Single-Family Residential Existing Construction Stock Assessment

Market Research Report

PREPARED BY

RLW Analytics

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www.nwalliance.org

529 SW Third Avenue, Suite 600
Portland, Oregon 97204
(tel) 503-827-8416 (fax) 503-827-8437

SINGLE-FAMILY RESIDENTIAL EXISTING CONSTRUCTION STOCK ASSESSMENT

Final Report

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Prepared for:

Prepared by:

RLW ANALYTICS

1055 Broadway, Suite G

Sonoma, CA 95476

Table of Contents

List of Tables

Executive Summary

This document is the final report for the Single-Family Residential Existing Construction Stock Assessment. The study was sponsored by the Northwest Energy Efficiency Alliance and was conducted by RLW Analytics.

The report characterizes single-family residential existing construction using a sample of buildings surveyed in 2004 through 2006 as part of NEEA's Distribution Efficiency Initiative program. The results of this study are expected to serve as a basis for planning, forecasting, and program development initiatives by various entities in the region.

Background

The Northwest Energy Efficiency Alliance (NEEA) is currently funding the Distribution Efficiency Initiative (DEI) project. The ongoing DEI research calls for allocating total energy consumption for each home into end use shares for the major end uses: cooling, heating, lighting, etc. to determine the impact of the voltage regulation on end use energy consumption. In order to estimate changes in *end use* energy consumption, the team first needed to understand the proportion of energy within each end use for each home. End use data are not collected by the utilities, therefore the only way to obtain these data was to perform some primary data collection.

Throughout 2004-2006, RLW performed 489 audits at single-family homes in the territories of utilities participating in DEI. This sample will primarily be used for the DEI project to assess demand-side impacts of voltage regulation, but in addition, the data can establish a baseline of Pacific Northwest residential building stock characteristics for single family homes.

Data collected during the on-site visits included general demographic information as well as the end use characteristics of refrigerators, stoves, water heaters, HVACs, and other appliances. The quantity, age, size, fuel type, and types of controls for appliances were recorded and a detailed lighting inventory was performed.

A total of 489 DEI sites were completed at the time the study began in late 2006, 91 of which are no longer qualified for participation in DEI but can be included in the stock assessment. The information from the 489 dwelling units was sufficient to provide statistically valid characteristic information on the existing residential sector in the PNW.

Objectives of the Project

The objectives of this project were to obtain a view of the current state of the construction characteristics in the existing residential market by understanding the saturation levels of energy using equipment and lighting. All of this information was needed to support NEEA's planning, project development, monitoring and evaluation needs. A project assessing residential new construction built in 2004 and 2005 was conducted concurrently with this study. A few comparisons between the two projects can be found in the body of this report, however a detailed comparison was not in the scope of this study.

Approach

Customers were recruited to participate in the study by phone for Washington and Idaho and by mail for Oregon. Each participant was paid $25 for agreeing to allow an on-site surveyor to visit their home to gather the required information. The on-site survey was implemented using handheld personal digital assistants (PDAs) and an application for collecting the specified information. A total of 489 single-family on-site surveys were completed between 2004 and 2006.

While on site, the surveyors collected data on the major appliances in the home: Refrigerator-Freezers, Dishwashers, Clothes Washers, Clothes Dryers, Water Heaters, Heating Equipment, Spa/Pool Equipment, and Cooling Equipment. Data on thermostats, large appliances, and consumer electronics were also gathered. The surveyors collected lamp fixture and wattage data for each lighting fixture within the home, including the front porch fixture. The surveyors also collected data on attic, floor and wall insulation R-values, wall construction, and window types, as well as demographic data.

The data underwent quality control measures and appliance model numbers were matched to databases of appliance efficiencies. RLW used data sources from the California Energy Commission (CEC), the Air-Conditioning and Refrigeration Institute (ARI), Association of Home Appliance Manufacturers (AHAM), and more. Once the model numbers were linked, the corresponding efficiency was assigned to the matched appliance.

The appliance and equipment efficiency findings presented in this report do not account for degradation. Most appliances (if not all) have been shown to degrade over time, the result of which can affect performance and energy efficiency. The efficiency information presented in this report is based on manufacturer compliance testing of new products to federal appliance and equipment standards. Therefore, efficiency data presented in this report is conservative since efficiency values are based on manufacturer tested performance.

The analysis for lighting and appliances is summarized in this report at the regional level. Each site was given its appropriate case weight to project to the population or various subsections of the population in the PNW. The report contains numerous data queries, which for the most part are summarized by efficiency, size, and capacity bins.

Key Findings

This section summarizes some of the more interesting findings that occurred at the regional level. Findings are grouped by appliance and equipment type, lighting, and building characteristics. Readers can find additional information and details on lighting and appliances in the detailed sections of the report.

Lighting

The data collection parameters included a collection of fixture type, number of lamps, lamp technology type and lamp wattage (when accessible). All of the indoor lighting data were characterized by room type.

On average, homes have 37 fixtures and 62 lamps. Ceiling fixtures account for 33% of all fixtures. Approximately 21% of homes have a torchiere.

Sixty-three percent of all homes have one or more CFL installed. This is slightly higher than the saturation in residential new construction at fifty-two percent. Almost 8% of all lamps are compact fluorescent; this is the same percentage for both existing and new homes. Of the numerous types of CFLs, spring lamp styles are the most common. On average, 9% of all fixtures have at least one CFL. Although ceiling fixtures are the most common fixture type, table lamps, floor lamps and torchieres are most likely to contain a CFL. The most common room types to have a CFL are bedrooms and living rooms. About 30% of bedrooms and 28% of living rooms contain a CFL.

General Characteristics

Forty-seven percent of the homes were two or more stories. Almost 40% of the residences were occupied by two people. The majority of homes are between 1,000 and 3,000 square feet.

Refrigerators

Data were gathered for primary, secondary, and tertiary refrigerators. The number of homes with a second refrigerator is 33.8%. The percentage of homes with three refrigerators is 2.5%.

The study found that 51.5% of primary refrigerators were reported to be less than six years old. Based on manufacturer's data obtained through the model number matching process and during the on-sites, the overall average age of refrigerators is 7.6 years.

The overall average nameplate UEC for primary refrigerators is 792.9 kWh/year. Overall, 6.3% of all primary refrigerators qualify with the 2004 ENERGY STAR® standards, while 15.2% of all refrigerators meet or exceed the 2001 ENERGY STAR® standards.

The average age of secondary refrigerators is 14.9 years. In terms of nameplate UEC, the secondary refrigerators use 816 kWh/yr. On average, secondary refrigerators are 4 cubic feet smaller than primary refrigerators (21.5 vs. 17.9).

Clothes Washers

All homes have a clothes washing machine. Nineteen percent of all machines are horizontal-axis, 81% are top loading. Fifty-six percent of washing machines are less than six years old, while 80% are less than eleven years old. The average washing machine age is 15.5 years old.

In 2004 federal standards switched from rating clothes washer efficiencies from Energy Factor (EF) units to Modified Energy Factor (MEF) units. The average MEF for standard washing machines is 1.5, while horizontal-axis units have an average MEF of 1.8.

Clothes Dryers

Overall, almost all homes have a clothes dryer. As one would expect, this saturation estimate closely compares to the saturation of washing machines. Clothes dryer fuel types observed are 89% electric, 10% gas and less than 1% are propane. The average age of clothes dryers is 8.3 years old.

Water Heaters

Data were gathered on many water heater characteristics, including system type, size, age, efficiency, fuel type, output, and insulation. The most common system types (53.8%) are electric storage systems. Gas is the next most common storage system

with 45.6%, while propane accounts for less than 1% of systems. This is quite different from new construction where 80% of all water heaters use gas storage

The average energy factor (EF) for 40 gallon gas water heaters is 0.57. This compares closely to the current federal standard for 40 gallon systems of 0.59. The average EF for electric water heaters is 0.89, which is consistent with the current federal standard for 50 gallon systems of 0.90.

Cooling Systems

Over half (61%) of all homes had some type of cooling system. The majority of cooling systems were central systems (82%). Split-system central air-conditioners are the most common AC type. This system type represents 54% of all central cooling systems, while heat pumps comprise 39% of central systems with packaged systems constituting the remainder of AC types.

The most common central air-conditioner size with 30% of the total is the 3-ton category, with the 4-ton category comprising the next most common size. About 55% of all central air-conditioners fall within the 3-4.5 ton capacity range. Of the 209 central systems surveyed, 141 units were matched to an efficiency database for determining the SEER. The findings show that 11% of all units are SEER 13 or greater. The majority of units, 70%, fell within the 10-10.99 SEER range, while no units were found to have a SEER rating of 9 or less.

Heating Systems

The study results show that 47% of homes have one heating system, 44% have two systems, and 9% have 3 systems or more. The most common heating system type is central system forced air furnaces (63%), followed by central heat pumps (14%). The primary heating fuel is natural gas (49.6%), followed by electric systems (41.1%). About 6.1% of primary heating systems are pellet stoves, another 1.2% are propane, and 2.0% are Fuel Oil.

The average Annual Fuel Utilization Efficiency (AFUE) for gas forced air heating systems is 82. Seventy-six percent of all central systems fall between 78-85 AFUE.

Dishwashers

Approximately forty homes that we visited did not have a dishwasher. The current average EF for dishwashers is 0.51, greater than the current federal energy standard (0.46), but less than the minimum ENERGY STAR® qualification (0.58), which is set 25% higher than the federal standard. Of the dishwashers matched in our efficiency databases, 21% met or surpassed the ENERGY STAR® threshold, while all but 11% were better than the federal energy factor requirement.

Windows

The saturation of double pane windows is 82%, with 0.2% of homes having triple pane, and the remainder of homes having single pane. Field surveyors carried low-e detectors for determining the presence of low-e coatings. Overall, 36% of homes have low-e windows.

Study Limitations

For the most part, all of the data the study aimed to collect through the on-site surveys were easily obtained. It should be noted that the SEER value was obtained from the

various efficiency databases based on the model number of the condensing unit. The evaporator coil has an impact on the overall SEER of the system, but gathering information on the evaporator coil involves additional effort on the part of both the surveyor and especially the analyst, as there is no available database that enables large scale matching of condenser and evaporator units. The AC SEER value was obtained from efficiency databases based on the *condensing* unit model number. However, the databases that were used in the matching process use an average SEER value of common condenser/evaporator combinations, and therefore provide a relatively accurate representation of the efficiency of the cooling systems observed.

Wattage was difficult to collect in some circumstances. Although surveyors were trained to remove luminaire covers if easily reachable and removable, approximately 10% of surveyed fixtures were inaccessible due to height, delicate fixture enclosures, or homeowner preference. For these lamps with unknown wattages, RLW calculated the missing wattages based on average values in other homes with identical fixture types in similar room types.

The databases used for appliance matching were a study limitation. For example, dryer efficiencies were very difficult to match due to the lack of a comprehensive dryer efficiency database. The CEC has recently begun to compile a list of dryer efficiencies, but only 4% of the 468 dryers that model numbers were collected for were in the database. More discussion on the model number matching is in the Introduction.

None of the appliance efficiency databases (i.e., CEC, AHAM, ARI) used for efficiency matching accounted for efficiency degradation over time. Appliance efficiencies were based on the manufacturer's test data at the time of manufacture. However, over time appliances and equipment degrade due to various factors that can affect operational performance. Considering this, the efficiencies of matched appliances, particularly of older appliances, most likely were less efficient than what was reported here considering no attempt was made to adjust for efficiency degradation.

The RLW surveyors faced many obstacles when trying to determine insulation levels since the homes were completely finished and occupied. In many instances, the surveyors had to make assumptions about the insulation.

There were a number of issues that complicated the recruiting for the DEI study that affected the homes that were included in DEI and therefore this study. These restrictions should be considered when utilizing this study's findings.

- The prime contractor for the DEI project recruited utilities to participate in the DEI project. The idea was to include a balanced representation of different types of utilities in the region that adequately represented the utilities in the surrounding areas, while controlling for east and west of the Cascades. However, the team was not able to be as geographically selective as originally planned since utility participation was much harder to secure than originally anticipated. Utility participants signed on to participate in the study over the course of a couple of years. As a result, RLW performed individual sample designs for each utility from the utility service territories. The DEI sample did not capture sample points from all regions in NEEA territory. No Montana utilities were included in DEI and therefore this study. The sampled utilities were recruited geographically and ultimately utilities were included in the study if they

were willing to participate. These sites were used to represent sites throughout the region.

- The DEI study only included residents that planned to stay in their homes for the 18 month duration of the study.
- The study only included primary residences with phone lines that allowed for 1-800 calls to be placed.
- The DEI study required a dirt surface below the electric meter and room within 2 feet on either side of the meter with 6 inches to 1 foot of space from the house or building. These requirements were needed to install either a 4x4 post, a 2-1/2 inch diameter steel post, or a steel fence post for the installation of a home voltage regulator. This requirement prevented the participation of homes with concrete aprons or decks near their meters. Additionally, the regulator equipment required a utility s-base meter and 120/240 volt Class 200 amp service for installation.
- The phone box and meter phone box at the sampled residences had to be within 50 feet of each other or on the same side of the house.
- Residents had to agree to have their power disrupted for 10 minutes to complete the installation.
- In Oregon, due to customer confidentiality requirements, opt-in postcard mailers were used to recruit customers, resulting in lower response rates than phone recruitment.
- Customers with locked gates were dropped by some utilities due to access issues.
- In Oregon, participants were required to have grounding rods installed in their homes in order to be considered for the study. Newer homes tended to be constructed with grounding rods.

While these recruiting restrictions were substantial, we did perform some checks for bias against secondary data sources. We compared the average annual kWh for the sampled sites by utility to the average annual kWh from the 2005 Residential Sales data from the NW Power Conservation Council and the averages were similar. We also compared the income distribution to Census 2000 data for the region and the homes in this study had a slightly higher income than the Census data by a small margin. Additionally the margin was not significantly different than income differentials between sampled and Census averages that we have observed in other research studies.

Table 1 presents a comparison of the average usage per customer in the DEI data to the 2005 residential sales and climate zone assignment data for all PNW utilities[1], post-stratified by kWh. The usages are relatively similar for all the utilities, with the exception of Hood River. Hood River opted to select the customers to participate in the study without RLW's assistance.

[1] Obtained from Tom Eckman in December 2006 (PNWResdentialSales&ClimateZones.xls).

Source:	2005 residential sales data	DEI study
Utility	**Average Use/Customer**	**Weighted Average Annual kWh**
Puget Sound Energy Inc	11,574	10,935
Portland General Electric Company	10,768	11,929
PacifiCorp	12,016	13,275
Idaho Power Co	12,742	12,860
PUD No 1 of Snohomish County	11,686	13,085
City of Eugene	12,758	15,501
City of Idaho Falls	13,146	14,120
PUD No 1 of Franklin County	14,503	14,083
PUD No 1 of Douglas County	22,943	23,323
PUD No 1 of Skamania County	13,580	15,870
Hood River Electric Coop	15,576	10,000

Table 1: Average Annual kWh per Customer

Table 2 shows a comparison of the income distribution for the DEI sample to Census 2000 data for the region. The homes in the DEI study had a slightly higher income than the Census data.

Total Household Income	DEI % of Homes	Census % of Homes
<$25,000	7%	27%
$25,000-$50,000	24%	28%
$50,001-$75,000	27%	20%
$75,001-$100,000	20%	11%
>$100,000	22%	14%

Table 2: Percentage of Homes by Total Household Income

Introduction

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The report characterizes single-family residential existing construction using a sample of buildings surveyed in 2004 through 2006. The results of this study are expected to serve as a basis for planning, forecasting, and program development initiatives by various entities in the region.

Objectives of the Project

The objectives of this project are to obtain a view of the current state of the characteristics in the existing residential market by understanding the saturation levels of energy using equipment and lighting. All of this information is needed to support NEEA's planning, project development, monitoring and evaluation needs.

Approach

A sample of residential accounts of the utilities participating in the DEI pilot study were selected to represent existing construction in the Pacific Northwest for the DEI study. Customers were recruited to participate in the study, and each participant was paid $25 for agreeing to allow an onsite surveyor to visit their home to gather the required information. The onsite survey was implemented using IPAQ hand held personal digital assistants (PDA) and a specially designed application for collecting the specified information. A total of 489 single-family on-site surveys were completed between 2004 and 2006.

While on-site, the surveyors collected data on the major appliances and lighting systems in the home. The surveyors collected nameplate data for the following appliances:

- Refrigerator-Freezer
- Dishwashers
- Clothes Washers and Dryers
- Water Heaters
- Heating Equipment
- Cooling Equipment
- Pool and Spa Equipment
- Large appliances
- Plug Loads
- Thermostats

For lighting, the surveyors collected lamp, fixture, and wattage data for each lighting fixture within the home, as well as the front porch fixture. The on-site surveyors also collected data on attic, floor, and wall area, insulation R-values, wall construction, and

window types. The survey also included a brief set of demographic and socioeconomic questions.

As the data were collected, the surveyors uploaded the site data from the PDA units to RLW's SQL database. The data underwent quality control measures and model numbers were matched to databases of appliance efficiencies. RLW used databases from a similar California study, in addition to new data sources, including CEC, ARI, AHAM, and more. Once the model numbers were linked, the corresponding efficiency was assigned to the matched appliance. Matching rates varied greatly by appliance type and age. In most cases this was a result of the comprehensiveness of the efficiency databases that were available for each appliance. In order to account for the uneven match rates of some models we calculated adjusted weights for the appliance efficiency data. This weighting adjustment to the appliance data is performed on baseline studies for existing homes in order to remove the upward bias in efficiency due to the lower matching rates for older models.

Table 3 presents the results of the model number matching for each appliance that we collected data for. The tables contain the following data in the same column order as listed below:

- Name of appliance,
- Number of each appliance found during all on-site visits,
- Number of model numbers found for each appliance,
- Percentage of model numbers that surveyors were **able** to identify on-site,
- Number of model numbers matched to efficiency database(s),
- Percentage of model numbers matched among **all** appliances recorded,
- Percentage of model numbers matched among appliances with model numbers.

For example, we recorded the presence of 684 refrigerators. During the on-site surveys, the surveyors were able to locate model numbers for 614 of the refrigerators, or 90% of all refrigerators.

When the data were aggregated at RLW's offices and linked to the refrigerator efficiency databases, only 471 of the 614 (77%) refrigerators with model numbers were matched. Another way to look at the match rate is to consider the percentage of the *total* number of refrigerators (684) that were successfully matched (471), which for refrigerators was 69%. This statistic combines the success rate of the matching with the success of the auditors in collecting model numbers. A high match rate among the units with model numbers collected is less meaningful if the auditors were only able to collect data on a handful of units.

Appliance/ Equipment	Total Number in Database (A)	Model Numbers Found (B)	% of Appliances with Model Number (B/A)	Model Numbers Matched (C)	% of All Appliances Matched (C/A)	% of Appliances with Model Numbers Matched (C/B)
Cooling	521	269	52%	167	32%	**62%**
Refrigerator	684	614	90%	471	69%	**77%**
Water Heat	522	452	87%	318	61%	**70%**
Washer	489	422	86%	129	26%	**31%**
Dishwasher	450	420	93%	109	24%	**26%**
Dryer	489	468	96%	20	4%	**4%**
Heating System Fuel	**Total Systems**	**Model Numbers Known**	**% of Systems with Model Number**	**Total Matched and Known Efficiency**	**% of All Appliances Matched**	**% of Systems with Model Numbers Matched**
Electric	364	200	55%	46	13%	**23%**
Gas	270	187	69%	143	53%	**76%**
Propane	37	15	41%	8	22%	**53%**
Total Heating	671	402	60%	197	29%	**49%**

Table 3: Model Number Match Rates by Appliance

Based upon our experience from previous studies, we anticipated that the match rates would approximate what are shown in the table above. We knew that matching model numbers to appliance databases would be a long process. One of the problems was that wildcards (*, /, #, etc.) are often included in the model number. The wildcards add to the complexity of the query designs and decrease match rates. The "layered" queries that we built searched several databases for matching model numbers. Once the automated process was complete, a manual process of looking up the unmatched appliances was undertaken.

Efficiency databases were exhausted using the above protocols for matching appliances. RLW is confident that the great majority of model numbers found on-site were matched if they appeared in any of the efficiency databases. The problem with the low matching rates lies in the efficiency databases themselves. Simply put, much of the equipment found in the field is not documented in publicly or privately available efficiency databases. Furthermore, the private data such as the refrigerator-freezer data that were purchased from AHAM were not in the best condition, and somewhat partial in content.

The analyses of lighting and appliances summarized in this report are at the regional level. Each site was given its appropriate sampling weight to project to the population or various subsections of the population. Analysis queries were written in MS Access and processed using RLW's Model Based Statistical Sampling (MBSS) software. The report contains numerous data queries, which for the most part are summarized by age bins, efficiency bins, size bins and capacity bins.

Sample Design

This chapter describes the calculation of case weights for the Single Family Residential Existing Construction Stock Assessment.

DEI Sample Selection

The Home Voltage Regulation (HVR) portion of the DEI project targeted a representative sample of homes throughout the Pacific Northwest. The primary goal of the load research sample design was to select the most efficient sample for estimating the average voltage and change in voltage, stratified by annual energy consumption. The research was designed to install voltage regulators at a collection of homes across multiple utility service territories in the Pacific Northwest. To calculate the average voltage reduction across a collection of homes in the region, the actual voltage reduction at each home was planned to be weighted by the annual energy consumption of each home.

The prime implementation contractor for the DEI project recruited utilities to participate in the DEI project. The idea was to include a balanced representation of different types of utilities in the region that adequately represented the utilities in the surrounding areas. However, the team was not able to be as geographically selective as originally planned since utility participation was much harder to secure than originally anticipated. Utility participants signed on to participate in the study over the course of a couple of years. As a result, RLW performed individual sample designs for each utility. Ideally, the homes would have been selected from one large sample frame that contained a record for each residence in the region. This was not possible since utilities signed on over such an extended timeframe.

Eleven utilities opted to participate in the load research study. RLW contacted each utility and requested a random extract of around 2,000 single-family residential accounts and the following information for each account:

- 1-yr of kWh billing data
- Heating type (if available)
- Contact information (name, phone, service and billing address)
- Filtered for: primary residences and S2 meter sockets

We planned to sample the residences in a similar proportion to heating types found in the Census PUMA data, however we were unable to obtain the heating type from all but one utility. The sample was ultimately stratified by annual energy consumption for all but the one utility that provided us heating fuel type. For this utility we were able to stratify by fuel type and annual kWh.

Table 4 shows the number of completed audits by utility.

Utility	Current HVR Goal	Valid Audits for HVR study	Dropped Audits	Total Audits
Douglas	49	49	9	58
EWEB	**46**	46		46
Franklin	25	25	8	33
HoodRiver	25	25	2	27
Idaho Power	75	53	7	60
IdahoFalls	25	7	20	27
PacifiCorp-Bend	25	25		25
PacifiCorp-Medford	10	10		10
Portland General Electric	44	44	4	48
Puget Sound Energy	45	45	3	48
Skamania	25	25	15	40
Snohomish	50	50	17	67
TOTAL	**444**	**404**	**85**	**489**

Table 4: Number of Audits by Utility

Weighting Methodology

Once a sample is selected it must be weighted in order to project the sample data to the population at large and arrive at results indicative of the whole region. There are two steps in the case weighting process:

1. **Post-stratify the sampled sites to the utility sub-populations**: This step was performed in order to ensure that the sites sampled from each utility were representative (in terms of kWh) of the utility populations from which they were selected. This step resulted in the first stage case weights.
2. **Extrapolate the weighted sample sites to the region-level using 2005 residential sales data and climate zone assignments**: This step was performed in order to project the total sampled sites from all the utilities to the total number of existing residences in the PNW region. The total number of existing residences was estimated as the total number of residential accounts in the region. This step resulted in the second stage case weights. The first and second stage case weights for each site were multiplied together to obtain the final case weight per site.

The details of this two-step methodology are described below.

Step 1: The first stage of case weights projected each utility's sample to the partial population provided to us by each utility by post-stratifying the sample by the annual kWh. This step was performed to ensure that each site was appropriately representing the mix of kWh sizes in the random extract obtained from each utility. By post-stratifying the sites to the utility sub-populations, we obtained case weights that adjusted for any differences in kWh between the sites in the sample and the utility populations. Once these case weights were assigned and applied to the sample, the weighted sample could be considered representative of the utility populations.

The utilities in the sample were classified by size as either 'Self-weighting' or 'Other'. Puget Sound Energy, Portland General Electric, Idaho Power and Snohomish PUD are large utilities and were characterized as 'self-weighting' utilities. All of the remaining sampled utilities were characterized as 'Other' or 'non-self-weighted'.

The case weights of non-self-weighting utilities were further adjusted to normalize or equalize the amount of influence for each utility's sample sites. A simplified version of this adjustment is described below.

There are 8 non-self-weighting utilities shown in Table 5 (Pacificorp is reflected twice for the different regions). Column 2 lists the number of homes in the sample for each utility. Column 3 lists the number of homes in the partial population for each utility from which the sample was drawn.

Using Douglas as an example, there are 58 homes in the sample and 2,785 homes in the partial population from which the sample was selected. The average case weight for each site in the Douglas sample is 48; the population divided by the sample (2,785/58).

For Franklin, the average case weight for each site in the sample is 453 (14,935/33), much larger than the average Douglas weight since Franklin provided us with a larger data extract. In order to treat each case equally, we normalized the population sizes to one utility partial population size. Douglas was chosen randomly as the utility to which to normalize. This was done by applying the following adjustment:

*Adjustment = NA/NB * nB/nA , where*

A= Douglas (all utilities normalized to Douglas)

B=Franklin

N=Partial population size

n=Sample size

These adjustments were applied to each kWh defined stratum for each utility. The weights of the remaining utilities were also similarly adjusted to Douglas. The following table lists the adjustment factors such that the average case weights of all non-self-weight utilities are equal.

Category	Sample Size	Population Size	Adjustment Factor
DOUGLAS	58	2,785	1.00
EWEB	48	1,958	1.18
FRANKLIN	33	14,935	0.11
HOODRIVER	27	27	48.02
IDAHO FALLS	26	5,439	0.23
PACIFICORP -BEND	24	681	1.69
PACIFICORP - MEDFORD	10	682	0.70
SKAMANIA	40	2,761	0.70

Table 5: Adjustments to Non Self Weighting Utilities

Step 2: Step 2 was performed in order to project the total sampled sites from all the utilities to the total number of existing residences in the PNW region. The total number of existing residences was estimated as the total number of residential accounts in the region, obtained from the 2005 residential sales and climate zones data.

The weighted sample and the 2005 residential sales data were divided into four different categories/regions by regional heating and cooling zones in order to ensure that sample

sites representative of climate regions were assigned to represent sites in the same climate region in the population. The sample homes were then weighted to represent the entire population of homes in the region from the 2005 residential sales data. The computation of weights in step 2 is shown below.

These four categories/regions are:

- Heating Zone 1 + Cooling Zone 1 (H1 - C1)
- Heating Zone 1 + Cooling Zones 2 and 3 (H1 - C2/3)
- Heating Zone 2 + Cooling Zones 1, 2, and 3 (H2 - C1/2/3)
- Heating Zone 3 + Cooling Zones 1, 2, and 3 (H3 - C1/2/3)

Table 6 shows the breakdown of the total number of consumers and utilities in each of the four categories.

Category	Total Consumers		Total Utilities	
	N	% of Total	N	% of Total
H1 - C1	2,012,929	40%	41	32%
H1 - C2/3	1,637,832	32%	26	20%
H2 - C1/2/3	1,191,639	24%	49	38%
H3 - C1/2/3	204,268	4%	14	11%
Grand Total	**5,046,668**	**100%**	**130**	**100%**

Table 6: Total Consumers and Utilities in 2005 Residential Sales Data

The above table contains counts of both residential single-family detached homes and multifamily consumers. The Census data show that on average approximately 65% of all homes are single family detached homes. Therefore the total counts of consumers that are reported in Table 1 were multiplied by 0.65 to obtain single family detached homes.

Table 7 presents the classification of each of the 11 sampled utilities into the four categories based on heating and cooling zones.

Category	Sampled, Self-Weighting	Sampled, All Others
H1 - C1	Puget Sound Energy Inc PUD No 1 of Snohomish County	PUD No 1 of Skamania County Hood River Electric Coop
H1 - C2/3	Portland General Electric Comp	PacifiCorp-Medford (0.5) City of Eugene PUD No 1 of Franklin County
H2 - C1/2/3	Idaho Power Co	PUD No 1 of Douglas County PacifiCorp-Bend (0.5)
H3 - C1/2/3		City of Idaho Falls

Table 7: Assignment of Sample Utilities

Table 8 shows the final allocation of all the sampled utilities into the four categories. As can be seen from the table, 11 utilities were sampled out of a total of 130 utilities in the

region[2]. Four utilities in the sample were classified as 'Self-weighting' and the remaining seven utilities were designated as 'Other'. Step 1 of the methodology post stratified the sampled sites into utility sub-populations. For the bigger or the 'Self-weighting' utilities, samples were weighted so that they represent the entire population of the respective utilities straightforwardly. Utilities classified as 'Other', on the other hand, were smaller utilities for which it was inappropriate to implement 'Self-weighting' as above. All homes, for example, were sampled from the partial population of Hood River in the 'Other' category. Each home from each utility was treated equally in 'Other' and weights were adjusted to equalize the amount of influence for each utility's sample sites.

For the self-weighting utilities, each sample point was projected to their full utility population from the 2005 residential sales data. For all other utilities, we normalized the partial populations provided to us for sampling as described in Step 1 and combined the sample points from the utilities into the appropriate categories.

