Evaluation Measurement and Verification Report for the Upstream High Efficiency Gas Water Heater Program #119-02

Prepared for ADM Associates, Inc.

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1. Executive Summary

This report provides the Evaluation, Measurement, and Verification (EM&V) findings for the ADM, Inc. Upstream High Efficiency Gas Water Heater Program #119-02. The program increased demand for and expanded sales of high efficiency gas water heaters (i.e., gas water heaters with an energy factor [EF] of 0.61 or higher) in the residential replacement market of Pacific Gas and Electric (PG&E). This was accomplished by providing incentives to participating wholesalers to encourage them to purchase, inventory, and promote these units. Water heaters sold for new construction were excluded from the program. Wholesalers participating in the program were offered an incentive of $10 per unit to stock high efficiency gas water heaters. Of this $10 incentive, $7 was passed along as an over-the-counter discount to plumbers and $3 remained with wholesalers to cover administrative costs.

The ex ante program implementation goals were to provide incentives for 44,740 high efficiency gas water heaters in the PG&E service area. The program provided incentives for 35,675 high efficiency gas water heaters with 0.61 EF of greater, and also provided incentives for 1,154 efficient gas water heaters with 0.60 EF and incentives for 3 units with 0.59 EF. The ex ante goals and ex post accomplishments are shown in **Table 1.1**. Accomplishments based on ex ante savings assumptions are 24 percent less than the proposed ex ante savings goals. This is due to the program starting late and deducting savings of 14 therms per year per unit for 3,499 units receiving incentives from the PG&E Statewide Residential Retrofit Single Family Energy Efficiency Rebates Program. The program ex ante cost effectiveness was 7.45 for the TRC test and 16.36 for the participant test. The ex-post cost effectiveness is 4.35 for the total resource cost (TRC) test and 13.41 for the participant test. The program ex post accomplishments are 41 percent lower than the ex ante goals. This is due to lower ex post savings based on lower average Unit Energy Consumption (UEC) values than what were assumed in the ex ante plan (i.e., ex post UEC is 191 therm/yr-unit and ex ante UEC was 305 therm/yr-unit). Nevertheless, the program is highly cost effective with a 4.35 ex post TRC test value – one of the highest in California. Ex post accomplishments were verified by randomly checking wholesale invoices for 8,862 units or 27 percent.

Table 1.1 Ex Ante Goals and Ex Post Accomplishments for the Program

Description	Proposed Ex Ante Goal	Accomplishment Based on Ex Ante	Ex Post Accomplishment
High Eff. Gas Water Heaters ≥0.61 EF	44,740	35,675	35,675
Units ≥0.61 EF credited to PG&E		-3,499	-3,499
Efficient Gas Water Heaters 0.60 EF		1,154	1,154
Efficient Gas Water Heaters 0.59 EF		3	3
Net Annual Savings (therms/yr)	1,181,136	925,285	710,947
Net Lifecycle Savings (therms)	17,717,040	13,879,274	10,664,203
Total Resource Cost (TRC) Test	**7.45**	**5.66**	**4.35**
TRC Test Benefits	$5,498,155	$4,307,176	$3,309,437
TRC Test Costs	$737,636	$760,450	$760,450
TRC Test Net Benefits	$4,760,519	$3,546,726	$2,548,987
Participant Test	**16.36**	**17.15**	**13.41**
Participant Test Benefits	$7,320,094	$5,717,299	$4,470,126
Participant Test Costs	$447,400	$333,330	$333,330
Participant Test Net Benefits	$6,872,694	$5,383,969	$4,136,796

Proposed ex ante first year and lifecycle load impact goals are summarized in **Table 1.2**. The net ex ante first year load impact goals are 1,181,136 therms per year and lifecycle savings are 17,717,040 therms.

Table 1.2 Proposed Ex Ante First Year and Lifecycle Load Impact Goals

Description	Qty.	Ex Ante Therm/y	Effective Useful Life	Net-to-Gross Ratio	Proposed Net Ex Ante 1st Year Savings therm/y	Proposed Net Ex Ante Lifecycle Savings therm
High Eff. Gas Water Heaters ≥0.61 EF	44,740	33	15	0.80	1,181,136	17,717,040

The accomplishments based on ex ante savings are summarized in **Table 1.3**. The first year accomplishments based on ex ante savings are 928,969 therms per year and lifecycle savings are 13,934,530 therms.

Table 1.3 Accomplishments Based Upon Ex-Ante Savings

Description	Qty.	Ex Ante Therm/y	Effective Useful Life	Net-to-Gross Ratio	Proposed Net Ex Ante Savings therm/y	Proposed Net Ex Ante Lifecycle Savings therm
High Eff. Gas Water Heaters ≥0.61 EF	35,675	33	15	0.80	941,820	14,127,300
Units ≥0.61 EF credited to PG&E	-3,499	14	15	0.80	-39,189	-587,832
Efficient Gas Water Heaters 0.60 EF	1,154	28.5	15	0.80	22,618	339,276
Efficient Gas Water Heaters 0.59 EF	3	23.8	15	0.80	35	530
Total	**33,333**	**33**	**15**	**0.80**	**925,285**	**13,879,274**

Net ex post first year and lifecycle load impacts are summarized in **Table 1.4**. The net ex post first year load impacts are 710,947 ± 871 therms per year and lifecycle savings are 10,664,203 ± 13,075 therms at the 90 percent confidence level. The net ex post realization rates are 0.60 ± 0.001 for therms.

Table 1.4 Ex Post First Year and Lifecycle Load Impacts

Description	Qty.	Gallons	Ex Post Therm/y	Effective Useful Life	Net-to-Gross Ratio	Net Ex Post First Year Savings therm/y	Net Ex Post Lifecycle Savings therm
High Eff. Gas Water Heaters 0.65 EF	99	50	37.7	15	0.8	2,985	44,778
High Eff. Gas Water Heaters 0.65 EF	1	40	30.8	15	0.8	25	370
High Eff. Gas Water Heaters 0.64 EF	122	50	35.2	15	0.8	3,437	51,560
High Eff. Gas Water Heaters 0.64 EF	187	40	28.4	15	0.8	4,241	63,617
High Eff. Gas Water Heaters 0.64 EF	43	30	22.0	15	0.8	757	11,361
High Eff. Gas Water Heaters 0.63 EF	245	50	32.7	15	0.8	6,403	96,040
High Eff. Gas Water Heaters 0.63 EF	4,323	40	25.8	15	0.8	89,227	1,338,401
High Eff. Gas Water Heaters 0.63 EF	62	30	19.5	15	0.8	965	14,480
High Eff. Gas Water Heaters 0.62 EF	11,035	50	30.0	15	0.8	265,125	3,976,872
High Eff. Gas Water Heaters 0.62 EF	17,550	40	23.2	15	0.8	325,275	4,879,126
High Eff. Gas Water Heaters 0.62 EF	**1,333**	30	16.8	15	0.8	17,941	269,120
High Eff. Gas Water Heaters 0.61 EF	190	50	27.3	15	0.8	4,151	62,270
High Eff. Gas Water Heaters 0.61 EF	291	40	20.4	15	0.8	4,761	71,409

Table 1.4 Ex Post First Year and Lifecycle Load Impacts

Description	Qty.	Gallons	Ex Post Therm/y	Effective Useful Life	Net-to-Gross Ratio	Net Ex Post First Year Savings therm/y	Net Ex Post Lifecycle Savings therm
High Eff. Gas Water Heaters 0.61 EF	194	30	14.1	15	0.8	2,188	32,825
High Eff. Gas Water Heaters 0.60 EF	1,154	50	24.5	15	0.8	22,618	339,276
High Eff. Gas Water Heaters 0.59 EF	3	40	14.7	15	0.8	35	530
Units ≥0.61 EF credited to PG&E	-3,499	n/a	14	15	0.8	-39,189	-587,832
Total	**33,333**		**21.3**	**15**	**0.8**	**710,947**	**10,664,203**
Realization Rate						**0.60**	**0.60**

Process surveys were conducted with 24 participating wholesale distributors and 5 non-participating wholesale distributors (the program had 110 participants). Survey results indicate 100 percent of participants were satisfied with the program. Non-participant survey results indicate wholesale distributors either would have participated if they had known about the program (i.e. information barrier), they normally only stocked standard efficiency units due to demand for low cost (i.e., organizational practices), or the program incentive process was too complicated to participate (i.e., information cost). Participant satisfaction survey questions and responses are provided in **Table 1.5.** Specific recommendations to help make the program more cost effective, efficient, and operationally effective are drawn from the process survey results. Process survey results were used to guide the overall process evaluation in terms of investigating operational characteristics of the program and developing specific recommendations to help make the program more cost effective, efficient, and operationally effective.

1.5 Participant Satisfaction Survey Questions and Responses

#	Question	Response
1	Please rate the courteousness and professionalism of the crew on a scale from 1 to 10?	9.42
2	Rate your satisfaction with incentive being paid within a reasonable timeframe from 1 to 10?	10
3	Rate the ADM water heater incentive program in terms of presentation on a scale from 1 to 10?	9.71
4	Rate the ADM water heater Incentive program in terms of usefulness on a scale from 1 to 10?	9.75
5	How would you rate the overall service you received on a scale from 1 to 100?	9.71
6	How would you rate the program in terms of increasing your understanding of the linkage between energy efficiency, bill savings, and comfort on a scale from 1 to 10?	1.25
7	Please rate the likelihood of your company participating if this program were offered in the future on a scale from 1 to 10?	10

Process evaluation findings indicate the program provided valuable energy efficiency services and incentives to participants. Participants generally rated ADM staff as courteous and professional and incentives were paid within a reasonable timeframe. Participants indicated program marketing materials were presented in a professional manner and program information was generally useful. Overall service was rated highly and all participants said they would participate in the program if it were offered again. The process evaluation found the majority of participants (83%) shared information about the program. As a result of sharing information a large number of additional distributors decided to participate in the program. Most participants provided positive comments about the program such as “great program”, “ADM staff was very professional”, and “please continue the program.” Participants indicated sales of high efficiency gas water heaters increased by an average of 16.7 percent as a result of the program. This increase was verified by checking participant invoices.

