	16.5	74	46.8
12	8	5.1	82	51.9
13	1	0.6	83	52.5
15	19	12.0	102	64.6
17	1	0.6	103	65.2
18	3	1.9	106	67.1
19	1	0.6	107	67.7
20	22	13.9	129	81.6
23	1	0.6	130	82.3
25	12	7.6	142	89.9
27	1	0.6	143	90.5
30	5	3.2	148	93.7
35	1	0.6	149	94.3
40	8	5.1	157	99.4
50	1	0.6	158	100.0

Frequency Missing = 44

Q22C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	2.3	1	2.3
1	4	9.1	5	11.4
2	5	11.4	10	22.7
3	2	4.5	12	27.3
5	5	11.4	17	38.6
6	1	2.3	18	40.9
7	1	2.3	19	43.2
8	5	11.4	24	54.5
10	7	15.9	31	70.5
12	2	4.5	33	75.0
15	4	9.1	37	84.1
20	2	4.5	39	88.6
23	1	2.3	40	90.9
25	1	2.3	41	93.2
30	2	4.5	43	97.7
40	1	2.3	44	100.0

Frequency Missing = 158

Q22D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
4	1	2.3	1	2.3
5	1	2.3	2	4.5
9	1	2.3	3	6.8
10	6	13.6	9	20.5
12	1	2.3	10	22.7
15	10	22.7	20	45.5
18	1	2.3	21	47.7
20	9	20.5	30	68.2
23	1	2.3	31	70.5
25	1	2.3	32	72.7
30	6	13.6	38	86.4
35	2	4.5	40	90.9
40	2	4.5	42	95.5
50	1	2.3	43	97.7
52	1	2.3	44	100.0

Frequency Missing = 158

23. On average, how many months are the pumps in use for any period of time? (READ LIST)

C357-358

Less than 3 months 11
3-6 months.....12
7-9 months.....13
Year round 14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ).....88

Q23	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	12	5.9	12	5.9
12	56	27.7	68	33.7
13	58	28.7	126	62.4
14	73	36.1	199	98.5
77	3	1.5	202	100.0

24. How important do you think it is to know the efficiency of the pumps? (READ LIST)

C359-360

Very important 11
Somewhat important 12
Not too important 13
Not at all important.....14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ).....88

Q24	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	131	64.9	131	64.9
12	51	25.2	182	90.1
13	13	6.4	195	96.5
14	5	2.5	200	99.0
77	2	1.0	202	100.0

ASK EVERYONE:

25. Do you believe that the pumps in your operation are running at optimum efficiency?

C361-362

Yes.....11 (ASK Q26a)
No.....12 (ASK Q26b)
Some are/Some are not.....13 (ASK Q26b)
Don't Know.....77 (GO TO Q27)

Refused .....88 (GO TO Q27)

Q25	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	97	48.0	97	48.0
12	64	31.7	161	79.7
13	24	11.9	185	91.6
77	17	8.4	202	100.0

IF Q25 = YES, ASK:

26a. How do you know? Is it: (READ LIST) **C363-364**

Because you have had the pumps tested..... 11 (GO TO Q28)
The age of the pumps..... 12 (ASK Q27)
You get the needed water..... 13 (ASK Q27)
Or some other reason? (specify) _____..... 14 (ASK Q27)
Don't Know (DO NOT READ)..... 77 (ASK Q27)
Refused (DO NOT READ) ..... 88 (ASK Q27)

Q26A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	39	40.2	39	40.2
12	18	18.6	57	58.8
13	28	28.9	85	87.6
14	10	10.3	95	97.9
77	2	2.1	97	100.0

Frequency Missing = 105

Responses specified in 'other'

Q26A	30070	Because it cost half of what it did before. I changed to diesel.
Q26A	30197	I have had the motors replaced.
Q26A	30261	It gets serviced regularly.
Q26A	30493	Because they were professionally installed.
Q26A	30596	I had them repaired five years ago.
Q26A	30743	After one pump burned out, we put in every type of protection there is to keep it up. So far, so good.
Q26A	30773	We follow the PG&E energy cost and compare it to the total output of the pumps.
Q26A	30849	We've been doing the same thing since they've been installed. We've done our maintenance.
Q26A	31188	They're running very smoothly and the sound of the pump. They run very nicely.