Category	Not Sampled	Sampled, Self-Weighting	Sampled, All Others	Total Utilities
H1 - C1	37	2	2	41
H1 - C2/3	21	1	2.5	26
H2 - C1/2/3	48	1	1.5	49
H3 - C1/2/3	13	0	1	14
Grand Total	**119**	**4**	**7**	**130**

Table 8: Allocated Total Utilities by Heating Zone and Size Classification

The computation of Step 2 weights are shown in Table 9 below. The population counts in each of the categories are presented in Table 9 (Columns (A) and (B)). The weighted sum of the samples from step 1 are also presented in columns named RASS n. The step 2 weights are the ratios of the population counts of residential customers and RASS n in each category – 'Self weighting' and 'All Other'.

	Self Weighting				All Others			
Category	Residential Customers (A)	Single Fam Customers (65% of (A))	Rass n (Weighted Sum)	Average Weight	Residential Customers (B)	Single Fam Customers (65% of (B))	Rass n (Weighted Sum)	Average Weight
H1 - C1	1,166,405	758,163	3,683	206	846,524	550,241	3,217	171
H1 - C2/3	680,093	442,060	1,950	227	957,739	622,530	4,362	143
H2 - C1/2/3	373,603	242,842	893	272	818,036	531,723	3,937	135
H3 - C1/2/3	0	0	0	N/A	204,268	132,774	1,248	106
Overall	2,220,101	1,443,066	6,526	221	2,826,567	1,837,268	12,765	144

Table 9: Case Weights in Step 2

Weights from Step 2 were multiplied to weights computed in Step 1 to determine the final weight of each sample point.

[2] Pacificorp Bend and Pacificorp Medford were grouped as one utility in this count. In the classification presented in Table 8 Pacificorp Bend was classified in the category H2-C1/2/3, and Pacificorp Medford in H1-C2/3.

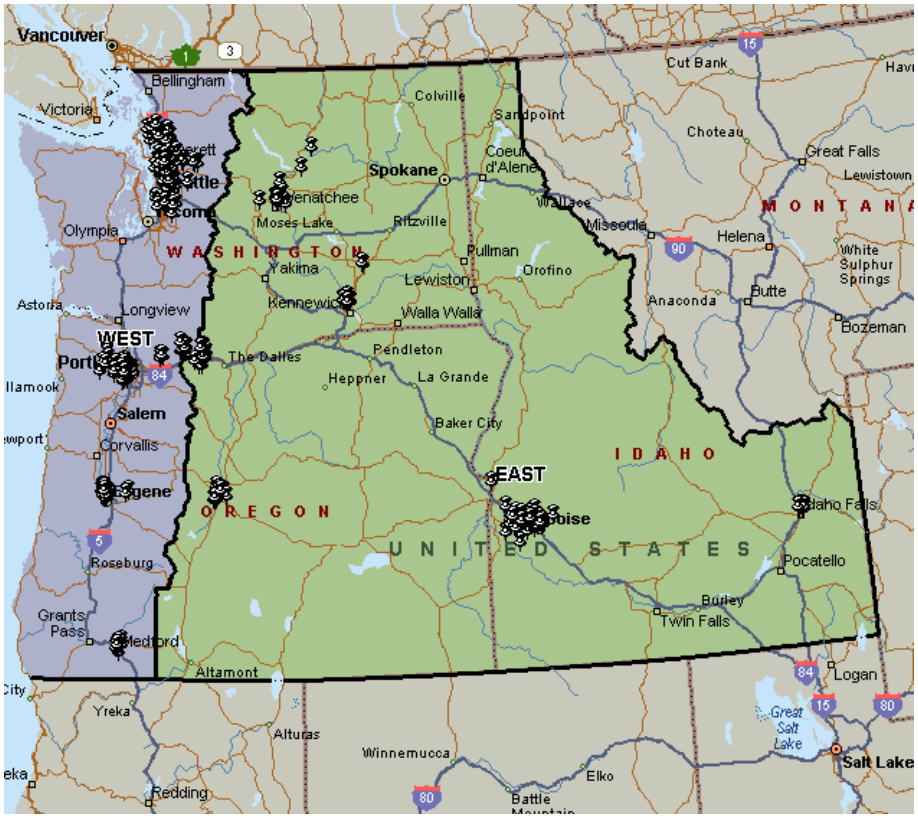

Figure 1: Final Sample Location

Data Collection

RLW performed 489 on-sites at single family residences from July 2004 through March 2006.

On-site Surveys

Quality Control

Senior level staff at RLW were available to auditors on a daily basis to answer questions and maintain quality control. Senior staff reviewed random samples of uploaded survey data, held conference calls with all surveyors to discuss unforeseen issues that arose, and provided guidance and training on project efficiency.

Fieldwork

The trained auditors conducted the on-site audits according to the schedule set by the recruiter. A PDA application was designed to sync with the recruiting database and contain all appointments for the auditor. The daily downloads provided the auditor with the information they needed to conduct the on-site, including special notes provided by the recruiter, directions, and of course customer name, address, and appointment information.

Each onsite visit consisted of two elements: the customer interview and the walk-through inventory. First, the auditor conducted the interview with the occupants to address demographic and behavioral factors. Next, the auditor conducted the walk-through audit of the home and recorded the lighting and appliance data into the hand-held.

All Data Collected

1. Envelope
    a. Windows
        i. Number of panes
        ii. Frame type
        iii. Low-E (RLW uses low-e detectors on all sites)
        iv. Window area
    b. Walls
        i. Framing type
        ii. Insulation R-value
    c. Roof/attic
        i. Insulation R-value or inches
    d. Basement
        i. Basement wall R-value
        ii. Finished/Unfinished
    e. Thermostat(s)
        i. Type
2. Detailed data on heating and cooling systems, primary, secondary, tertiary, etc.
    a. Central or Space

   b. System type (e.g., heat pump, electric resistance, forced-air, etc.)
   c. Fuel
   d. Make and model number
   e. Capacity
   f. Manufactured date
   g. Owner reported age
3. Detailed data on refrigerator, primary, secondary, tertiary, etc.
   a. System type (e.g., standard, side by side, bottom freezer, etc.)
   b. Make and model number
   c. Options (ice maker, water, combo, none)
   d. Size
   e. Manufactured date
   f. Owner reported age
4. Water heater
   a. System type (e.g., storage, tankless, heat pump, etc.)
   b. Fuel (gas, electric, solar assisted)
   c. Make and model number
   d. Size (gallons)
   e. Capacity (input BTU-h or kW)
   f. Manufactured date
   g. Owner reported age
   h. Energy Factor (if possible)
5. Dishwasher
   a. Make and model number
   b. Capacity
   c. Manufactured date
   d. Owner reported age
6. Clothes Washer
   a. System type (e.g., h-axis, standard)
   b. Make and model number
   c. Manufactured date
   d. Owner reported age
   e. Energy Factor (if possible)
   f. Usage
7. Clothes Dryer
   a. Make and model number
   b. Fuel type
   c. Usage
   d. Manufactured date
   e. Owner reported age
8. Lighting

   a. Fixture type by room (e.g., ceiling mounted, wall mounted, recessed can, etc.)
   b. Number of lamps per fixture
   c. Lamp technology type by fixture
   d. Lamp wattage
   e. Control type (e.g., switch, dimmer, occupancy sensor, etc.)
9. Pool and spa
   a. Fuel type
10. Other appliances (e.g., TV, computer, large appliances, etc.)
   a. Presence and some quantities

Appliances

Data were collected for heating systems, cooling systems, washing machines, clothes dryers, dishwashers, pools and spas, refrigerator/freezers, and water heaters. Data were also collected on plug loads, other large end uses, and thermostats.

- The residents were asked for the age of each appliance. If the resident did not know the age of the appliance, the surveyor would estimate the age of the appliance whenever possible.
- The classification of each appliance by type was observed from visual inspections of the appliances and recorded. Appliance types that were noted include; standard or horizontal axis washers, side-by-side, freezer on top or other refrigerator types, and others.
- Fuel types, such as electricity, natural gas or propane for heating systems, clothes dryers and water heaters were noted from visual inspection.
- The manufacturer, model number and size were taken from nameplate data when observable. If possible, sizes of some appliances were estimated in the case of missing, or unreadable data tags.
- Various features relating to energy efficiency were noted such as the existence of a through the door water dispenser for refrigerator-freezers or insulation levels for water heaters.

Lighting

Every lighting fixture in each residence was inventoried by fixture type, number of lamps, lamp type, and lamp wattage. Fixture control type was also noted for all fixtures in this study.

Insulation

The insulation levels of the floor, walls and attic were obtained by visual inspection if possible. Efforts were made to estimate the insulation levels through discussions with the residents and based on educated judgment (i.e. wall construction 2x4, 2x6, etc.) when no visual observations were possible.

Windows

The surveyor recorded the predominant window frame construction; wood, metal or vinyl, found in the home, and the number of panes found of the predominant window type. Low-e detectors were used to determine whether the window had a low-e glazing.

Final Databases

The data collected during the 489 on-site visits are contained in two final databases. One database contains all appliance and envelope information for the residences; another contains all the lighting information.

These databases are in MS Access format. In addition to the surveyor information collected on site, the appliance database contains all information linked from the efficiency databases that pertains to the appliance models in the sample, and contains the efficiency categories that were created in order to analyze the data.

The appendix contains a description of the databases and the steps taken to prepare the databases for analysis and delivery as well as a complete description of each table and query.

Merging of Saturation and Efficiency Information

The surveyors were able to observe the make and model number of appliances on-site, but in most cases, not energy efficiency. The RLW team used all available resources to match the model numbers collected on-site with a reliable source of efficiency ratings and/or Unit Energy Consumption (UEC). Sources that were used included:

- 2005 California Energy Commission Database of Energy Efficient Appliances,
- 2004 Federal Trade Commission (FTC) databases,
- 2003 AHAM Refrigeration database,
- 2003 Carriers Electronic Blue Book of Heating and Cooling Equipment, and
- 2000 ARI HVAC database.

RLW matched the on-site information by model number with standard efficiency ratings for each end-use. For example, in the case of residential cooling, the energy efficiency rating is provided in SEER, or Seasonal Energy Efficiency Ratio units. End-uses that do not have an associated standard efficiency rating (e.g., refrigerators) are characterized in terms of nameplate annual unit energy consumption or UEC.

The difficulty in matching model numbers should not be underestimated by anyone wishing to conduct this type of study in the future. RLW invested a lot of time manually linking sites, as a result of model number wildcards and irregular alphanumeric characters such as dashes, hyphens, slashes, stars, and other text. These characters made automated matching difficult and resulted in a more rigorous model number matching effort.

Single Family Demographics

A list of demographic data was developed by the study team to be collected by the field surveyors. The following demographic data were collected:

- Type of residence
- Number of residents by age
- Total annual income for the home
- Year residence was built
- Total heated floor space of the home
- Whether the residence is rented or owner occupied

The remainder of this section contains tables that summarize the demographic characteristics of the sample. *Unless otherwise noted the complete sample consisted of 489 homes.* All of the data presented henceforth have been weighted according to the procedure outlined in the methodology section.

Table 10 shows the percentage of homes by type of residence. Approximately 47% of all the residences are single-family, unattached, 1-story dwellings. The second most commonly visited type of residence was single-family, unattached, 2-story housing, totaling 44% of the sample.

Type of Residence	% of Homes
Single Family Unattached (1 story)	46.5%
Single Family Unattached (2 stories)	44.3%
Single Family Unattached (3 or more stories)	3.4%
Single Family Attached	1.8%
Mobile Home - Double	2.3%
Mobile Home - Single	1.0%
Modular Home	0.8%

Table 10: Percentage of Homes by Type of Residence

Table 11 shows the percentage of homes by number of people occupying the home. The largest percentage of homes, or 39%, has 2 occupants. The average total number of people living in the home was 2.8.

Total People in Home	% of Homes
1	14.4%
2	39.3%
3	12.6%
4	19.0%
5	9.4%
> 5	3.7%
Not Obs	1.7%

Table 11: Percentage of Homes by Number of People

Table 12 shows the percentage of homes by number of adults occupying the home. Not surprisingly, over two-thirds of all homes, or 68%, have 2 adults present.

Total Number of Adults	% of Homes
1	18.3%
2	68.3%
3	8.6%
4	2.7%
5	0.5%
Not Obs	1.7%

Table 12: Percentage of Homes by Number of Adults

Table 13 shows the percentage of homes by total household income, collected in the bins shown below. The largest percentage of residents has an annual income between $50,000 and $70,000, totaling 22% of the sample.

Total Household Income	% of Homes	Sample Size
<$25,000	5.3%	25
$25,000-$45,000	18.8%	94
$50,000-$70,000	21.5%	106
$75,000-$95,000	16.1%	85
>=$100,000	17.2%	77
Refused	21.1%	102

Table 13: Percentage of Homes by Total Household Income

Table 14 shows the percentage of homes by age of home, collected in the bins shown below. As can be seen from the table, most homes were built after 1970.

Year Home Built	% of Homes	Sample Size
1996-2006	23.3%	42
1991-1995	18.5%	37
1980-1990	13.3%	44
1970-1979	19.8%	96
1960-1969	8.6%	69
1950-1959	7.1%	84
< 1950	7.2%	105
Unknown	2.3%	12

Table 14: Percentage of Homes by Age Range of Home

Table 15 shows the percentage of homes by the total heated floor space of the homes, collected in the bins shown below. There were very few homes less than 1,000 SQFT. The homes were generally evenly distributed across the other floor space categories.

Total Heated Floorspace	% of Homes	Sample Sizes
600 to 999 sq.ft.	2.9%	17
1,000 to 1,599 sq.ft.	25.6%	123
1,600 to 1,999 sq.ft.	24.2%	121
2,000 to 2,399 sq.ft.	17.1%	83
2,400 to 2,999 sq.ft.	17.4%	80
3,000 or more sq.ft.	8.4%	40
DK	4.3%	25

Table 15: Percentage of Homes by Total Heated Floor Space

Table 16 shows the percentage of homes by type of ownership. Over 94% of homes were occupied by owners. Renters constituted roughly 2.5% of the sample.

Rent or Own	% of Homes
Own	94.1%
Rent	2.5%
DK	3.4%

Table 16: Percentage of Homes by Ownership Type

Single-Family Lighting

This section of this chapter presents findings from the lighting analysis. Recall that every lighting fixture in each residence was inventoried by fixture types, fixture control types, number of lamps, lamp types, and lamp wattages. A total of 489 residences were surveyed for the study but we were unable to obtain lighting information for two homes bringing the sample size to 487. This chapter of the report is broken up into the following three subsections that present the analyses shown below:

- Lighting Overview (by home)
    - number of fixtures and lamps per home,
    - average number of lamps per fixture,
    - percentage of homes having a certain fixture or lamp type[3],
    - prevalence of compact fluorescent lamps,
    - lamp wattages, and
    - fixture control types
- Specific Fixture Overviews (by home)
    - summary of recessed cans, torchieres, and ceiling fans
    - these fixtures were selected for further analysis because efficient lighting technologies are currently being developed for these fixture types
- Room Lighting Analysis (by room)
    - percentage of rooms with fixture types and lamp types

Throughout the lighting analysis, the room type "other" is given as a category of room. The Other room type is includes attics, bars, exercise rooms, music rooms, sewing rooms, as well as pool houses.

Lighting Overview

Table 17 presents the average number of fixtures and lamps per home by type of residence. Overall, homes have approximately 37 fixtures and 62 lamps on average.

[3] For a complete list and definition of lamp and fixture types refer to the Appendix.

Type of Residence	Fixtures		Lamps		Sample Size
	Average #	EB	Average #	EB	
Overall	37.3	1.3	61.5	2.0	487
Mobile - Double	21.7	2.1	41.2	4.2	11
Mobile - Single	13.8	3.4	19.2	3.3	4
Modular	26.3	2.7	42.7	9.3	4
Single Family Attached	31.7	8.0	51.5	9.7	7
Single Family Unattached (1 story)	33.8	1.5	56.4	2.4	240
Single Family Unattached (2 stories)	41.9	2.2	68.4	3.3	204
Single Family Unattached (3 or more stories)	48.1	10.4	78.6	14.7	17
Total Single Family Unattached	38.1	1.4	62.8	2.1	461

Table 17: Average Number of Fixtures/Lamps by Type of Residence

Table 18 displays the average number of fixtures per home by fixture type. The most common fixture types by a large margin are ceiling mount fixtures, with homes having an average of 12.4. Also, homes have on average 7 recessed can fixtures and 6 wall mount fixtures. Table 18 also tells us that homes average over one ceiling fan with lights.

Fixture Type	Average # of Fixtures (n=487)	EB
All Fixture Types	37.27	1.32
Architectually Integrated	0.83	0.16
Ceiling Fan	1.04	0.12
Ceiling Fixtures	12.37	0.57
Chandelier Hanging	1.89	0.16
Floor Lamp	1.63	0.17
Garage Door Opener	0.68	0.08
Other	0.23	0.09
Recessed Can	6.94	0.82
Recessed Lighting-Other	0.61	0.14
Table lamps	3.86	0.26
Torchiere	0.33	0.07
Track Lighting	0.44	0.11
Wall Mount	6.42	0.38

Table 18: Average Number of Fixtures by Fixture Type

Table 19 presents the percentage of all fixtures that are of a certain type. Over 33% of all fixtures are ceiling fixtures, while 19% are recessed cans. Additionally, wall mounted fixtures account for about 17%, while table lamps are over 10%.

Fixture Type	Percent of Total Fixtures (n=487)	EB
All Fixture Types	**100.0%**	
Architectually Integrated	2.2%	0.4%
Ceiling Fan	2.8%	0.3%
Ceiling Fixtures	33.2%	1.6%
Chandelier Hanging	5.1%	0.4%
Floor Lamp	4.4%	0.5%
Garage Door Opener	1.8%	0.2%
Other	0.6%	0.2%
Recessed Can	18.6%	1.8%
Recessed Lighting Other	1.6%	0.4%
Table Lamps	10.4%	0.7%
Torchiere	0.9%	0.2%
Track Lighting	1.2%	0.3%
Wall mount	17.2%	0.8%

Table 19: Percentage Fixture Types

Table 20 displays the percentage of homes having each fixture type. Approximately 51% of homes have a ceiling fan. Nearly all homes, 99.8%, have ceiling mounted fixtures. About 68% of homes have recessed cans. Nearly 92% of homes have wall mount fixtures. Almost 78% of all homes have a table lamp.

Fixture Type	Percent of Homes (n=487)	EB
Architectually Integrated	23.7%	3.5%
Ceiling Fan	50.7%	4.2%
Ceiling Fixtures	99.8%	0.3%
Chandelier Hanging	77.4%	3.4%
Floor Lamp	64.2%	4.0%
Garage Door Opener	47.2%	4.2%
Other	9.1%	2.4%
Recessed Can	67.5%	3.8%
Recessed Lighting Other	19.8%	3.4%
Table Lamps	77.5%	3.4%
Torchiere	21.2%	3.5%
Track Lighting	18.9%	3.2%
Wall Mount	91.9%	2.2%

Table 20: Percentage of Homes with Fixture Types

Table 21 shows the distribution of the number of fixtures per home. Over 30% of homes had 21-30 fixtures. Approximately 24% of homes had 31-40 fixtures present.

Number of Fixtures	Percent of Homes (n=487)	EB
1 to 10	0.6%	0.6%
11 to 20	10.1%	2.5%
21 to 30	30.5%	3.9%
31 to 40	23.8%	3.5%
41 to 50	18.8%	3.4%
>50	16.2%	3.0%

Table 21: Distribution of Number of Fixtures per Home

Table 22 presents the distribution of the number of fixtures per home by residence type.

Type of Residence	1 - 10 Fixtures		11 - 20 Fixtures		21 - 30 Fixtures		31 - 40		41 - 50		> 50 Fixtures		Sample Size
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	
Overall	0.6%	0.6%	10.1%	2.5%	30.5%	3.9%	23.8%	3.5%	18.8%	3.4%	16.2%	3.0%	487
Single Family Unattached (1 story)	0.8%	1.0%	11.4%	3.6%	39.2%	5.8%	23.3%	5.0%	13.0%	3.9%	12.2%	3.7%	240
Single Family Unattached (2 stories)	-	-	6.3%	3.2%	19.1%	5.1%	27.2%	5.5%	26.8%	6.0%	20.6%	5.2%	204
Single Family Unattached (3 or more stories)	-	-	-	-	33.7%	23.9%	13.6%	12.8%	12.3%	13.8%	40.4%	21.2%	17
Single Family Attached	-	-	30.0%	31.8%	14.0%	21.8%	25.2%	30.9%	30.8%	31.8%	-	-	7
Mobile-Double	-	-	28.5%	23.2%	71.5%	23.2%	-	-	-	-	-	-	11
Mobile-Single	18.6%	29.2%	81.4%	29.2%	-	-	-	-	-	-	-	-	4
Modular	-	-	-	-	100.0%	-	-	-	-	-	-	-	4

Table 22: Distribution of Number of Fixtures per Home by Residence Type

Table 23 displays the percentage of fixtures containing a compact fluorescent lamp by fixture type. Over 9% of fixtures contain a compact fluorescent lamp. Table lamps are most likely to contain compact fluorescent lamps, with about 15% having such a lamp. Approximately 14% of floor lamps and 13% of torchieres have a compact fluorescent lamp installed. Only 5% of ceiling fixtures, the most common fixture in homes, contained CFLs.

Fixture Type	Percent Fixtures with CFL	EB	Sample Size (# Homes)
Overall	9.4%	4.0%	487
Architectually Integrated	0.5%	1.2%	487
Ceiling Fan	9.1%	0.6%	115
Chandelier Hanging	9.1%	2.9%	257
Ceiling Fixtures	5.1%	1.5%	486
Floor Lamp	13.7%	1.6%	369
Garage Door Opener	0.8%	3.3%	323
Other	3.2%	0.7%	214
Recessed Can	8.2%	4.6%	40
Recessed Lighting-Other	7.7%	3.1%	302
Table Lamps	14.8%	4.3%	89
Torchiere	12.9%	2.3%	362
Track Lighting	8.5%	6.3%	95
Wall Mount	10.8%	7.0%	98

Table 23: Fixtures Containing Compact Fluorescent Lamps

Table 24 shows the average number of lamps per fixture by fixture type. Chandeliers/Hanging fixtures contain more lamps (3.63 lamps) than any other fixture type. Ceiling fans contain 2.71 lamps on average. Recessed cans, table lamps, and

torchieres contain the fewest number of lamps, with each of these fixtures containing approximately one lamp on average.

Fixture Type	Lamps per Fixture		
	Average	EB	Sample Size (# Homes)
Architectually Integrated	1.69	0.14	115
Ceiling Fan	2.71	0.16	257
Ceiling Fixtures	1.64	0.03	486
Chandelier Hanging	3.63	0.21	369
Floor Lamp	1.44	0.07	323
Garage Door Opener	1.36	0.07	214
Recessed Can	1.00	0.00	302
Recessed Lighting-Other	1.47	0.16	89
Table Lamps	1.09	0.02	362
Torchiere	1.06	0.04	95
Track Lighting	2.58	0.27	98
Wall Mount	2.03	0.07	443

Table 24: Average Number of Lamps per Fixture

Table 25 presents the average number of lamps per home by general lamp type. Overall, homes have 61.53 lamps on average. Incandescent lamps are the most prevalent throughout the Pacific Northwest, with an average home having 46.99 incandescent lamps.

Lamp Type	Average # of Lamps (n = 487)
All Lamp Types	61.53
Compact Fluorescent Total	4.85
Fluorescent Total	6.80
Halogen Total	2.89
Incandescent Total	46.99

Table 25: Average Number of Lamps by Lamp Type

Table 26 shows the percentage of all lamps by general lamp type. Over 76% of all lamps are incandescent lamps.

Lamp Type	Percent of Total Lamps (n=487)
Compact Fluorescent Total	7.9%
Fluorescent Total	11.0%
Halogen Total	4.7%
Incandescent Total	76.4%

Table 26: Percentage Lamp Types

Table 27 shows the percentage of homes where a particular lamp type is present. All homes are equipped with at least one incandescent lamp, while over half (52.2%) have at least one halogen lamp. Almost 63% of all homes contain at least one type of compact fluorescent lamp. Over 74% of homes contain fluorescent lamps.

Lamp Type	Percent of Homes (n=487)	EB
Compact Fluorescent Total	62.6%	4.0%
Fluorescent Total	74.3%	3.7%
Halogen Total	52.2%	4.2%
Incandescent Total	100.0%	-

Table 27: Percentages of Homes with Lamp Types

Table 28 displays the distribution of the number of lamps per home. Approximately 36.2% of homes have 41 to 60 lamps. Furthermore, 25% of homes contained 61 to 80 lamps. Only 7% had greater than 100 lamps. This finding combined with findings about the number of fixtures per home suggests that most homes are equipped with fixtures containing more than one lamp.

Number of Lamps	Percentage of Homes (n = 487)	EB
1 to 20	2.5%	1.3%
21 to 40	15.9%	3.0%
41 to 60	36.2%	4.0%
61 to 80	25.0%	3.6%
81 to 100	13.8%	2.9%
>100	6.7%	2.0%

Table 28: Distribution of Number of Lamps per Home

Table 29 presents the distribution of the number of lamps per home by residence type. Less than 3% had fewer than 20 lamps. Over 36% of all single-family, unattached homes that are one story have 41-60 lamps.

Type of Residence	1 - 20 Lamps		21 - 40 Lamps		41 - 60 Lamps		61 - 80 Lamps		81 - 100 Lamps		>100 Lamps		Sample Size
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	
Overall	2.5%	1.3%	15.9%	3.0%	36.2%	4.0%	25.0%	3.6%	13.8%	2.9%	6.7%	2.0%	487
Single Family Unattached (1 story)	2.9%	1.7%	21.9%	4.9%	36.3%	5.7%	23.8%	5.0%	12.0%	3.7%	3.1%	1.8%	240
Single Family Unattached (2 stories)	1.6%	1.9%	8.5%	3.6%	34.1%	6.1%	28.0%	5.9%	17.9%	5.1%	9.9%	3.7%	204
Single Family Unattached (3 or more stories)	-	-	-	-	37.7%	22.6%	27.1%	20.6%	10.4%	13.3%	24.8%	17.3%	17
Single Family Attached	-	-	8.3%	13.7%	67.2%	31.6%	24.5%	30.2%	-	-	-	-	7
Mobile-Double	-	-	26.9%	22.3%	73.1%	22.3%	-	-	-	-	-	-	11
Mobile-Single	43.4%	42.2%	56.6%	42.2%	-	-	-	-	-	-	-	-	4
Modular	-	-	76.8%	34.7%	-	-	23.2%	34.7%	-	-	-	-	4

Table 29: Distribution of Number of Lamps per Home by Residence Type

As one would expect, the average number of screw-based fixtures is far greater than that of pin-based fixtures. Lamps with a screw-base accounted for approximately 54 of the average 62, or 87%, of the lamps found at the average house as seen in Table 30 and Table 31 below.

n= 487	Average Number of Lamps per Home	EB
Screw Base	53.72	1.81
Pin Base	7.81	0.74

Table 30: Average Number of Lamps per Home by Base Type

n= 487	Percentage of Base Type	EB
Screw Base	87.3%	1.1%
Pin Base	12.7%	1.1%

Table 31: Percentage of Lamps by Base Type

Table 32 displays the percentage of all screw-based lamps that are CFLs. Recall from Table 26 that the percentage of all lamps that are compact fluorescent is 7.9%, but when only screw-based lamps are examined, 9.0% of those lamps are CFLs.

Percent of Screw Based Lamps that are CFL	EB	Sample Size
9.0%	1.2%	487

Table 32: Percentage of Screw-Based Lamps that are CFL

Table 33 shows that 10.6% of the fixtures with a screw base contain CFLs. Recall from Table 23 that the percentage of all fixtures containing a compact fluorescent lamp is 9.4%.

Percent of Fixtures with Screw Base containing CFLs	EB	Sample Size
10.6%	1.4%	487

Table 33: Percentage of Fixtures with Screw Base containing CFLs

Specific Fixture Overviews

This section presents in-depth overviews for recessed cans, ceiling fans, and torchieres. These fixture types were selected for further analysis because efficient lighting technologies are currently being developed for these fixture types. For each of these fixture types, the distribution of the number of fixtures as well as the percentage of homes containing these fixtures is presented.

Recessed Cans

About 68% of homes have at least one recessed can. Recessed cans account for approximately 19% of all fixtures, and on average, homes contain 6.94 recessed cans. About 8% of all recessed cans contain a compact fluorescent lamp.

Table 34 presents the distribution of the number of recessed cans per home. Almost 33% of homes have no recessed cans present. About 24% have 1-4 cans, while 12% of homes have between 5-7 cans.

Number of Recessed Cans	Percentage of Homes (n = 487)	EB
0	32.5%	3.8%
1-4	23.8%	3.5%
5-7	12.0%	2.8%
8-10	8.2%	2.4%
11-20	14.5%	3.2%
> 21	9.0%	2.4%

Table 34: Number of Recessed Cans per Home

Table 35 shows the percentage of homes with recessed cans by room type. The most common location for recessed cans is in the kitchen, with more than 51% of homes having recessed cans in the kitchen. Hallways, bathrooms, living rooms, and recreation rooms are among the next most common; as recessed cans were found in 22.5% to 28.8% of homes in these rooms.