The EM&V study recommendations include improving the program tracking database and quality control (QC) procedures to screen non-qualifying units (i.e., EF < 0.61). Better advertising through telephone, email, mail, newspapers, or television will increase participation. Advertising should explain the benefits of high efficiency gas water heaters offered by the program. Better coordination with utility programs and Flex Your Power to gain more support for the program and greater demand and consumer awareness. The program should develop a list of qualifying water heaters (i.e., ≥0.60 EF) to assist distributors in marketing the program. One distributor said that he would like to receive rebates for new construction as well as for retrofits.

The study assessed the continuing need for the program by analyzing cost effectiveness under the new US Department of Energy gas water heater efficiency standards effective January 20, 2004 after the program ended.[1] With higher minimum efficiency levels, the savings per unit for future programs would be lower (see **Table 3.7**). Conservatively assuming the same quantity of rebated high efficiency water heaters in 2002-03, the program TRC test is 1.3 under the new USDOE standards and the program would still be cost effective. However, since future programs would focus incentives on higher efficiency units (i.e., 0.62 EF or greater), the TRC test for future programs could potentially be greater than two. The program achieved the objectives defined in the program theory, and participants were generally satisfied with ADM program implementation strategies. The program strategy merits future consideration statewide since it can provide cost effective natural gas savings to thousands of customers at a relatively low cost even under the new more stringent Federal standards. Most existing water heaters are replaced in emergency situations where market barriers to efficiency cause lost opportunities for savings (i.e., information, performance uncertainty, hassle costs, organization practices, and misplaced or split incentives). This program successfully addresses the emergency replacement market barriers. ADM successfully implemented a similar program in Southern California from 1999 through 2000.

Section 2 describes how the EM&V study addresses the required CPUC Energy Efficiency Policy Manual objectives, including baseline information, energy efficiency measure information, measurement and verification approach, and the evaluation approach. **Section 2** also includes equations used to develop energy savings and the sample design. **Section 3** provides EM&V study findings including load impact results, verification findings, and process evaluation results. **Section 3** also includes process evaluation recommendations regarding what works, what doesn't work, and suggestions to improve the program's services and procedures. **Appendix A** provides the participant and non-participant survey instruments.

2. Required CPUC Objectives and Components

This section discusses how the EM&V study meets the required CPUC objectives and components including baseline information, energy efficiency measure information, measurement and verification approach, and the evaluation approach.

[1] The January 20, 2004 U.S. Department of Energy efficiency standards for gas water heaters are as follows: 0.0.613 EF for 30 gallons; 0.594 EF for 40 gallons; and 0.575 for 50 gallons. See Energy Conservation Program for Consumer Products: Energy Conservation Standards for Water Heaters. Final Rule. Federal Register, v. 66, #11, pp. 4473 – 4497, http://www.eere.energy.gov/buildings/appliance_standards/residential/pdfs/water_heater_fr.pdf.

2.1 Baseline Information

Existing studies were used to evaluate baseline and measure-specific multifamily energy savings data. Existing baseline data was obtained from prior EM&V studies, the CALIFORNIA MEASUREMENT ADVISORY COMMITTEE (CALMAC, www.calmac.org), and the California Energy Commission (CEC, www.energy.ca.gov). Existing baseline studies for residential gas water heaters are provided in **Table 2.1**.

Table 2.1 Existing Baseline Studies for Residential Gas Water Heaters

1	*Consumers' Directory of Certified Efficiency Ratings for Heating and Water Heating Equipment*, Gas Appliance Manufacturers Association (GAMA), 2003.
2	*2001 DEER Update Study, Final Report*, prepared for the California Energy Commission, Contract Number 300-99-008, prepared by XENERGY Inc., Oakland, California, August, 2001.
3	*Micropas Version 6.0 Simulation for 1,800 ft^2 Single Family Home with Standard 0.53 EF Gas Water Heater*, prepared by ADM, Inc. 2001.
4	*Residential Energy Survey Report and PG&E RASS Data UECs*, Pacific Gas and Electric Company, 1998.
5	*Filing of Southern California Gas Company Requesting Approval of Proposed Energy Efficiency Programs and Budgets as Part of the 2002 Energy Efficiency Program Selection Process Required by Rulemaking 01-08-028*, December 14, 2001.
6	*Deemed Savings Estimates for the Summer Initiative Program*, prepared for SDG&E, SCE, PG&E, and SCG, prepared by Regional Economic Research and Robert Mowris & Associates, San Diego, CA, 2001.
7	*Natural Gas Water Heater Baseline Market Effects Study*, prepared for Southern California Gas Company, prepared by Robert Mowris & Associates, 1999.
8	*California Statewide Residential Appliance Saturation Study*, prepared for Prepared for the California Energy Commission Prepared by KEMA-XENERGY, Itron, Roper, ASW, 400-04-009, June 2004.

Existing baseline Unit Energy Consumption (UEC) data for residential gas water heaters are provided in **Table 2.2**. The baseline UEC values shown in **Table 2.2** were evaluated to determine if they were appropriate for the study. The Federal Trade Commission (FTC) baselines for 30, 40, and 50 gallon units are printed on the FTC Energy Guide yellow labels required on all water heaters sold in the United States. These UEC values were evaluated and found not applicable for use in PG&E.

Table 2.2 Existing Baseline Residential Gas Water Heater UEC Data

End Use	Baseline UEC therm/yr-unit	Source
30 gallon Residential Gas DHW UEC	266	0.563 EF FTC Baseline, GAMA Study 1, **Table 2.1**
40 gallon Residential Gas DHW UEC	275	0.544 EF FTC Baseline, GAMA Study 1, **Table 2.1**
50 gallon Residential Gas DHW UEC	285	0.525 EF FTC Baseline, GAMA Study 1, **Table 2.1**
Residential SF Gas DHW UEC	272	2001 DEER Update Study 2, **Table 2.1**[2]
Residential SF Gas DHW UEC	248	Micropas Study 3, **Table 2.1**
Residential SF Gas DHW UEC	214	PG&E Study 4, **Table 2.1**

[2] The 2001 DEER Update Study UEC is 273 therm/yr-unit based on North Coast and Central Valley DHW UEC for pre-1978 and post 1978 prototypes (i.e., average of 343, 204, 341, and 203 therm/yr-unit). See page 5-18, Table 5-5, *2001 DEER Update Study*, prepared for the CEC, prepared by XENERGY, Inc., 2001.

The EM&V study used the baseline UEC values shown in **Table 2.3** as the basis for developing savings estimates for this study. These UEC values were obtained from a recently completed *California Statewide Residential Appliance Saturation Study*.

Table 2.3 Baseline Residential Gas Water Heater UEC Data Used in the EM&V Study

End Use	Baseline UEC therm/yr-unit	Source
30 gallon Residential Gas DHW UEC	183	CEC Study 8, **Table 2.1** (UEC for PG&E)
40 gallon Residential Gas DHW UEC	189	CEC Study 8, **Table 2.1** (UEC for PG&E adjusted)
50 gallon Residential Gas DHW UEC	196	CEC Study 8, **Table 2.1** (UEC for PG&E adjusted)

2.2 Energy Efficiency Measure Information

This section provides energy efficiency measure information including assumptions about important variables and unknowns, especially those affecting energy savings. Ex ante energy savings for each measure are provided in **Table 2.4**. The ex ante energy savings are based on GAMA Study 1 in **Table 2.1**.

Table 2.4 Ex Ante Savings for Measures Installed in PG&E Service Area

Description	Rebate per unit	Demand Savings per unit kW	Annual Hours of Operation per unit	Savings per unit kWh	Savings per unit therm	EUL	NTG Ratio	Units
Upstream High Efficiency Gas Water Heater (0.61 EF or higher)	$10	n/a	n/a	n/a	33	15	0.80	44,740

2.2.1 Measure Assumptions and Intended Results

Measure assumptions were provided by ADM in their proposal and PIP as shown in **Table 2.5**. The EM&V study assessed the ex ante measure assumptions and developed ex post measure assumptions. This was accomplished using engineering analyses of data collected during the study (i.e., actual program database of gas water heater energy factors and storage volume sizes that are provided incentives). Ex post energy savings were developed for each measure using the ex post baseline and measure assumptions determined in the study.

Table 2.5 Baseline and Energy Efficiency Measure Assumptions

Description	Baseline Assumption	Measure Assumption	Annual Hours of Operation	Minimum Savings Target
30 Gallon High Efficiency Gas Water Heater (0.61 EF or higher)	0.563 EF	0.61 EF	n/a	7.7% savings per unit
	0.563 EF	0.62 EF	n/a	9.2% savings per unit
	0.563 EF	0.63 EF	n/a	10.6% savings per unit
40 Gallon High Efficiency Gas Water Heater (0.61 EF or higher)	0.544 EF	0.61 EF	n/a	10.8% savings per unit
	0.544 EF	0.62 EF	n/a	12.3% savings per unit
	0.544 EF	0.63 EF	n/a	13.7% savings per unit
50 Gallon High Efficiency Gas Water Heater (0.61 EF or higher)	0.525 EF	0.61 EF	n/a	13.9% savings per unit
	0.525 EF	0.62 EF	n/a	15.3% savings per unit
	0.525 EF	0.63 EF	n/a	16.7% savings per unit
	0.525 EF	0.65 EF	n/a	19.2% savings per unit

The intended ex ante energy results for ADM local program #119 are shown in **Table 2.6**. The EM&V study will provide ex post results for the programs.