Q26A	31260	Haven't made the effort to know the efficiency and haven't had them tested.

IF Q25 = "NO" OR "SOME ARE/SOME ARE NOT", ASK:

26b. How do you know? Is it: (READ LIST) **C368-369**

Because you have had the pumps tested	11	(GO TO Q28)
The age of the pumps	12	(ASK Q27)
You don't get the needed water	13	(ASK Q27)
Or some other reason? (specify) _____	14	(ASK Q27)
Don't Know (DO NOT READ)	77	(ASK Q27)
Refused (DO NOT READ)	88	(ASK Q27)

Q26B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	35	39.8	35	39.8
12	27	30.7	62	70.5
13	13	14.8	75	85.2
14	11	12.5	86	97.7
77	2	2.3	88	100.0

Frequency Missing = 114

Responses specified in 'other'

Q26B	30180	It's been repaired twice and that costs us money.
Q26B	30185	They have not been tested, and I don't know if they are running at peak efficiency.
Q26B	30319	It's a combination of all the above.
Q26B	30360	I know some are not running right because that's the way things are.
Q26B	30382	By comparing the output between our different pumps.
Q26B	30439	Most have gone over 10 years since a test and the efficiency has got to be down, maybe 25%.
Q26B	30570	All I can say is it's hard to tell.
Q26B	30693	All three come into play.
Q26B	30796	All apply. Our own maintenance program.
Q26B	30816	Because the bill fluctuates.
Q26B	31042	Never been tested.

ASK Q27 UNLESS RESPONDENT SAID "HAD PUMPS TESTED" IN Q26A OR B:

27. What keeps you from finding out the efficiency of the pumps? Is it because: (READ LIST) **C373-374**

It costs too much 11
It's not worth the effort 12
You don't need to know the efficiency 13
Or some other reason? _____ 14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ) 88
By observation, the flow or pressure is OK 15
Inconvenient/lack of time/haven't gotten to it 16
Equipment is new 17
Haven't thought about it 18
I/We know their efficiency 19

Q27	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	25	19.5	25	19.5
12	13	10.2	38	29.7
13	27	21.1	65	50.8
14	26	20.3	91	71.1
15	5	3.9	96	75.0
16	8	6.3	104	81.3
17	3	2.3	107	83.6
18	4	3.1	111	86.7
19	5	3.9	116	90.6
77	11	8.6	127	99.2
88	1	0.8	128	100.0

Frequency Missing = 74

Responses specified in 'other'

Q27	30012	I don't understand it (the efficiency).
Q27	30042	I don't like to impose on PG&E. It seems like an imposition.
Q27	30157	I don't know how to have pumps tested.
Q27	30185	If it's free and more available, and if I had a name and the pump test service is free, I would pursue it.
Q27	30200	I don't know how I would check that. Ignorance.
Q27	30237	We get a pump test once every two years. Then we know what's what.
Q27	30320	For the volume of water we're using, they're the cheapest ones relative to water usage.
Q27	30327	Can't get PG&E to do it.
Q27	30406	We go by the time of day to get lower rates.

Q27	30413	Because they are in use 12 months a year.
Q27	30427	It's tough.
Q27	30500	When we need to know we get them tested.
Q27	30522	PG&E didn't come out.
Q27	30719	The manufacturer puts out specifications for pump and motor.
Q27	30752	Because I have never had them tested.
Q27	30855	It depends on the efficiency of the equipment at the time.
Q27	30884	I didn't need to use them until this point.
Q27	30922	I'm never totally sure if they're working or not.
Q27	30937	Just haven't.
Q27	31042	I don't know what to do.
Q27	31090	In many cases I have access to good surface water, so I'm not dependent on the pumps to know their efficiency to the most minute detail.
Q27	31159	No one has contacted us about it.
Q27	31176	I hadn't really considered it. I didn't know it was an option.
Q27	31198	I have had them tested and PG&E is coming again next week.
Q27	31214	New ownership.
Q27	31260	I haven't had them tested.

ASK EVERYONE:

Now I'm going to ask you some questions regarding pump repairs and pump tests.