Room	Percentage of Homes	EB	Sample Size
Basement	10.4%	9.6%	41
Bathroom	28.5%	3.9%	481
Bedroom	14.2%	3.0%	484
Breakfast Nook	10.7%	5.7%	91
Closet	6.4%	2.9%	250
Dining Room	3.0%	1.3%	378
Family Room	2.7%	4.7%	6
Garage	1.1%	1.0%	362
Hall	28.8%	4.1%	454
Kitchen	51.3%	4.2%	480
Laundry Room	7.4%	2.6%	371
Living Room	25.0%	3.8%	474
Office	14.1%	4.4%	236
Other	5.0%	3.2%	97
Porch	14.2%	3.2%	422
Recreation Room	22.5%	6.1%	164
Whole House	67.5%	3.8%	487

Table 35: Percentage of Homes with Recessed Cans by Room Type

Table 36 presents the percentage of homes with recessed cans by the age of the home. It appears that newer homes are more likely to have recessed cans, as more than three-quarters of the homes built since 1980 had this technology. Conversely, no more than 63% of the homes built before 1980 had recessed cans.

Age of Home	Percentage of Homes	EB	Sample Size
<1950	41.1%	14.5%	42
1950-1959	56.0%	15.0%	36
1960-1969	52.1%	13.8%	44
1970-1979	63.4%	8.8%	96
1980-1990	75.0%	8.7%	69
1991-1995	80.9%	7.3%	84
> 1995	78.0%	6.9%	105
Unknown	12.6%	14.4%	11

Table 36: Percentage of Homes with Recessed Cans by Age of Home

Table 37 shows the average number of recessed cans in each home by the age of the home. Consistent with Table 36 above, newer homes tend to have more recessed cans. Homes built after 1980 averaged 7.5 to 10.9 recessed cans, while homes built before that averaged only 2.8 to 4.6.

Age of Home	Number of Recessed Cans	EB	Sample Size
<1950	2.81	1.40	42
1950-1959	3.25	1.99	36
1960-1969	2.99	1.89	44
1970-1979	4.64	1.40	96
1980-1990	7.50	2.63	69
1991-1995	9.61	1.69	84
> 1995	10.85	2.09	105
Unknown	0.33	0.46	11

Table 37: Number of Recessed Cans per Home by Age of Home

Table 38 displays the average number of recessed cans per home in homes that have at least one recessed can. Such homes have approximately 12 recessed cans.

Average Number of Recessed Cans	EB	Sample Size
11.93	1.15	302

Table 38: Average Number of Recessed Cans in Homes with Recessed Cans

As can be seen below in Table 39, the overwhelming majority of recessed can fixtures use screw-based lamps. This accounts for more than 99% of all recessed can fixtures, while pin-based lamps make up the remaining 0.8%.

n=302	Percent	EB
Screw Base	99.2%	0.7%
Pin Base	0.8%	0.7%

Table 39: Percentage of Lamp Base Type for Recessed Can Fixtures

CFLs are installed in slightly over 8% of screw-based recessed can fixtures. Table 40 displays the associated error bound and sample size.

Percent of CFL	EB	Sample Size
8.3%	3.1%	302

Table 40: Percentage of CFLs in Screw-Based Recessed Can Fixtures

Ceiling Fans

Data were only collected and analyzed for ceiling fans that are designed to contain lamps. Over half of homes have at least one ceiling fan. Ceiling fans account for approximately 3% of all fixtures, and on average, homes contain 1.04 ceiling fans. About 9.1% of all ceiling fans contain a compact fluorescent lamp.

Table 41 displays the distribution of the number of ceiling fans per home. Less than half of homes do not have any ceiling fans, and about one-quarter of homes have only one ceiling fan. Approximately 3% of homes have five or more ceiling fans.

Number of Ceiling Fans	Percent of Homes (n = 487)	EB
0	49.3%	4.2%
1	24.1%	3.5%
2	12.4%	2.8%
3	6.9%	2.0%
4	4.6%	1.6%
5+	2.6%	1.3%

Table 41: Number of Ceiling Fans per Home

Table 42 presents the percentage of homes with ceiling fans by room type. Approximately 38% of homes have a ceiling fan in the family room. Bedrooms and living rooms were the next most prevalent locations, as ceiling fans were found in 28.6% and 23.4% of each room, respectively.

Room	Percentage of Homes	EB	Sample Size
Basement	-	-	41
Bathroom	-	-	481
Bedroom	28.6%	3.8%	484
Breakfast Nook	7.6%	5.1%	91
Closet	-	-	250
Dining Rm	8.9%	2.5%	378
Family Room	37.9%	35.1%	6
Garage	0.6%	0.6%	362
Hall	3.9%	1.5%	454
Kitchen	5.4%	2.0%	480
Laundry Rm	-	-	371
Living Rm	23.4%	3.4%	474
Office	9.6%	3.5%	236
Other	1.7%	2.4%	97
Outside	-	-	422
Rec Rm	12.3%	4.5%	164
Whole House	50.7%	4.2%	487

Table 42: Percentage of Homes with Ceiling Fans by Room Type

Table 43 shows the distribution of the number of lamps per ceiling fan. About 31% of ceiling fans contain four lamps, while 5% have 5 lamps. Less than 1% of the homes surveyed had 6 or more lamps per ceiling fan.

Number of Lamps	Percent of Fans (n = 257 Homes)	EB
1	32.0%	5.3%
2	7.3%	2.3%
3	24.3%	3.9%
4	30.9%	4.9%
5	5.1%	2.1%
6+	0.4%	0.6%

Table 43 : Distribution of Number of Lamps per Ceiling Fan

Torchieres

About 21% of homes have at least one torchiere. Torchieres account for approximately 0.9% of all fixtures, with an average of 0.33 torchieres per home. About 13% of all torchieres contain a compact fluorescent lamp.

Table 44 shows the distribution of the number of torchieres per home. Approximately 14% of homes have one torchiere.

Number of Torchieres	Percent of Homes (n = 487)	EB
0	78.8%	3.5%
1	14.2%	3.0%
2	4.7%	1.9%
3	1.3%	1.0%
4	0.6%	0.6%
5+	0.5%	0.6%

Table 44: Number of Torchieres per Home

Table 45 displays the percentage of homes with at least one torchiere by room type. Almost 14% of homes have a torchiere in the living room. More than 7% of homes have a torchiere in the recreation room. No homes have a torchiere in the bathroom, breakfast nook, closet, family room, garage, hall, kitchen, or outside.

Room	Percentage of Homes	EB	Sample Size
Basement	2.6%	4.2%	41
Bathroom	-	-	481
Bedroom	5.2%	1.8%	484
Breakfast Nook	-	-	91
Closet	-	-	250
Dining Rm	2.6%	1.7%	378
Family Room	-	-	6
Garage	-	-	362
Hall	-	-	454
Kitchen	-	-	480
Laundry Rm	0.2%	0.4%	371
Living Rm	13.9%	3.0%	474
Office	4.4%	2.6%	236
Other	2.5%	3.0%	97
Outside	-	-	422
Rec Rm	7.4%	4.0%	164
Whole House	21.2%	3.5%	487

Table 45: Percentage of Homes with Torchieres by Room Type

Table 46 displays the percentage of torchieres equipped with each lamp type. Over 43% of torchieres have incandescent lamps installed, and another 39% of torchieres are equipped with halogen tube lamps. Additionally, the percentage of torchieres with compact fluorescent bulbs is almost 13%.

Lamp Type	Percent of Torchieres (n = 95)	EB
Compact Fluorescent Mini Square	1.2%	1.4%
Compact Fluorescent Mini Unknown	1.2%	2.0%
Compact Fluorescent Spring	9.3%	5.7%
Compact Fluorescent Unknown	1.2%	2.0%
Compact Fluorescent Total	**12.9%**	**6.3%**
Fluorescent Circline	4.3%	3.4%
Fluorescent Other	0.6%	0.9%
Fluorescent Total	**4.8%**	**3.5%**
Halogen Other	2.8%	2.5%
Halogen Tube	34.8%	8.0%
Halogen Unknown	1.5%	1.6%
Halogen Total	**39.1%**	**8.0%**
Incandescent Decorative	0.4%	0.7%
Incandescent Globe	3.5%	4.0%
Incandescent Standard	39.3%	8.1%
Incandescent Total	**43.2%**	**8.9%**

Table 46: Torchiere Lamp Types

Table 47 presents the percentage of homes that had various lamp types in exterior fixtures. Standard incandescent lamps were by far the most prevalent and were present in more than 98% of the homes. Incandescent reflectors, compact fluorescent spring lamps, and halogen parabolic reflectors were the next most common and were found in 19.3%, 17.2%, and 16.2% of homes, respectively.

Lamp Type	Percentage of Homes (n=487)	EB
Compact Fluorescent A Style	1.2%	0.8%
Compact Fluorescent Decorative	0.4%	0.5%
Compact Fluorescent Globe	0.4%	0.5%
Compact Fluorescent Reflector	0.6%	0.6%
Compact Fluorescent Spring	17.2%	2.8%
Compact Fluorescent Square	1.0%	0.8%
Compact Fluorescent Unknown	0.4%	0.5%
Fluorescent T12	1.4%	0.9%
Fluorescent Other	0.6%	0.6%
Fluorescent Tube Unknown	0.2%	0.3%
MR-16 Pin Based Halogen	0.2%	0.3%
Halogen Unknown	2.5%	1.2%
Halogen Parabolic Reflector	16.2%	2.8%
Halogen Quart Tube	4.7%	1.6%
Halogen Tube	0.4%	0.5%
Halogen Unknown	1.2%	0.8%
High Intensity Discharge	0.2%	0.3%
Decorative Incandescent	7.0%	1.9%
Incandescent Globe	2.5%	1.2%
Incandescent Other	4.1%	1.5%
Incandescent Reflector	19.3%	2.9%
Incandescent Standard	98.2%	1.0%
Incandescent Unknown	0.8%	0.7%

Table 47: Percentage of Homes with Lamp Type in Exterior Fixtures

Fixture Control Types

Table 48 shows the percentage of homes that have a given lamp type and lamp control type among all lamps. About 70% of lamps are standard incandescents that are controlled manually. Only approximately 9% were T12 fluorescent lamps on a manual switch, while 8% were CFLs on a manual switch.

Lamp Type	Percent of Lamps by Control Type (n=4,791)											
	Manual		Dimmer		Motion Detector		Motion Detector with Photocell		Photocell		Timer	
	Percentage	EB	Percentage	EB	Percentage	EB	Percentage	EB	Percentage	EB	Percentage	EB
Compact Fluorescent	7.71%	1.98%	0.03%	0.05%	0.06%	0.01%	0.00%	0.00%	0.06%	0.04%	0.01%	0.03%
Fluorescent Other	1.53%	0.17%	-	-	0.01%	0.00%	-	-	-	-	-	-
Fluorescent T12	8.68%	0.44%	-	-	0.12%	0.01%	-	-	0.00%	0.00%	-	-
Fluorescent T8	0.71%	0.67%	-	-	-	-	-	-	0.01%	0.01%	-	-
Halogen	3.75%	1.16%	0.43%	0.43%	0.45%	0.02%	0.01%	0.01%	0.06%	0.04%	-	-
Incandescent	70.11%	2.63%	4.88%	0.96%	0.66%	0.05%	0.07%	0.07%	0.36%	0.07%	0.27%	0.07%

Table 48: Percent of Lamps by Control Types

Lamp Wattage

Table 49 shows average lamp wattage for each lamp type observed in this study. The highest average wattages were found in heat lamps, halogen quartz tubes, high intensity discharge lamps (HIDs), and halogen tubes. The most common lamp, the standard incandescent, has an average wattage of 63.4. The most common compact fluorescent lamp, the spring lamp, had an average wattage of 16.8. A total of 14,471 fixtures were surveyed in the 487 homes and were included in this table.

Lamp Type	Average Wattage	EB	Sample Size
Compact Fluorescent A Style	15.0	1.33	26
Compact Fluorescent Decorative	13.6	1.74	10
Compact Fluorescent Globe	15.9	1.68	22
Compact Fluorescent Reflector	17.7	1.57	25
Compact Fluorescent Spring	16.8	0.50	234
Compact Fluorescent Square	18.7	1.42	40
Compact Fluorescent Unknown	21.0	1.55	18
Compact Fluorescent Mini Decorati	18.3	7.29	2
Compact Fluorescent Mini Globe	14.4	1.84	5
Compact Fluorescent Mini Reflecto	20.0	1.93	4
Compact Fluorescent Mini Square	22.2	3.61	10
Compact Fluorescent Mini Unkown	24.1	3.82	5
Fluorescent T12	42.6	1.50	297
Fluorescent T5	16.1	2.23	3
Fluorescent T8	30.8	0.82	44
Fluorescent Circline	40.6	4.21	29
Fluorescent Other	20.2	1.57	26
Fluorescent Tube Unknown	40.6	3.97	24
MR-16 Pin Based Halogen	50.0	6.56	29
Halogen Other	93.3	27.12	40
Halogen Parabolic Reflector	106.6	18.08	84
Halogen Quartz Tube	156.2	31.13	87
Halogen Tube Other	95.3	56.75	5
Halogen Unknown	57.8	11.85	43
Heat Lamp	245.7	8.82	3
High Intensity Discharge	175.0	0.00	1
Incandescent Decorative	38.7	1.80	246
Incandescent Globe	47.8	1.50	247
Incandescent Other	75.2	12.48	67
Incandescent Reflector	74.9	2.14	230
Incandescent Standard	63.4	0.89	482
Incandescent Unknown	63.3	15.11	23

Table 49: Average Lamp Wattage by Lamp Type

Table 50 presents the average wattage per fixture, inclusive of all lamp technology types found in the fixtures, and number of lamps found in the fixture. Chandelier/Hanging lamps were found to have the highest overall wattage (183), followed by track lighting fixtures (179), and ceiling fans (147). All three of these fixture types commonly have multiple lamps per fixture, explaining the high wattage for these fixtures. Table lamps have the lowest wattage, with an average of 60 watts. Recessed cans have the second lowest average wattage.

Fixture Type	Average Fixture Wattage	EB	Sample Size
Architectually Integrated	110.8	11.1	222
Ceiling Fan	147.3	6.0	466
Ceiling Fixtures	94.3	1.7	3,684
Chandelier Hanging	183.8	8.0	668
Floor Lamp	92.0	4.7	610
Garage Door Opener	82.7	5.0	161
Other	108.0	25.9	43
Recessed Can	73.8	2.1	939
Recessed Lighting-Other	88.3	9.4	129
Table lamps	59.6	1.7	1,171
Torchiere	138.9	19.8	103
Track Lighting	179.0	16.8	140
Wall Mount	132.1	4.0	1,772

Table 50: Average Fixture Wattage

Table 51 looks at the average wattage by room type, when considering all fixtures and lamps within the specific room. These numbers varied dramatically when considering size of home, type of home, and income. The bathroom topped the list in terms of highest overall wattage by room type, most likely caused by homes having multiple bathrooms. Information was not collected on individual bathrooms, but all bathrooms per home were grouped. The bedroom is second on the list; once again likely caused by having multiple rooms per home. The basement, outside, and living room round out the top five high wattage rooms. Conversely, on the low end of wattages are laundry rooms and closets. These rooms typically have few fixtures and lamps.

Room	Watts	EB	Sample
Basement	415.7	101.1	41
Bathroom	559.7	27.3	481
Bedroom	498.1	23.2	484
Breakfast Nook	186.3	16.7	91
Closet	122.5	10.2	250
Dining Room	262.3	15.8	378
Family Room	193.7	104.9	6
Garage	335.1	22.5	362
Hall	297.9	19.2	454
Kitchen	337.2	17.2	480
Laundry Room	123.7	8.2	371
Living Room	361.8	20.3	474
Office	227.0	20.0	236
Other	343.8	51.4	97
Outside	375.6	29.0	422
Recreation Room	342.3	34.4	164
Whole House	3,175.5	119.5	487

Table 51: Average Wattage by Room Type

Single-Family Appliances

Refrigerator Freezers

The following section describes the refrigerator/freezers found at the surveyed households. In total, 489 households were surveyed. All homes surveyed for this study have at least one refrigerator, 33.8% of all homes have a second, and only 2.5% of all homes have a third refrigerator. For this analysis any refrigerator with a capacity under 8 cubic feet is considered a "compact" refrigerator, while any refrigerator with a capacity of 8 cubic feet and above is referred to as "full-size". The following table summarizes second and third refrigerators by the residence types where they were found.

Type of Residence	Secondary Refrigerator				Third Refrigerator				Sample Size
	Full or Compact		Full Only		Full or Compact		Full Only		
	%	EB	%	EB	%	EB	%	EB	
Overall	33.8%	3.9%	33.2%	3.9%	2.5%	1.3%	1.3%	0.9%	489
Mobile-Dbl	-	-	-	-	-	-	-	-	11
Mobile-Sgl	-	-	-	-	-	-	-	-	4
Modular	41.9%	46.5%	41.9%	46.5%	-	-	-	-	4
SF-UN-1S	35.3%	5.7%	34.1%	5.6%	2.0%	1.5%	1.8%	1.5%	240
SF-UN-2S	35.0%	6.0%	35.0%	6.1%	3.1%	2.3%	1.0%	1.1%	206
SF-UN-3S+	41.1%	22.6%	41.1%	22.6%	6.5%	8.7%	1.3%	2.3%	17
Town/Row	9.8%	15.9%	9.8%	15.9%	-	-	-	-	7

Table 52: Percentage of Homes with Second or Third Refrigerator by Type of Residence

Due to the small number of homes with third refrigerators, the following summary information is only based upon the primary and secondary refrigerators. This refrigerator/freezer section of the report first summarizes the analysis conducted on the primary refrigerators, and then summarizes the secondary refrigerators.

The primary and secondary refrigerators are summarized by type, size, age, energy consumption, ENERGY STAR® qualifications, and nameplate UEC relative to standards. Because the amount of data for each of the aforementioned characteristics differs, the number of sites in each of the analyses will differ. The data used in the refrigerator analyses are described below.

- Type-The type of each refrigerator was obtained from the site visit.
- Size-The size of the refrigerators, in cubic feet, was first obtained from the efficiency databases (CEC and AHAM) if the model number successfully matched a model in the database. In the event that the models were not matched, the data on the size collected on-site were used.
- Age-The age of the appliance was also obtained from the efficiency databases if a match was made, otherwise the age from the on site visit was used in the analysis.
- Usage (nameplate UEC)-The usage data were obtained exclusively from the efficiency databases.

- ENERGY STAR® Qualification-The unit was marked as ENERGY STAR® qualified if its nameplate UEC was calculated as 15% above standard for 2001 standards. The 2001 ENERGY STAR® standard was 10% above standard for 2001 standards.

Primary Refrigerators

All homes that were visited over the course of this study have a primary refrigerator. The classification of the refrigerators is by size, configuration, and existence of a through the door ice dispenser. Full size refrigerators are categorized as either single or double door. The double door refrigerators are further classified by freezer position: either bottom mounted, top mount, or side-by-side. In the case of the side by side and top mount, a further division is the existence of a through the door ice and water dispenser.

Figure 2 shows the percentage breakdown of primary refrigerators by type. The most common type of primary refrigerators found is top mounted freezer (without ice dispenser) models, accounting for over 41% of all the primary refrigerators. Freezer on bottom models account for 38.4% of the primary refrigerators.

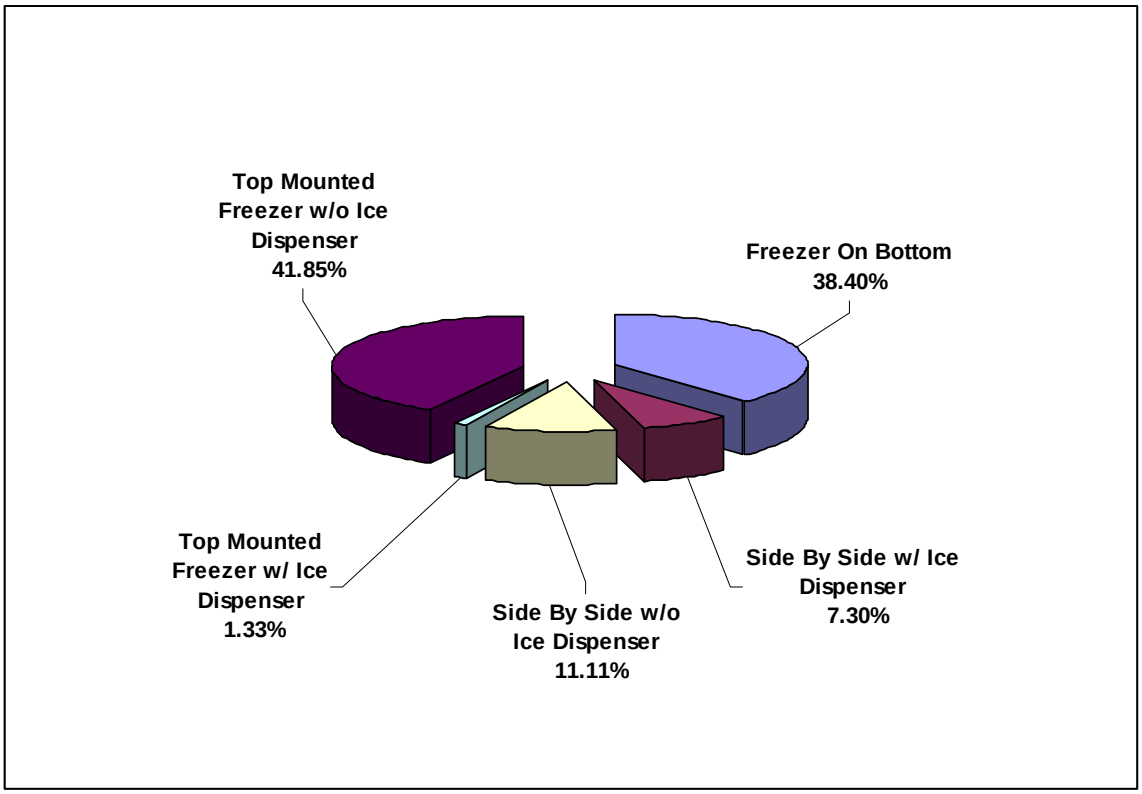

Figure 2: Percentage of Homes with Primary Refrigerator/Freezer by Type

The following abbreviations (common for refrigerators) are used throughout this section to describe the various types of refrigerator found:

- **BF** = Bottom Mounted Freezer
- **SS** = Side by Side without Ice Dispenser

- **SI =** Side by Side with Ice Dispenser
- **TF** = Top Mounted Freezer without Ice Dispenser
- **TI =** Top Mounted Freezer with Ice Dispenser
- **SD =** Single Door (Refrigerator Only)
- **CO** = Compact

Size

The sizes of refrigerators were obtained from manufacturer data if the unit is matched, or else from survey data if not matched. The following summary of the sizes of the refrigerators summarizes both the matched and unmatched units, or the manufacturer reported and surveyor estimated sizes.

The sample size that is used in the following table that summarizes the average size of the refrigerators is 357. This is the number of full size refrigerators, 8 cubic feet or greater, for which we obtained size data from the efficiency databases. The average manufacturer reported size for all refrigerators obtained from the efficiency databases is 21.5 cubic feet.

Refrigerator Type	Manufacturer Reported Size	EB	Sample Size
All Types	21.5	0.3	357
BF	20.1	0.6	42
SI	24.1	0.3	140
SS	21.3	0.9	32
TI	25.0	1.0	3
TF	19.2	0.3	140

Table 53: Average Estimated Size by Refrigerator Type

The following table shows the distribution of the sizes of the refrigerators including matched and unmatched units. Almost half (49.9%) of all refrigerators are between 19 and 22 cubic feet. Almost 29.2% are between 15 and 18 cubic feet, while almost 19.8% are larger than 22 cubic feet.

Refrigerator Type	Sample Size	Size Range (Cu.Ft.)							
		11.00 to 14.99	EB	15.00 to 18.99	EB	19.00 to 21.99	EB	> 22.00	EB
All Types	489	1.1%	0.8%	29.2%	3.8%	49.9%	4.2%	19.8%	3.2%
BF	52	-	-	31.0%	11.9%	66.4%	12.0%	2.6%	3.0%
SI	180	-	-	3.8%	2.9%	49.2%	6.9%	47.0%	6.8%
SS	41	-	-	20.5%	12.2%	69.4%	13.3%	10.1%	7.8%
TI	5	-	1.9%	42.6%	41.9%	54.0%	42.1%	3.4%	6.1%
TF	211	2.6%	0.8%	53.2%	6.3%	42.6%	6.2%	1.6%	1.4%

Table 54: Percentage of All Refrigerators by Type within Size Ranges- Estimated Sizes

Age

During the on-site survey, surveyors examined the refrigerator nameplate for a manufactured date and residents were asked for the approximate age of their refrigerators. If the resident was unable to provide an age, or the nameplate didn't provide a manufactured date, the surveyor estimated the age of the refrigerators whenever possible. The nameplate manufactured date, resident reported age, and surveyor estimated ages were used for refrigerators when no age data from the matching process were available for the following estimated age analysis.

The sample size of 442 primary refrigerator ages represents all full size primary refrigerator ages obtained in this study. Age information was not available for all 489 primary refrigerators. Table 55 shows that the average age of these refrigerators is 7.6 years with an error bound of 0.5 years. The manufacture date range of 2000 through 2006 accounts for 51.5% of all primary refrigerators.

Manufactured Date and Estimated Mfr Date Ranges										
Ref Type	Size Range (Cu.Ft.)	Avg Mfg Age	Avg Mfg Age EB	2000-2006	1995-1999	1990-1994	1985-1989	1980-1984	1979 & Older	Sample Size
All Types	Overall	7.6	0.5	51.5%	28.7%	12.4%	4.1%	1.5%	1.8%	442
	11.00-14.99	28.1	7.8	-	5.7%	-	23.1%	13.0%	58.3%	6
	15.00-18.99	8.3	1.0	47.0%	28.2%	16.1%	5.2%	2.2%	1.3%	114
	19.00-21.99	7.7	0.7	47.7%	32.6%	13.6%	4.3%	0.5%	1.3%	225
	> 22	5.3	0.9	70.3%	20.8%	4.9%	1.2%	2.5%	0.2%	97
BF	Overall	5.9	1.2	65.0%	20.0%	11.3%	3.7%	-	-	49
	15.00-18.99	7.7	2.5	59.3%	11.6%	25.7%	3.4%	-	-	13
	19.00-21.99	5.2	1.2	68.1%	22.7%	5.2%	4.0%	-	-	34
	> 22	4.4	4.1	51.7%	48.3%	-	-	-	-	2
SI	Overall	6.1	0.6	61.3%	29.1%	6.7%	1.5%	1.3%	0.1%	172
	11.00-14.99	8.9	2.9	19.7%	68.6%	-	11.7%	-	-	5
	15.00-18.99	6.7	0.8	54.8%	34.2%	10.1%	0.9%	-	-	22
	19.00-21.99	8.7	3.8	31.2%	26.8%	42.0%	-	-	-	4
	> 22	5.2	1.0	72.2%	19.9%	3.6%	1.3%	2.8%	0.3%	86
SS	Overall	11.2	2.2	27.1%	28.4%	24.1%	11.5%	1.9%	7.0%	37
	15.00-18.99	13.0	5.1	28.7%	22.4%	31.3%	-	4.7%	13.0%	6
	19.00-21.99	11.1	2.8	26.2%	30.3%	19.8%	16.1%	1.3%	6.3%	27
	> 22	8.7	3.8	31.2%	26.8%	42.0%	-	-	-	4
TI	Overall	7.9	3.7	68.0%	-	32.0%	-	-	-	5
	15.00-18.99	11.8	3.9	24.8%	-	75.2%	-	-	-	2
	19.00-21.99	5.2	1.1	100.0%	-	-	-	-	-	2
	> 22	2.0	0.0	100.0%	-	-	-	-	-	1
TF	Overall	9.0	0.9	41.2%	32.0%	15.7%	5.8%	2.2%	3.1%	179
	11.00-14.99	28.1	7.8	-	5.7%	-	23.1%	13.0%	58.3%	6
	15.00-18.99	7.9	1.1	48.9%	29.2%	12.9%	5.5%	2.6%	0.9%	88
	19.00-21.99	9.2	1.2	33.8%	37.4%	20.4%	5.3%	1.1%	2.1%	81
	> 22	5.8	2.7	64.6%	26.2%	9.2%	-	-	-	4

Table 55: Average Age and Percentage of Refrigerator Manufacturer Reported and On Site Estimated Ages within Size Ranges

Energy Consumption

The average annual nameplate unit energy consumption (UEC) for refrigerator/freezers was obtained from the model number matches to manufacturer data. A sample of 354 was used for the analysis below. This is the number of refrigerators for which we obtained nameplate UEC from the efficiency databases. Table 56 shows the average nameplate UEC by type of refrigerator and size range.

The average overall nameplate UEC for all types of refrigerators is 792.9 with an error bound of 30.4. The most efficient units are bottom freezer refrigerators, which have the lowest nameplate UEC at 646.5. The next most efficient are standard top freezer

refrigerators, which have an average nameplate UEC of 733.2, followed by side by side models, which have an average nameplate UEC of 777.7. The tables in the next section of the report that summarize the nameplate UECs relative to standards help to put these numbers into perspective.