Table 2.6 Ex Ante and Ex Post Energy Results

Program	Utility	Net kWh/yr	Net kW	Net therm/yr	Net Lifecycle kWh	Net Lifecycle therm
Ex Ante ADM #119	PG&E	n/a	n/a	1,181,136	n/a	17,717,040
Ex Post ADM #119	PG&E	n/a	n/a	709,964	n/a	10,649,466

2.2.2 Description of Energy Efficiency Measures

This section provides a full description of each energy efficiency measure including assumptions about important variables and unknowns, especially those affecting energy savings. Energy efficiency measure assumptions will be examined in the EM&V study. Proper installation of energy efficiency measures will be verified during the on-site inspections.

High Efficiency Storage Gas Water Heater (0.61 EF or higher)

High efficiency storage gas water heaters have a minimum 0.61 Energy Factor or higher rating. For gas storage water heaters, the Energy Factor rating is defined as follows.

Eq. 1 $\mathrm{EF} = 0.62 - 0.0019 \times (\text{Storage Volume})$

Federal law requires the following minimum Energy Factors for standard gas storage water heaters based on **Equation 1**: 0.563 EF for 30 gallon; 0.544 for 40 gallon; and 0.525 for 50 gallon units. Ex ante energy savings for 30, 40, and 50 gallon units are provided in **Table 2.7**. These savings are based on the Federal Trade Commission (FTC) Energy Guide Label required on all water heaters sold in the United States. The EM&V study evaluated these savings.

Table 2.7 Ex Ante Energy Savings for Gas Storage Water Heaters (0.61 EF or higher)

Storage Volume Gallons	Baseline EF	FTC UEC Therm/yr	0.61 EF Savings therm/yr	0.62 EF Savings therm/yr	0.63 EF Savings therm/yr	0.64 EF Savings therm/yr	0.65 EF Savings therm/yr
50	0.525	285.4	39.8	43.8	47.6	51.3	54.9
40	0.544	275.4	29.8	33.8	37.6	41.3	44.9
30	0.563	266.1	20.5	24.5	28.3	32	35.6

2.3 Measurement and Verification Approach

The measurement and verification approach for the study was based on *International Performance Measurement & Verification Protocols* (IPMVP) Option A (partially measured retrofit isolation) and Option C (conditional demand analysis from RASS to establish baseline UEC values). The four IPMVP Options are defined in **Table 2.8**.[3]

Table 2.8 IPMVP M&V Options

M&V Option	How Savings Are Calculated	Typical Applications
Option A. Partially Measured Retrofit Isolation Savings are determined by partial field measurement of energy use of system(s) to which a measure was applied, separate from facility energy use. Measurements may be either short-term or continuous. Partial measurement means that some but not all parameters may be stipulated, if total impact of possible stipulation errors is not significant to resultant savings. Careful review of measure design and installation will ensure that stipulated values fairly represent the probable actual value.	Engineering calculations using short term or continuous post-retrofit measurements or stipulations.	Water heater EF values were verified based on published GAMA values from distributor invoices and savings are based on percentage improved EF compared to minimum EF values times the baseline unit energy consumption values for PG&E from RASS data.
Option B. Retrofit Isolation Savings are determined by field measurement of the energy use of the systems to which the measure was applied, separate from the energy use of the rest of the facility. Short-term or continuous measurements are taken throughout the post-retrofit period.	Engineering calculations using short term or continuous measurements	Variable speed controls used on a constant speed pump. . Electricity use is measured with a kWh meter on pump motor. Metering is performed to verify pre-retrofit constant speed operation and post-retrofit variable speed operation.
Option C. Whole Facility Savings are determined by measuring energy use (and production) at the whole facility level. Short-term or continuous measurements are taken throughout the post-retrofit period. Continuous measurements are based on whole-facility billing data.	Analysis of whole facility utility meter or sub-meter data using techniques from simple comparison to regression analysis or conditional demand analysis.	Energy management program affecting many systems in a building. Utility meters measure energy use for 12-month base year and throughout post-retrofit period.
Option D. Calibrated Simulation Savings are determined through simulation of the energy use of components or the whole facility. Simulation routines must be demonstrated to adequately model actual energy performance measured in the facility. This option usually requires considerable skill in calibrated simulation.	Energy use simulation, calibrated with hourly or monthly utility billing data and/or end-use metering.	Project affecting many systems in a building but where base year data are unavailable. Utility meters measure post-retrofit energy use. Base year energy use is determined by simulation using a model calibrated with post-retrofit utility data.

Ex post energy or peak demand savings will be determined by comparing standard storage gas water heaters to the actual program database of gas water heater energy factors and storage volume sizes that are provided incentives.

The measurement and verification approach for the load impact evaluation involved using the ADM program tracking system to obtain the quantity, storage volume sizes, and energy factors of water heaters provided incentives under the program.[4] Therm savings for the program were calculated using the following equation.

[3] See *International Performance Measurement & Verification Protocols*, DOE/GO-102000-1132, October 2000.
[4] The ADM tracking database also contains the make and model number of each unit, date of sale, and wholesale/distributor name, address, telephone, and contact.

Eq. 2 $$\hat{Y}_{Program} = \sum_{i=1}^{N_{30}} UEC_{30}\left(1-\frac{0.563}{EF_{HE_i}}\right) + \sum_{j=1}^{N_{40}} UEC_{40}\left(1-\frac{0.544}{EF_{HE_j}}\right) + \sum_{k=1}^{N_{50}} UEC_{50}\left(1-\frac{0.525}{EF_{HE_k}}\right)$$

Where,

$\hat{Y}_{Program}$ = Therm savings for the program.

UEC_{30}, UEC_{40}, UEC_{50} = Baseline UEC for each size unit from **Table 2.3** (i.e., 183 therm/yr-unit for 30 gallon 0.563 EF unit, 189 therm/yr-unit for 40 gallon 0.544 EF unit, and 196 therm/yr-unit for 50 gallon 0.525 EF unit).

N_{30}, N_{40}, N_{50} = Quantity of 30, 40, or 50 gallon water heaters provided incentives from ADM database.

EF_{HE_i}, EF_{HE_j}, EF_{HE_k} = Energy Factor for high efficiency units from ADM database.

Mean savings for the program will be calculated using **Equation 3**.

Eq. 3 $$\bar{y} = \text{Mean Savings} = \frac{\hat{Y}_{Program}}{N}$$

Where,

$\bar{y}$ = Mean savings (i.e., therm/yr).

N= Total quantity of 30, 40, or 50 gallon water heaters provided incentives from ADM database.

$\hat{Y}_{Program}$ = Therm savings for the program.

Mean savings per unit will be calculated based on all 30, 40, and 50 gallon units and efficiency levels that were provided incentives from the ADM tracking database. The standard deviation over all units, s, of the mean will be calculated using **Equation 4**.

Eq. 4 $$s = \text{Standard Deviation} = \sqrt{\frac{\sum_{j=1}^{N}\left(y_j - \bar{y}\right)^2}{N-1}}$$

The standard deviation will be used to compare ex post savings per unit to the ex ante savings per unit.[5] The confidence interval for the mean savings will be calculated using **Equation 5**.

Eq. 5 $$\text{Confidence Interval} = \bar{y} \pm t\frac{s}{\sqrt{N}}$$

[5] ADM assumed ex ante savings per unit of 33 therm/yr and total gross program savings of 1,476,420 therm/yr for 44,740 units. The ex post standard deviation per unit was used to calculate the per unit confidence interval and the program confidence interval to compare ex post savings to ex ante savings at the 90 percent confidence level.

Where,

t = The value of the normal deviate corresponding to the desired confidence probability of 1.64 at the 90 percent confidence level.

The confidence interval for the program will be calculated using **Equation 6**.

Eq. 6 $$\text{Program Confidence Interval} = (N \times \bar{y}) \pm \left(N \times t \times \frac{s}{\sqrt{N}} \right)$$

ADM obtained invoices from participating wholesalers/distributors and their tracking database was based on these invoices. The impact evaluation randomly audited the ADM process of tracking wholesaler/distributor invoices. The ADM tracking system and wholesale distributor invoices were used to verify high efficiency units. The study reviewed and verified the ADM procedure used to ensure that sales go to retrofit applications. "Double-dipping" was included in the study by deducting savings for 3,499 high efficiency gas water heaters that received incentives from the PG&E Statewide Residential Retrofit Single Family Energy Efficiency Rebates Program.

The measurement and verification approach for the process evaluation involved designing and implementing telephone surveys to measure participant satisfaction and obtain suggestions to improve the program's services and procedures. Interview questions also assessed how the program influenced awareness of linkages between energy factor, efficiency, and bill savings for customers. Participants were asked why and how they decided to participate in the program. Non-participants will be asked why they chose not to participate. This was done to identify reasons why program marketing efforts were not successful with some wholesalers/distributors as well as to identify market barriers. The process evaluation also evaluated what works, what doesn't work, and the level of need for the program.

2.4 Evaluation Approach

The evaluation approach included:

- A list of questions answered by the study;
- A list of evaluation tasks undertaken by the study; and
- A description of how the study was used to meet all of the Commission objectives described in the CPUC EEPM (page 31).

2.4.1 List of Questions Answered by the Study

The following questions were answered by the study.

1. **Are the ex ante measure assumptions appropriate and relevant with respect to actual measures being installed in the program?**
   The study answered this question by using published UEC baseline values based on conditional demand analyses and verified energy factors of water heaters provided incentives under the program including the mean and standard deviation for 30, 40 and 50 gallon units. The energy factor percentage improvement was multiplied by the baseline UEC values to determine ex post energy savings. Ex post energy savings were used to evaluate ex ante

measure assumptions. Ex ante measure assumptions were found to be higher than ex post savings.