28. Did your business or organization repair any deep well pumps since January 1996? **C378-379**

Yes.....11 (ASK Q29 and Q30)
No.....12 (GO TO Q31)
Don't Know.....77 (GO TO Q31)
Refused.....88 (GO TO Q31)

Q28	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	61	30.2	61	30.2
12	140	69.3	201	99.5
77	1	0.5	202	100.0

IF Q28 = YES, ASK:

29. How many? **C408-411** (# REPAIRED SINCE JAN. 1996)

30. How many of these pumps were/Was this pump repaired simply as a result of equipment breakdown? **C412-415** (# REPAIRED DUE TO BREAKDOWN)

Q29	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	25	41.0	25	41.0
2	19	31.1	44	72.1
3	9	14.8	53	86.9
4	2	3.3	55	90.2
5	1	1.6	56	91.8
6	3	4.9	59	96.7
7	1	1.6	60	98.4
10	1	1.6	61	100.0

Frequency Missing = 141

Q30	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	9	14.8	9	14.8
1	24	39.3	33	54.1
2	17	27.9	50	82.0
3	7	11.5	57	93.4
5	3	4.9	60	98.4
6	1	1.6	61	100.0

Frequency Missing = 141

(IF HAD PUMPS TESTED IN Q26A OR B, SKIP Q31 AND ASK Q32-Q34)

31. Have you ever had a pump tested? **C416-417**

Yes.....11 (ASK Q32)
No.....12 (GO TO Q35)
Don't Know.....77 (GO TO Q35)
Refused.....88 (GO TO Q35)

Q31	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	77	60.2	77	60.2
12	45	35.2	122	95.3
77	6	4.7	128	100.0

Frequency Missing = 74

IF Q31=YES OR IF "HAD PUMPS TESTED" IN Q26A OR B, ASK:

32. Do you <u>believe</u> the benefits of a pump repair as projected by a pump test? **C418-419**

Yes 11
No 12
Don't Know 77
Refused.....88

C420-421

33. From your past experiences with pump repairs, have you obtained the benefits that were estimated from the pump test?

Yes 11
No 12
Some.....13
No past experience 14 **C422-423**
Don't Know 77
Refused.....88

34. Do you believe that you would get similar benefits in the future?

Yes 11
No 12
Maybe 13
Don't Know 77
Refused.....88

Q32	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	114	75.5	114	75.5
12	17	11.3	131	86.8
77	20	13.2	151	100.0

Frequency Missing = 51

Q33	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	96	63.6	96	63.6
12	23	15.2	119	78.8
13	6	4.0	125	82.8
14	13	8.6	138	91.4
77	12	7.9	150	99.3
88	1	0.7	151	100.0

Frequency Missing = 51

Q34	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	108	71.5	108	71.5
12	11	7.3	119	78.8
13	19	12.6	138	91.4
77	12	7.9	150	99.3
88	1	0.7	151	100.0

Frequency Missing = 51

35. As you may know, a pump test provides you with information about flow rate and overall plant efficiency of your pump. Currently, how would you rate your confidence in the benefits projected by the pump test if were done by: (ITEM)? Would you be: (READ

					(DO NOT READ)		
	Very Confident	Somewhat Confident	Not too Confident	Not at all Confident	Don't Know	Refused	
a. PG&E	11	12	13	14	77	88	**C424-425**
b. A pump dealer	11	12	13	14	77	88	**C426-427**
c. An independent pump tester	11	12	13	14	77	88	**C428-429**

Q35A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	125	61.9	125	61.9
12	51	25.2	176	87.1
13	5	2.5	181	89.6
14	4	2.0	185	91.6
77	16	7.9	201	99.5
88	1	0.5	202	100.0

Q35B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	64	31.7	64	31.7
12	91	45.0	155	76.7
13	26	12.9	181	89.6
14	6	3.0	187	92.6
77	14	6.9	201	99.5
88	1	0.5	202	100.0

Q35C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	80	39.6	80	39.6
12	81	40.1	161	79.7
13	13	6.4	174	86.1
14	5	2.5	179	88.6
77	22	10.9	201	99.5
88	1	0.5	202	100.0

36. Now, suppose PG&E did not offer pump tests in the future and you had to choose between a pump dealer and an independent pump tester. What would your level of confidence be in tests performed by (ITEM)? (READ SCALE IF NECESSARY)

		(DO NOT READ)