Ref Type	Size Range (CuFt)	Average UEC	EB	Sample Size
All Types	Overall	792.9	30.4	354
	11.00-14.99	1,300.3	349.7	3
	15.00-18.99	695.3	42.2	90
	19.00-21.99	793.9	42.2	177
	>22.00	890.5	71.2	84
BF	Overall	646.5	51.6	42
	15.00-18.99	671.1	82.7	11
	19.00-21.99	638.3	65.7	30
	>22.00	505.0	0.0	1
SI	Overall	864.0	50.4	139
	15.00-18.99	1,036.6	420.6	3
	19.00-21.99	822.9	63.2	61
	>22.00	891.9	76.2	75
SS	Overall	944.1	96.1	32
	15.00-18.99	777.7	74.3	4
	19.00-21.99	969.4	123.5	23
	>22.00	1,050.7	181.7	5
TI	Overall	891.0	184.7	3
	19.00-21.99	900.8	193.2	2
	>22.00	736.0	0.0	1
TF	Overall	733.2	49.8	138
	11.00-14.99	1,300.3	349.7	3
	15.00-18.99	674.8	44.6	72
	19.00-21.99	773.2	82.1	61
	>22.00	705.9	78.9	2

Table 56: Average Nameplate UEC by Type of Refrigerator

The bin distribution of unit energy consumption of all successfully matched full size primary refrigerators is shown below in Table 57 grouped by size and type. The nameplate UEC range that makes up the largest percentage of all refrigerators is the range between 550 to 749.9 kWh/year, which covers 41% of all types of refrigerators.

Ref Type	Unit Energy Consumption Ranges (kWh/Year)							Sample Size
	Size Range (CuFt)	350 to 549.9	550 to 749.9	750 to 949.9	950 to 1,149.9	1,150 to 1,349.9	1,350+	
All Types	Overall	16.9%	41.0%	22.5%	9.5%	3.1%	6.9%	354
	11.00-14.99	-	8.1%	23.2%	-	-	68.7%	3
	15.00-18.99	29.5%	42.0%	18.8%	7.0%	-	2.8%	90
	19.00-21.99	17.1%	37.7%	26.1%	8.4%	4.7%	6.0%	177
	>22.00	1.3%	48.9%	19.0%	15.8%	3.7%	11.4%	84
BF	Overall	42.4%	33.9%	10.8%	9.7%	1.5%	1.8%	42
	15.00-18.99	28.8%	36.9%	24.9%	9.5%	-	-	11
	19.00-21.99	47.5%	33.3%	4.3%	10.0%	2.2%	2.7%	30
	>22.00	100.0%	-	-	-	-	-	1
SI	Overall	-	49.2%	29.3%	9.4%	3.3%	8.9%	139
	15.00-18.99	-	48.1%	20.6%	-	-	31.4%	3
	19.00-21.99	-	46.1%	43.1%	2.5%	4.8%	3.5%	61
	>22.00	-	52.1%	17.0%	16.3%	2.0%	12.5%	75
SS	Overall	7.5%	19.8%	34.6%	12.6%	11.7%	13.8%	32
	15.00-18.99	-	33.9%	66.1%	-	-	-	4
	19.00-21.99	9.9%	19.6%	25.4%	14.9%	10.2%	20.1%	23
	>22.00	6.0%	-	38.3%	18.6%	37.1%	-	5
TI	Overall	-	44.3%	-	55.7%	-	-	3
	19.00-21.99	-	40.8%	-	59.2%	-	-	2
	>22.00	-	100.0%	-	-	-	-	1
TF	Overall	28.2%	39.5%	17.5%	7.7%	1.8%	5.3%	138
	11.00-14.99	-	8.1%	23.2%	-	-	68.7%	3
	15.00-18.99	33.4%	43.3%	14.0%	7.4%	-	1.9%	72
	19.00-21.99	24.2%	36.7%	20.1%	8.7%	4.2%	6.0%	61
	>22.00	-	39.5%	60.5%	-	-	-	2

Table 57: Percentage of Primary Refrigerators by Nameplate UEC Ranges and Type within Size Ranges

Additionally, the above groupings of full size primary refrigerators are compared with the 2001 Federal Appliance Standards for annual energy consumption.

Percentage Above/Below 2001 Federal Appliance Standards

The average percentage above or below the 2001 standards for each unit is calculated as follows:

$$\%\ \text{Relative to Std} = \frac{\text{2001 Standard (KWh/Yr)} - \text{UEC (KWh/Yr)}}{\text{2001 Standard (KWh/Yr)}}$$

For example, suppose the nameplate annual energy consumption for a refrigerator is 550 KWh/Yr. The 2001 standard consumption for this unit is 500 kWh/Yr. The percentage better or worse than 2001 standards is calculated as follows:

$$\frac{500 - 550}{500} = \frac{-50}{500} = -10\%$$

Thus, the annual energy consumption for this unit is 10% worse than 2001 standards.

Table 58 shows the average percentage above or below the 2001 standard for refrigerators, broken down by type and size. The average percentage below standards for all types of refrigerators is 32.1%. The sample size for this analysis is 349. There

were 8 refrigerators in the original matched sample size of 357 for which we had limited size information and therefore were unable to calculate the 2001 standard consumption.

Ref Type	Size Range (CuFt)	Average UEC Relative to 2001	EB	Sample Size
All Types	Overall	-32.1%	5.3%	349
	11.00-14.99	-199.6%	75.6%	3
	15.00-18.99	-36.0%	8.3%	85
	19.00-21.99	-31.6%	7.5%	176
	>22.00	-25.2%	10.1%	85
BF	Overall	-14.4%	9.4%	41
	15.00-18.99	-19.8%	14.8%	11
	19.00-21.99	-12.5%	11.9%	29
	>22.00	15.0%	0.0%	1
SS	Overall	-22.5%	7.1%	140
	15.00-18.99	-53.6%	59.1%	3
	19.00-21.99	-19.1%	9.2%	61
	>22.00	-23.8%	10.6%	76
SI	Overall	-49.0%	15.1%	32
	15.00-18.99	-25.4%	12.3%	4
	19.00-21.99	-53.2%	19.7%	23
	>22.00	-59.9%	29.2%	5
TI	Overall	-54.6%	28.7%	3
	19.00-21.99	-53.2%	19.7%	23
	>22.00	-29.2%	20.9%	2
TF	Overall	-47.5%	10.6%	133
	11.00-14.99	-199.6%	75.6%	3
	15.00-18.99	-39.3%	9.8%	67
	19.00-21.99	-49.7%	16.6%	61
	>22.00	-29.2%	20.9%	2

Table 58: Percentage Above/Below 2001 Federal Appliance Standards by Type of Refrigerator

We performed a simple analysis across all types and sizes of refrigerators comparing their UEC to their calculated allowable UEC as dictated by the standards. Twenty eight percent of primary refrigerators had lower UEC's than the standards required for a unit of their similar type and size.

ENERGY STAR® Qualified

To qualify for 2001 ENERGY STAR® standards, the annual energy consumption of a refrigerator must be at least 10% less than 2001 Federal Appliance Standards for annual energy consumption. To qualify for 2004 ENERGY STAR® standards, the annual energy consumption of a refrigerator must be at least 15% less than 2001 Federal Appliance Standards for annual energy consumption. The following analysis is based on a sample of 349 primary refrigerators. Similar to the last analysis there were 8 refrigerators missing necessary size information to calculate the standard consumption.

The distribution of Primary Refrigerator/Freezers that meet ENERGY STAR® qualifications grouped by size and type is shown below. As can be seen in Table 59, the percentage of all refrigerators that meet 2001 ENERGY STAR® qualifications is 15% with a 4% error bound. The percentage of all refrigerators that meet 2004 ENERGY STAR® qualifications is 6% with a 2.5% error bound.

Ref Type	Size Range (CuFt)	2004 Energy Star		2001 Energy Star		Sample Size
		Percentage	EB	Percentage	EB	
All Types	Overall	6.3%	2.5%	15.2%	3.6%	349
	11.00-14.99	-	-	-	-	3
	15.00-18.99	3.1%	3.6%	4.9%	4.1%	85
	19.00-21.99	6.3%	3.5%	16.1%	5.2%	176
	>22.00	10.5%	6.6%	26.3%	9.4%	85
BF	Overall	12.2%	8.8%	30.9%	12.8%	41
	15.00-18.99	10.3%	16.0%	16.4%	18.3%	11
	19.00-21.99	10.9%	10.1%	36.3%	16.2%	29
	>22.00	100.0%	-	100.0%	-	1
SS	Overall	7.5%	7.5%	10.6%	8.9%	32
	15.00-18.99	-	-	-	-	4
	19.00-21.99	9.9%	10.6%	14.3%	12.5%	23
	>22.00	6.0%	10.5%	6.0%	10.5%	5
SI	Overall	9.5%	5.0%	23.3%	7.0%	140
	15.00-18.99	-	-	-	-	3
	19.00-21.99	9.3%	7.4%	20.2%	9.9%	61
	>22.00	10.2%	7.0%	27.5%	10.1%	76
TI	Overall	-	-	-	-	3
	19.00-21.99	-	-	-	-	2
	>22.00	-	-	-	-	1
TF	Overall	1.1%	1.8%	3.2%	2.7%	133
	11.00-14.99	-	-	-	-	3
	15.00-18.99	2.1%	3.4%	3.3%	3.9%	67
	19.00-21.99	-	-	3.4%	4.2%	61
	>22.00	-	-	-	-	2

Table 59: Percentage of ENERGY STAR® Qualified Primary Refrigerators by Type and Size Range

Secondary Refrigerators

Of the 36.7% of homes with second refrigerator/freezers, the majority (65.6%) have top mount freezers (standard, in the figure below), while 9.62% of homes have side-by-side refrigerators, and 9.62% have side by side models with ice dispenser. In addition, 7.63% have freezer on bottom models, 6.08% have compact models, and 1.87% have top mounted freezer with ice dispensers. A complete breakdown of secondary refrigerator/freezer by type is shown below.

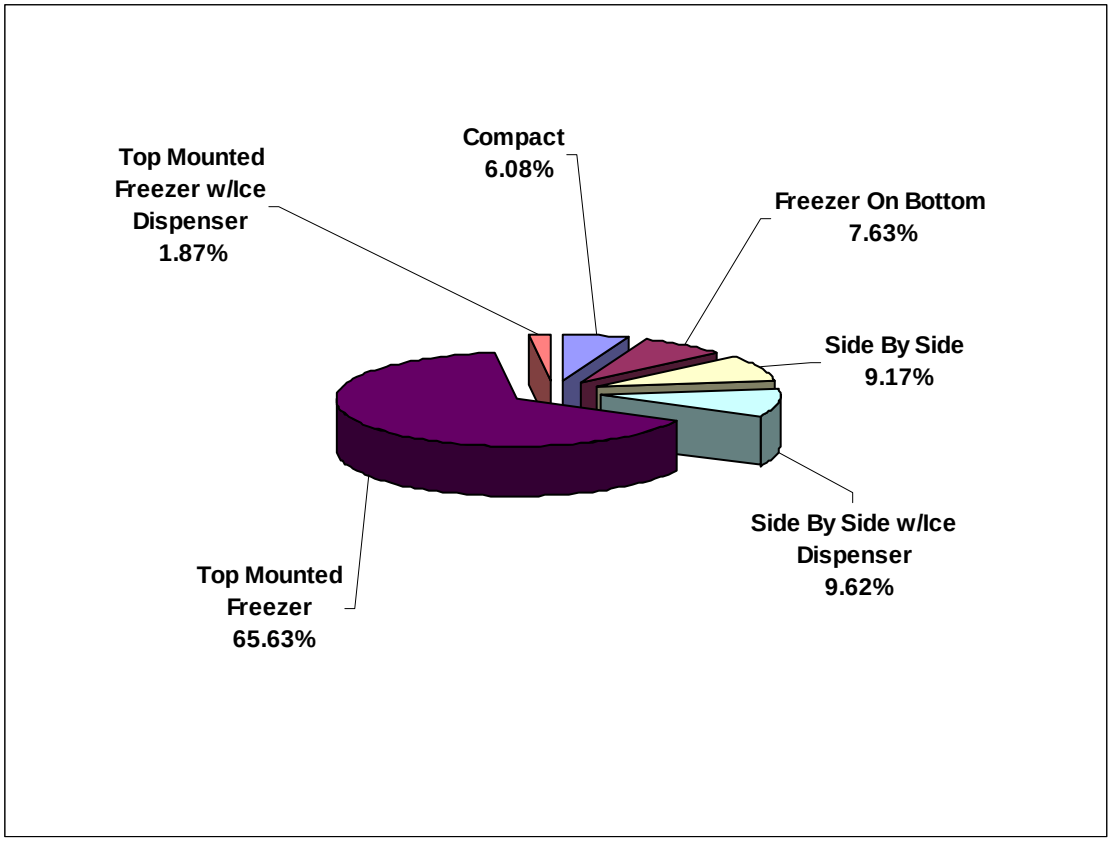

Figure 3: Secondary Refrigerators by Type

Size

The sample size that is used in the following analysis of the secondary refrigerators by size of the unit is 179. Size data for secondary refrigerators were obtained from the manufacturer data and the surveyor estimate.

Table 60 shows the average estimated size of the refrigerators by type. The average volume information is missing for 75 secondary refrigerators. The average of all types of refrigerators is 17.9 cubic feet with an error bound of .8 cubic feet. The side by side refrigerators with ice dispensers were the largest, averaging 24.4 cubic feet.

Refrigerator Type	Avg Est Size (CuFt)	EB	Sample Size
All Types	17.9	0.8	104
CO	4.2	1.5	4
BF	19.0	1.7	9
SS	19.7	0.9	13
SI	24.4	1.0	9
TF	17.4	0.7	66
TI	20.7	1.7	3

Table 60: Average Estimated Size of Secondary Refrigerators by Type

The following table shows the distribution of the sizes of the refrigerators. The largest percentage of the secondary refrigerators surveyed (45.0%) fall in the size range of 15.00 to 18.99 cubic feet.

Size Range (CuFt)	All Types (n=179)		Compact (CO) (n=9)		Freezer on Bottom (BF) (n=13)		Side by Side (SS) (n=17)		Side by Side (SI) (n=18)		Top Mounted Freezer (TF) (n=117)		Top Mounted Freezer w/ Ice Dispenser (TI) (n=5)	
	%	EB	%	EB	%	EB	%	EB	%	EB	%	EB	%	EB
< 10.99	7.4%	3.6%	100.0%	-	-	-	-	-	-	-	2.1%	2.0%	-	-
11.00 to 14.99	10.1%	3.9%	-	-	6.5%	10.5%	-	-	-	-	14.7%	5.6%	-	-
15.00 to 18.99	45.0%	6.8%	-	-	40.1%	23.9%	12.0%	13.6%	8.6%	9.9%	60.3%	8.2%	25.7%	37.1%
19.00 to 21.99	29.9%	6.2%	-	-	53.3%	24.2%	88.0%	13.6%	33.3%	19.8%	21.2%	7.0%	31.1%	32.8%
> 22.00	7.5%	3.7%	-	-	-	-	-	-	58.1%	20.9%	1.7%	2.0%	43.2%	46.1%

Table 61: Estimated Size Distribution of Secondary Refrigerators by Type

Age

The sample size of 151 secondary refrigerator ages represents all secondary refrigerator age data obtained in this study, from both model number matching and on-site estimation. The average age and error bound along with the distribution of date range by type and size range are presented in the following table. The average age of the refrigerators is 14.9 years with an error bound of 1.4 years.

This is older than the average age of primary refrigerators, which is 7.6 years. The manufacture date range of 1990 through 1994 has the largest percentage, accounting for 24.4% of all secondary refrigerators.

Manufactured Date and Estimated Mfr Date Ranges										
Ref Type	Size Range (Cu.Ft.)	Avg Mfg Age	Avg Mfg Age EB	2000-2006	1995-1999	1990-1994	1985-1989	1980-1984	1979 & Older	Sample Size
All Types	Overall	14.9	1.4	19.0%	23.4%	24.4%	11.4%	8.5%	13.4%	152
	<10	10.7	3.8	35.0%	33.8%	19.7%	-	11.5%	-	9
	11.00-14.99	23.3	4.2	4.4%	9.1%	14.3%	23.2%	6.9%	42.0%	18
	15.00-18.99	15.8	2.2	16.7%	20.5%	24.9%	14.5%	6.8%	16.6%	73
	19.00-21.99	12.5	2.0	23.3%	27.9%	27.3%	7.3%	10.5%	3.7%	42
	> 22	10.5	3.0	24.3%	35.9%	27.8%	-	12.0%	-	10
CO	Overall	11.2	4.5	33.5%	29.8%	23.2%	-	13.5%	-	7
	<10	10.5	4.5	33.5%	29.8%	23.2%	-	13.5%	-	7
BF	Overall	15.4	5.2	13.7%	28.1%	20.6%	14.1%	-	23.5%	12
	11.00-14.99	20.0	0.0	-	-	-	100.0%	-	-	1
	15.00-18.99	19.9	8.2	-	24.7%	26.2%	-	-	49.1%	5
	19.00-21.99	11.0	4.8	27.4%	34.9%	18.8%	14.1%	-	4.8%	6
SS	Overall	15.3	3.7	9.7%	23.7%	32.3%	6.8%	27.4%	-	11
	15.00-18.99	14.0	0.0	-	-	100.0%	-	-	-	1
	19.00-21.99	15.4	4.0	10.8%	26.2%	25.0%	7.6%	30.4%	-	10
SI	Overall	9.5	1.6	21.1%	42.1%	36.9%	-	-	-	15
	15.00-18.99	11.9	2.3	-	53.2%	46.8%	-	-	-	2
	19.00-21.99	9.0	4.2	30.2%	29.6%	40.1%	-	-	-	5
	> 22	9.3	1.8	21.4%	44.3%	34.3%	-	-	-	8
TF	Overall	15.9	1.9	19.3%	19.2%	23.0%	14.5%	6.9%	17.2%	102
	<10	8.3	2.3	43.7%	56.3%	-	-	-	-	2
	11.00-14.99	23.5	4.5	4.6%	9.7%	15.2%	18.7%	7.3%	44.5%	17
	15.00-18.99	15.6	2.4	19.0%	18.7%	23.3%	16.4%	7.8%	14.8%	64
	19.00-21.99	12.2	2.6	26.1%	25.9%	30.9%	6.6%	4.3%	6.3%	18
	> 22	4.0	0.0	100.0%	-	-	-	-	-	1
TI	Overall	13.9	7.2	19.8%	37.0%	-	-	43.2%	-	5
	15.00-18.99	10.0	0.0	-	100.0%	-	-	-	-	1
	19.00-21.99	4.6	2.6	63.7%	36.3%	-	-	-	-	3
	> 22	23.0	0.0	-	-	-	-	100.0%	-	1

Table 62: Average Age and Percentage of Secondary Refrigerator Manufacturer Reported Ages and On Site Estimated Ages by Size Range

Energy Consumption

The average annual nameplate unit energy consumption (UEC) data for refrigerator/freezers is obtained from the model number matches to manufacturer data. A sample of 104 nameplate UECs were obtained for the analysis below. The bin distribution and the average of nameplate annual energy consumption based upon the sample of all successfully matched secondary refrigerators is shown below grouped by type and size.

The average overall nameplate UEC is 816.0 kWh/year with an error bound of 64.0 kWh/year, as compared to the primary refrigerator UEC of 792.9. The largest percentage of refrigerators (36.3%) is within the range from 550 to 749.9 kWh/year.

Ref Type	Unit Energy Consumption Ranges										Sample Size
	Size Range (CuFt)	Average UEC	Average UEC EB	150 - 349.9	350 - 549.9	550 - 749.9	750 - 949.9	950 - 1149.9	1150 - 1349.9	1350- 1349.9	
All Types	Overall	816.0	64.0	3.5%	19.0%	36.3%	15.5%	8.6%	5.2%	12.0%	104
	<10	370.1	46.9	70.0%	30.0%	-	-	-	-	-	5
	11.00-14.99	670.7	101.9	-	21.2%	65.2%	-	-	11.9%	1.7%	11
	15.00-18.99	790.1	108.0	-	26.1%	42.0%	11.8%	5.8%	-	14.3%	40
	19.00-21.99	914.8	90.8	-	12.4%	28.5%	27.1%	13.6%	4.7%	13.7%	41
	> 22	1,088.6	169.4	-	25.0%	-	-	-	-	-	7
CO	Overall	356.3	44.6	78.2%	21.8%	-	-	-	-	-	4
	<10	356.3	44.6	78.2%	21.8%	-	-	-	-	-	4
BF	Overall	785.5	141.7	-	15.1%	55.6%	-	10.6%	18.7%	-	9
	11.00-14.99	1,200.0	0.0	-	-	-	-	-	100.0%	-	1
	15.00-18.99	603.6	41.9	-	-	100.0%	-	-	-	-	2
	19.00-21.99	780.8	166.6	-	22.5%	49.6%	-	15.9%	12.1%	-	6
SS	Overall	1,103.4	239.0	-	13.3%	9.4%	26.3%	7.1%	-	43.9%	13
	15.00-18.99	808.3	551.9	-	70.3%	-	-	-	-	29.7%	2
	19.00-21.99	1,172.0	229.4	-	-	11.6%	32.5%	8.8%	-	47.2%	11
SI	Overall	1,034.3	128.7	-	-	8.5%	36.6%	30.6%	7.4%	17.0%	9
	19.00-21.99	933.9	143.0	-	-	-	-	-	-	-	4
	> 22	1,097.8	179.9	-	-	-	28.4%	31.8%	12.1%	27.7%	5
TF	Overall	775.6	72.5	-	21.7%	44.8%	14.8%	6.7%	2.6%	9.3%	66
	<10	488.0	0.0	-	100.0%	-	-	-	-	-	1
	11.00-14.99	634.8	76.8	-	22.6%	69.6%	-	-	5.9%	1.8%	10
	15.00-18.99	804.8	118.6	-	23.8%	41.8%	13.3%	6.6%	-	14.6%	35
	19.00-21.99	844.8	100.9	-	15.6%	30.9%	30.0%	12.5%	5.3%	5.7%	19
	> 22	1,333.3	0.0	-	-	-	-	-	100.0%	-	1
TI	Overall	981.2	411.3	-	43.4%	-	-	-	56.6%	-	3
	15.00-18.99	527.0	0.0	-	100.0%	-	-	-	-	-	1
	19.00-21.99	509.0	0.0	-	100.0%	-	-	-	-	-	1
	> 22	1333.3	0.0	-	-	-	-	-	100.0%	-	1

Table 63: Percentage of Refrigerators by Nameplate UEC Ranges and Type within Size Ranges

Percentage Above/Below 2001 Federal Appliance Standards

Additionally, the above groupings of secondary refrigerators are compared with the 2001 Federal Appliance Standards for nameplate annual energy consumption, calculated the same as described in the primary refrigerator section.

Table 64 shows that on average, the secondary refrigerators are 63% less efficient than 2001 standards.

Ref Type	Size Range (CuFt)	Average UEC	EB	Sample Size
All Types	Overall	-63.4%	11.2%	96
	<=10	-28.8%	0.0%	1
	11.00-14.99	-49.9%	17.4%	10
	15.00-18.99	-68.5%	22.8%	38
	19.00-21.99	-63.7%	15.5%	40
	>22.00	-61.3%	29.4%	7
BF	Overall	-30.1%	23.1%	8
	15.00-18.99	-10.7%	7.5%	2
	19.00-21.99	-36.3%	30.0%	6
SS	Overall	-76.4%	37.9%	13
	15.00-18.99	-31.9%	91.2%	2
	19.00-21.99	-86.5%	36.4%	11
SI	Overall	-47.1%	18.2%	9
	19.00-21.99	-39.1%	25.8%	4
	>22.00	-51.8%	24.4%	5
TF	Overall	-67.9%	14.5%	63
	<10	-28.8%	0.0%	1
	11.00-14.99	-49.9%	17.4%	10
	15.00-18.99	-76.8%	24.8%	33
	19.00-21.99	-68.0%	20.0%	18
	>22.00	-0.6%	0.0%	1
TI	Overall	-91.7%	72.1%	3
	15.00-18.99	-7.5%	0.0%	1
	19.00-21.99	-6.5%	0.0%	1
	>22.00	-7.5%	0.0%	1

Table 64: Percentage Comparison to 2001 Federal Appliance Standards By Type of Refrigerator

We performed a simple analysis across all types and sizes of refrigerators comparing their UEC to their calculated allowable UEC as dictated by the standards. Thirteen and a half percent of secondary refrigerators had lower UEC's than the standards required for a unit of their similar type and size.

ENERGY STAR® Qualified

To qualify for 2001 ENERGY STAR® standards, the nameplate annual energy unit consumption of a refrigerator must be at least 10% less than 2001 Federal Appliance Standards for nameplate annual energy consumption. To qualify for 2004 ENERGY STAR® standards, the nameplate annual energy consumption of a refrigerator must be at least 15% less than 2001 Federal Appliance Standards for nameplate annual energy consumption. The following analysis is based on a sample of 96 secondary refrigerators for which we have obtained nameplate UEC data.

The distribution of secondary refrigerator/freezers that meet ENERGY STAR® qualifications grouped by size is shown below. As can be seen in the table, the percentage of all secondary refrigerators that meet 2001 ENERGY STAR® qualifications is 3% with a 3% error bound. Additionally, the percentage of secondary refrigerators meeting the 2004 ENERGY STAR® qualifications is 1.4% with an error bound of 2.3%.

Due to the variation and the small sample sizes, nothing can be stated with statistical certainty.

Ref Type	Size Range (CuFt)	2004 Energy Star Qualified		2001 Energy Star Qualified		Sample Size
		Percentage	EB	Percentage	EB	
All Types	Overall	1.4%	2.3%	2.9%	3.3%	96
	11.00-14.99	-	-	-	-	10
	15.00-18.99	3.6%	5.8%	3.6%	5.8%	38
	19.00-21.99	-	-	3.8%	6.1%	40
	>22.00	-	-	-	-	7

Table 65: Percentage of 2001 and 2004 ENERGY STAR® Qualified Secondary Refrigerators by Type and Size Range

Water Heaters

The following section summarizes the data on the water heaters that were collected during the on-site visits. As can be seen in Figure 4, the large majority of water heaters in homes are storage type water heaters. Approximately 53.2% of all water heaters are electric storage heaters, while 45.2% are gas storage. Approximately 92.85% of the observed water heaters were unwrapped.

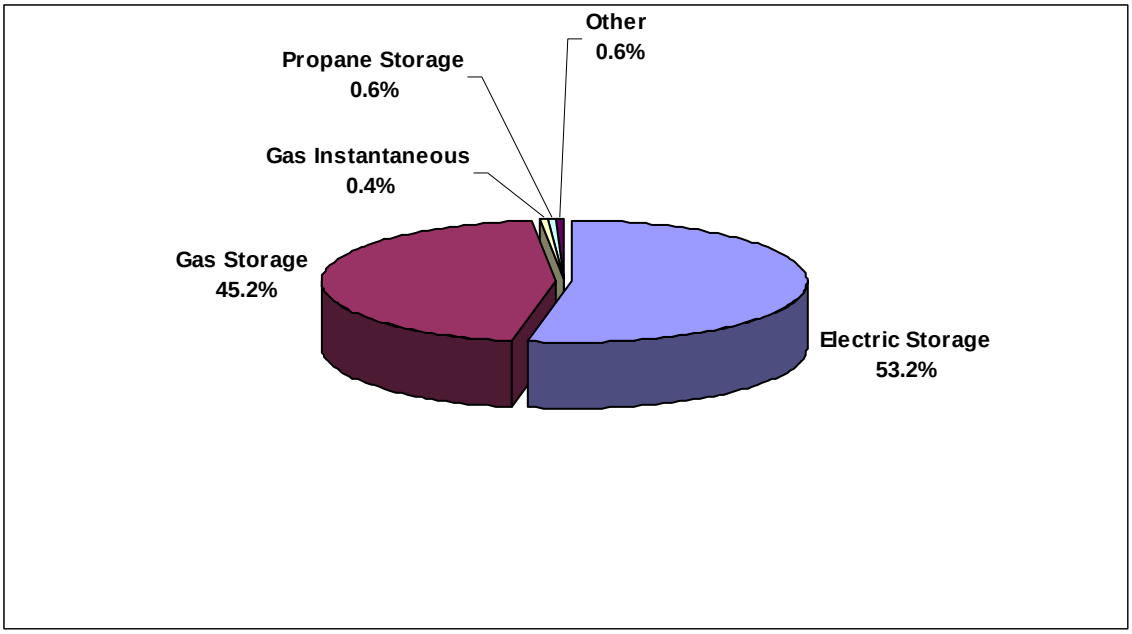

Figure 4: Water Heaters by Type

Fuel Type

Figure 5 shows the breakdown of water heaters by fuel type. The majority (53.8%) of water heaters are electric, while 45.6% are natural gas, and 0.6% are propane.