2. **Are the ex ante energy savings estimates per measure appropriate and relevant?**
   The study answered this question by evaluating the appropriate baseline UEC values from the most recent *California Statewide Residential Appliance Saturation Study.* Ex post savings were evaluated based on the number of high efficiency gas water heaters that were provided incentives under the program using Equation 2 (above), and information contained in the ADM tracking database regarding model number, size, and energy factor. Ex ante energy savings estimates per measure were found to be higher than ex post savings.

3. **Is the ex ante net-to-gross ratio of 0.80 appropriate and relevant to this program?**
   The study used the default 0.80 NTGR based on previous studies. Insufficient budget was available to evaluate the ex ante NTGR.

4. **Are the total program savings estimates accurate?**
   The study answered this question by developing ex post energy savings for the program at the 90 percent confidence level as per CADMAC Protocols. Ex post unit savings were found to be 32 percent lower than ex ante savings due to lower ex post baseline UEC values.

5. **Are customers satisfied with the program implementation and are customers satisfied with the measures that were offered and installed in the program?**
   The study answered this question by summarizing customer satisfaction questions from telephone surveys. Survey results indicated 100 percent of participants were satisfied with the program. Most participants provided positive comments about the program such as “great program”, “ADM staff was very professional”, and “please continue the program.” Participants indicated sales of high efficiency gas water heaters increased by an average of 16.7 percent as a result of the program.

6. **Have some wholesalers or distributors decided not to participate in the program?**
   The study answered this question by conducting telephone interviews with non-participants. Non-participant survey results indicated wholesale distributors either would have participated if they had known about the program (i.e. information barrier), they normally only stock standard efficiency units due to demand for low cost (i.e., organizational practices), or program incentive process was too complicated to participate (i.e., information cost).

7. **Is there a continuing need for the program?**
   The study assessed the continuing need for the program by analyzing cost effectiveness under the new US Department of Energy gas water heater efficiency standards effective January 20, 2004 after the program ended. With higher minimum efficiency levels, the savings per unit for future programs would be lower (see **Table 3.7**). Conservatively assuming the same quantity of rebated high efficiency water heaters in 2002-03, the program TRC test is 1.3 under the new USDOE standards and the program would still be cost effective. However, since future programs would focus incentives on higher efficiency units (i.e., 0.62 EF or greater), the TRC test for future programs could potentially be greater than 2.

Process survey responses from the telephone surveys of participant and non-participant wholesalers/distributors were also analyzed to determine how important the upstream incentives are to stocking and promoting high efficiency storage gas water heaters. Most participants provided positive comments about the program such as "please continue the program." All participants indicated they would continue to stock and recommend high efficiency gas water heaters in the future without incentives. However, they also said most customers are more concerned about cost and warranty than efficiency so sales of high efficiency units would probably go down without incentives. The program strategy merits future consideration statewide since it can provide cost effective natural gas savings to thousands of customers at a relatively low cost even under the new more stringent Federal standards. Most existing water heaters are replaced in emergency situations where market barriers to efficiency cause lost opportunities for savings (i.e., information, performance uncertainty, hassle costs, organization practices, and misplaced or split incentives). This program successfully addresses the emergency replacement market barriers.

8. **Did the program cause participating vendors to increase stocking and sales of high efficiency water heaters?**
   The study answered this question by analyzing survey interview responses to determine the percentage increase in high efficiency sales due to the program. Participants indicated sales of high efficiency gas water heaters increased by an average of 16.7 percent as a result of the program. This was verified by checking participant invoices.

2.4.2 List of Tasks Undertaken by the Study

Four tasks will be undertaken by the study. The four tasks are briefly summarized as follows.

Task 1. Project Initiation Meeting
The project initiation meeting refined the research objectives and methods, clarified pertinent issues, discussed data requirements, and discussed the detailed work plan and schedule of project tasks.

Task 2. Prepare EM&V Plan
The EM&V Plan contained a detailed description of all activities required to complete the study.

Task 3. Perform EM&V Work
EM&V work for the Upstream High Efficiency Gas Water Heater Program included collecting and analyzing data to determine the impacts of the program. For the impact evaluation we obtained a complete database from ADM of model number, energy efficiency and size. From this database we calculated energy savings for the program (as per Equation 2). For the process evaluation we performed telephone surveys of participants, and non-participants to identify what works, what doesn't work, and the level of need for the program as well as recommendations to improve the program. Process surveys were used to measure participant satisfaction and obtain suggestions to improve the program's services and procedures. Interview questions also assessed how the program influenced awareness of linkages between energy factor, efficiency, and bill savings for customers. Participants were asked why and how they decided to participate in the program. Non-participants were asked questions regarding why they chose not to participate. This was done to identify reasons why program marketing efforts were not successful with some wholesalers/distributors as well as to identify

market barriers. The study analyzed sales data and asked survey questions of participants to determine the percentage increase in sales of high efficiency units due to the program. The ADM tracking system and wholesale invoices were used to verify the number of high efficiency units. The study reviewed and verified the ADM procedure used to ensure that sales went to retrofit applications.

Task 4. Progress, Draft, and Final EM&V Reports
Progress, draft, and final EM&V reports included a description of the study methodology and all deliverables as per the CPUC EEPM. The reports provided results of the impact evaluation including gross and net energy savings for each measure and the program as well as results.

Section 3 provides a detailed description of each task to be undertaken during the course of the study. A timeline and deliverables for each task are also provided.

2.4.3 How Study will meet CPUC EEPM Objectives

The study met the following Commission objectives described in the CPUC EEPM (pg. 31).

- **Measure the level of energy savings achieved.**
  The study met this objective by evaluating baseline UEC values using the *California Statewide Residential Appliance Saturation Study*. Ex post savings were evaluated based on the number of high efficiency gas water heaters that were provided incentives under the program using Equation 2 (above), and information contained in the ADM tracking database regarding model number, size, and energy factor. The net ex post first year load impacts are 710,947 ± 871 therms per year and lifecycle savings are 10,664,203 ± 13,075 therms at the 90 percent confidence level. The net ex post realization rates are 0.60 ± 0.001 for therms.

- **Measure cost-effectiveness.**
  The study will met this objective by developing ex post energy savings for the program. Ex post measure savings and implementation costs were used to develop ex post Total Resource Cost (TRC) test values using the CPUC cost effectiveness worksheets. The program ex ante cost effectiveness was 7.45 for the TRC test and 16.36 for the participant test. The ex-post cost effectiveness is 4.35 for the total resource cost (TRC) test and 13.41 for the participant test. The program ex post accomplishments are 41 percent lower than the ex ante goals. This is due to lower ex post savings based on lower average Unit Energy Consumption (UEC) values than what were assumed in the ex ante plan (i.e., ex post UEC is 191 therm/yr-unit and ex ante UEC was 305 therm/yr-unit).

- **Provide up-front market assessments and baseline analysis.**
  The study met this objective by performing a market assessment and baseline analysis including an evaluation of the baseline unit energy consumption values for gas water heating. The telephone survey interviews included questions about market barriers to energy efficiency and the success of the program in overcoming these market barriers.

- **Provide ongoing feedback and corrective or constructive guidance regarding the implementation of programs.**

The study met this objective by performing telephone surveys to evaluate customer satisfaction and obtain suggestions to improve the program's services and procedures. Interview questions also assessed how the program influenced awareness of linkages between energy factor, efficiency, and bill savings for customers. Participants were asked why and how they decided to participate in the program. The study reviewed and verified the ADM procedure used to ensure that sales go to retrofit applications. The EM&V study recommendations include improving the program tracking database and quality control (QC) procedures to screen non-qualifying units (i.e., EF < 0.61). Better advertising through telephone, email, mail, newspapers, or television will increase participation. Advertising should explain the benefits of high efficiency gas water heaters offered by the program. Better coordination with utility programs and Flex Your Power to gain more support for the program and greater demand and consumer awareness. The program should develop a list of qualifying water heaters (i.e., ≥0.60 EF) to assist distributors in marketing the program. One distributor said that he would like to receive rebates for new construction as well as for retrofits.

- **Measure indicators of the effectiveness of the programs, including testing of the assumptions that underlie the program theory and approach.**
  ADM provided the following program theory in their implementation plan.

  "The Upstream High Efficiency Gas Water Heater Program #119-02 increased demand for and expanded sales of high efficiency gas water heaters (i.e., gas water heaters with an energy factor [EF] of 0.61 or higher) in the residential replacement market of Pacific Gas and Electric (PG&E). This was accomplished by providing incentives to participating wholesalers to encourage them to purchase, inventory, and promote these units. Water heaters sold for new construction were excluded from the program. Wholesalers participating in the program were offered an incentive of $10 per unit to stock high efficiency gas water heaters. Of this $10 incentive, $7 was passed along as an over-the-counter discount to plumbers and $3 remained with wholesalers to cover administrative costs."

  Key performance metrics are as follows: 1) Number of high efficiency (i.e., 0.61 EF or higher) gas water heaters provided incentives under the program. 2) Number of efficient (i.e., greater than minimum but less than 0.61 EF) gas water heaters provided incentives. The EM&V study evaluated whether the program performed in accordance with the program theory by auditing the tracking database, by checking all EF values for units receiving incentives, and by performing a process evaluation of the program including telephone surveys of participants and non-participants. Questions were asked about stocking practices of high efficiency water heaters both with and without the program incentives. The ADM tracking system and wholesale invoices were used to develop the percentage increase in sales of high efficiency units due to the program. Participating distributors indicated high efficiency water heater sales increased by an average of 16.7% ± 8.4% due to the ADM incentive program. The GAMA directory (www.gamanet.org) was used to check EF values for units receiving incentives and 98 percent of units were correctly reported. Roughly 2 percent were reported with lower EF values than verified with a net positive load impact. In general the program achieved the objectives defined in the program theory, and participants were generally satisfied with ADM program implementation strategies.