	Very Confident	Somewhat Confident	Not too Confident	Not at all Confident	Don't Know	Refused	
a. A pump dealer	11	12	13	14	77	88	**C430-431**
b. An independent pump tester	11	12	13	14	77	88	**C432-433**

Q36A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	55	27.2	55	27.2
12	102	50.5	157	77.7
13	23	11.4	180	89.1
14	6	3.0	186	92.1
77	15	7.4	201	99.5
88	1	0.5	202	100.0

Q36B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	85	42.1	85	42.1
12	81	40.1	166	82.2
13	11	5.4	177	87.6
14	6	3.0	183	90.6
77	18	8.9	201	99.5
88	1	0.5	202	100.0

37. Would you be willing to pay for a pump test in the future if it is not offered to you free of charge? **C434-435**

Yes.....11 (ASK Q38)
No.....12 (GO TO Q39)
Don't Know/Maybe.....77 (GO TO Q39)
Refused.....88 (GO TO Q39)

Q37	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	94	46.5	94	46.5
12	63	31.2	157	77.7
13	44	21.8	201	99.5
88	1	0.5	202	100.0

IF Q37 = YES, ASK:

39. How much would you be willing to pay? (IF THE RESPONDENT ASKS, SAY: "The normal cost to run a pump test is about 150 dollars.") (ALLOW A RANGE OF DOLLARS IF THEY GIVE THAT)

C436 = 1 denotes average given. C436 = 2 denotes range given.

$ **C437-439** (DOLLARS)/ WILLING TO PAY FROM $ **C440-442** TO $ **C443-445**

Q38A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	91	96.8	91	96.8
2	3	3.2	94	100.0

Frequency Missing = 108

Q38B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	8	8.8	8	8.8
20	2	2.2	10	11.0
40	1	1.1	11	12.1
50	10	11.0	21	23.1
60	1	1.1	22	24.2
75	2	2.2	24	26.4
100	8	8.8	32	35.2
110	1	1.1	33	36.3
125	1	1.1	34	37.4
150	52	57.1	86	94.5
200	3	3.3	89	97.8
500	2	2.2	91	100.0

Frequency Missing = 111

Q38C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	33.3	1	33.3
75	1	33.3	2	66.7
250	1	33.3	3	100.0

Frequency Missing = 199

Q38D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
100	1	33.3	1	33.3
150	1	33.3	2	66.7
500	1	33.3	3	100.0

Frequency Missing = 199

39. Would you say you get your pumps tested: (READ LIST AND ENTER ALL THAT APPLY)
"Yes" to item denoted by "1" in column. "No" denoted by "0" in column.

a. When they don't supply the needed water 11 **C446**
b. When it seems like the bill is high.....12 **C447**
c. At regular intervals 13 **C448**
d. When it is recommended by your pump dealer.....14 **C449**
e. When it is recommended by your PG&E rep.....15 **C450**

f. Any other reason? (Specify)_____.....16 **C451**
g. Don't Know (DO NOT READ) 77 **C452**
h. Refused (DO NOT READ).....88 **C453**
i. Never.....17 **C454**
j. When equipment breaks down/when there is a problem 18 **C455**

Q39A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	98	48.5	98	48.5
1	104	51.5	202	100.0

Q39B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	138	68.3	138	68.3
1	64	31.7	202	100.0

Q39C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	158	78.2	158	78.2
1	44	21.8	202	100.0

Q39D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	161	79.7	161	79.7
1	41	20.3	202	100.0

Q39E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	157	77.7	157	77.7
1	45	22.3	202	100.0

Q39F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	186	92.1	186	92.1
1	16	7.9	202	100.0

Q39G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	197	97.5	197	97.5
1	5	2.5	202	100.0

Q39H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	202	100.0	202	100.0

Q39I	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	193	95.5	193	95.5

1	9	4.5	202	100.0

Q39J	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	197	97.5	197	97.5
1	5	2.5	202	100.0

Responses specified in 'other'

Q39	30012	Tested due to change of ownership.
Q39	30209	The sea water plugs up the test equipment and we get inaccurate results.
Q39	30237	When we need to know the water output.
Q39	30321	When we remember.
Q39	30327	Whenever we can find somebody to do it.
Q39	30406	I don't know if they've ever been tested.
Q39	30603	New development or growth.
Q39	30641	Whenever I pull the well, then I have the pump tested.
Q39	30713	They were tested once to confirm it was a drop in the water table and not a problem with the pump.
Q39	30719	I wait until it breaks.
Q39	30796	A spreadsheet analysis from the consultant.
Q39	30797	Checking on a new installation.
Q39	30878	When questioning the reliability.
Q39	30906	They're randomly tested when we think about it, have time to do it, or when trying to evaluate the water system.
Q39	31118	For loans.