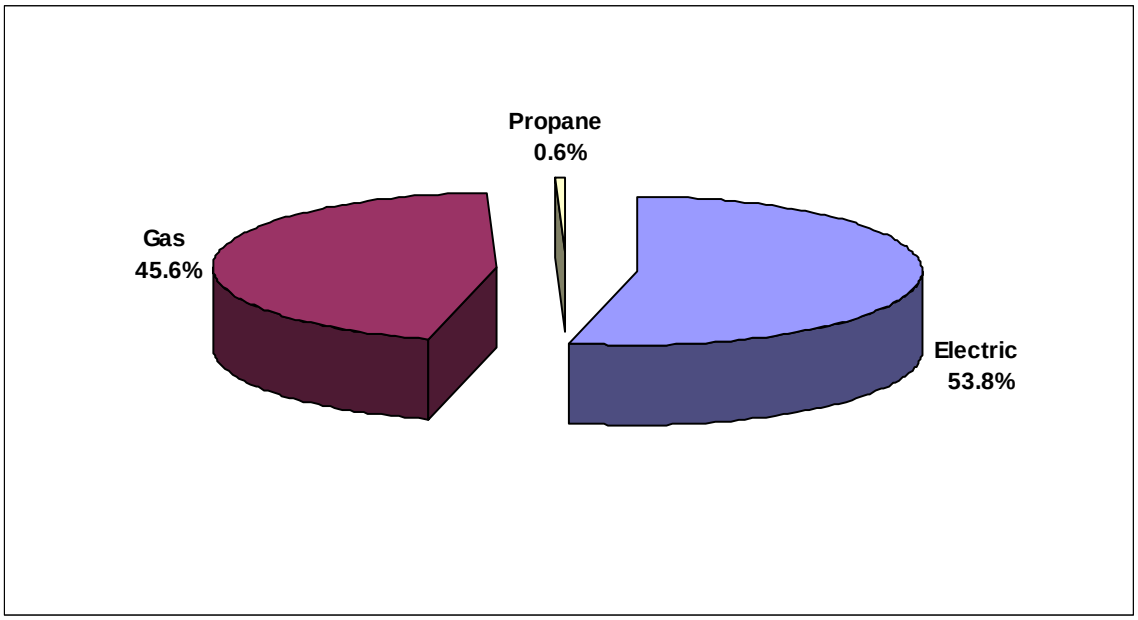

Figure 5: Water Heaters by Fuel Type

Table 66 shows the average size of the water heaters, overall and for each of the fuel types. The average sizes of the units were obtained from two sources, the first being from the manufacturer if the model number matched a model in the efficiency databases, the second being from the site visit if the model was not matched. The surveyor attempted to obtain the capacity of the water heater from the nameplate information; if no nameplate capacity data were available, the surveyor made an estimate wherever possible. The average water heater had a capacity of 50 gallons.

Fuel	Average Size (Gallons)	EB	Sample Size
All Types	50.2	0.8	488
Electric	51.7	0.9	292
Gas	48.5	1.3	189
Propane	48.7	2.0	7

Table 66: Average Size of Water Heaters by Fuel Type

Table 67 shows the percentage of water heaters in each size range within each fuel type. The sample sizes used to calculate the percentages in each fuel type are also presented in the table below. Notice that the distribution of water heater capacities differs slightly by fuel type. The majority of all units are in the 50 to 59 gallon range. Additionally, approximately 37% of gas units and 12.8% of propane units are in the 40-49 gallon range.

Size (Gallons)	Fuel Type							
	All Types (n=488)		Electric (n=292)		Gas (n=189)		Propane (n=7)	
	%	EB	%	EB	%	EB	%	EB
Tankless	-	-	-	-	-	-	-	-
Gallons 30 to 39	1.6%	-	2.7%	1.8%	0.3%	0.5%	-	-
Gallons 40 to 49	19.3%	20.2%	4.5%	2.1%	37.0%	6.4%	12.8%	20.2%
Gallons 50 to 59	69.6%	20.2%	82.2%	4.1%	54.6%	6.6%	87.2%	20.2%
Gallons 60 to 69	3.5%	-	5.7%	2.6%	1.0%	1.4%	-	-
Gallons 70 to 79	3.5%	-	0.5%	0.9%	7.1%	3.4%	-	-
Gallons 80 to 89	2.4%	-	4.4%	2.2%	-	-	-	-

Table 67: Percentage of Water Heaters by Size Range and Fuel Type

Table 68 shows the percentage of total water heaters by fuel type within the size ranges. These percentages were calculated as a proportion relative to the entire set of water heaters, regardless of fuel type. This summary table better displays the actual percentage of the population of water heaters in each size range. Table 67, for example, shows that the 50 to 59 gallon size range accounted for 54.6% of all gas water heaters. Table 68, on the other hand, shows that the same size gas heaters constitute only 24.9% of the entire population. However, the same table also shows the market dominance of 50 to 59 gallon water heaters that account for 69.6% of all water heaters.

Size (Gallons) (n=488)	Fuel Type							
	All Types		Electric		Gas		Propane	
	%	EB	%	EB	%	EB	%	EB
Tankless	-	-	-	-	-	-	-	-
Gallons 30 to 39	1.6%	-	1.3%	0.9%	0.1%	0.2%	-	-
Gallons 40 to 49	19.3%	20.2%	2.4%	1.1%	16.9%	3.3%	0.1%	0.1%
Gallons 50 to 59	69.6%	20.2%	43.9%	4.1%	24.9%	3.8%	0.5%	0.4%
Gallons 60 to 69	3.5%	-	3.1%	1.4%	0.5%	0.7%	-	-
Gallons 70 to 79	3.5%	-	0.3%	0.5%	3.2%	1.6%	-	-
Gallons 80 to 89	2.4%	-	2.2%	1.2%	-	-	-	-

Table 68: Percentage of Water Heaters within each Size Range Among all Water Heaters

Age

Table 69 shows the average age of water heaters by fuel type in each of the size ranges. The ages of the water heaters were obtained during the site visit only. No age information was available in the efficiency databases. The average age of all water heaters for which an age obtained is 7.5 years old. The ages of the electric and gas water heaters were significantly different; with electric averaging 7.7 years and gas averaging 7.2 years.

Size (Gallons)	Fuel Type											
	All Types			Electric			Natural Gas			Propane		
	Average Age	EB	Sample Size	Average Age	EB	Sample Size	Average Age	EB	Sample Size	Average Age	EB	Sample Size
All Sizes	7.5	0.5	419	7.7	0.7	234	7.2	0.6	179	5.6	3.0	6
30 to 39	7.6	5.9	5	6.5	6.1	4	15.0	0.0	1	-	-	-
40 to 49	7.7	1.0	77	11.1	5.3	8	7.4	1.0	68	5.0	-	1
50 to 59	7.4	0.6	298	7.4	0.8	196	7.4	0.8	97	5.7	3.7	5
60 to 69	8.3	2.1	14	8.9	2.1	13	4.0	0.0	1	-	-	-
70 to 79	5.2	1.6	13	6.0	-	1	5.2	1.7	12	-	-	-
80 to 89	10.7	2.9	12	10.7	2.9	12	-	-	-	-	-	-

Table 69: Average Age of Water Heaters by Fuel Type within Size Ranges

Table 70 shows the percentage of water heaters within each fuel type and size range that fall into each of the manufacture date ranges. The first row of data, representing all water heaters, shows the largest percentage of water heaters were manufactured from 2000-2006, totaling over 51.5% of all the units.

All size/fuel categories with a substantial sample show a similar distribution of age ranges. The largest percentage of water heaters is found in the most recent age ranges and the percentage decreases with each successive older age range ending with a few percent in the 1979 and older category.

Fuel Type	Size Range (Gallons)	Estimated Manufacture Date						Sample Size
		2000-2006	1995-1999	1990-1994	1985-1989	1980-1984	1979 & Older	
All Types	All Sizes	51.5%	27.5%	16.1%	2.7%	0.9%	1.3%	419
	30 to 39	70.7%	-	13.5%	-	15.8%	-	5
	40 to 49	46.9%	30.9%	19.4%	0.8%	0.9%	1.1%	77
	50 to 59	53.5%	25.4%	15.5%	3.4%	0.8%	1.4%	298
	60 to 69	42.0%	37.1%	15.2%	5.7%	-	-	14
	70 to 79	60.7%	34.2%	5.2%	-	-	-	13
	80 to 89	20.0%	48.3%	24.7%	-	-	7.1%	12
Electric	All Sizes	53.6%	26.4%	11.8%	4.4%	1.1%	2.6%	234
	30 to 39	81.7%	-	-	-	18.3%	-	4
	40 to 49	28.3%	32.4%	24.9%	-	-	14.4%	8
	50 to 59	56.8%	24.7%	10.6%	4.8%	0.9%	2.2%	196
	60 to 69	33.4%	42.6%	17.4%	6.6%	-	-	13
	70 to 79	100.0%	-	-	-	-	-	1
	80 to 89	20.0%	48.3%	24.7%	-	-	7.1%	12
Natural Gas	All Sizes	49.2%	28.6%	20.4%	1.0%	0.7%	0.0%	179
	30 to 39	-	-	100.0%	-	-	-	1
	40 to 49	48.2%	30.9%	19.1%	0.9%	1.0%	-	68
	50 to 59	48.2%	26.5%	23.3%	1.3%	0.7%	0.0%	97
	60 to 69	100.0%	-	-	-	-	-	1
	70 to 79	57.1%	37.3%	5.6%	-	-	-	12
Propane	All Sizes	63.0%	23.4%	13.5%	-	-	-	6
	40 to 49	100.0%	-	-	-	-	-	1
	50 to 59	55.6%	28.2%	16.2%	-	-	-	5

Table 70: Percentage of Water Heaters in Purchase Date Ranges by Fuel Type

Energy Factor

Energy factor for water heaters is a measure of efficiency expressed as the ratio defined below, where a higher energy factor equates to a more efficient water heater:

$$\frac{\text{heater supplied energy content of the delivered hot water}}{\text{energy consumed by the water heater}}$$

The average energy factor for the popular 40 gallon gas fired water heater is 0.57, which is slightly below the average of 0.59 from the National Appliance Energy Conservation Act Standards (NAECA), implemented in 2004. However, the average energy factor for 50- gallon gas and propane models are above the federal standard.

Energy Factor Comparison			
Size	**Fuel Type**	**Energy Factor Standard**	**Average Energy Factor**
40 Gallons	Gas	0.59	0.57
50 Gallons	Propane	0.53	0.55
50 Gallons	Gas	0.53	0.57
50 Gallons	Electric	0.90	0.89

Table 71: Energy Factor Comparison

Table 72 shows the average energy factor by fuel type within each size range. The energy factor was obtained from the efficiency databases, thus only the models that matched were included in the following summary table. The average energy factor from matched gas units is 0.57 while the average energy factor for all electric units is 0.89.

Size (Gallons)	Fuel Type								
	Electric			Natural Gas			Propane		
	Average Energy Factor	EB	Sample Size	Average Energy Factor	EB	Sample Size	Average Energy Factor	EB	Sample Size
All Sizes	0.89	0.01	170	0.57	0.038	124	0.56	0.005	2
30 to 39	0.89	0.01	4	0.53	0.000	1	-	-	0
40 to 49	0.89	0.01	5	0.57	0.005	51	0.56	-	1
50 to 59	0.89	0.01	146	0.57	0.041	62	0.55	-	1
60 to 69	0.88	0.01	6	0.53	0.044	2	-	-	0
70 to 79	-	-	0	0.49	0.006	8	-	-	0
80 to 89	0.90	0.01	9	0.00	-	0	-	-	0

Table 72: Average Energy Factor by Fuel Type in Size Ranges

Table 73 shows the percentage of water heaters within each fuel type and size range that fall into each of the energy factor ranges. Energy factors of most gas and propane water heaters are clustered throughout the range from 0.48 to 0.64, while most electric water heaters fall within the range from 0.80 to 0.96. It is difficult to make any comprehensive comparisons between these data and the 2004 federal standard due to the standard being a function of water heater volume.

Fuel Type	Size Range (Gallons)	Energy Factor																
		0.48 to 0.519	EB	0.52 to 0.559	EB	0.56 to 0.599	EB	0.60 to 0.639	EB	0.80 to 0.839	EB	0.84 to 0.879	EB	0.88 to 0.919	EB	0.92 to 0.959	EB	Sample Size
Electric	All Sizes	-	-	-	-	-	-	-	-	2.3%	2.0%	33.3%	6.6%	39.8%	6.8%	24.6%	5.9%	170
	30 to 39	-	-	-	-	-	-	-	-	-	-	-	-	100.0%	-	-	-	4
	40 to 49	-	-	-	-	-	-	-	-	-	-	-	-	100.0%	-	-	-	5
	50 to 59	-	-	-	-	-	-	-	-	-	-	35.2%	7.1%	37.5%	7.3%	27.3%	6.2%	146
	60 to 69	-	-	-	-	-	-	-	-	-	-	40.1%	37.1%	59.9%	37.1%	-	-	6
	80 to 89	-	-	-	-	-	-	-	-	45.6%	31.6%	26.3%	34.3%	16.8%	17.5%	11.3%	17.8%	9
Gas	All Sizes	8.8%	4.5%	48.9%	8.1%	29.4%	7.4%	12.7%	5.7%	-	-	-	-	0.1%	0.2%	-	-	9
	30 to 39	-	-	100.0%	-	-	-	-	-	-	-	-	-	-	-	-	-	124
	40 to 49	-	-	29.4%	11.4%	64.8%	3.5%	5.8%	5.4%	-	-	-	-	-	-	-	-	1
	50 to 59	3.2%	4.0%	72.9%	10.7%	2.9%	3.5%	20.6%	10.0%	-	-	-	-	0.3%	0.5%	-	-	51
	60 to 69	13.5%	27.2%	-	-	86.5%	86.5%	-	-	-	-	-	-	-	-	-	-	62
	70 to 79	100.0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Propane	All Sizes	-	-	44.6%	57.5%	55.4%	57.5%	-	-	-	-	-	-	-	-	-	-	8
	40 to 49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	50 to 59	-	-	100.0%	-	-	-	-	-	-	-	-	-	-	-	-	-	1

Table 73: Percentage of Water Heaters in Energy Factor Ranges by Fuel Type and Size

Clothes Washers

This section describes the clothes washer data. The model numbers collected on the washers were linked with the CEC database in order to obtain the modified energy factor. The CEC maintains a public database of all washing machines that are certified for sale in California and therefore meet federal efficiency minimums. There is an additional database of washers that do not meet the current standards but did meet previous ones and are still certified for sale if manufactured before the new standards went into effect. Therefore, this database consists mainly of newer washers and may not include older, less efficient models as well as all units sold in states other than California. Unfortunately, there is no other more complete publicly available database. Only a small percentage of the total washers, 9%, were matched through the database accounting for 44 washers. There were no manufacture date data, thus all the age data presented in this section are customer reported dates from the on-site survey. All of the homes have a clothes washing machine.

Table 74 shows the distribution of the 489 clothes washers found on site, presented by type of washer and type of residence. Nearly 19% of all washers found were horizontal-axis washing machines. The largest percentage of homes with horizontal-axis washers occurred in single-family two story houses. Approximately 27% of all homes of that type have horizontal-axis washers. The second largest percentage was around 25% and was found in the houses with 3 or more stories.

Type of Residence	Horizontal Axis		Standard		Sample Size
	%	EB	%	EB	
Overall	18.9%	3.4%	81.1%	3.4%	489
Single Family Unattached (1 story)	11.8%	3.9%	88.2%	3.9%	240
Single Family Unattached (2 stories)	27.3%	6.0%	72.7%	6.0%	206
Single Family Unattached (3 or more stories)	25.3%	19.0%	74.7%	19.0%	17
Single Family Attached	-	-	100.0%	-	7
Moblile Home - Double	21.3%	21.7%	78.7%	21.7%	11
Moblile Home - Single	-	-	100.0%	-	4
Modular Home	-	-	100.0%	-	4

Table 74: Distribution of Clothes Washers by Type of Washer and by Type of Residence

The sample size of washers with ages was 455 washers. Again, the data on the year of manufacture of the washing machine is the year that the customer reported. The washing machine was excluded from this part of the analysis if the customer was not aware of the age of the machine. As can be seen from the table below, more than half of the washers (56%) in the data were manufactured between 2000 and 2006. Among the remaining washers, approximately 24% were manufactured between 1995 and 1999. The average overall self-reported age of clothes washers is 7.4 years old.

Manufacture Date Range	% (n=455)	EB
2000-2006	56.0%	4.3%
1995-1999	24.0%	3.7%
1990-1994	11.1%	2.7%
1985-1989	4.9%	1.9%
1980-1984	2.5%	1.3%
1979 and older	1.4%	0.9%

Table 75: Distribution of Manufactured Date of Clothes Washers

In 2004 federal standards switched from rating clothes washer efficiencies from Energy Factor (EF) units to Modified Energy Factor (MEF) units. The change was made due to differences in the amount of water extracted from the clothing between different models. The MEF accounts for these differences, which have an impact on the energy consumption of the clothes dryer.

Modified Energy Factor for clothes washers is a ratio of cubic feet per kWh per cycle. The current federal efficiency standards for clothes washers, effective in 2004, set a minimum energy factor of 1.04. The minimum ENERGY STAR qualifying MEF is 1.42 for all clothes washers. The average MEF of each of the types of clothes washers, based upon the sample of clothes washers that were successfully linked with the efficiency database, meets the 2004 minimum standard energy factor. Additionally, it was apparent that horizontal axis washers, which easily achieved ENERGY STAR qualifying levels on average, perform significantly better than standard units. The efficiency databases for washers are limited therefore only 44 MEFs were obtained from matching model data. Because the database used consists of only washers that meet the current efficiency standards or that met the past standards it is no surprise that the average MEF is so high. The reader should understand that the MEFs presented are based upon limited data and may be biased towards newer models included in the databases.

Type of Washer	2004 MEF Minimum Standard	Energy Star Qualifying MEF	Average Modified Energy Factor	EB	Sample Size
H-Axis	1.04	1.42	1.75	0.04	27
Standard	1.04	1.42	1.54	0.15	17

Table 76: Average Modified Energy Factor and Comparative Standards

The following table summarizes the modified energy factor distribution relative to efficiency standards. It shows that all washers exceed the minimum federal

requirements, and 92.3% meet ENERGY STAR minimum requirements. All stacked horizontal axis washers exceed ENERGY STAR minimum requirements. A large amount (79.3%) of standard washers meet or exceed the ENERGY STAR minimum requirement, though again, this may be due to the data source. Overall, more than half of the washers for which we could match efficiencies meet the new ENERGY STAR threshold as of January 2007 of an MEF of 1.72.

Type of Washer	Modified Energy Factor					Sample Size
	< 1.04	1.04 to 1.41	1.42 to 1.71	1.72 to 1.8	>= 1.8	
All Washers	-	7.7%	41.5%	24.9%	25.9%	44
H-Axis	-	0.0%	35.9%	35.6%	28.5%	27
Standard	-	20.7%	51.1%	6.9%	21.3%	17

Table 77: Modified Energy Factor Distribution Relative to Standards

Clothes Dryers

The following section describes the clothes dryers found during the on site surveys. Data on clothes dryers were very limited in the CEC database. This section contains information on the percentage of homes with dryers, the breakdown of the fuel types, age of the dryers obtained by the surveyors during the site visits, average energy factor, and presence of a moisture sensor. All of the sites that were visited had a dryer.

Figure 6 shows the breakdown of fuel types among all dryers found during the on site visits. A total of 489 homes in the sample have dryers. The majority of homes used electric dryers, while about 10% used gas dryers.

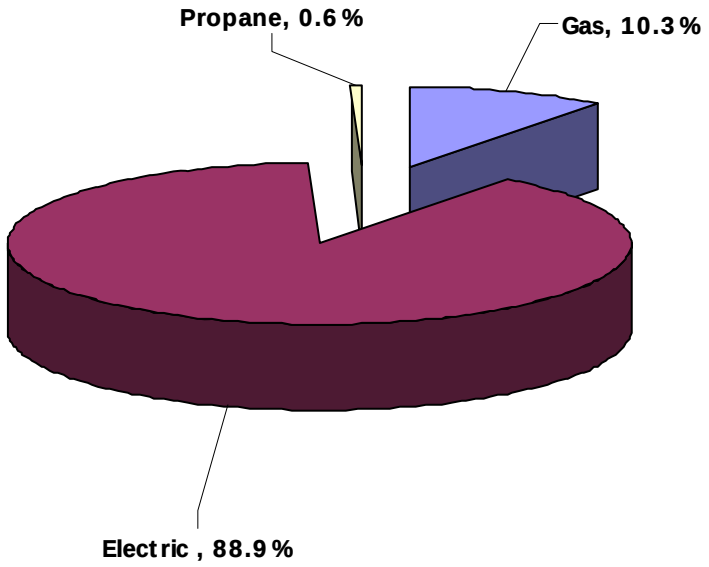

Figure 6: Percentage of Dryers by Fuel Type

The data on the age of the dryers were obtained from either the owner of the house or the surveyor estimation of the age. A total of 455 dryers in the sample have an estimated age. The average weighted age of the dryers is 8.3 years old. Table 78 shows the distribution of the estimated manufacture date for the dryers. The largest

percentage of dryers is between 0 to 6 years old. However, over 24% of all dryers are between 7 and 11 years old.

Manufacture Date Range	Percentage (n=455)	EB
2000-2006	50.9%	4.3%
1995-1999	24.5%	3.7%
1990-1994	12.9%	2.9%
1985-1989	6.5%	2.2%
1980-1984	2.9%	1.4%
1979 and older	2.2%	1.1%

Table 78: Distribution of Estimated Manufacture Date of Dryers

As the databases containing efficiency data for dryers are not extensive, only 20 energy factors were obtained from matching model numbers. The reader should understand that the energy factors presented are based upon limited data and may be biased towards newer models included in the databases. Energy factor for dryers is measured in pounds of clothing dried per kWh. The federal minimum for electric dryers is 3.01 and for gas dryers is 2.67. All matched dryers meet these federal standards. The average energy factor was 3.08 with an error bound of 0.03. The federal standards are the only standards that exist as Energy Star does not certify dryers.

Fuel Type	Average Energy Factor	EB	Sample Size
All Dryers	3.08	0.03	20
Electric	3.10	-	19
Gas	2.75	-	1

Table 79: Average Dryer Energy Factor

Moisture sensors detect the amount of moisture in the load of laundry, and terminate the cycle prematurely if the moisture content reaches a certain moisture threshold. Machines with this option save energy and wear, as it prevents over-drying. We did not collect information about moisture sensors for the study this year.

Dishwashers

The following section summarizes the 450 dishwashers found during the site visit. The data were merged with CEC database to obtain the energy factor for the model. This section contains information on the percentage of homes with dishwashers, the age of the dishwasher obtained by the surveyor during the site visit, and the energy factor from the CEC database.

Table 80 shows the percentage of homes with dishwashers by type of home. Approximately 93% of all homes had a dishwasher.

Type of Residence	Percentage with Dishwashers	EB	Sample Size
Overall	92.6%	2.1%	489
Single Family Unattached (1 story)	90.5%	3.3%	240
Single Family Unattached (2 stories)	94.6%	3.0%	206
Single Family Unattached (3 or more stories)	100.0%	-	17
Single Family Attached	100.0%	-	7
Mobile Home - Double	92.8%	11.6%	11
Mobile Home - Single	56.6%	42.2%	4
Modular Home	100.0%	-	4

Table 80: Percentage of Homes with Dishwasher by Type of Residence

Based on the subset of 358 dishwashers for which age information was found, 57% of the dishwashers were built in 2000-2006.

Manufacture Date Range	Percentage (n=358)	EB	Sample Size
2000-2006	57.3%	4.8%	199
1990-1999	34.6%	4.6%	128
1980-1989	6.3%	2.3%	25
pre-1979	1.8%	1.3%	6

Table 81: Distribution of Manufacture Date of Dishwashers

Energy factor for dishwashers is defined as loads per kWh. The average energy factor for all dishwashers that were matched to the CEC database is 0.535. Table 82 displays the average energy factor compared to the current federal minimum standard, enacted in 1994 (n=106). Overall, only 23% of the dishwasher model numbers were successfully matched. As is shown in Table 83, there is not too much systematic bias in the efficiency of the units matched by dishwasher age. The only bias that may exist lies in the 21 dishwashers with age unknown. Besides this subsection, this data correlates well to the manufacture date ranges shown in Table 81. Most matched units were manufactured post 2000, yet there was also a substantial subset between 1990 and 1999. Most of the surveyed dishwashers in the sample were manufactured after 1990, with the large majority post 2000.

Dishwasher Energy Factor		
Current Federal Standards	Minimum Energy Star Qualification	Average Energy Factor
0.46	0.58	0.51

Table 82: Comparison of Energy Factor with Federal Standards

The average energy factors of dishwashers manufactured in 1999 or before are generally similar while those made between 2000 and 2006 have a slightly higher average energy factor of 0.55.

Manufacture Date Range	Average Energy Factor	EB	Sample Size
2000-2006	0.55	0.02	36
1995-1999	0.49	0.02	29
1990-1994	0.47	0.04	14
1985-1989	0.48	0.01	4
1980-1984	0.49	0.00	1
pre 1979	0.49	0.00	1
Age Unknown	0.50	0.03	21

Table 83: Average Energy Factor by Age

The distribution of dishwasher energy factors is found in Table 84. The highest percentage of dishwashers with energy factors falls within the range of 0.460 to 0.579, containing 68% of the dishwashers. This energy factor range encompasses all dishwashers that met 1994 standards but were below the current ENERGY STAR minimum. The range of 0.580 to 0.775 accounts for all dishwashers that met or exceeded the ENERGY STAR minimum qualifying energy factor of 0.58. The total percentage of dishwashers meeting 1994 federal standards is 89.2%. The sample size for the distribution of the energy factors is 109, which is the total number of dishwashers in single-family residences that we were able to match with the CEC database.

Energy Factor	Percentage	EB
0.275 - 0.459	10.8%	5.9%
0.460 - 0.579	67.8%	8.3%
0.580 - 0.775	21.4%	7.0%

Table 84: Distribution of Energy Factor of Dishwashers

Cooling Equipment

This section presents the summary analysis of the data on primary cooling equipment found at the 304 sites that had air conditioning. The air conditioner model numbers were linked with efficiency databases from the ARI, CEC, Carrier Bluebook, and FTC in order to obtain manufacture date, capacity, seasonal energy efficiency ratio (SEER), and energy efficiency ratio (EER).

The primary cooling equipment identified during this study was of five distinct types

- Packaged System Air Conditioning - These units have the air-conditioning cycle components, the condenser, compressor, evaporator (cooling) coil and air handler fan, combined into one piece of equipment or "package". The equipment can be mounted on the roof or the side of a residence depending on the duct location.
- Split System Air Conditioning - These units are the typical residential air-conditioner with a "split" between an indoor and outdoor piece of equipment. These pieces include a remote condenser and compressor located outside the home and commonly referred to as the outdoor or condensing unit. The

indoor unit is typically in the same location as the furnace and houses the evaporator coil and air handler fan.

- Split System Heat Pumps - These units are similar to Split System A/Cs, but are configured to operate in both a normal and reverse refrigeration cycle. This allows the heat pump to provide cool air in the summer and warm air in the winter.
- Packaged Terminal Air Conditioning (PTAC) - These systems are commonly referred to as window units, room A/Cs, or wall units. They are package units because they have all components located in the same piece of equipment, but have a lower range of available cooling capacity. This category includes packaged terminal heat pumps.
- Portable- Stand Alone Units - These systems are sometimes called spot coolers and are similar to PTACs, but they are not mounted in a fixed location.

The distribution of these cooling equipment types is shown below in Table 85.

System Type (n=489)		% of Primary Cooling Types	EB
None		39.2%	4.1%
Central	Heat Pump	19.1%	3.2%
	Packaged System A/C	4.0%	1.6%
	Split System A/C	26.6%	3.6%
Space	Evaporative System	0.5%	0.6%
	Portable	3.0%	1.3%
	PTAC	7.6%	2.0%

Table 85: Distribution of Cooling System Types

The analysis of cooling equipment is presented in this section. We will include heat pumps in this analysis and consider heat pumps the same as air conditioners, as the cooling portion of a heat pump is very similar in terms of energy use to a standard A/C.

From our analysis of the surveyed residences, 39% with a 4.1% error bound of homes have no cooling equipment in place. The remaining homes have one or more cooling equipments present. Of the homes that have primary cooling equipment, the distribution of central systems versus space cooling units is shown below.

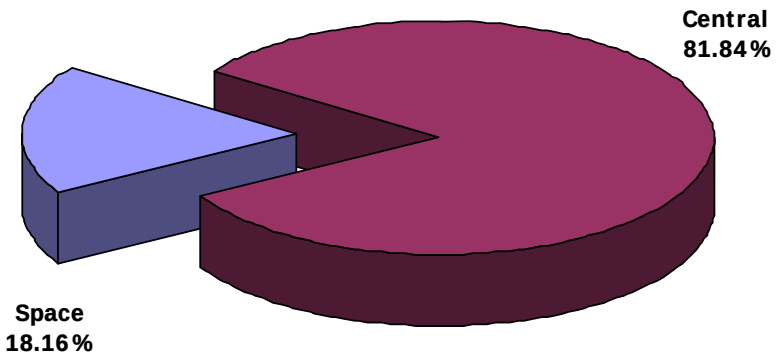

Figure 7: The Distribution of Primary Cooling Systems

Cooling equipment was classified into five types; heat pump, packaged system A/C, and Split System AC, all classified as central systems, and window units, and portable considered space units. The data show that the majority of systems are split A/C which corresponds to common building practices. The second most predominant systems were Heat Pumps.

Equipment Type	Central (n=244)		Space (n=60)	
	% of System Class	EB	% of System Class	EB
Heat Pump	38.5%	5.5%	-	-
Packaged System AC	8.1%	3.2%	-	-
Split System A/C	53.5%	5.7%	-	-
Portable	-	-	26.7%	9.9%
PTAC	-	-	69.1%	10.5%
Evaporative System	-	-	4.2%	4.9%

Table 86: Breakdown of Classes of Primary Cooling Systems by Equipment Type

Table 87 below shows the average estimated age of the primary system found at a residence. The estimated ages were obtained from a combination of dates that were gathered from the manufacturer nameplate and the surveyor estimates during the on site visit. The sample size of 213 (summing central and space units) represents all sites that were found with some type of cooling equipment and age estimate. The average central air conditioning system type is 8.08 years old, and the average space air conditioning system is 8.73 years old. As would be expected, the air conditioners are new and not being recycled from older homes.