- **Assess the overall levels of performance and success of the program.**

The study provides ex post energy savings at the 90 percent confidence level as per the CADMAC Protocols. The study determined participant satisfaction and ways to improve the program. Non-participants were interviewed to evaluate why they chose not to participate. This was done to identify reasons why program marketing efforts were not successful with some wholesalers/distributors as well as to identify additional market barriers (i.e., incentives or other inducements to achieve greater participation). The program was successful in providing incentives for 35,675 high efficiency gas water heaters and 1,157 efficient gas water heaters with an overall TRC test ratio of 4.35 and participant test ratio of 13.41.

- **Help to assess whether there is a continuing need for the program.**
  The study assessed the continuing need for the program by analyzing cost effectiveness under the new US Department of Energy gas water heater efficiency standards effective January 20, 2004 after the program ended. With higher minimum efficiency levels, the savings per unit for future programs would be lower (see **Table 3.7**). Conservatively assuming the same quantity of rebated high efficiency water heaters in 2002-03, the program TRC test is 1.3 under the new USDOE standards and the program would still be cost effective. However, since future programs would focus incentives on higher efficiency units (i.e., 0.62 EF or greater), the TRC test for future programs could potentially be greater than 2. Process survey responses from the telephone surveys of participant and non-participant wholesalers/distributors were also analyzed to determine how important the upstream incentives are to stocking and promoting high efficiency storage gas water heaters. All participants were satisfied with the program and wish to see the program continued. The program merits future consideration statewide since it can provide cost effective natural gas savings to thousands of customers at a relatively low cost even under the new more stringent Federal standards. Most existing water heaters are replaced in emergency situations where market barriers to efficiency cause lost opportunities for savings (i.e., information, performance uncertainty, hassle costs, organization practices, and misplaced or split incentives). This program successfully addresses the emergency replacement market barriers.

2.3.2 Sampling Plan

The sampling plan was used to verify sales of high efficiency units based on wholesale invoices as well as for estimating ex post energy savings. The statistical sample design involved selecting a random sample of participants from the program participant population. Samples were selected to obtain a reasonable level of precision and accuracy at the 90 percent confidence level per CPUC Energy Efficiency Policy Manual (EEPM). Sampling methods were used to analyze the data and extrapolate mean savings estimates from the sample measurements to the population of all program participants and to evaluate the statistical precision of the results.[6]

The sample size necessary to obtain the desired 10% relative precision for program mean savings estimates was calculated using **Equation 7**.

Eq. 7 $$\text{Sample Size} = n_i = \frac{t^2 C_{vi}^{\ 2}}{r^2}$$

[6] Cochran, William G. *Sampling Techniques*. New York: John Wiley & Sons, 1977, Kish, Leslie. *Survey Sampling*. New York: John Wiley & Sons, 1965. Thompson, Steven K. *Sampling*. New York: John Wiley & Sons, 1992.

Where,

n_i = Required sample size for measure "i",

t = The value of the normal deviate corresponding to the desired confidence probability of 1.645 at the 90 percent confidence level per CADMAC Protocols,

r = Desired relative precision, 10% per CADMAC Protocols,

C_{vi} = Coefficient of variation, $\frac{s_i}{\bar{y}_i}$, for measure "i."

For small populations, the sample size was corrected using the finite population correction (FPC) equation as follows.[7]

Eq. 8 FPC Sample Size = $n_{FPCi} = \frac{n_i}{1+(n_i-1)/N}$

Where,

n_{FPCi} = Sample size for measure "i" with finite population correction.

Ex post accomplishments were verified by randomly checking wholesale invoices for 8,862 units or 27 percent of the total population of high efficiency water heaters in the program. Ex post savings are based on analyses of the entire population of water heaters (i.e., a census).

3. EM&V Findings

This section provides load impact results for the program and for each measure. This section also provides the process evaluation results based on participant and non-participant surveys and recommendations regarding what works, what doesn't work, and the continuing need of the program. Also provided are recommendations for each measure to increase savings, achieve greater persistence of savings, and improve customer satisfaction.

3.1 Load Impact Results

The ex ante program implementation goals were to provide incentives for 44,740 high efficiency gas water heaters in the PG&E service area. The program provided incentives for 35,675 high efficiency gas water heaters with 0.61 EF of greater, and also provided incentives for 1,154 efficient gas water heaters with 0.60 EF and incentives for 3 units with 0.59 EF. The ex ante goals and ex post accomplishments are shown in **Table 3.1**. Accomplishments based on ex ante savings assumptions are 24 percent less than the proposed ex ante savings goals. This is due to the program starting late and deducting savings of 14 therms per year-unit for 3,499 units receiving incentives from the PG&E Statewide Residential Retrofit Single Family Energy Efficiency Rebates Program. The program ex ante cost effectiveness was 7.45 for the TRC test and 16.36 for the participant test. The ex-post cost effectiveness is 4.35 for the total resource cost (TRC) test and 13.41 for the participant test. The program ex post accomplishments are 41

[7] Ibid.

percent lower than the ex ante goals. This is due to lower ex post savings based on lower average Unit Energy Consumption (UEC) values than what were assumed in the ex ante plan (i.e., ex post UEC is 191 therm/yr-unit and ex ante UEC was 305 therm/yr-unit). Nevertheless, the program is highly cost effective with a 4.35 ex post TRC test value – one of the highest in California. Ex post accomplishments were verified by randomly checking wholesale invoices for 8,862 units or 27 percent.

Table 3.1 Ex Ante Goals and Ex Post Accomplishments for the Program

Description	Proposed Ex Ante Goal	Accomplishment Based on Ex Ante	Ex Post Accomplishment
High Eff. Gas Water Heaters ≥0.61 EF	44,740	35,675	35,675
Units ≥0.61 EF credited to PG&E	0	-3,499	-3,499
Efficient Gas Water Heaters 0.60 EF	0	1,154	1,154
Efficient Gas Water Heaters 0.59 EF	0	3	3
Net Annual Savings (therms/yr)	1,181,136	925,285	710,947
Net Lifecycle Savings (therms)	17,717,040	13,879,274	10,664,203
Total Resource Cost (TRC) Test	**7.45**	**5.66**	**4.35**
TRC Test Benefits	$5,498,155	$4,307,176	$3,309,437
TRC Test Costs	$737,636	$760,450	$760,450
TRC Test Net Benefits	$4,760,519	$3,546,726	$2,548,987
Participant Test	**16.36**	**17.15**	**13.41**
Participant Test Benefits	$7,320,094	$5,717,299	$4,470,126
Participant Test Costs	$447,400	$333,330	$333,330
Participant Test Net Benefits	$6,872,694	$5,383,969	$4,136,796

Proposed ex ante first year and lifecycle load impact goals are summarized in **Table 3.2**. The net ex ante first year load impact goals are 1,181,136 therms per year and lifecycle savings are 17,717,040 therms.

Table 3.2 Proposed Ex Ante First Year and Lifecycle Load Impact Goals

Description	Qty.	Ex Ante Therm/y	Effective Useful Life	Net-to-Gross Ratio	Proposed Net Ex Ante 1st Year Savings therm/y	Proposed Net Ex Ante Lifecycle Savings therm
High Eff. Gas Water Heaters ≥0.61 EF	44,740	33	15	0.80	1,181,136	17,717,040

The accomplishments based on ex ante savings are summarized in **Table 3.3**. The first year accomplishments based on ex ante savings are 928,969 therms per year and lifecycle savings are 13,934,530 therms.

Table 3.3 Accomplishments Based Upon Ex-Ante Savings

Description	Qty.	Ex Ante Therm/y	Effective Useful Life	Net-to-Gross Ratio	Proposed Net Ex Ante Savings therm/y	Proposed Net Ex Ante Lifecycle Savings therm
High Eff. Gas Water Heaters ≥0.61 EF	35,675	33	15	0.80	941,820	14,127,300
Units ≥0.61 EF credited to PG&E	-3,499	14	15	0.80	-39,189	-587,832
Efficient Gas Water Heaters 0.60 EF	1,154	28.5	15	0.80	22,618	339,276
Efficient Gas Water Heaters 0.59 EF	3	23.8	15	0.80	35	530
Total	**33,333**	**33**	**15**	**0.80**	**925,285**	**13,879,274**

Net ex post first year and lifecycle load impacts are summarized in **Table 3.4**. The net ex post first year load impacts are 710,947 ± 871 therms per year and lifecycle savings are 10,664,203 ± 13,075 therms at the 90 percent confidence level. The net ex post realization rates are 0.60 ± 0.001 for therms.

Table 3.4 Ex Post First Year and Lifecycle Load Impacts

Description	Qty.	Gallons	Ex Post Therm/y	Effective Useful Life	Net-to-Gross Ratio	Net Ex Post 1st Year Savings therm/y	Net Ex Post Lifecycle Savings therm
High Eff. Gas Water Heaters 0.65 EF	99	50	37.7	15	0.8	2,985	44,778
High Eff. Gas Water Heaters 0.65 EF	1	40	30.8	15	0.8	25	370
High Eff. Gas Water Heaters 0.64 EF	122	50	35.2	15	0.8	3,437	51,560
High Eff. Gas Water Heaters 0.64 EF	187	40	28.4	15	0.8	4,241	63,617
High Eff. Gas Water Heaters 0.64 EF	43	30	22.0	15	0.8	757	11,361
High Eff. Gas Water Heaters 0.63 EF	245	50	32.7	15	0.8	6,403	96,040
High Eff. Gas Water Heaters 0.63 EF	4,323	40	25.8	15	0.8	89,227	1,338,401
High Eff. Gas Water Heaters 0.63 EF	62	30	19.5	15	0.8	965	14,480
High Eff. Gas Water Heaters 0.62 EF	11,035	50	30.0	15	0.8	265,125	3,976,872
High Eff. Gas Water Heaters 0.62 EF	17,550	40	23.2	15	0.8	325,275	4,879,126
High Eff. Gas Water Heaters 0.62 EF	**1,333**	30	16.8	15	0.8	17,941	269,120
High Eff. Gas Water Heaters 0.61 EF	190	50	27.3	15	0.8	4,151	62,270
High Eff. Gas Water Heaters 0.61 EF	291	40	20.4	15	0.8	4,761	71,409
High Eff. Gas Water Heaters 0.61 EF	194	30	14.1	15	0.8	2,188	32,825
High Eff. Gas Water Heaters 0.60 EF	1,154	50	24.5	15	0.8	22,618	339,276
High Eff. Gas Water Heaters 0.59 EF	3	40	14.7	15	0.8	35	530
Units ≥0.61 EF credited to PG&E	-3,499	n/a	14	15	0.8	-39,189	-587,832
Total	**33,333**		**21.3**	**15**	**0.8**	**710,947**	**10,664,203**
Realization Rate						**0.60**	**0.60**

3.1.1 Verification Findings

Ex post accomplishments were verified by randomly checking wholesale invoices for 8,862 units or 27 percent. Energy Factors were verified using the online Gas Appliance Manufacturers Association (GAMA) directory at www.gamanet.org. Reported and verified energy factors are shown in **Table 3.5**.