41. Which of the following commonly triggers your decision to repair a pump? (READ LIST AND ENTER ALL THAT APPLY) **"Yes" to item denoted by "1" in column. "No" denoted by "0" in column.**

a.	The equipment is broken 11	**C464**
b.	The low performance of the pump 12	**C465**
c.	You question the equipment reliability 13	**C466**
d.	Your previous experience with pump repairs 14	**C467**
e.	PG&E service rep recommendation. 15	**C468**
f.	Pump dealer recommendation. 16	**C469**
g.	Information from a pump test. 17	**C470**
h.	Any other reason? (Specify) _____ ... 18	**C471**
i.	Don't Know (DO NOT READ) 77	**C472**
j.	Refused (DO NOT READ) 88	**C473**
k.	**If the bill went up 19**	**C474**

Cumulative Cumulative

Q40A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	58	28.7	58	28.7
1	144	71.3	202	100.0

Q40B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	70	34.7	70	34.7
1	132	65.3	202	100.0

Q40C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	135	66.8	135	66.8
1	67	33.2	202	100.0

Q40D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	144	71.3	144	71.3
1	58	28.7	202	100.0

Q40E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	139	68.8	139	68.8
1	63	31.2	202	100.0

Q40F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	142	70.3	142	70.3
1	60	29.7	202	100.0

Q40G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	125	61.9	125	61.9
1	77	38.1	202	100.0

Q40H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	195	96.5	195	96.5
1	7	3.5	202	100.0

Q40I	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	201	99.5	201	99.5
1	1	0.5	202	100.0

Q40J	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	202	100.0	202	100.0

Q40K	Frequency	Percent	Cumulative Frequency	Cumulative Percent

0	200	99.0	200	99.0
1	2	1.0	202	100.0

Responses specified in 'other'

Q40	30589	Well test results.
Q40	30603	Increased water needs.
Q40	30231	To increase capacity.
Q40	30733	There is no reason.
Q40	30796	Vandalism.
Q40	31050	Whenever I think about it.
Q40	31250	Never had problems, yet.

41. How important are the results from a pump test in your decision to repair a pump? Are they: (READ LIST)? **C508-509**

Very important 11
Somewhat important 12
Not too important 13
Not at all important.....14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ) 88

Q41	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	128	63.4	128	63.4
12	56	27.7	184	91.1
13	6	3.0	190	94.1
14	7	3.5	197	97.5
77	4	2.0	201	99.5
88	1	0.5	202	100.0

42. Which of the following describes why you would keep a pump in service if a pump test showed you needed a repair? (READ LIST AND ENTER ALL THAT APPLY) **"Yes" to item denoted by "1" in column. "No" denoted by "0" in column.**

a. It wasn't worth the repair cost.....11 **C510**
b. You needed the pump in service 12 **C511**
c. You were too busy to get it repaired 13 **C512**
d. Other (Specify):_____.....14 **C513**
e. Don't Know (DO NOT READ).....77 **C514**
f. Refused (DO NOT READ).....88 **C515**
g. No reason to keep in service/Would repair the pump 15 **C516**
h. Could not afford the repair 16 **C517**

Q42A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	133	65.8	133	65.8
1	69	34.2	202	100.0

Q42B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	63	31.2	63	31.2
1	139	68.8	202	100.0

Q42C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	155	76.7	155	76.7
1	47	23.3	202	100.0

Q42D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	198	98.0	198	98.0
1	4	2.0	202	100.0

Q42E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	196	97.0	196	97.0
1	6	3.0	202	100.0

Q42F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	201	99.5	201	99.5
1	1	0.5	202	100.0

Q42G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	194	96.0	194	96.0
1	8	4.0	202	100.0

Q42H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	199	98.5	199	98.5
1	3	1.5	202	100.0

Responses specified in 'other'

Q42	30102	If pump is not too far off its maximum output, then we'd keep it running.
Q42	30367	I watch the electricity for the hours -- consistency. It hasn't changed by more than 5% in 17 years.
Q42	30797	If it's not used much.
Q42	30917	Only if I knew it needed repair.