Air Conditioning System Type		Primary Cooling System Estimated Age	EB	Sample Size
Central	All Types	8.08	0.97	166
	Heat Pump	7.47	1.71	58
	Packaged System A/C	7.41	3.66	14
	Split System A/C	8.56	1.22	94
Space	All Types	8.73	2.36	47
	Evaporative System	14.30	8.22	2
	Portable	9.61	4.24	13
	PTAC	7.95	2.91	32

Table 87 Average Age of Primary Cooling Equipment

Table 88 shows the percentage distribution for each type of cooling system by age or year manufactured. Over half (approximately 52%) of the primary central and space type air conditioners were manufactured between 2000 and 2006.

Age	Central								Space							
	All Types (n=166)		Heat Pump (n=58)		Packaged System A/C (n=14)		Split System A/C (n=94)		All Types (n=47)		Evaporative System (n=2)		Portable (n=13)		PTAC (n=32)	
	%	EB	%	EB	%	EB	%	EB	%	EB	%	EB	%	EB	%	EB
1979 or Older	3.5%	11.8%	4.0%	4.7%	5.8%	9.4%	2.8%	9.4%	8.3%	7.4%	-	-	7.4%	11.8%	9.3%	9.8%
1980 - 1984	4.1%	2.4%	3.3%	3.9%	5.8%	9.4%	4.4%	3.2%	1.9%	3.1%	-	-	-	-	2.8%	4.5%
1985 - 1989	2.5%	1.8%	2.0%	2.6%	6.0%	9.6%	2.3%	2.2%	7.9%	7.4%	62.0%	54.8%	17.4%	18.6%	-	-
1990 - 1994	14.6%	14.6%	11.4%	7.0%	-	-	19.0%	7.1%	9.6%	8.6%	-	-	10.2%	15.8%	10.1%	11.0%
1995 - 1999	23.4%	23.4%	22.8%	9.8%	17.1%	21.3%	24.9%	8.1%	12.4%	8.8%	-	-	7.2%	11.5%	15.5%	15.5%
2000 - 2006	51.8%	51.8%	56.5%	11.4%	65.3%	23.2%	46.8%	9.4%	59.8%	12.9%	38.0%	54.8%	57.7%	23.7%	62.3%	62.3%

Table 88: Age Range Distribution of Cooling System by Types

Table 89 below shows bin distributions of capacities for cooling system types. The capacities were obtained from a combination of manufacturer information and the surveyor estimates during the on site visit. The sample size of 244 represents all cooling equipment for which capacity data was obtained. All central air conditioning capacities were found to be between 1.5 and 5.0 tons. The largest percentage bin of combined central air conditioning types is 30% found in the 3 to 3.49 ton range. The largest percentage bin of space air conditioning type window/wall units (PTAC) is 74.6% and falls in the 0 to 0.99 ton range.

Ton Range	Central								Space					
	All Central (n=209)		Heat Pump (n=82)		Packaged System A/C (n=12)		Split System A/C (n=115)		All Space (n=35)		Portable- Stand Alone (n=6)		PTAC (n=29)	
	%	EB	%	EB	%	EB	%	EB	%	EB	%	EB	%	EB
0.0-0.99	-	-	-	-	-	-	-	-	73.8%	12.4%	70%	30.7%	74.6%	13.6%
1.0-1.49	-	-	-	-	-	-	-	-	26.2%	26.2%	29.6%	30.7%	25.4%	13.6%
1.5-1.99	2.4%	2.1%	1.8%	3.0%	-	-	3.0%	3.1%	-	-	-	-	-	-
2.0-2.49	19.1%	4.8%	22.1%	8.2%	31.2%	25.3%	15.6%	5.5%	-	-	-	-	-	-
2.5-2.99	23.3%	5.3%	24.5%	8.5%	18.3%	22.8%	23.1%	7.0%	-	-	-	-	-	-
3.0-3.49	30.0%	5.7%	23.7%	8.0%	22.8%	20.3%	35.1%	8.1%	-	-	-	-	-	-
3.5-3.99	14.8%	4.6%	13.6%	6.2%	6.3%	10.2%	16.7%	6.9%	-	-	-	-	-	-
4.0-4.49	6.2%	3.0%	9.0%	5.5%	16.3%	18.1%	3.1%	3.0%	-	-	-	-	-	-
4.5-5.00	4.3%	2.5%	5.3%	4.8%	5.1%	8.4%	3.4%	2.9%	-	-	-	-	-	-

Table 89: Size Distribution of Cooling Systems by Type

Table 90 shows the percentage of cooling systems by type and capacity within age ranges. For example, from the table we can identify that 51.8% of all types of central cooling units were built between 2000 and 2006.

Central System Type	Ton Range	1979 Or Older		1980-84		1985-89		1990-94		1995-99		2000-06		Sample Size
		%	EB	%	EB	%	EB	%	EB	%	EB	%	EB	
All Types	All Ranges	3.5%	2.3%	4.1%	2.4%	2.5%	1.8%	14.6%	4.7%	23.4%	6.0%	51.8%	6.9%	166
	1.5 to 1.99	-	-	-	-	-	-	-	-	-	-	100.0%	-	2
	2.0 to 2.49	3.1%	5.0%	6.5%	7.5%	3.1%	5.0%	17.2%	11.8%	10.1%	9.4%	60.0%	15.6%	28
	2.5 to 2.9	5.5%	6.3%	5.6%	6.4%	-	-	18.6%	11.1%	39.1%	15.9%	31.2%	14.0%	33
	3.0 to 3.49	1.8%	3.0%	-	-	3.4%	3.9%	15.2%	9.1%	22.9%	10.6%	56.7%	12.8%	48
	3.5 to 3.9	1.7%	2.8%	-	-	-	-	5.8%	6.9%	29.6%	18.2%	62.9%	18.9%	20
	4.0 to 4.49	-	-	9.9%	15.8%	6.6%	10.9%	22.7%	30.8%	9.3%	14.9%	51.5%	30.6%	9
	4.5 to 5	-	-	-	-	-	-	11.2%	18.0%	40.5%	33.1%	48.2%	34.6%	7
	Unknown	10.6%	13.4%	13.6%	12.5%	6.8%	8.6%	12.5%	13.9%	11.2%	12.7%	45.4%	20.1%	19
Heat Pump	All Ranges	4.0%	4.7%	3.3%	3.9%	2.0%	2.6%	11.4%	7.0%	22.8%	9.8%	56.5%	11.4%	58
	1.5 to 1.99	-	-	-	-	-	-	-	-	-	-	100.0%	-	1
	2.0 to 2.49	8.6%	13.8%	11.0%	17.1%	-	-	22.2%	22.9%	12.2%	18.8%	45.9%	27.6%	9
	2.5 to 2.9	-	-	-	-	-	-	19.8%	19.1%	30.4%	23.5%	49.8%	24.4%	13
	3.0 to 3.49	-	-	-	-	5.7%	9.1%	7.8%	10.4%	27.2%	19.2%	59.3%	20.8%	17
	3.5 to 3.9	-	-	-	-	-	-	10.7%	17.3%	37.5%	34.8%	51.8%	35.4%	6
	4.0 to 4.49	-	-	32.1%	45.0%	-	-	-	-	-	-	67.9%	45.0%	3
	4.5 to 5	-	-	-	-	-	-	-	-	17.8%	31.0%	82.2%	31.0%	3
	Unknown	21.1%	30.3%	-	-	4.4%	7.6%	-	-	18.0%	26.9%	56.5%	35.1%	6
Packaged System A/C	All Ranges	5.8%		5.8%		6.0%		-		17.1%		65.3%		14
	2.0 to 2.49	-	-	-	-	-	-	-	-	-	-	100.0%	-	2
	2.5 to 2.9	-	-	-	-	-	-	-	-	-	-	-	-	2
	3.0 to 3.49	27.2%	40.3%	-	-	-	-	-	-	-	-	72.8%	40.3%	3
	3.5 to 3.9	-	-	-	-	-	-	-	-	-	-	100.0%	-	1
	4.0 to 4.49	-	-	-	-	-	-	-	-	-	-	100.0%	-	2
	4.5 to 5	-	-	-	-	-	-	-	-	-	-	-	-	0
	Unknown	-	-	23.4%	34.2%	24.1%	35.0%	-	-	-	-	52.5%	41.7%	4
Split System A/C	All Ranges	2.8%	2.4%	4.4%	3.2%	2.3%	2.2%	19.0%	7.1%	24.9%	8.1%	46.8%	9.4%	94
	1.5 to 1.99	-	-	-	-	-	-	-	-	-	-	100.0%	-	1
	2.0 to 2.49	-	-	4.6%	7.4%	5.5%	8.9%	16.6%	14.7%	10.3%	11.5%	63.0%	19.6%	17
	2.5 to 2.9	10.7%	11.9%	10.9%	12.1%	-	-	20.4%	14.9%	36.9%	21.2%	21.1%	16.5%	18
	3.0 to 3.49	-	-	-	-	2.5%	4.1%	20.9%	13.6%	23.2%	13.8%	53.5%	17.2%	28
	3.5 to 3.9	2.2%	3.8%	-	-	-	-	4.7%	7.7%	28.7%	21.9%	64.4%	22.9%	13
	4.0 to 4.49	-	-	-	-	15.3%	25.8%	52.7%	47.9%	21.6%	34.3%	10.4%	18.3%	4
	4.5 to 5	-	-	-	-	-	-	19.7%	30.3%	57.8%	40.7%	22.5%	33.4%	4
	Unknown	5.6%	9.3%	22.1%	23.6%	-	-	31.8%	29.5%	10.2%	16.1%	30.3%	25.2%	9

Table 90: Size Distributions by Age Range for Central System Types

Seasonal energy efficiency ratio (SEER) is a measure of air conditioning efficiency given in kBtu of cooling delivered per kWh of electrical energy consumed. The SEER data for this analysis were obtained strictly from the manufacturer data of matched model

numbers. The sample of size of 141 represents all of the cooling systems that were successfully matched with manufacturer data.

The distribution of SEER range by cooling system type is shown below in Table 91. The greatest amount of combined central system air conditioners are in the 10 to 10.99 SEER range accounting for 70.3% of central systems with a 7.0% error bound. As these homes were permitted before 2006, the 10 to 10.99 SEER range met the national standard of that time, though it should be noted that the current national standard has increased to 13 SEER. The ENERGY STAR threshold has increased to 14 SEER.

Efficiency Range	All Central Types (n=141)		Heat Pump (n=53)		Packaged System A/C (n=5)		Split System A/C (n=83)	
	%	EB	%	EB	%	EB	%	EB
14 or Higher SEER	3.9%	3.0%	5.0%	4.9%	-	-	3.6%	4.1%
13 - 13.99 SEER	6.9%	4.0%	7.8%	6.7%	-	-	6.9%	5.4%
12 - 12.99 SEER	6.8%	3.6%	9.4%	6.2%	21.7%	31.8%	4.0%	4.1%
11 - 11.99 SEER	12.1%	5.2%	9.6%	7.0%	13.4%	21.6%	13.5%	7.5%
10 - 10.99 SEER	70.3%	7.0%	68.2%	10.9%	64.9%	35.8%	71.9%	9.5%

Table 91: Distribution of Cooling Systems by SEER ranges and Cooling System Type

The distribution of average SEER values across the system capacity ranges is shown in Table 92. The average SEER for capacity range can be observed in this table. For split system units in the range of 3.0 to 3.49 tons, the most saturated capacity range, the average system efficiency is 10.5. The most efficient unit in the sample was a single heat pump in the 1.5 to 1.99 range with an efficiency of 13.

System Type	Ton Range	Average Efficiency	EB	Sample Size
All Central	1.5 to 1.99	10.8	1.1	4
	2.0 to 2.49	10.3	0.3	30
	2.5 to 2.9	10.2	0.2	32
	3.0 to 3.49	10.6	0.3	45
	3.5 to 3.9	11.2	0.6	18
	4.0 to 4.49	11.2	1.0	5
	4.5 to 5	10.9	0.7	6
	Unknown	10.0	0.0	1
Heat Pump	1.5 to 1.99	13.0	0.0	1
	2.0 to 2.49	10.2	0.2	12
	2.5 to 2.9	10.4	0.4	14
	3.0 to 3.49	10.7	0.4	14
	3.5 to 3.9	12.0	1.2	5
	4.0 to 4.49	11.4	1.7	2
	4.5 to 5	10.9	0.9	4
	Unknown	10.0	0.0	1
Packaged System A/C	2.0 to 2.49	10.0	0.0	2
	2.5 to 2.9	-	-	0
	3.0 to 3.49	10.4	0.5	2
	3.5 to 3.9	-	-	0
	4.0 to 4.49	12.0	0.0	1
	4.5 to 5	-	-	0
	Unknown	-	-	0
Split System A/C	1.5 to 1.99	10.0	0.0	3
	2.0 to 2.49	10.5	0.5	16
	2.5 to 2.9	10.0	0.1	18
	3.0 to 3.49	10.5	0.3	29
	3.5 to 3.9	11.0	0.7	13
	4.0 to 4.49	10.0	0.0	2
	4.5 to 5	10.9	1.2	2
	Unknown	-	-	0

Table 92: Cooling Systems by Type, Tonnage Range, and Average Efficiency (SEER)

As mentioned above, the current minimum efficiency standard for split-system air conditioners, packaged air conditioners, and heat pumps is a SEER of 13.0. The minimum qualifying ENERGY STAR SEER is 14.0 for split-system and packaged air conditioners and heat pumps. Table 93 shows the average SEER compared with current and previous standards. The average SEER for all of the system types listed below exceed the previous federal standard (which was current when the homes were permitted), but fall short of the 2006 standard and ENERGY STAR minimum.

Type of System	Previous Minimum Federal Standard	2006 Minimum Federal Standard	Minimum Energy Star Standard	Average SEER	Sample Size
Heat Pump	9.7	13	14	10.49	53
Packaged System A/C	9.7	13	14	10.73	5
Split System A/C	10	13	14	10.54	83

Table 93: Average SEER Standard Comparison

Table 94 shows the distribution of SEER ratings compared to the standards. As shown in the table above, the majority of units are in the 10-10.99 SEER range. Very few units meet or exceed the 2006 standards.

Type of Sys	Previous Federal Standard	2006 Federal Standard	ENERGY STAR® Standard	SEER					Sample Size
				10-10.99	11-11.99	12-12.99	13-13.99	14 or Greater	
Heat Pump	9.7	13	14	64.2%	9.4%	13.2%	7.5%	5.7%	53
Packaged System A/C	9.7	13	14	60.0%	20.0%	20.0%	0.0%	0.0%	5
Split System A/C	10	13	14	77.1%	10.8%	3.6%	6.0%	2.4%	83

Table 94: Distribution of SEER Ratings

Heating Equipment

This section presents the summary analysis of the primary heating systems found during the site visits. The heating systems were linked with efficiency databases from the CEC and the Carrier Bluebook in order to obtain manufacture date, input, output, capacity, and annual fuel utilization efficiency (AFUE, expressed as a percentage). The efficiency of gas units is shown in AFUE, and no distribution of electric unit efficiencies is given due to the fact that all electric units are assumed to be 100% efficient. Heat pumps are included in the next several tables due to the fact that the heat pump may be the only heating system at the home. They are excluded from the efficiency tables due to low efficiency matching rates.

Table 95 shows the percentage of homes that have one or more heating system. A similar amount of homes had either one or two heating systems, with approximately 46% of homes having one system and 44% with two systems. For the homes with more than one heating system, the surveyor determined which system was primary and noted it accordingly.

Number of Heating Systems	% of Homes (n=489)	EB
1	46.7%	4.1%
2	44.4%	4.1%
3	7.2%	2.2%
4	0.3%	0.3%
5 or more	1.4%	0.9%

Table 95: Percentage of Homes with Heating System

Figure 8 shows the distribution of primary heating system fuel types. The fuel types were taken from the surveyor information. Half of all primary systems were fueled by

gas and 41% of all systems were electric. Next are wood fueled systems at 6% and the last 3% are represented by fuel oil and propane combined.

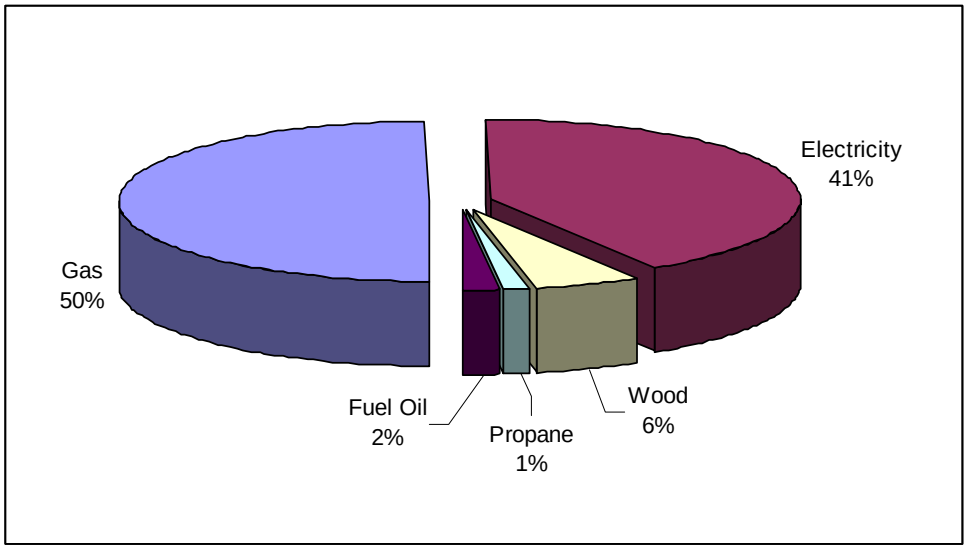

Figure 8: Percentage of Primary Heating System Fuel Types

Table 96 shows the percentage of heating system fuel types for secondary systems as well. There is almost a three way split between gas, electricity and wood. The percentage of wood fueled secondary systems, 33%, is much higher than that for primary systems, 6%.

Primary Fuel			Secondary Fuel		
Fuel Type	% of Homes	Sample Size	Fuel Type	% of Homes	Sample Size
Gas	50%	207	Gas	31%	67
Electricity	41%	230	Electricity	26%	74
Wood	6%	30	Wood	33%	99
Propane	1%	10	Propane	8%	2
Fuel Oil	2%	12	Fuel Oil	1%	24

Table 96: Percentage of Primary & Secondary Heating System Fuel Types

Table 97 shows the primary heating system type among all houses with heating system types. The majority of all primary heating systems were found to be forced air furnaces, totaling just over 60% of the population of primary heating systems. Space units used as the primary heating system were far less common than central units.

	System Type (n=489)	% of Primary Heating Types	EB
Central	Forced Air Furnace	62.6%	3.9%
	Heat pump w/Electric Supp	13.9%	2.7%
	Heat pump w/out Elec Supp	0.5%	0.5%
	Hydronic System	0.7%	0.8%
Space	Baseboards	6.8%	1.9%
	Ceiling Cable	2.7%	1.2%
	Fireplace	3.0%	1.5%
	Floor	0.3%	0.5%
	Wall Unit	4.4%	1.6%
	Pellet Stove	5.0%	1.8%

Table 97: Percentage of Primary Heating Types by Type of System

Table 98 shows the percentage of heating systems by fuel type and system type. Among all the system types found, a slightly higher percentage consumed natural gas. Among all forced air furnaces, 74.2% consumed natural gas.

System Type		Fuel Type										Sample Size
		Gas		Electricity		Pellets		Propane		Fuel Oil		
		%	EB	%	EB	%	EB	%	EB	%	EB	
All Types		49.6%	4.2%	41.1%	4.0%	6.1%	1.9%	1.2%	0.8%	2.0%	1.1%	489
Central	All Central	60.4%	4.5%	36.2%	4.4%	0.4%	0.7%	0.6%	0.5%	2.4%	1.4%	368
	Forced Air Furnace	74.2%	4.3%	22.6%	4.1%	-	-	0.7%	0.6%	2.4%	1.4%	291
	Heat pump w/Electric Supp	1.2%	2.0%	96.5%	4.2%	2.3%	3.7%	-	-	-	-	71
	Heat pump w/o Supplemental	-	-	100.0%	-	-	-	-	-	-	-	3
	Hydronic System	42.4%	53.9%	6.6%	12.4%	-	-	-	-	51.1%	54.7%	3
Space	All Space	12.0%	6.4%	58.0%	8.4%	25.9%	7.4%	3.4%	3.1%	0.6%	1.0%	121
	Baseboards	-	-	100.0%	-	-	-	-	-	-	-	42
	Ceiling Cable	-	-	94.7%	8.5%	-	-	-	-	5.3%	8.5%	14
	Fireplace	61.0%	22.0%	-	-	34.9%	21.1%	4.1%	5.0%	-	-	15
	Floor	100.0%	-	-	-	-	-	-	-	-	-	1
	Wall Unit	12.4%	13.8%	80.1%	16.7%	-	-	7.5%	11.7%	-	-	24
	Pellet Stove	-	-	-	-	93.8%	8.2%	6.2%	8.2%	-	-	25

Table 98: Percentage of Heating Systems by Fuel Type within Type of Heating System

Table 99 shows the average estimated age of each type of heating system, and the percentage of each type of heating systems in various manufacture date ranges. As explained previously, the estimated ages were obtained from a combination of the dates that were obtained from the manufacturer information and the surveyor estimates during the on site visit. On average, forced air furnaces were 11 years old.

System Type		Manufactured Date and Estimated Manufactured Date Ranges										Sample Size
		Avg Mfr Age	Ave Mfr EB	2006		2005		2004		2003		
				%	EB	%	EB	%	EB	%	EB	
All Types		12.56	1.07	38.6%	4.8%	35.7%	4.7%	13.2%	3.2%	12.5%	3.1%	347
Central	All Central	10.94	1.06	42.1%	5.5%	38.0%	5.4%	11.5%	3.4%	8.4%	3.0%	275
	Forced Air Furnace	11.02	1.11	40.6%	6.2%	39.8%	6.1%	11.7%	3.9%	7.9%	3.2%	222
	Heat pump w/Electric Supplement	9.44	2.19	50.4%	12.6%	29.8%	11.3%	11.6%	7.5%	8.2%	7.4%	49
	Heat pump w/no Supplemental Heat	2.30	0.49	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2
	Hydronic System	31.86	23.06	0.0%	0.0%	45.4%	57.7%	0.0%	0.0%	54.6%	57.7%	2
Space	All Space	19.57	3.04	23.7%	9.4%	25.6%	9.4%	20.6%	7.8%	30.1%	9.7%	72
	Baseboards	24.83	5.69	14.5%	14.0%	12.9%	10.3%	40.3%	18.0%	32.2%	19.0%	23
	Cable Ceiling	32.38	3.37	0.0%	0.0%	0.0%	0.0%	21.0%	19.3%	79.0%	19.3%	12
	Fireplace	13.55	7.14	48.0%	30.3%	25.4%	26.4%	9.5%	15.2%	17.1%	19.2%	10
	Floor	35.00	0.00	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	1
	Wall Unit	13.01	4.47	34.5%	22.0%	39.5%	22.5%	11.5%	12.8%	14.5%	13.6%	16
	Pellet Stove	9.10	2.52	32.1%	24.7%	58.9%	26.3%	9.0%	14.3%	0.0%	0.0%	10

Table 99: Average Estimated Age and Percentage of Heating System by Type within Age Ranges

Table 100 shows the percentage of all furnaces by fuel type and capacity range. The capacity of the furnaces was obtained from manufacturer information if the model number linked to one of the databases. The on site estimation of the capacity of the furnaces was used if the model number did not link with the database. Nearly 40% of all gas units were between 55 to 69.99 kBtu. The second largest percentage of gas furnaces were between 70 and 84.99 kBtu. 39% of all electric units were less than 7 kW.

Fuel	Capacity Ranges (n = 164)	% of Furnaces with Capacity	EB
Gas kBtu (n=141)	24 to 39.99	3.9%	2.9%
	40 to 54.99	15.6%	5.6%
	55 to 69.99	38.1%	7.5%
	70 to 84.99	27.0%	6.9%
	85 to 99.99	11.2%	4.8%
	100 to 114.99	3.7%	3.1%
	115 to 129.99	0.6%	0.9%
Electric kW (n=23)	< 7	39.2%	17.3%
	7 to 11	35.2%	17.4%
	11 to 16	24.1%	14.7%
	>16	1.4%	2.4%

Table 100: Percentage of All Furnaces with Capacity by Fuel Type

Table 101 shows the percentage distribution for the output capacities of the heat pumps in the Pacific Northwest. The highest percentage falls within the 30 – 39.9 kBtuh range, at 60%.

Output Range (n=31)	Percent	EB
20 - 29.9	20.7%	10.8%
30 - 39.9	60.3%	12.2%
40 - 49.9	14.8%	8.5%
50 - 59.9	4.1%	4.8%

Table 101: Heat Pump Output Bins

Table 102 shows the percentage of heating systems with an AFUE by type and AFUE range. The large majority of the forced air furnaces have an AFUE between 78 and 84.99.

AFUE Range	Central Forced Air Furnace (n=142)	
	%	EB
Below 78	7.4%	4.2%
78 - 84.99	76.3%	6.5%
85 - 89.99	-	-
90 - 96	16.3%	5.5%

Table 102: Percentage of Heating Systems by Type within AFUE Ranges

Table 103 shows the overall average AFUE for central gas fired forced air furnaces compared with standards. On average, the forced air furnaces meet 1992 minimum standards, but fall short of ENERGY STAR qualifying standards. This standard is currently in the rulemaking process.

Annual Fuel Utilization Efficiency			
Type	Minimum Federal Standard	Minimum Energy Star Standard	Average AFUE
Gas Fired Forced Air Furnace	78	90	81.9

Table 103: Average AFUE Standard Comparison

There were too few matches on heat pump Heating Seasonal Performance Factor (HSPF) to present averages in this report.

Table 104 shows the bin distribution of heat pump HSPF. Over half 58.6% fell between the previous federal standard of 6.8 and the current standard of 7.7, while approximate 24.1% surpass the current federal standard but fall short of the Energy Star minimum HSPF. Approximately 17.2% meet or surpass the current Energy Star standard for split heat pumps.

HSPF Range (n=29)	Percent of Sample	Sample Size
6.95-7.69	58.6%	17
7.7-8.19	24.1%	7
8.2 or Greater	17.2%	5

Table 104: Heat Pump HSPF Bins

Thermostats

Table 105 shows the percentage of homes by the type of thermostat within each home. The majority of homes (55%) had digital thermostats.

Type	% of Homes (n=489)	EB
Mechanical Thermostat	34.8%	3.9%
Digital Thermostat	55.5%	4.1%
Hybrid Thermostat	3.4%	1.4%
Not Observed	5.5%	1.7%

Table 105: Percent of Homes by Type of Thermostat

Programmable thermostats were examined during the onsite but due to individual preferences for temperature and schedules it is difficult to define from the data what percentage of thermostats customers were able to program.

Pool and Spa

The following section describes the pools and spas found at the residences. Information on the fuel type and the presence of a pool or spa was recorded during the site visit.

Pool

Approximately 5% of sites visited had a below ground swimming pool of some sort.

Spa

Sixteen percent of homes in the region had a spa. The large majority of spas were heated with electricity. Table 106 outlines the percentage of various fuel types for sites that had spas.

Spa Fuel Type	Percentage (n=80)	EB
Gas	9.9%	6.8%
Electric	86.9%	7.3%
Propane	0.4%	0.7%
Other	2.8%	2.7%

Table 106: Percentage of Spas by Fuel Type

Consumer Electronics

RLW surveyors were asked to record the number of plug loads in each residence by type. The table below shows the percentage of homes with each plug load.

Electronics	% of Homes (n=488)	EB
Has Computer	89.9%	2.4%
Has Printer/Fax	78.3%	3.4%
Has TV	99.6%	0.6%

Table 107: Percent of Homes with Plug Load

The table below shows the average number of each plug load found in each surveyed home. There are on average 2.6 televisions per home, compared to only 1.4 computers per home. Over 50% of homes had 1 printer or fax machine per home and over 20% had more than 1. The average number of printers or fax machines per home was therefore 1.0, although 21.7% of all homes (Table 107) did not have any.

Consumer Appliances	Average Number (n=488)	EB
Television	2.6	0.1
Computers	1.4	0.1
Printer/Fax	1.0	0.1

Table 108: Average Number of Each Plug Load

Large Appliances

Information on other major end uses in the home was captured. Table 109 presents the percentage of homes that had each of the large appliances surveyed.

Large Appliances	% of Homes (n=488)	EB
Has Well	10.7%	2.4%
Has Photovoltaic System	0.0%	0.0%
Has Welding Equipment	4.0%	1.5%
Has Shop Equipment	18.3%	3.1%
Has Waterbed	4.0%	1.6%
Has Aquarium	6.9%	2.1%
Has Sauna	2.5%	1.3%

Table 109: Percent of Homes with Large Appliances

Single-Family Building Components

The following section discuses the findings for building envelope components as observed by the survey. We have chosen to remove the mobile homes from this portion of the analysis as manufactured homes have a different set of building codes to which they must comply. Modular homes are included because they must abide by state building codes. This makes for a refined sample of 474 homes.

Windows

The following section describes the window types at the residences. Information on the type of window frame and the number of panes in each window was recorded during the site visit. If the customer reported that there were multiple types of frames or panes in their home, the predominant window type was observed and recorded.

Table 110 shows the breakdown of homes by window frame type and type of panes by type of residence. Over 63% of all the homes have non metal, double paned windows. On average, approximately 20% of all homes have metal, double paned windows. Approximately 17% of the homes in the sample have single paned windows, and 0.2% have triple paned windows.