Table 3.5 Reported and Verified Energy Factors By Manufacturer

Manufacturer	Model	Qty.	Reported Energy Factor	Verified Energy Factor	Storage Size Gallons
A. O. Smith Water Products Co.	FGR-30-242	12	0.61	0.61	30
A. O. Smith Water Products Co.	GCVL-30	5	0.61	0.61	30
A. O. Smith Water Products Co.	FGR-30-240	377	0.62	0.62	30
A. O. Smith Water Products Co.	FVR-30	137	0.62	0.62	30
A. O. Smith Water Products Co.	GCV-30	15	0.62	0.62	30
A. O. Smith Water Products Co.	GVR-30	43	0.63	0.63	30
A. O. Smith Water Products Co.	FPD-40-230	3	0.59	0.59	40
A. O. Smith Water Products Co.	FGR-40-242	31	0.61	0.61	40
A. O. Smith Water Products Co.	FGR-40-240	3700	0.62	0.62	40
A. O. Smith Water Products Co.	FVR-40	1500	0.62	0.62	40
A. O. Smith Water Products Co.	GVR-40	403	0.62	0.62	40
A. O. Smith Water Products Co.	CTG-40-226	5	0.63	0.63	40
A. O. Smith Water Products Co.	PGCG-40-226	18	0.63	0.63	40

Table 3.5 Reported and Verified Energy Factors By Manufacturer

Manufacturer	Model	Qty.	Reported Energy Factor	Verified Energy Factor	Storage Size Gallons
A. O. Smith Water Products Co.	PGV-40	1	0.63	0.63	40
A. O. Smith Water Products Co.	FPSE-40-230E	1	0.65	0.65	40
A. O. Smith Water Products Co.	FGR-50	175	0.6	0.6	50
A. O. Smith Water Products Co.	FVR-50	1587	0.62	0.62	50
A. O. Smith Water Products Co.	GVR-50	392	0.62	0.62	50
A. O. Smith Water Products Co.	PGCG-50-226	105	0.62	0.62	50
A. O. Smith Water Products Co.	PGV-50	66	0.63	0.63	50
A. O. Smith Water Products Co.	XGV-50	1	0.63	0.63	50
A. O. Smith Water Products Co.	XGV-50	2	0.63	0.63	50
A. O. Smith Water Products Co.	FPCR-50	4	*0.65*	*0.64*	*50*
A. O. Smith Water Products Co.	FGSE-50-230E	2	0.65	0.65	50
American Water Heater Company	FG61-30S30-3NOV	69	0.61	0.61	30
American Water Heater Company	FG*240T343N	20	0.61	0.61	40
American Water Heater Company	FG*240T403N	300	0.61	0.61	40
American Water Heater Company	G122-40T40-3N	2	0.61	0.61	40
American Water Heater Company	G52-40T34-3N	208	0.62	0.62	40
American Water Heater Company	G62-50T35-3N	49	0.62	0.61	50
American Water Heater Company	FG62-50T40-3NOV	40	0.62	0.62	50
Bradford white	M-4-30T***N-11	1	0.61	0.61	30
Bradford white	M-I-303T6FBN-4	23	0.61	0.61	30
Bradford white	M-4-30T6FBN-5	43	0.64	0.64	30
Bradford white	M-4-40T6FBN-5	168	0.62	0.62	40
Bradford white	M-I-TW40L6BN-12	15	0.62	0.62	40
Bradford white	M-4-403T***N-12	4226	0.63	0.63	40
Bradford white	M-4-50S**N-12	1757	0.62	0.62	50
Bradford white	M-4-50S*FBN	2212	0.62	0.62	50
Bradford white	M-4-5036FBN-5	126	0.63	0.63	50
Bradford white	M-II-TW50T6BN-12	64	0.65	0.65	50
Maytag	HVN412-40X	49	0.63	0.63	40
Maytag	HN4X-40X-960	170	0.64	0.64	40
Maytag	HRN412-40X	6	0.64	0.64	40
Maytag	HN4X-50Q-960	6	0.6	0.6	50
Maytag	HRN412-50X	2	0.63	0.63	50
Maytag	HVN412-50X	45	0.63	0.63	50
Maytag	HN4X-50X-960	118	0.64	0.64	50
Rheem Mfg. Co., Water Heater Div.	22V30S-30F	1	0.61	0.61	30
Rheem Mfg. Co., Water Heater Div.	22V30-30F	473	*0.61*	*0.62*	*30*
Rheem Mfg. Co., Water Heater Div.	41VR40	14	0.62	0.62	40
Rheem Mfg. Co., Water Heater Div.	41VR40-40F	941	0.62	0.62	40
Rheem Mfg. Co., Water Heater Div.	41VR40N	2244	0.62	0.62	40
Rheem Mfg. Co., Water Heater Div.	42VR40-40F	419	0.62	0.62	40
Rheem Mfg. Co., Water Heater Div.	RHGPRO40-40	239	0.62	0.62	40
Rheem Mfg. Co., Water Heater Div.	41VRP40NT	11	0.64	0.64	40
Rheem Mfg. Co., Water Heater Div.	41VR50	20	*0.62*	*0.61*	*50*
Rheem Mfg. Co., Water Heater Div.	41VR50-40F	607	0.62	0.62	50
Rheem Mfg. Co., Water Heater Div.	41VR50N	1351	0.62	0.62	50
Rheem Mfg. Co., Water Heater Div.	42VR50-40-F	322	0.62	0.62	50
Rheem Mfg. Co., Water Heater Div.	RHGPRO50-40	253	0.62	0.62	50
Rheem Mfg. Co., Water Heater Div.	41VRP50NT	33	0.65	0.65	50
State Industries, Inc.	PR* 30 NORT***	0	0.57	0.57	30
State Industries, Inc.	PR6 30 NORT***	0	0.57	0.57	30
State Industries, Inc.	GS6-30-XBRT	0	0.59	0.59	30
State Industries, Inc.	PR* 30 NORT*** 2	0	0.59	0.59	30
State Industries, Inc.	PR* 30 NOCT*** 32W	0	0.6	0.6	30
State Industries, Inc.	GS6-30-YBRS	6	0.61	0.61	30
State Industries, Inc.	PR* 30 NORT*** 2W	8	0.61	0.61	30
State Industries, Inc.	GS6-30-XOCT	331	0.62	0.62	30
State Industries, Inc.	GS6-30-YOCT	19	0.63	0.63	30
State Industries, Inc.	GS6-40-XBRT	0	0.57	0.57	40

Table 3.5 Reported and Verified Energy Factors By Manufacturer

Manufacturer	Model	Qty.	Reported Energy Factor	Verified Energy Factor	Storage Size Gallons
State Industries, Inc.	PR* 40 NODS***	0	0.59	0.59	40
State Industries, Inc.	PR6 40 NODS***	0	0.59	0.59	40
State Industries, Inc.	PR* 40 NOCT*** 42W	4959	0.61	0.61	40
State Industries, Inc.	PR* 40 NODS*** W	56	0.61	0.61	40
State Industries, Inc.	GS6-40-XOCT	1952	0.62	0.62	40
State Industries, Inc.	GS6-40-YOCT	734	0.62	0.62	40
State Industries, Inc.	PR6-40-NBJT*** 42W	43	0.62	0.62	40
State Industries, Inc.	GPX-40-XXRT	4	0.63	0.63	40
State Industries, Inc.	GPX-40-YXRT	3	0.63	0.63	40
State Industries, Inc.	PR* 50 NODS***	0	0.59	0.59	50
State Industries, Inc.	PR6 50 NODS***	0	0.59	0.59	50
State Industries, Inc.	PR* 50 NOCT*** 32W	570	0.6	0.6	50
State Industries, Inc.	PR* 50 NXRT***	0	0.6	0.6	50
State Industries, Inc.	PR6 50 NOCT*** 32W	493	0.6	0.6	50
State Industries, Inc.	PR* 50 NXRT*** 2	25	0.61	0.61	50
State Industries, Inc.	PR6-50-XCVIT	3	0.61	0.61	50
State Industries, Inc.	GS6-50-XOCT	2129	0.62	0.62	50
State Industries, Inc.	PR* 50 NBJT*** 42W	81	0.62	0.62	50
State Industries, Inc.	PR* 50 NXRT*** 2W	143	*0.63*	*0.62*	*50*
State Industries, Inc.	PR6 50 NBJT*** 42W	38	0.62	0.62	50
Total		**36,832**			

3.1.2 Baseline UEC Values and Annual Therm Savings per Unit

Load impacts are based on UEC values and annual therm savings per unit shown in **Table 3.6**. The UEC values were obtained from the *California Statewide Residential Appliance Saturation Study* from a population of 15,260 homes. The UEC for 30 gallon units is taken directly from the study for PG&E. The 40 and 50 gallon UEC values are based on the FTC UEC ratios from **Table 2.2**. Annual therm savings per unit are based on Equation 2. The values shown in Table 3.6 are based on pre-2004 minimum energy factors.