43. How likely are you to get a pump tested this year? (READ LIST)

Very likely.....11 **C526-527**
Somewhat likely.....12
Not too likely.....13
Not at all likely.....14
Don't Know (DO NOT READ).....77
Refused (DO NOT READ).....88

Q43	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	47	23.3	47	23.3
12	32	15.8	79	39.1
13	46	22.8	125	61.9
14	65	32.2	190	94.1
77	12	5.9	202	100.0

44. How likely is it that you will be getting your pumps tested in the future? (READ LIST)

C528-529

Very likely.....11
Somewhat likely.....12
Not too likely 13
Not at all likely.....14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ).....88

Q44	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	89	44.1	89	44.1
12	58	28.7	147	72.8
13	21	10.4	168	83.2
14	26	12.9	194	96.0
77	8	4.0	202	100.0

45. How long are you willing to wait for a pump test? (READ LIST) **C530-531**

A few weeks 11
A few months 12
Over 6 months 13
Over a year 14
Don't Know (DO NOT READ) 77
Refused (DO NOT READ) 88

Q45	Frequency	Percent	Cumulative Frequency	Cumulative Percent
11	120	59.4	120	59.4
12	35	17.3	155	76.7
13	11	5.4	166	82.2
14	16	7.9	182	90.1
77	18	8.9	200	99.0
88	2	1.0	202	100.0

Those are all my questions. On behalf of PG&E, I thank you very much for your time.

NOTE: IF RESPONDENT REQUESTED CONTACT INFORMATION FOR PG&E, CHECK BOX AT BOTTOM OF CONTACT RECORD SHEET.

NOTE: IF RESPONDENT WANTED COMMENTS FORWARDED TO PG&E, ENTER THEM HERE: see "comments.doc"

RESPONDENT NAME: _____

SAMPLE ID NUMBER: C137-142

INTERVIEWER ID: _____

TIME ENDED: C117-124

DATE: C125-130

APPENDIX D – DETAILS, STRENGTHS, AND WEAKNESSES OF MODELING APPROACH

Market transformation is of complex interaction of many factors. A significant drawback to the approach used in this study is that overall effects can not be studied simultaneously. Instead, the effect of the program is estimated for each specific market barrier. There are two main reasons for this. First, the importance of each market barrier is different at different points in time. For example, lack of motivation amongst customers could have been a major issue for a market in the initial stage of introducing the efficiency concept and now it is no longer as important. Second, the extent of change in one market barrier is not the same as the change in another market barrier. Though the disadvantage is that an overall market effect is not estimated, the advantage is that it gives specific treatment to each market barrier.

To offset this concern about inter-linked market barriers, an attempt was made to study/check the interdependency of the market barriers but multicollinearity was observed and hence the effect was not successfully separated. Also, the differences in the importance of each market barrier at different times makes it difficult to study the linkages. For example, effects of motivation can be observed while analyzing other market barriers. But, if customers are not motivated, and have not heard about a pump test, how would their motivation be affected by whether they believe in the projected benefits via pump test or not? In fact, customers who are not aware of a pump test may not have an idea about whether they believe in pump test savings projections or not. However, since market barriers are inter-linked and, therefore, need a procedure that can account for the effect of participation on all market factors at the same time.

Market factors change over a period of time. Using a self-report survey, customers can not reliably inform us about year-specific opinions on market barriers. Since the market factors are inter-linked and change over a period of time, the approach presented in this study cannot simulate the previous years' market effect. Therefore effects due to continuous changes in the market barriers and global factors cannot be accounted for using this method.

This approach uses customers' opinions (collected via a telephone survey) in a discrete choice model to associate causality between their perceptions/opinions about each market factor and program participation. Thus, perceived existence or nonexistence of market factor and its causality with program participation is studied. Assessment of these perceptions may not be a sufficient method of truly identifying the contribution of PG&E's AEMS pump test program to changing the market.

The approach can turn out to be more useful if in-depth interviews with different market actors can be used along with the telephone survey. With detailed information, it may be possible to understand what influences each market barrier and an attempt can be made to understand the process and deal with each market barrier if it appears to be an obstacle to transforming the market.

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