Type of Residence	Window and Pane Type										
	Metal Single		Metal Double		Non Metal Single		Non Metal Double		Metal Triple		Sample
	%	EB	%	EB	%	EB	%	EB	%	EB	Size
Overall	10.11%	2.64%	19.9%	3.5%	6.7%	2.1%	63.1%	4.2%	0.2%	0.3%	447
Modular	0.00%	0.00%	-	-	-	-	100.0%	-	-	-	4
Single Family Unattached (1 story)	8.46%	3.38%	21.0%	5.0%	8.1%	3.3%	62.0%	5.9%	0.3%	0.6%	227
Single Family Unattached (2 stories)	11.06%	4.15%	20.0%	5.3%	6.2%	3.0%	62.8%	6.4%	-	-	192
Single Family Unattached (3 or more stories)	23.02%	20.49%	19.9%	17.8%	-	-	57.1%	22.6%	-	-	17
Single Family Attached	8.32%	13.75%	-	-	-	-	91.7%	13.7%	-	-	7

Table 110: Percentage of Glass Area by Frame Type and Panes Type by Type of Residence

Table 111 shows the percentage of glass area in homes by glazing characteristics and type of residence. Low E glazing constitutes 35.7% of the overall window glazing. Non Low E glazing constitutes 60.3% of glazing area, and 4% of window glazing characteristics were unknown.

Type of Residence	Window Glazing Characteristics						
	Low E Glazing		Not Low E Glazing		Unknown		Sample
	%	EB	%	EB	%	EB	Size
Overall	35.7%	4.2%	60.3%	4.3%	4.0%	1.6%	447
Single Family Unattached (1 story)	34.1%	5.7%	62.4%	5.9%	3.4%	2.2%	227
Single Family Unattached (2 stories)	37.1%	6.5%	60.5%	6.6%	2.4%	1.4%	192
Single Family Unattached (3 or more stories)	29.4%	20.7%	60.1%	21.7%	10.6%	10.6%	17
Single Family Attached	35.7%	33.5%	21.5%	22.2%	42.8%	35.0%	7
Modular	79.0%	32.3%	21.0%	32.3%	-	-	4

Table 111: Percentage of Glass Area by Glazing Type and Type of Residence

Insulation

The following section describes the insulation in walls, floors, and attics. The insulation in raised floors and attics was often directly observable in occupied homes, while wall and slab edge insulation typically were not observable. Unobservable insulation levels were estimated based on framing size and any documentation available on site. Difficulty arose when the attic was inaccessible due to the fact that access was blocked by furniture, the homeowner denying the surveyor access, etc.

Attic

The average R-Value among all homes with an estimated or verified R-Value for attic insulation is 30 with an error bound of 1.1.

Table 112 shows the average R-Value and the percentage of homes with R-Values in ranges by type of residence. The largest percent of homes are in the range between R-38 to R-41.99, totaling 33% of the homes with an R-Value observed.

Type of Residence	Average R Value	Average R Value EB	R11 to R18.99		R19 to R21.99		R22 to R29.99		R30 to R37.99		R38 to R41.99		Greater Than R42		Sample Size
			%	EB	%	EB	%	EB	%	EB	%	EB	%	EB	
Overall	30.0	1.1	16.4%	3.6%	10.7%	3.1%	9.3%	2.7%	22.5%	4.1%	32.9%	4.6%	8.2%	2.6%	353
Single Family Unattached (1 story)	29.8	1.5	18.0%	5.3%	11.7%	4.6%	8.3%	3.4%	16.4%	4.9%	39.0%	6.8%	6.5%	3.1%	176
Single Family Unattached (2 stories)	30.1	1.6	14.5%	5.2%	10.9%	4.6%	9.8%	4.3%	28.3%	6.6%	26.4%	6.6%	10.1%	4.4%	156
Single Family Unattached (3 or more stories)	29.9	5.1	14.3%	15.9%	-	-	20.5%	24.8%	29.3%	24.5%	24.4%	21.1%	11.6%	13.5%	13
Single Family Attached	27.3	10.3	39.0%	39.3%	-	-	6.0%	10.6%	-	-	55.0%	40.5%	-	-	5
Modular	33.8	4.1	-	-	-	-	-	-	53.1%	50.7%	46.9%	50.7%	-	-	3

Table 112: Average R-Value and Percentage of Homes with Attic R-Values within R-Value Bins

Walls

The percentage of insulated homes with different insulation levels are presented in the table below. Among those homes where it was possible to observe the percentage of the walls that were insulated, the percentage of homes with R21 is 17.1%.

Construction Type	Insulation Level												Sample Size
	None		R 11		R 13		R 15		R 19		R 21		
	%	EB	%	EB	%	EB	%	EB	%	EB	%	EB	
All Types	4.9%	2.3%	37.1%	5.0%	12.2%	3.3%	0.9%	0.9%	27.8%	4.6%	17.1%	4.0%	307
2 X 4	4.3%	2.8%	58.6%	6.5%	18.3%	4.9%	0.3%	0.3%	10.9%	4.1%	7.7%	3.7%	188
2 X 6	2.3%	2.8%	6.7%	4.4%	3.6%	3.5%	2.0%	2.3%	53.9%	8.5%	31.5%	8.0%	112
Masonry	100.0%	-	-	-	-	-	-	-	-	-	-	-	4
Unknown	24.4%	37.3%	-	-	-	-	-	-	43.7%	49.7%	31.9%	44.3%	3

Table 113: Percentage of Homes by Wall Construction Type by Insulation Level

Floor

The following table displays the percentage of homes for which an R-Value was obtained for the floor insulation. Twelve percent of all homes are slab on grade. 7% of the homes have no floor insulation.

Floor R-Value (n=474)	%	EB
No Insulation	7.0%	2.2%
<R11	12.0%	2.6%
R11	4.3%	1.7%
R13	7.6%	2.2%
R15	0.2%	0.3%
R19	21.7%	3.6%
>R19	9.2%	2.6%
Slab	12.2%	2.7%
Unknown	25.8%	3.7%

Table 114: Percentage of Homes with Floor R-Values

Table 115 shows the percentage of homes with basements. Over 80% of homes do not have basements.

Basement (n=474)	% of Homes	EB
None	80.1%	3.3%
Finished	11.7%	2.6%
Paritally Finished	4.6%	1.7%
Unfinished	3.6%	1.5%
Not Observed	0.1%	0.1%

Table 115: Percent of Homes with Basement Type

This concludes the Residential Existing Construction Stock Assessment Report. A final study appendix is also available that contains more detailed information on how the data analyses were performed and describes the final study datasets.

SINGLE-FAMILY RESIDENTIAL EXISTING CONSTRUCTION STOCK ASSESSMENT

Appendix

July 26, 2007

Prepared for:

Prepared by:

1055 Broadway, Suite G

Sonoma, CA 95476

Table of Contents

List of Tables

Onsite Survey Instrument

Customer:_____ **Customer ID #_____**

Address _____

City: _____ **MO# _____**

Phone: _____

Inspector _____

Date _____ Time _____

Occupant Interview - Introduction

Hello, my name is _____ with RLW Analytics, working on behalf of (UTILITY NAME).

I'm here to meet with _____. **(Show Identification and business card.)**

[Customer should be expecting inspector].

On-Site Interview

During my visit I'll be asking a few questions about your home's primary lighting fixtures and major appliances. Then I'll go on to inspect your heating and cooling equipment, washer, dryer, dishwasher, refrigerator, freezer, water heating equipment, and the insulation levels in your home. Do you have any questions regarding my visit?

General Information

1. Type of Residence?
    - Single Family, Unattached, One story
    - Single Family, Unattached, Two story
    - Single Family, Unattached, Three or more stories
    - Townhouse or Rowhouse
    - Duplex, Triplex, or Quadplex
    - Apartment/Condo with more than 4 units (1 or 2 stories)
    - Apartment/Condo with more than 4 units (3 or more stories)
    - Mobile Home, Single Wide
    - Mobile Home, Double Wide
    - Mobile Home, triple Wide
    - Modular/prefabricated
    - Other _____

2. What month/year did you move into home? _____

3. How many people live in this household in the following age ranges?
    - Under 1 year _____
    - 2 to 5 years _____
    - 6 to 18 years _____
    - 18 to 29 years _____
    - 30 to 49 years _____
    - 50 to 64 years _____
    - 65 or more years _____

4. Number of people working outside the home? _____

5. Do you operate a business out of the home?
    - Yes
    - No

6. Do you rent or own this home?
    - Own/Buying
    - Rent
    - Occupied without payment of rent

    Who pays the electric bill? O Occupant O Landlord

    Who pays the gas bill? O Occupant O Landlord

7. Do you obtain public assistance in paying bills?
    - Yes
    - No
    - Don't Know
    - Refused

    7a. If (7, yes) _____% of total electric NA DK
    _____% total gas NA DK

8. Participated in electric utility efficiency program during the last year?
    - Yes
    - No (skip next)

9. If yes what measures?
    - audit
    - lighting
    - heating system
    - cooling systems
    - windows
    - insulation
    - caulking/WS

- water heater
- other_____

10. Participated in gas utility efficiency program during the last year?
    - Yes
    - No (skip next)

11. If yes what measures?
    - audit
    - heating system
    - windows
    - insulation
    - caulking/WS
    - water heater
    - other_____

12. What is the total annual income for the home?
    - < $25,000
    - $25,001 - $50,000
    - $50,001 - $75,000
    - $75,001 - $100,000
    - $100,000
    - D/K
    - Refused

13. In what year was the house built? _____ (Only one source for the age of the residence is needed)

7a Source: O Auditor B. O Customer

- Age: <1950
- 1950-1959
- 1960-1969
- 1970-1979
- 1980-1990
- 1991-1995
- >1995

14. What is the total conditioned floor area of the home?
    - Fewer than 600 square feet
    - 600 to 999 square feet
    - 1,000 to 1,599 square feet
    - 1,600 to 1,999 square feet
    - 2,000 to 2,399 square feet
    - 2,400 to 2,999 square feet

- 3,000 or more square feet
- Don't Know

15. Do you have a garage?
    - No
    - Single
    - Double
    - Triple

16. Is the garage heated?
    - No heat
    - Electric Heat
    - Gas Heat
    - Propane
    - Wood stove
    - Other

17. Frequency of use?
    - Never
    - Very Little
    - Sometimes
    - Often

Thermostat Information

18. Thermostat type:
    - Digital
    - Hybrid
    - Mechanical
    - Not Observed
    - Other

19. Heating: Daytime Temp:_____/OFF Nighttime Temp_____ /OFF
    Cooling: Daytime Temp:_____/OFF/No Cooling Nighttime Temp_____ /OFF(not used)

Heating Information

20. Primary heating system fuel type:
    - Gas
    - Fuel Oil
    - Electricity
    - Wood: cords per year_____
    - Kerosene
    - Solar
    - Propane

21. Primary heating system type:

- Wall
- Heat pump w/ electric supplement
- Heat pump w/o electric supplement
- Forced Air Furnace
- Portable
- Hydronic System
- Floor
- Ceiling Cable
- Fireplace
- Window Unit Resistance
- Woodstove
- Baseboards

22. Heating System # 1 Specs:
    - Manufacturer
    - Model #:
    - Manufacture Date:
    - Estimated Age:
    - Input Capacity (kW, kBtu):
    - Output Capacity (kW, kBtu):
    - Efficiency:

Secondary Heating System

23. Is there a secondary heating system in your home? o yes o no (if no, skip to next section)

24. Secondary heating system fuel type:
    - Gas
    - Fuel Oil
    - Electricity
    - Wood: cords per year_____
    - Kerosene
    - Solar
    - Propane

25. Secondary heating system type:
    - Baseboards
    - Wall
    - Heat pump w/ electric supplement
    - Heat pump w/o electric supplement
    - Forced Air Furnace
    - Portable
    - Hydronic System
    - Floor

- Ceiling Cable
- Fireplace
- Window Unit Resistance
- Woodstove

26. Heating System # 2 Specs:
    - Manufacturer
    - Model #:
    - Manufacture Date:
    - Estimated Age:
    - Input Capacity (kW, kBtu):
    - Output Capacity (kW, kBtu):
    - Efficiency:

Primary Cooling System

27. Do you have an air conditioning/cooling system for your home? [Do not include fans]?

    O Yes O No [Go to next section]

28. Typical summer AC use:
    - Not at all
    - Low (When needed)
    - Moderate (Frequently)
    - High (All the time)
    - Usually gone in Summer

29. AC system type:
    - Split System AC
    - Packaged System AC
    - Window/ Wall Room Air Conditioner
    - Evaporative System
    - Portable- Stand Alone
    - Heat Pump
    - PTAC
    - PTHP

30. Cooling System # 1 Specs:
    - Manufacturer
    - Model #:
    - Manufacture Date:
    - Estimated Age:
    - Capacity (kW, kBtu):
    - Efficiency:

31. Do you have a second air conditioning/cooling system for your home? [Do not include fans]?

O Yes O No [Go to next section]

32. Typical summer AC use:
- Not at all
- Low (When needed)
- Moderate (Frequently)
- High (All the time)
- Usually gone in Summer

33. Secondary AC system type:
- Split System AC
- Packaged System AC
- Window/ Wall Room Air Conditioner
- Evaporative System
- Portable- Stand Alone
- Heat Pump
- PTAC
- PTHP

34. Cooling System # 2 Specs:
- Manufacturer
- Model #:
- Manufacture Date:
- Estimated Age:
- Capacity (kW, kBtu):
- Efficiency:

Clothes Washer

35. Do you have a Clothes Washer?
- Yes
- No

36. Clothes washer use per week:
- 1 Load
- 2-4 Loads
- 5-9 Loads
- 10-14 Loads
- >15 Loads

37. Type of washer: o Standard o Horizontal axis

38. Washing Machine Specs:

- Manufacturer:
- Model #:
- Manufacture Date:
- Estimated Age:

39. Do you have a second washing machine that you regularly use?
    - Yes
    - No

Clothes Dryer

40. Clothes Dryer
    - Yes
    - No

41. Use of dryer:
    - Used for All Loads
    - Used for Most Loads
    - Infrequent Use
    - Unknown

42. Fuel type: o Electric o Gas o Propane o Other

43. Dryer Specs:
    - Manufacturer:
    - Model #:
    - Manufacture Date:
    - Estimated Age:

Refrigerators:

44. Type of Primary Refrigerator:
    - Standard
    - Side by Side
    - Built-in
    - Top-Bottom Freezer

45. Primary Refrigerator Options:
    - None
    - Ice maker
    - Through the door service

46. Refrigerator Volume:
    - VERY SMALL (<=10 CUBIC FEET)

- SMALL (11-14 CUBIC FEET)
- MEDIUM (15-18 CUBIC FEET)
- LARGE (19-22 CUBIC FEET)
- VERY LARGE (>22 CUBIC FEET)

47. Primary Refrigerator Specs:
    - Manufacturer:
    - Model #:
    - Manufacture Date:
    - Estimated Age:

SAME INFO FOR SECONDARY AND THIRD REFRIGERATOR (IF APPLICABLE), ALSO INCLUDE THE FOLLOWING QUESTIONS FOR THESE UNITS.

48. Is this refrigerator plugged in year round?
    - Yes
    - No

49. If not plugged in year round, what percent of the time is it used?
    - Fall_____%
    - Spring____%
    - Winter ____%
    - Summer___%
    - Not used

Other Kitchen Appliances:

50. Range Usage:
    - >Once per Day
    - 4-6 times per week
    - <4 times per week

51. Range Specs:
    - Fuel Type:
    - Manufacturer:
    - Model #:
    - Manufacture Date:
    - Estimated Age:

52. Microwave Usage:
    - >Once per Day
    - 4-6 times per week
    - <4 times per week

53. Microwave Specs:
    - Fuel Type:

- Manufacturer:
- Model #:
- Manufacture Date:
- Estimated Age:

54. Dishwasher Usage:
    - >Once per Day
    - 4-6 times per week
    - <4 times per week

55. Dishwasher Specs:
    - Fuel Type:
    - Manufacturer:
    - Model #:
    - Manufacture Date:
    - Estimated Age:

Freezer

56. Do you have a Freezer that is used?
    - Yes
    - No

57. Freezer Type:
    - Upright
    - Chest
    - Other

58. Freezer Volume:
    - VERY SMALL (<=10 CUBIC FEET)
    - SMALL (11-14 CUBIC FEET)
    - MEDIUM (15-18 CUBIC FEET)
    - LARGE (19-22 CUBIC FEET)
    - VERY LARGE (>22 CUBIC FEET)

59. Primary Freezer Specs:
    - Manufacturer:
    - Model #:
    - Manufacture Date:
    - Estimated Age:

60. Is this freezer plugged in year round?
    - Yes
    - No

61. If not plugged in year round, what percent of the time is it used?
    - Fall_____%
    - Spring____%
    - Winter ____%
    - Summer___%
    - Not used

Water Heater

62. Water Heater Type?
    - GAS STORAGE
    - PROPANE STORAGE
    - ELECTRIC STORAGE
    - GAS INSTANTANEOUS
    - ELECTRIC INSTANTANEOUS
    - HEAT PUMP
    - Solar
    - Solar w/ Electric Storage
    - Solar w/ Gas Storage
    - Solar w/ Propane

63. Hot Water Heater Specifications
    - Manufacturer:
    - Model #:
    - Tank Size:
    - Input (kW or kBtu):
    - Energy Factor:
    - External Tank Wrap:
    - Internal R-value:
    - Manufacture Date:
    - Estimated Age:

Spa/Pool

64. Do you have a hot tub?
    - Yes

- No
- Yes, but no currently used

65. What fuel does your hot tub's hot water heater use?
    - Electric
    - Gas
    - Propane
    - Solar / Electric
    - Solar / Gas
    - Solar / Propane

66. Do you have a pool?
    - Yes
    - No
    - Yes, but no currently used

67. What fuel does your pools heater use?
    - Electric
    - Gas
    - Propane
    - Other
    - Solar Only
    - Solar / Electric
    - Solar / Gas
    - Solar / Propane

Insulation **(if customer has any contractor invoices regarding insulation, use these instead of visual inspection for the following)**

68. Floor Construction? Crawlspace:____% Concrete slab:____% Basement ____% (must sum to 1)

69. Basement finished?
    - Yes
    - No
    - Partial

70. Wall construction type:
    - 2 x 4
    - 2 x 6
    - Masonry
    - Not observable

71. What percentage of the exterior walls in the home are insulated?

- 0%
- 25%
- 50%
- 75%
- 100%
- Unknown

72. Estimate Wall Insulation R-Value:
    - <R-11
    - R-11
    - R-13
    - R-14
    - R-15
    - R-19
    - Not observable
    - None

73. Blown-in attic insulation (estimate number of inches): _____

74. Attic/Ceiling Batt insulation (estimate number of inches): _____

75. Attic/Ceiling Batt insulation R-Value:

- <R-11
- R-11
- R-13
- R-14
- R-15
- R-19
- R-21
- R-22
- R-28
- R-30
- R-36
- R-38
- R-49
- Not observable
- None

76. Floor insulation?
    - <R-11
    - R-11
    - R-13
    - R-15
    - R-19
    - >R-19
    - Slab on grade
    - Not observable
    - None

Basement

77. Basement wall R-value

- <R-11
- R-11
- R-13
- R-15
- R-19
- >R-19
- None

78. Basement knee wall R-value

- <R-11
- R-11
- R-13
- R-15
- R-19
- R-21
- R-30
- Not observable
- None

Windows

79. What is the predominant window type in the home?

Frame Type	Panes	Low E Coating	Storm
Metal	Single	Yes	Yes
Wood	Double	No	No
Vinyl	Triple	Unk	Unk
Other			

80. Square footage by orientation (N, W, E, S)

	North	West	East	South
Area (sf)				
Shading Fraction				

Other major end uses:

81. Waterbed yes no
82. Aquarium yes no
83. Welding equipment yes no
84. Shop attached yes no
85. # of TVs
86. # of computers/workstations
87. #faxes
88. Solar PV yes no _____#watts
89. Other large gas or electric end uses?_____

Lighting and Ceiling Fans (census of sockets in home by room)

In each of the following rooms, record the number of fixtures by type and the number of lamps by type:

Room Bathroom , Master bedroom , Bedroom , Breakfast Nook, Closets, Dining room, Garage, Halls, Kitchen, Laundry room, Living room, Office, Garage, Other **(Categorize Using the above list)**	Fixture Type (Track lighting, Table lamps, Chandelier / Hanging, Torchiere, Recessed can, Recessed lighting-Other, Wall mount, Ceiling fixtures, Ceiling Fan, Floor Lamp, Architecturally Integrated, Other, Garage Door Opener)	Number of Each Fixture	Lamp Type (CF-I-A, CF-I-DEC, CF-I-GLO, CF-I-REF, CF-I-SPRN, CF-I-SQR, CF-I-UNK, CF-M-DEC, CF-M-GLO, CF-M-REF, CF-M-SQR, CF-M-UNK, F-12, F-4, F-5, F-8, F-CIR, F-OTH, F-TUBE-UNK, HAL-MR, HAL-OTH, HAL-PAR, HALQTZTUB, HAL-UNK, I-DEC, I-GLO, I-OTH, I-REF, I-STD, I-UNK)	Number of Each Lamps per Fixture	Wattage per lamp	Controller (Dimmer, Motion, None, Photo, Photo/Motion, Timer)

Room	Fixture Type	Number of Each Fixture	Lamp Type	Number of Each Lamp per Fixture	Wattage per lamp	Controller

Lighting Data Tables

Definitions

All -Fixtures Table

The All Fixtures Table contains the number of fixtures by fixture type in each home.

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Number of Fixtures	Total fixtures in house	
Archit_Integrated	Number of architecturally integrated fixtures	
Ceiling Fan	Number of ceiling fan fixtures	
Ceiling Fixtures	Number of ceiling fixtures	
Chandelier Hanging	Number of hanging chandelier	
Floor Lamp	Number of floor lamps	
Garage Door Opener	Number of garage door openers	
Other	Number of other fixtures	
Recessed can	Number of recessed can fixtures	
Recessed lighting Other	Number of recessed lighting other fixtures	
Table lamps	Number of table lamps	
Torchiere	Number of torchieres	
Track lighting	Number of track lighting fixtures	
Under Counter	Number of under counter fixtures	
Wall mount	Number of wall mount fixtures	

All - Lamps Table

The All Lamps Table contains the number of lamps by lamp type per home.

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Total Lamps	Total number of lamps in the house	
CF-I-A	Number of A-type compact fluorescent lamps with an integrated ballast	

CF-I-CAP	Number of capsule compact fluorescent lamps with an integrated ballast	
CF-I-CIRC	Number of circline-type compact fluorescent lamps with an integrated ballast	
CF-I-DEC	Number of decorative-type compact fluorescent lamps with an integrated ballast	
CF-I-FLOOD	Number of flood-type compact fluorescent lamps with an integrated ballast	
CF-I-GLO	Number of globe-type compact fluorescent lamps with an integrated ballast	
CF-I-SPRN	Number of spring-type compact fluorescent lamps with an integrated ballast	
CF-I-TUBE	Number of tube-type compact fluorescent lamps with an integrated ballast	
CF-I-UNK	Number of unknown type compact fluorescent lamps with an integrated ballast	
CF-MINI	Number of miniature compact fluorescent lamps	
CF-PIN-BASE	Number of pin based compact fluorescent lamps with an integrated ballast	
F-12	Number of F-12 fluorescent lamps	
F-4	Number of F-4 fluorescent lamps	
F-5	Number of F-5 fluorescent lamps	
F-8	Number of F-8 fluorescent lamps	
F-CIR	Number of circline fluorescent lamps	
F-OTH	Number of other fluorescent lamps	
F-TUBE-UNK	Number of unknown fluorescent lamps	
HAL-MR	Number of halogen MR lamps	
HAL-OTH	Number of other halogen lamps	
HAL-PAR	Number of halogen PAR lamps	
HAL-QTZTUB	Number of halogen quartz tube lamps	
HAL-UNK	Number of unknown halogen lamps	
HEAT LAMP	Number of heat lamps	
I-DEC	Number of incandescent decorative lamps	
I-FLOOD	Number of incandescent flood lamps	

I-GLO	Number of incandescent globe lamps	
I-MINI	Number of incandescent mini lamps	
I-OTH	Number of other incandescent lamps	
I-STD	Number of incandescent standard A-type lamps	
I-UNK	Number of unknown incandescent lamps	

Control and Wattage All Table

The Control and Wattage All table contains the inventory of fixture type and quantity, lamp type, wattage, and quantity, and control type in each room of the home.

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Room	Room type	
FixType	Type of light fixture	
FixQTY	Number of each fixture	
LampType	Lamp technology installed in fixture	
LampQTY	Number of lamps per fixture	
LampWATTS	Wattage of lamps in fixture	
Total Lamp Qty	Number of similar lamps in similar fixtures	
LControl	Switch, timer, dimmer, motion, photo	
Fixture Number	Unique number identifier generated for fixture	

Rooms – Fixtures Table

The Rooms - Fixtures table provides, for each room type including the whole house, the total number of fixtures as well as indicator variables indicating whether the site had a particular fixture type and lamp type combination.

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Room	Room Type	
Number of Fixtures	Total Number of Fixtures	
Archit_ Integrated	Count of Architecturally Integrated Fixtures	

Ceiling Fan	Count of Ceiling Fan Fixtures	
Ceiling fixtures	Count of Ceiling Mounted Fixtures	
Chandelier Hanging	Count of Chandelier/Hanging Fixtures	
Floor Lamp	Count of Floor Lamps	
Garage Door Opener	Count of garage door openers	
Other	Count of other fixtures	
Recessed can	Count of recessed can fixtures	
Recessed lighting Other	Count of recessed lighting other fixtures	
Table lamps	Count of table lamps	
Torchiere	Count of torchieres	
Track lighting	Count of track lighting fixtures	
Under Counter	Count of under counter fixtures	
Wall mount	Count of wall mount fixtures	

Rooms – Lamp Presence Table

The Rooms – Lamp Presence Table provides, for each room type the type of lamps present.

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
ROOM	Room Type	
Total Lamps	Total Number of Lamps	
CF-Compact Fluorescent	Compact fluorescent lamps with an integrated ballast	
F-Fluorescent	Linear fluorescent lamps	
HAL-Halogen	halogen lamps	
Inc- Incandescent	All incandescent lamps	

General Information Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Type of Residence	Single Family Home, Apartment, etc.	

Total People	Total Number of Residents at Site	
Total Adults	Total Number of Adults at Site	18 and Over
People		
Adults		
People Under 1 year	Total Number of People Under 1 Year at Site	
People 2 to 5 years	Total Number of People between 2 to 5 years at site	
People 6 to 18 years	Total Number of People between 6 to 18 years at site	
People 18 to 29 years	Total Number of People between 18 to 29 years at site	
People 30 to 49 years	Total Number of People between 30 to 49 years at site	
People 50 to 64 years	Total Number of People between 50 to 64 years at site	
People 65 or more years	Total Number of People over 65 years at site	
Income	Annual Household Income Range	Resident Supplied
Total Heated Sqft	Square Footage Range of Residence	
Age Range	Age Range of Residence	
Rent or Own	Ownership Status of Residence	
Who Pays Electric? (Occ or Landlord)	Responsibility for Electric Bill	
Who Pays Gas?	Responsibility for Gas Bill	
Total Heated Floorspace	Square Footage of Heated Floorspace of Residence	

Single Family Appliance Data Tables

Definitions

Primary and Secondary Refrigerators Tables

Field Heading	Value	Comments
SITE ID	RLW Site Identification Number	
Refrigerator	Primary or secondary and use	
FridgeType	Standard, side by side, freezer on bottom, single door	
YearsOld	Age of refrigerator in years	
Through Door Dispenser	Icemaker, water and ice service in door, none	
SizeRange	Small, medium, large, very large	
MFG	Name of manufacturer	
ModelNo	Model number	
MFGdate	Date of manufacture	
AEC	Model number parsed for matching	
MModel	Model number parsed for matching	
Match	Matching model number found in efficiency database?	