Table 3.6 Baseline UEC Values and Annual Therm Savings per Unit (2002-03 Program)

Storage Volume Gallons	Baseline Energy Factor	PG&E RASS UEC therm	0.57 EF Savings therm	0.58 EF Savings therm	0.59 EF Savings therm	0.60 EF Savings therm	0.61 EF Savings therm	0.62 EF Savings therm	0.63 EF Savings therm	0.64 EF Savings therm	0.65 EF Savings therm
50	0.525	196	15.5	18.6	21.6	24.5	27.3	30.0	32.7	35.2	37.7
40	0.544	189	8.6	11.7	14.7	17.6	20.4	23.2	25.8	28.4	30.8
30	0.563	183	2.2	5.4	8.4	11.3	14.1	16.8	19.5	22.0	24.5

New US Department of Energy gas water heater efficiency standards went into effect on January 20, 2004 after the program ended.[8] With higher minimum efficiency levels, the savings per unit for future programs would be lower as shown in **Table 3.7**.

[8] The January 20, 2004 U.S. Department of Energy efficiency standards for gas water heaters are as follows: 0.0.613 EF for 30 gallons; 0.594 EF for 40 gallons; and 0.575 for 50 gallons. See Energy Conservation Program for Consumer Products: Energy Conservation Standards for Water Heaters. Final Rule. Federal Register, v. 66, #11, pp. 4473 – 4497, http://www.eere.energy.gov/buildings/appliance_standards/residential/pdfs/water_heater_fr.pdf.

Table 3.7 Baseline UEC Values and Annual Therm Savings per Unit (2004 Standards)

Storage Volume Gallons	2004 Baseline Energy Factor	PG&E RASS UEC therm	0.57 EF Savings therm	0.58 EF Savings therm	0.59 EF Savings therm	0.60 EF Savings therm	0.61 EF Savings therm	0.62 EF Savings therm	0.63 EF Savings therm	0.64 EF Savings therm	0.65 EF Savings therm
50	0.575	196	n/a	1.7	5.0	8.2	11.2	14.2	17.1	19.9	22.6
40	0.594	189	n/a	n/a	n/a	1.9	5.0	7.9	10.8	13.6	16.3
30	0.613	183	n/a	n/a	n/a	n/a	n/a	2.1	4.9	7.7	10.4

The impact on net program savings based on reported versus verified energy factors is shown in **Table 3.8**. The net first year savings increased by 678 therms per year and the net lifecycle savings increased by 10,170 therms. For example, ADM reported an energy factor of 0.61 and quantity of 473 for the 30 gallon Rheem Model 22V30-30F. The verified energy factor in the GAMA directory is 0.62 EF for this model. Using the verified GAMA energy factor yields additional net savings of 1,031 therms per year and 15,463 lifecycle therms.

Table 3.8 Impact on Net Savings Based on Reported versus Verified Energy Factors

Description	Reported EF	Verified EF	Qty.	Gallons	Delta Therm/y	EUL	NTGR	Net First Year Therms/y	Net Lifecycle Therms
High Eff. Gas Water Heater	0.65	0.64	4	50	-2.5	15	0.8	-8	-119
High Eff. Gas Water Heater	0.63	0.62	143	50	-2.6	15	0.8	-301	-4,521
High Eff. Gas Water Heater	0.62	0.61	20	50	-2.7	15	0.8	-44	-653
High Eff. Gas Water Heater	0.61	0.62	473	30	2.7	15	0.8	1,031	15,463
Total			**640**					**678**	**10,170**

3.2 Process Evaluation Results

Process evaluation recommendations are based on process surveys conducted in-person with 24 participating and 5 non-participating wholesale distributors. Participants were asked why and how they decided to participate in the program. Non-participants were asked why they chose not to participate. The process surveys were used to evaluate participant satisfaction and obtain suggestions to improve the program's services and procedures. Interview questions assessed market barriers to high efficiency gas water heaters and participant satisfaction. Survey results were used to guide the process evaluation in terms of investigating operational characteristics of the program and developing specific recommendations to help make the program more cost effective, efficient, and operationally effective. The process survey instruments are provided in Appendix A.

3.2.1 Participant Survey Results

Participant process survey results are summarized to answer the following questions from the CPUC-approved EM&V plan.

1. **Are distributors satisfied with services or information provided by the program?**
   Participant satisfaction was very high as indicated by the following survey responses. Results indicate that energy education efforts could be improved.
   - Overall Satisfaction with Program – 97% ± 0.2% satisfaction rating (i.e., average score of 9.7 out of 10 points).
   - Courteous and Professional Crew – 94% ± 0.3% satisfaction rating (i.e., 9.4 out of 10).
   - Timeliness (i.e., work scheduled and completed on time) – 100% satisfaction rating (average reported time to receive the rebates was 2.7 weeks).

- Increased Understanding of Link between Energy Efficiency, Savings, and Comfort – 12.5% ± 0.2% indicating that energy education efforts could be improved.
- Participating distributors indicated high efficiency water heater sales increased by an average of 16.7% ± 8.4% due to the ADM incentive program.

2. Are distributors satisfied with the program?

Customers were very satisfied with the incentives that the ADM program offered as indicated by the following ratings.

- 100% of distributors would participate in the program if it were offered in the future.
- 100% of distributors will continue to stock high efficiency units in the future.
- 100% of distributors will continue to recommend high efficiency units to customers in the future.
- 100% of distributors stated that all other distributors could benefit from the ADM Water heater Incentive Program.

3. Are distributors satisfied with services or information provided by the program?

Distributor satisfaction with the services or information provided by the program is indicated by the following customer ratings.

- 97.5% ± 0.2% usefulness of the ADM Water heater Incentive Program.
- 97.0% ± 0.2% presentation of the ADM Water heater Incentive Program.

4. What are market barriers of the ADM Water heater Incentive Program?

Distributors were asked to respond to a series of statements regarding market barriers.

- 61% ± 0.7% of their customers (i.e., plumbers) made the decision regarding the type of water heater purchased.
- 50% ± 0.7% of their customers are more concerned with warranty than energy efficiency.
- 72% ± 0.5% of the time distributors provide comparable information to customers for both standard and high efficiency water heaters. Distributors often try to steer customers into purchasing high efficiency units because most of the time high efficiency units have less operational problems later.
- 99% ± 0.1% of interviewed distributors were very aware of high efficiency water heaters.
- All interviewed distributors consider “high efficiency water heaters” to have an energy factor of 0.61 or higher.
- All interviewed distributors were very aware of the fact that the higher initial cost of a high efficiency water heater would be recovered within a few years through lower gas bills. Distributors recommend high efficiency water heaters to their customers 88% of the time. The reason that distributors do not always not recommend high efficiency units is because the standard units are often smaller and will fit into smaller spaces if there is a limited amount of room.
- Distributors stated that it was almost always just as easy to order and obtain high efficiency units as standard units.

5. Do distributors have any suggestions to improve the program?

62.5% of participants provided comments or suggestions to improve the program.

- 33% said “great program, program was easy to work with”.
- 27% said “great staff, friendly and informative”.

- 27% said that they would like the program to continue.
- 20% said that ADM could have advertised better.
- One distributor said that he would like to receive rebates for new construction as well as for retrofits.

6. Did participating distributors share information with business associates about the benefits of measures offered by the program (i.e., multiplier effects)?

- 83% of participants interviewed (20 out of 24) shared information about the benefits of high efficiency water heaters with businesses associates. The interviewed participants shared information about the program with an average of 5 business associates. Most of these informed business associates decided to stock and promote high efficiency water heaters, but we were unable top verify this due to budget limitations.

3.2.2 Non-Participant Survey Results

Non-participant process survey results are summarized to in order to answer the following questions from the CPUC-approved EM&V plan.

1. Is there a continuing need for the program?

The study assessed the continuing need for the program by analyzing cost effectiveness under the new US Department of Energy gas water heater efficiency standards effective January 20, 2004 after the program ended. With higher minimum efficiency levels, the savings per unit for future programs would be lower (see **Table 3.7**). Conservatively assuming the same quantity of rebated high efficiency water heaters in 2002-03, the program TRC test is 1.3 under the new USDOE standards and the program would still be cost effective. However, since future programs would focus incentives on higher efficiency units (i.e., 0.62 EF or greater), the TRC test for future programs could potentially be greater than 2. The following process survey responses indicate a continuing need for the program.

- 100% of non-participant distributors are familiar with high efficiency water heaters.
- 80% ± 0.3% of non-participant distributors stock and recommend high efficiency water heaters to their customers.
- 68% of the water heaters that the non-participant distributors stock are high efficiency units, but these were mostly for new construction (i.e. having an energy factor of .61 or higher). One distributor only stocked standard efficiency units, and plumbers generally purchase standard efficiency units for retrofit applications.

2. Why have distributors chosen not to participate (i.e., market barriers)?

- 20% didn't know about the program (i.e., information cost barrier).
- 20% didn't participate because they didn't have time to consider the program or understand high efficiency water heaters (i.e., hassle cost).
- 20% didn't participate because the program incentive process was too complicated to participate (i.e., information cost).
- 20% didn't participate because they felt that they didn't sell enough water heaters to make filling out the paperwork worth their time (i.e., hassle cost).
- 10% didn't participate because the distributor stocks only standard efficiency units due to customer demands for lower priced units (i.e., organizational practices).
- 10% didn't participate because the customers make the purchasing decisions and don't seem to care about efficiency (misplaced or split incentive).

The most often cited barriers to participation include information costs, misplaced or split incentives, hassle costs, information costs, and organizational practices.

3. **Do non-participants have any suggestions to improve participation?**
   - 20% of non-participants suggested better advertising might have helped.
   - One non-participant said that he would like the program to consider offering incentives for tankless water heaters.

The following section provides process evaluation recommendations to improve the program.

3.2.3 Process Evaluation Recommendations

The following process evaluation recommendations are provided as per the CPUC-approved EM&V plan regarding what works, what doesn't work, and suggestions to improve the program's services and procedures.

3.2.3.1 General Program Recommendations

The following general program recommendations are provided to improve the program's services, procedures, and cost effectiveness.

1. Improve the program tracking database and quality control (QC) procedures to screen non-qualifying units (i.e., EF < 0.61).
2. Participants provided the following suggestions to improve the program.
   - Better advertising through telephone, email, mail, newspapers, or television will increase participation. Advertising should explain the benefits of high efficiency gas water heaters offered by the program.
   - Better coordination with utility programs and Flex Your Power to gain more support for the program and greater demand and consumer awareness.
   - One distributor said that he would like to receive rebates for new construction as well as for retrofits.

3.2.3.2 Recommendations for Database

Improve the program tracking database and implement quality control (QC) procedures to screen non-qualifying units (i.e., EF < 0.61). Tracking and reporting of program accomplishments is vital since without an accurate and reliable database the program cannot be properly evaluated.

3.2.3.3 Recommendations for Marketing

Develop a list of qualifying water heaters (i.e., ≥0.60 EF) to assist distributors in marketing the program.

Appendix A: Process Survey Instrument

1. Purpose

The purpose of the Process Survey is to evaluate what works, what doesn't work, customer satisfaction, and suggestions for improvement in the program's services and procedures. Complete at least 24 participant and 5 non-participant surveys.

2. Selection of Respondent

Surveys will be randomly selected from the list of participating and non-participating wholesale water heater distributors.

1. **Participants** must be the person responsible for deciding to sell high efficiency water heaters from the wholesale facility. If this person is unavailable locate someone who is at least familiar with how that decision was made.
2. **Non-participants** must be a water heater wholesale distributor who was unaware of the program, did not distribute high efficiency water heaters or decided not to participate in the ADM incentive program.

3. How to Start a Survey
Complete the following steps to start one of these surveys:

1. Review ADM customer file information (for participants).
2. Make sure you understand the make, model, size, rated efficiency, and number of water heaters installed prior to initiating the call.
3. Participant Survey Introduction.
   Say: "Hello! My name is [_____], and I am conducting a survey regarding the ADM Upstream High Efficiency Gas Water Heater Program. The program provided incentives for high efficiency water heaters at wholesale distributors. Funding for the program came from the California Public Utilities Commission. Would you mind spending 10 minutes to answer a few questions to help us evaluate and improve the program?
4. Non-participant Survey Introduction.
   Say: "Hello! My name is [_____], and I am conducting a survey regarding the ADM Upstream High Efficiency Gas Water Heater Program that was funded by the California Public Utilities Commission in 2002 and 2003. You didn't participate in the program, but your feedback will help us evaluate and improve the program. The program provided rebate incentives for 30, 40, or 50 gallon high efficiency gas water heaters at a rated efficiency of .61 and higher: Would you mind spending 5 minutes to answer a few questions?

ADM PARTICIPANT SURVEY #_____

Wholesaler_____ Name _____ Title _____

Address _____ City _____ ZIP _____

Phone Number_____ Survey Date _____Surveyor Initials _____

Participant Survey Process Evaluation Questions

1. Do you remember receiving incentives from ADM for selling high efficiency gas water heaters?
   ___ **1** (Yes) ___ **2** (No) **98** Don't Know **99** Refused to Answer
2. How did you learn about the ADM Water Heater Incentive Program?
   __ **1** (Referral) __ **2** (ADM) __ **3** (Contractor) __ **4** (Other Distributor) __ **5** (Manufacturer) **98** DK **99** Refused
3. How would you rate the ADM staff in terms of being courteous and professional on a scale from 1 to 10?
   ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer
4. Were incentives processed and paid within a reasonable timeframe?
   ___ **1** (Yes) ___ **2** (No) **98** Don't Know **99** Refused to Answer
5. How long did it take to get your incentives after you submitted your application?
   ___ 1 wk ___2 wks ___3 wks ___4 wks ___>4 wks **98** Don't Know **99** Refused to Answer
6. How would you rate the ADM Water heater Incentive Program in terms of usefulness on a scale from 1 to 10?
   ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer
7. How would you rate the ADM Water heater Incentive Program in terms of presentation on a scale from 1 to 10?
   ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer
8. How would you rate the ADM Water heater Incentive Program overall service on a scale from 1 to 10?
   ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer
9. How would you rate the program in terms of increasing your understanding of the linkage between energy efficiency and bill savings on a scale from 1 to 10?
   ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer
10. Would you participate in the program if it were offered in the future?
    ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer
11. Will your company continue to stock high efficiency water heaters in the future without incentives?

    ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer
12. Will your company continue to recommend high efficiency water heaters in the future without incentives?

    ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer
13. Have you shared information with any of your business associates about the benefits of high efficiency water heaters?
    ___ **1** (Yes) ___ **2** (No) **98** Don't Know **99** Refused to Answer

    With how many other businesses have you shared this information in the last 12 months? _____

    About how many of these people have installed any of these measures? _____
14. Do you know any other distributors who might benefit from this program (name/address)? _____

    _____

ADM PARTICIPANT SURVEY (cont'd) #_____

I will now read eight (market barrier) statements and ask you to respond to each one on a scale of 1 to 10, where 1 is strongly disagree and 10 is strongly agree. Here is the first statement.

15. My customers usually make the decision regarding type of water heaters to purchase.
    ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer

16. My customers are more concerned about warranty than efficiency.
    ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer

17. I provide comparable product information to customers for both standard and high efficiency water heaters.
    ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer

18. I am very aware of high efficiency gas water heaters.
    ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer

19. I consider any gas water heater with an Energy Factor (EF) rating of 0.61 or above a high efficiency model.
    ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer

    Ask the following question only if response to above question is 3 or less.
    19b. What rating level (i.e., energy factor) or scale (therms, etc.) do you use to determine high efficiency?
    _____

20. The additional cost to purchase a high efficiency gas water heater (rather than standard efficiency) can be recovered within a few years through lower gas bills.
    ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer

21. I recommend high efficiency gas water heaters to my customers.
    ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer

22. High efficiency gas water heaters are easy to order and obtain from my suppliers.
    ___ Response (**1 is low and 10 is high**) **98** Don't Know **99** Refused to Answer

23. Do you have any suggestions to improve the program?
    ___ **1** (Yes) ___ **2** (No) **98** Don't Know **99** Refused to Answer

    If so, please provide the suggestion(s). _____

ADM NON-PARTICIPANT SURVEY #_____

Wholesaler_____ Name _____ Title _____

Address _____ City _____ ZIP _____

Phone Number_____ Survey Date _____Surveyor Initials _____

Non-Participant Survey

Surveys will be randomly selected from a list of non-participants.

Say: I "Hello! My name is [_____], and I am conducting a survey regarding the ADM Upstream High Efficiency Gas Water Heater Program that was funded by the California Public Utilities Commission in 2002 and 2003. You didn't participate in the program, but your feedback will help us evaluate and improve the program. The program provided incentives for 30, 40, or 50 gallon high efficiency gas water heaters at a rated efficiency of .61 and higher: Would you mind spending 5 minutes to answer a few questions?

1. Are you familiar with high efficiency water heaters (i.e., 0.61 energy factor or better)? Energy Factor (EF) is a measure of the overall efficiency of a water heater determined by comparing the energy supplied in heated water to the total daily consumption of the water heater (see GAMA Directory, pages 131-133).
   ___ **1** (Yes) ___ **2** (No) **98** Don't Know **99** Refused to Answer

2. Do you **stock** high efficiency water heaters with an energy factor of 0.61 or higher?
   ___ **1** (Yes) ___ **2** (No) **98** Don't Know **99** Refused to Answer

3. Do you **recommend** high efficiency water heaters with an energy factor of 0.61 or higher?
   ___ **1** (Yes) ___ **2** (No) **98** Don't Know **99** Refused to Answer

4. Approximately what percentage of the water heaters you stock are high efficiency units?
   _____% **98** Don't Know **99** Refused

5. Please tell me why you choose not to participant in the program: (Read list – Multiple answers are okay.)
   1 Didn't know about the program (i.e., information cost).
   2 Would you have participated if the program had better marketing, design, implementation, delivery and follow-up efforts (i.e., information cost)?
   ___ **1** (Yes) ___ **2** (No) **98** Don't Know **99** Refused to Answer
   3 Didn't understand energy savings benefits of the program or incentive process (i.e., performance uncertainty).
   4 Didn't have time to consider the program or understand high efficiency water heaters (i.e., hassle cost).
   Would you have participated if someone else you know (i.e., an employee) had taken time to help you participate (i.e., apply for an incentive)?
   ___ **1** (Yes) ___ **2** (No) **98** Don't Know **99** Refused to Answer
   5 Program incentive process was too complicated to participate (i.e., information cost).
   6 Normally stock standard efficiency units due to demand for low cost (i.e., organizational practices).
   7 Customers care more about warranties than efficiency (i.e., inseparability of product features).
   8 Customers make purchasing decision and don't seem to care about efficiency (misplaced or split incentive).
   9 Other _____
   98 Don't Know **99** Refused to Answer

6. Do you have any suggestions that might have helped you participate in the program?
   ___ **1** (Yes) ___ **2** (No) **98** Don't Know **99** Refused to Answer
   If so, please provide the suggestion(s). _____