Clothes Dryer Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Dryer Number	1=primary, 2=secondary	Code for primary, secondary dryer
Usage	Infrequent use, most loads, all loads	
Age of Machine	Resident reported age from on-site	
Fuel Type	Natural Gas. Propane, or Electric	
Manufacturer	Manufacturer from on-site	

Model Number	Model number from on-site	
Manufacture Date	Manufacture Date from matching	
Moisture Sensor	Does the unit have moisture sensing	
Energy Factor	Energy Factor from matching	

Cooling System Table

SiteID	RLW Site Identification Number	
Cooling Unit #	Cooling system ID number	Cooling unit#_1 = Primary
CoolingSystem	Cooling system present?	Y=Yes, N=No
Space or Central	Space or Central System Classification	
Tons Estimate	Estimated tonnage of cooling system	
ACUsage	Customer reported usage of AC	High, Moderate, Low, None
System Type	System type (e.g.. split system, win/wall, package, etc.)	
SysCap	Capacity of cooling system	
Manufacturer	Manufacturer of system, from on-site	
Model Number	Model number of system from on-site	
Age of System	Customer reported age of system in years old, from on-site	
Manufacture Date	Date of manufacture from efficiency database	
SEER	Matched Efficiency	
PriSec	-1 if primary, 0 if secondary	
EER	Matched Efficiency	

Dishwasher Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Dishwasher Number	Code for primary or secondary dishwasher	
Age of Dishwasher (in years old)	Age from model number match	
Manufacturer	Manufacturer from on-site	
Manufacturer Date	Date of manufacture	
Model Number	Model number from onsite	
Model_Clean	Model Number with non alphanumerics removed	
Energy Factor	Energy Factor	[load/kWh]-from database
Source	CEC_ckwa if matched,	CEC_ckwa was only database used

Envelope Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Wall Construction Type	Exterior wall construction type	
Wall Insulation R-Value	R-Value of Walls	
Attic R-Value	Batt Insulation (R-Value)	
Floor Insulation (R-Value)	Floor Insulation (R-Value)	
Frame Type	Predominant Window Frame Type	
Number of Panes	Average Number of Panes per Window	
LowE	Low-e coating on windows	
Storm	Storm windows	
CrawlVenting	Is the crawl space vented	
Basement	Does the home have a basement	

General Information Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Weight	Case weight used for all saturation analyses	
Type of Residence	Single Family Home, Apartment, etc.	
Total People	Total Number of Residents at Site	
Total Adults	Total Number of Adults at Site	18 and Over
People	Total Number of Residents at Site	Converted from text to number
Adults	Total Number of Adults at Site	Converted from text to number
People Under 1 year	Total Number of People Under 1 Year at Site	
People 2 to 5 years	Total Number of People between 2 to 5 years at site	
People 6 to 18 years	Total Number of People between 6 to 18 years at site	
People 18 to 29 years	Total Number of People between 18 to 29 years at site	
People 30 to 49 years	Total Number of People between 30 to 49 years at site	
People 50 to 64 years	Total Number of People between 50 to 64 years at site	
People 65 or more years	Total Number of People over 65 years at site	
Income	Annual Household Income Range	Resident Supplied
Total Heated Sqft	Square Footage Range of Residence	
Age Range	Age Range of Residence	
Rent or Own	Ownership Status of Residence	
Who Pays Electric? (Occ or Landlord)	Responsibility for Electric Bill	
Who Pays Gas?	Responsibility for Gas Bill	
Total Heated Floorspace	Square Footage of Heated Floorspace of Residence	

Heating System

SiteID	RLW Site Identification Number	
Furnace #	Furnace ID number	Furnace#_1 = Primary
Space or Central	Space or Central System Type	
Fuel Type	Fuel type of system (i.e. electric, gas wood, etc.)	
System Type	System type (i.e. forced air furnace, baseboard, wall, etc.)	
Age of System	Customer reported age of system in years old.	From on-site
Manufacturer	On-site name of furnace manufacturer	From nameplate
Model Number	On-site model number	From nameplate
Model_Clean	Model number with all alphanumeric symbols removed	
Input	CEC_cent input capacity (kBtuh)	
Output	CEC_cent output capacity (kBtuh)	
Afue1	Annual Fuel Utilization Efficiency for unit if matched	
Manufacture Date	Date of manufacture	
HP_HSPF	Efficiency of heat pump	
HP_Output	Output of heat pump	

Swimming Pool Table

Field Heading	**Value**	**Comments**
SiteID	RLW Site Identification Number	
Heated	Is pool heated	
FuelTyp	Fuel type for heater	

Washing Machine Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Washing Machine #		
Type of Washer	Standard or Horizontal Axis	
Age of Machine (in years old)	Age from model number match	
Age of Machine	Resident reported age	
Manufacturer	Manufacturer from on-site	
Model Number	Model Number as recorded from On-site	
Model_Clean	Model Number with non alphanumerics removed	Used for model number to database matching
Type	Numeric Code for Washer Type	
Energy Factor	Energy Factor [cubic feet/kWh]	
Water Factor	Gallon capacity over cubic feet	Not Used
Moisture Content	Remaining water content from CEC_ckwa.dbf database	Not Used
Source	Database from which washer data was extracted	
Age estimate	Resident reported age from on-site	

Spa

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
FuelTyp	Fuel type for heater	

Water Heater Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Water Heater #	1=primary, 2=secondary	
Fuel Type	Gas or Electric	From on-site
Fuel Type_On Site	Gas, Heat Pump, No Heat Pump	To determine if Electric water heater users have heat pump or not
on-site energy factor	Energy Factor from nameplate	
Size (Gallons)	Storage capacity in Gallons	From on-site
Heater Type	Storage or Instantaneous	
Internal Tank Insulation (R-Value)	R-Value of Internal Tank insulation from on-site	
External Tank Wrap?	Yes -external tank wrap, No wrap	
Age (in years old)	Estimated Age of Water heater in years old	Resident reported
If Electric-KW	Capacity in kW if Electric	
If Gas-kBtuh	Capacity in kBtuh if gas	
Manufacturer	Manufacturer from on-site	
Model Number	Model number from on-site	
Model_Clean	Model number with non-alphanumerics removed	Used for database matching
Fuel	Electric, Gas	Gas is natural gas or propane
Gallons	Storage capacity in gallons from database match	
Gallons Estimate	Storage capacity in gallons from on-site	
Instant	Yes = Instantaneous , No = storage	Only one instantaneous heater found
Input	Input Capacity Btu or kW from database match	
Efficiency	Efficiency of water heater from database match	No cycling, and transmission losses considered
Annual Energy Consumption	Annual Energy consumption from database matching	Btu for Gas, kWh for electric
Energy Factor	Energy Factor from database matching	Energy Factor for water heater is unit less, (water heater delivered

		energy/energy consumed)
Source	CEC_gwh for matched gas heaters, CEC_ewh for matched electric water heaters	
Age Estimate	Estimated Manufacture Date from on-site	(2000-Age in years old)

Tables 1d-9d contain the adjusted case weights that were applied to the efficiency analyses to take into account the match rates of appliances by age group.

Room Lighting Analysis

Fixture and Lamp Type by Room

Table 1 shows the types of fixtures and lamps that were found in the kitchen. Ceiling fixtures and recessed cans were the most common fixture types and were found in 56.4% and 51.3% of homes, respectively. Almost 82% of the homes had incandescent bulbs in the kitchen. Slightly over 15% had compact fluorescents.

Fixture Type (n=480)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	15.2%	3.0%	3.3%	1.5%	27.8%	3.7%	5.6%	1.9%	8.1%	2.2%	81.8%	3.3%
Architectually Integrated	11.8%	2.7%	0.3%	0.3%	1.4%	1.0%	3.3%	1.6%	0.7%	0.6%	2.9%	1.3%	4.9%	1.7%
Ceiling Fan	5.4%	2.0%	1.2%	1.0%	-	-	0.3%	0.5%	-	-	0.2%	0.3%	3.7%	1.6%
Ceiling Fixtures	56.4%	4.2%	6.0%	1.9%	1.4%	0.9%	20.2%	3.3%	4.2%	1.7%	1.6%	1.0%	35.1%	3.9%
Chandelier Hanging	10.7%	2.6%	1.3%	1.1%	-	-	0.1%	0.1%	-	-	0.8%	0.7%	9.1%	2.4%
Floor Lamp	0.3%	0.4%	-	-	-	-	-	-	-	-	-	-	0.3%	0.4%
Other	2.1%	1.1%	-	-	-	-	0.3%	0.4%	0.5%	0.6%	-	-	1.2%	0.8%
Recessed Can	51.3%	4.2%	6.7%	2.2%	-	-	-	-	-	-	2.0%	1.2%	44.6%	4.2%
Recessed Lighting-Other	6.5%	2.2%	0.3%	0.5%	0.1%	0.2%	4.2%	1.8%	-	-	0.2%	0.4%	1.8%	1.2%
Table lamps	0.9%	0.6%	-	-	-	-	-	-	-	-	-	-	0.9%	0.6%
Track Lighting	4.1%	1.6%	0.7%	0.8%	-	-	-	-	-	-	0.5%	0.5%	2.9%	1.3%
Wall Mount	6.3%	1.9%	0.7%	0.7%	0.4%	0.6%	0.5%	0.5%	0.4%	0.6%	0.6%	0.5%	3.7%	1.5%

Table 1: Percentage of Homes with Fixture and Lamp Type in Kitchens

Table 2 shows the types of fixtures and lamps that were found in bedrooms. Ceiling fixtures (80.8%) and table lamps (66.5%) were the most common fixture types. Almost all (97.4%) of the homes had incandescent bulbs, while 29.5% had compact fluorescent bulbs in bedrooms.

Fixture Type (n=484)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	29.5%	3.9%	0.8%	0.6%	3.8%	1.5%	2.1%	1.2%	11.0%	2.7%	97.4%	1.5%
Architectually Integrated	2.1%	1.2%	-	-	0.1%	0.2%	-	-	-	-	0.8%	0.8%	1.2%	0.9%
Ceiling Fan	28.6%	3.8%	2.6%	1.3%	-	-	-	-	-	-	0.1%	0.2%	27.6%	3.7%
Ceiling Fixtures	80.8%	3.3%	13.5%	3.0%	0.7%	0.6%	1.8%	0.9%	0.9%	0.7%	1.7%	1.2%	75.3%	3.6%
Chandelier Hanging	7.4%	2.2%	0.7%	0.8%	-	-	0.3%	0.4%	-	-	0.2%	0.4%	6.2%	2.0%
Floor Lamp	24.4%	3.5%	4.6%	1.9%	-	-	-	-	1.3%	1.0%	1.1%	0.9%	19.8%	3.2%
Other	0.6%	0.8%	-	-	-	-	-	-	-	-	-	-	0.6%	0.8%
Recessed Can	14.2%	3.0%	0.8%	0.9%	-	-	-	-	-	-	1.2%	0.9%	12.5%	2.8%
Recessed Lighting-Other	3.4%	1.5%	0.5%	0.5%	-	-	1.0%	0.9%	-	-	-	-	1.8%	1.1%
Table lamps	66.5%	3.9%	14.2%	3.0%	-	-	0.2%	0.3%	0.2%	0.3%	4.1%	1.7%	62.2%	4.0%
Torchiere	5.2%	1.8%	0.5%	0.6%	-	-	-	-	0.1%	0.1%	1.9%	1.1%	2.7%	1.4%
Track Lighting	3.3%	1.4%	0.1%	0.2%	-	-	-	-	-	-	1.3%	0.9%	2.5%	1.2%
Wall Mount	14.8%	3.0%	0.4%	0.6%	-	-	0.6%	0.7%	-	-	0.7%	0.7%	13.3%	2.8%

Table 2: Percentage of Homes with Fixture and Lamp Type in Bedrooms

Table 3 shows the types of fixtures and lamps that were found in living rooms. Table lamps and floor lamps were the most common fixture types and were found in 59.3%

and 48.8% of homes, respectively. More than 91% of the homes had incandescent bulbs in the living room. Slightly over 28% had compact fluorescents.

Fixture Type (n=474)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	28.4%	3.9%	0.4%	0.4%	3.4%	1.6%	5.6%	2.0%	15.0%	3.1%	91.4%	2.5%
Architectually Integrated	3.0%	1.5%	-	-	-	-	0.4%	0.5%	0.5%	0.6%	0.9%	0.9%	1.3%	1.0%
Ceiling Fan	23.4%	3.4%	3.4%	1.6%	-	-	-	-	0.1%	0.1%	0.1%	0.2%	20.0%	3.2%
Ceiling Fixtures	26.2%	3.7%	2.0%	1.1%	0.4%	0.4%	1.4%	1.1%	0.4%	0.6%	1.1%	0.8%	22.3%	3.5%
Chandelier Hanging	10.7%	2.6%	0.9%	0.9%	-	-	-	-	-	-	-	-	9.8%	2.5%
Floor Lamp	48.8%	4.2%	9.8%	2.6%	-	-	-	-	3.1%	1.4%	3.3%	1.5%	40.6%	4.1%
Recessed Can	25.0%	3.8%	1.6%	1.2%	-	-	-	-	-	-	1.2%	1.0%	23.1%	3.7%
Recessed Lighting-Other	2.2%	1.3%	0.2%	0.3%	-	-	1.2%	1.0%	0.2%	0.4%	0.3%	0.5%	0.3%	0.4%
Table lamps	59.3%	4.1%	15.7%	3.1%	-	-	0.2%	0.3%	0.5%	0.7%	1.3%	1.0%	51.3%	4.2%
Torchiere	13.9%	3.0%	2.3%	1.4%	-	-	-	-	0.9%	0.8%	5.0%	1.9%	6.3%	2.1%
Track Lighting	5.7%	2.0%	0.7%	0.8%	-	-	-	-	-	-	2.1%	1.3%	3.5%	1.6%
Wall Mount	7.8%	2.3%	0.8%	0.6%	-	-	0.5%	0.6%	-	-	1.1%	0.9%	5.5%	1.9%

Table 3: Percentage of Homes with Fixture and Lamp Type in Living Rooms

Table 4 shows the types of fixtures and lamps that were found in bathrooms. Wall mounted fixtures (84.4%) and ceiling fixtures (50.8%) were the most common fixture types. Almost all (96.8%) of the homes had incandescent bulbs, while 15.8% had compact fluorescent bulbs in bathrooms.

Fixture Type (n=481)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	15.8%	3.2%	0.5%	0.5%	8.1%	2.4%	2.2%	1.2%	5.6%	2.1%	96.8%	1.7%
Architectually Integrated	6.6%	1.9%	-	-	-	-	1.0%	0.8%	0.6%	0.6%	-	-	5.7%	1.8%
Ceiling Fixtures	50.8%	4.2%	4.5%	1.7%	-	-	3.6%	1.6%	1.1%	0.8%	0.4%	0.5%	46.1%	4.2%
Chandelier Hanging	4.6%	1.7%	0.7%	0.8%	-	-	0.2%	0.3%	-	-	-	-	3.8%	1.5%
Floor Lamp	1.1%	0.9%	-	-	-	-	-	-	-	-	-	-	1.1%	0.9%
Other	1.1%	0.9%	-	-	-	-	-	-	-	-	-	-	1.1%	0.9%
Recessed Can	28.5%	3.9%	2.6%	1.5%	-	-	-	-	-	-	1.3%	1.0%	26.2%	3.8%
Recessed Lighting-Other	10.3%	2.7%	0.7%	0.7%	-	-	2.2%	1.4%	-	-	0.8%	0.7%	7.2%	2.2%
Table lamps	2.6%	1.5%	-	-	-	-	-	-	-	-	-	-	2.6%	1.5%
Track Lighting	0.9%	0.7%	-	-	-	-	-	-	-	-	0.4%	0.5%	0.5%	0.6%
Wall Mount	84.4%	3.0%	10.4%	2.8%	0.5%	0.5%	1.2%	0.9%	0.5%	0.6%	3.9%	1.8%	79.5%	3.4%

Table 4: Percentage of Homes with Fixture and Lamp Type in Bathrooms

Table 5 shows the types of fixtures and lamps that were found in hallways. Ceiling fixtures and hanging chandeliers were the most common fixture types and were found in 75.5% and 31.7% of homes, respectively. Almost 96% of the homes had incandescent bulbs in the hall. Almost 17% had compact fluorescents.

Fixture Type (n=454)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	16.7%	3.4%	0.1%	0.2%	2.3%	1.2%	1.1%	0.9%	4.6%	1.8%	95.7%	1.7%
Architectually Integrated	1.9%	1.2%	-	-	-	-	-	-	-	-	0.3%	0.4%	1.7%	1.2%
Ceiling Fan	3.9%	1.5%	0.5%	0.5%	-	-	-	-	-	-	-	-	3.3%	1.4%
Ceiling Fixtures	75.5%	3.8%	9.2%	2.6%	0.1%	0.2%	2.0%	1.1%	1.1%	0.9%	0.8%	0.7%	70.7%	4.0%
Chandelier Hanging	31.7%	4.1%	0.7%	0.6%	-	-	-	-	-	-	0.5%	0.5%	30.5%	4.1%
Floor Lamp	1.6%	1.2%	0.4%	0.6%	-	-	-	-	-	-	-	-	1.3%	1.0%
Recessed Can	28.8%	4.1%	4.6%	2.1%	-	-	-	-	-	-	1.5%	1.2%	25.8%	3.9%
Recessed Lighting-Other	1.9%	1.2%	0.7%	0.8%	-	-	-	-	-	-	0.3%	0.5%	1.0%	0.9%
Table lamps	2.4%	1.3%	0.2%	0.2%	-	-	-	-	-	-	-	-	2.3%	1.2%
Track Lighting	1.3%	1.0%	-	-	-	-	-	-	-	-	0.8%	0.7%	0.5%	0.6%
Wall Mount	18.8%	3.3%	2.9%	1.6%	-	-	0.3%	0.6%	-	-	0.5%	0.5%	16.1%	3.1%

Table 5: Percentage of Homes with Fixture and Lamp Type in Halls

Table 6 shows the types of fixtures and lamps that were found in dining rooms. Hanging chandeliers were by far the most common fixture type and were found in almost 71% of homes. Almost 90% of the homes had incandescent bulbs, while 8.2% had compact fluorescent bulbs in the dining room.

Fixture Type (n=378)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	8.2%	2.6%	0.3%	0.3%	2.2%	1.5%	0.9%	1.0%	5.4%	2.1%	89.9%	3.0%
Architectually Integrated	2.0%	1.5%	-	-	-	-	0.3%	0.5%	-	-	-	-	1.7%	1.4%
Ceiling Fan	8.9%	2.5%	0.5%	0.5%	-	-	-	-	-	-	0.1%	0.2%	8.3%	2.5%
Ceiling Fixtures	19.4%	3.6%	2.2%	1.4%	0.3%	0.3%	1.9%	1.4%	0.5%	0.8%	0.5%	0.5%	15.0%	3.2%
Chandelier Hanging	70.7%	4.2%	3.5%	1.8%	-	-	-	-	-	-	2.0%	1.4%	65.4%	4.4%
Floor Lamp	4.3%	1.8%	0.6%	0.7%	-	-	-	-	-	-	0.7%	0.7%	3.5%	1.6%
Recessed Can	3.0%	1.3%	0.3%	0.5%	-	-	-	-	-	-	0.2%	0.4%	2.4%	1.2%
Recessed Lighting-Other	1.0%	0.9%	0.3%	0.5%	-	-	-	-	-	-	0.4%	0.6%	0.3%	0.5%
Table lamps	6.7%	2.4%	1.2%	1.1%	-	-	-	-	0.3%	0.5%	-	-	5.7%	2.2%
Torchiere	2.6%	1.7%	0.5%	0.8%	-	-	-	-	0.1%	0.1%	1.3%	1.2%	0.7%	0.9%
Track Lighting	0.3%	0.3%	-	-	-	-	-	-	-	-	0.2%	0.3%	0.1%	0.1%
Wall Mount	0.7%	0.7%	-	-	-	-	-	-	-	-	0.3%	0.5%	0.4%	0.5%

Table 6: Percentage of Homes with Fixture and Lamp Type in Dining Rooms

Table 7 shows the types of fixtures and lamps that were found in breakfast nooks. Hanging chandeliers dominated the fixture types and were found in almost 63% of homes. Almost 88% of the homes had incandescent bulbs in the hall. Almost 8% had compact fluorescents.

Fixture Type (n=91)	Lamp Type											
	Overall		Compact Fluorescent		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	7.9%	5.2%	4.0%	3.8%	0.8%	1.4%	5.1%	4.2%	87.6%	6.4%
Architectually Integrated	0.8%	1.4%	-	-	-	-	-	-	0.8%	1.4%	-	-
Ceiling Fan	7.6%	5.1%	2.2%	3.2%	-	-	-	-	-	-	5.4%	4.1%
Ceiling Fixtures	14.9%	6.1%	2.6%	2.5%	2.4%	2.8%	0.8%	1.4%	1.3%	2.2%	7.7%	4.5%
Chandelier Hanging	62.5%	9.0%	0.3%	0.5%	-	-	-	-	1.6%	2.6%	60.6%	9.1%
Floor Lamp	2.4%	3.1%	-	-	-	-	-	-	-	-	2.4%	3.1%
Recessed Can	10.7%	5.7%	0.8%	1.4%	-	-	-	-	1.3%	2.2%	10.7%	5.7%
Recessed Lighting-Other	1.0%	1.6%	-	-	-	-	-	-	-	-	1.0%	1.6%
Table lamps	2.1%	2.1%	-	-	-	-	-	-	-	-	2.1%	2.1%
Track Lighting	3.6%	4.1%	1.9%	3.2%	-	-	-	-	-	-	1.6%	2.6%
Wall Mount	3.2%	3.2%	-	-	1.6%	2.6%	-	-	-	-	1.6%	1.8%

Table 7: Percentage of Homes with Fixture and Lamp Type in Breakfast Nooks

Table 8 shows the types of fixtures and lamps that were found in offices. Ceiling fixtures (62.7%) and table lamps (40.4%) were the most common fixture types. More than 83% of the homes had incandescent bulbs, while 21.0% had compact fluorescent bulbs in the office.

Fixture Type (n=236)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	21.0%	5.1%	1.5%	1.3%	6.7%	2.8%	3.0%	2.1%	13.7%	4.2%	83.1%	4.5%
Architectually Integrated	0.9%	1.4%	-	-	-	-	-	-	-	-	0.9%	1.4%	-	-
Ceiling Fan	9.6%	3.5%	0.3%	0.5%	-	-	-	-	-	-	0.2%	0.4%	9.1%	3.4%
Ceiling Fixtures	62.7%	5.9%	8.4%	3.6%	1.0%	1.0%	5.8%	2.6%	0.8%	1.1%	0.8%	1.0%	47.5%	6.0%
Chandelier Hanging	5.8%	2.7%	0.4%	0.7%	-	-	0.4%	0.6%	-	-	0.2%	0.4%	4.8%	2.5%
Floor Lamp	13.7%	4.0%	2.7%	1.9%	0.5%	0.8%	-	-	0.6%	0.6%	1.6%	1.6%	9.1%	3.3%
Recessed Can	14.1%	4.4%	0.6%	1.0%	-	-	-	-	-	-	1.0%	1.5%	13.2%	4.2%
Recessed Lighting-Other	1.1%	1.3%	-	-	-	-	-	-	-	-	-	-	1.1%	1.3%
Table lamps	40.4%	5.9%	9.8%	3.8%	-	-	-	-	0.8%	1.1%	6.1%	2.8%	29.1%	5.4%
Torchiere	4.4%	2.6%	0.8%	1.3%	-	-	-	-	0.7%	1.1%	1.9%	1.7%	1.1%	0.9%
Track Lighting	6.1%	2.8%	-	-	-	-	-	-	-	-	2.2%	1.6%	3.9%	2.3%
Wall Mount	6.4%	3.1%	1.4%	1.6%	-	-	0.5%	0.8%	0.8%	1.3%	-	-	4.4%	2.5%

Table 8: Percentage of Homes with Fixture and Lamp Type in Offices

Table 9 shows the types of fixtures and lamps that were found in laundry rooms. Ceiling fixtures were by far the most common fixture type and were found in 86.3% of homes. Almost 72% of the homes had incandescent bulbs in the laundry room. Approximately 9% had compact fluorescents.

Fixture Type (n=371)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	8.5%	2.9%	2.6%	1.6%	16.4%	3.4%	4.1%	1.8%	2.8%	1.7%	71.5%	4.4%
Architectually Integrated	0.9%	0.8%	-	-	-	-	0.5%	0.6%	0.2%	0.4%	-	-	0.2%	0.3%
Ceiling Fixtures	86.3%	3.4%	6.3%	2.5%	2.2%	1.5%	14.3%	3.2%	3.8%	1.8%	1.2%	1.0%	61.2%	4.7%
Chandelier Hanging	1.3%	0.9%	0.2%	0.3%	-	-	0.4%	0.4%	-	-	-	-	0.8%	0.8%
Floor Lamp	0.6%	0.7%	-	-	-	-	-	-	-	-	-	-	0.6%	0.7%
Other	0.5%	0.8%	-	-	-	-	-	-	-	-	-	-	0.5%	0.8%
Recessed Can	7.4%	2.6%	1.0%	1.2%	-	-	-	-	-	-	0.5%	0.8%	5.9%	2.3%
Recessed Lighting-Other	1.2%	1.2%	-	-	-	-	1.2%	1.2%	-	-	-	-	-	-
Table lamps	1.5%	1.2%	0.3%	0.5%	-	-	-	-	-	-	-	-	1.2%	1.1%
Torchiere	0.2%	0.4%	-	-	-	-	-	-	-	-	0.2%	0.4%	-	-
Track Lighting	0.2%	0.4%	-	-	-	-	-	-	-	-	0.2%	0.4%	-	-
Wall Mount	6.9%	2.4%	0.7%	0.8%	0.4%	0.7%	0.5%	0.6%	0.1%	0.2%	0.6%	0.9%	4.5%	1.9%

Table 9: Percentage of Homes with Fixture and Lamp Type in Laundry Rooms

Table 10 shows the types of fixtures and lamps that were found in closets. Ceiling fixtures dominated the fixture types and were found in more than 90% of homes. Eighty-six percent of the homes had incandescent bulbs, while 6.4% had compact fluorescent bulbs in closets.

Fixture Type (n=250)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	6.4%	3.0%	4.5%	2.5%	14.4%	4.0%	3.9%	2.2%	0.1%	0.1%	86.0%	4.1%
Ceiling Fixtures	90.1%	3.5%	6.1%	2.9%	0.9%	1.1%	12.0%	3.7%	1.8%	1.4%	-	-	76.4%	5.0%
Chandelier Hanging	1.2%	1.4%	-	-	-	-	-	-	-	-	-	-	1.2%	1.4%
Recessed Can	6.4%	2.9%	0.3%	0.5%	-	-	-	-	-	-	0.1%	0.1%	6.0%	2.8%
Recessed Lighting-Other	1.0%	1.3%	-	-	-	-	-	-	-	-	-	-	1.0%	1.3%
Table lamps	0.1%	0.2%	-	-	-	-	-	-	-	-	-	-	0.1%	0.2%
Track Lighting	0.2%	0.3%	-	-	-	-	-	-	-	-	-	-	0.2%	0.3%
Wall Mount	17.0%	4.4%	0.8%	1.0%	3.6%	2.3%	2.4%	1.8%	2.0%	1.7%	-	-	8.7%	3.3%

Table 10: Percentage of Homes with Fixture and Lamp Type in Closets

Table 11 shows the types of fixtures and lamps that were found in garages. Ceiling fixtures and garage door openers were the most common fixture types and were found in 90.3% and 62.4% of homes, respectively. More than 84% of the homes had incandescent bulbs in the garage. Almost 15% had compact fluorescents.

Fixture Type (n=362)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	14.7%	3.5%	1.6%	1.1%	42.3%	4.8%	3.7%	2.0%	3.6%	1.8%	84.4%	3.3%
Architectually Integrated	0.1%	0.1%	-	-	-	-	-	-	-	-	-	-	0.1%	0.1%
Ceiling Fan	0.6%	0.6%	-	-	-	-	0.1%	0.1%	-	-	-	-	0.5%	0.6%
Ceiling Fixtures	90.3%	2.9%	14.0%	3.4%	1.3%	1.0%	33.2%	4.6%	3.4%	1.9%	1.8%	1.4%	52.5%	4.8%
Chandelier Hanging	10.0%	2.8%	0.5%	0.8%	0.3%	0.5%	8.2%	2.6%	0.4%	0.6%	-	-	0.6%	0.8%
Floor Lamp	0.2%	0.4%	0.2%	0.4%	-	-	-	-	-	-	-	-	-	-
Garage Door Opener	62.4%	4.6%	0.6%	0.6%	-	-	0.4%	0.6%	-	-	-	-	61.8%	4.6%
Other	2.3%	1.6%	-	-	-	-	-	-	-	-	-	-	2.3%	1.6%
Recessed Can	1.1%	1.0%	-	-	-	-	-	-	-	-	0.1%	0.2%	1.0%	1.0%
Table lamps	0.5%	0.6%	0.3%	0.5%	-	-	-	-	-	-	0.2%	0.4%	-	-
Track Lighting	1.4%	1.3%	-	-	-	-	-	-	-	-	0.4%	0.6%	1.0%	1.1%
Wall Mount	4.9%	2.0%	0.3%	0.5%	-	-	0.7%	0.7%	-	-	1.1%	1.0%	2.9%	1.5%

Table 11: Percentage of Homes with Fixture and Lamp Type in Garages

Table 12 shows the types of fixtures and lamps that were found in other rooms. Ceiling fixtures dominated the fixture types and were found in more than 79% of homes. Seventy-one percent of the homes had incandescent bulbs, while 15.7% had compact fluorescent bulbs in other rooms.

Fixture Type (n=97)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	15.7%	6.8%	4.3%	3.7%	30.9%	8.6%	2.7%	2.8%	9.7%	5.9%	71.0%	8.6%
Architectually Integrated	0.2%	0.4%	-	-	-	-	-	-	-	-	-	-	0.2%	0.4%
Ceiling Fan	1.7%	2.4%	-	-	-	-	-	-	-	-	-	-	1.7%	2.4%
Ceiling Fixtures	79.3%	7.7%	10.7%	5.9%	3.9%	3.6%	26.8%	8.1%	1.5%	2.4%	0.9%	1.5%	53.4%	9.3%
Chandelier Hanging	10.2%	6.1%	-	-	-	-	6.4%	4.9%	-	-	-	-	3.8%	4.0%
Floor Lamp	0.8%	1.4%	-	-	-	-	-	-	-	-	-	-	0.8%	1.4%
Recessed Can	5.0%	3.2%	0.7%	1.2%	-	-	-	-	-	-	-	-	4.2%	3.0%
Recessed Lighting-Other	3.2%	2.7%	-	-	-	-	1.3%	1.6%	-	-	-	-	1.9%	2.2%
Table lamps	13.2%	6.2%	3.4%	3.4%	0.4%	0.6%	-	-	0.8%	1.3%	1.3%	2.1%	8.0%	5.0%
Torchiere	2.5%	3.0%	-	-	-	-	-	-	-	-	2.5%	3.0%	-	-
Track Lighting	5.9%	4.5%	-	-	-	-	-	-	-	-	2.9%	3.3%	3.0%	3.1%
Wall Mount	9.3%	5.5%	1.0%	1.6%	-	-	-	-	0.4%	0.7%	2.1%	3.4%	6.2%	4.3%

Table 12: Percentage of Homes with Fixture and Lamp Type in Other Rooms