

Don't Skip the Commercial: Televisions in California's Business Sector

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ABSTRACT

The prevalence of televisions in commercial settings is rapidly escalating – in paying a visit to your local restaurant, retail store, or doctor's office, you are more than likely to see a TV. The California Commercial Saturation Survey (CSS) targeted televisions as one of the focused measures in order to analyze the associated purchasing behavior, saturation, and energy efficiency in California businesses. Using data gathered from telephone surveys, on-site surveys, and subsequent make/model lookups, we are able to paint a representative picture of the current state of televisions across California's commercial sector. This paper will present the results of these studies from over 850 sites with televisions. In particular, it will focus on the characterization of televisions in the commercial sector and the evolving energy efficiency profiles of televisions throughout the state. Extensive data has been gathered for these TVs in terms of both saturation and electric load. These include television-specific data such as display technology, On Mode/Standby power consumption, screen size, and ENERGY STAR rating, along with usage statistics such as hours of commercial use and the purchases of new versus replacement TVs. Synthesis of this data allows for a comprehensive characterization of the progress of TV energy efficiency in recent years. The information on the efficiency distribution and other characteristics of TVs in the commercial sector will be presented by utility, year, and business type to help illustrate the development of television purchases in a way that is of particular interest to program planners and regulators.

Introduction

Until recently, televisions were seldom analyzed within the commercial sector; they were primarily viewed as an energy-consuming end use within the residential sector. Anecdotal evidence, however, indicates that the number of TVs within the business sector is rising. The California Market Share Tracking (CMST) analysis, which focused on the efficiency of recently purchased technologies, found that 60% of the TVs purchased by businesses from 2009 to 2012 represented new or additional TVs rather than replacements.

Recent advances in TV technology have created a push toward increased energy efficiency. The ENERGY STAR rating for TVs has been updated three times during the 2009-2012 time period. Modern liquid crystal display (LCD) TVs, which are backlit by cold-cathode fluorescent lamps (CCFLs), and light-emitting diode backlit (LED) TVs use less energy than older cathode ray tube (CRT) TVs even though they tend to be substantially larger (Abbott and Novitsky 2011). This study provides a better understanding of the saturation of TVs within the commercial sector and a characterization of their types and distribution. The CSS characterizes TVs by their technology type, size, and efficiency using ENERGY STAR rating information. The CSS TV data is compiled from data collected on site and from make and model lookups to determine the TV efficiency levels.

Sources of Data

Information on TVs within CSS businesses¹ was collected during 6,907 telephone and 1,439 on-site surveys that were completed between November 2011 and May 2013. During the telephone survey, respondents were asked if they have one or more TVs at their facility. Those that reported that they had purchased TVs from 2009 to 2012 were recruited to participate in on-site surveys to collect additional verification information. Sites within CSS business types were recruited to participate in on-site surveys to collect detailed on-site information on multiple end uses. For 888 businesses with TVs, data was collected on the number of TVs at the facility, their age, their technology type, their size, and their make and model number.

Using the make and model number information collected during the on-sites, the research team verified the type and efficiency level of the televisions. As part of the make and model number lookup, the research team requested and received make and model number tables from ENERGY STAR. These tables identify TVs that qualify for all ENERGY STAR efficiency levels since 2009. These data, combined with web-based make and model look ups were used to identify whether a TV was ENERGY STAR-certified and if so, the corresponding ENERGY STAR efficiency version. The results presented are weighted by site weights. These were developed by stratifying the on-site sample by IOU, size and EE participation and estimating population values for the number of sites in each segment.

The televisions were categorized into performance groups based on ENERGY STAR version. These groups were established by matching the on-site data with the quarterly ENERGY STAR Qualifying Products Lists from 2009-2013, corresponding with ENERGY STAR ratings of 3.0, 4.1, and 5.3 (ENERGY STAR, 2009 – 2013).² Table 1 lists the ENERGY STAR version numbers and their start and end dates. For the ENERGY STAR eligible units, higher version numbers represent more efficient units. Each new version introduces increasingly stringent specifications regarding the relationship between screen area and power consumption. Given the data collected on-site, all ENERGY STAR-qualified TVs were classified into one of the three versions based on the TV meeting the ENERGY STAR qualification as well as the age of the TV as noted during the on-site survey.

Table 1. ENERGY STAR Version number and eligibility dates

ENERGY STAR Version	Start Date	End Date
Version 3.0	October 2008	April 2010
Version 4.1	April 2010	September 2011
Version 5.3	September 2011	June 2013

CSS Television Characteristics

¹ CSS businesses include Food/Liquor stores, Health/Medical Clinics (non-hospital), Miscellaneous, Restaurants, Retail, Offices, Schools, and Warehouses.

² The official ENERGY STAR Product List was provided to Itron by ICF International with the permission of ENERGY STAR. The list included qualified products for 2009, 2010, 2011, 2012, and the first quarter of 2013. There was very little opportunity for our end users to purchase TVs in 2013 and be observed for this analysis. Very few surveys were completed in 2013. Due to the lack of a full year's-worth of 2013 purchase data, the 2013 purchasers are generally grouped with the 2012 purchasers.

While on-site, surveyors collected various data about the televisions including technology type, age, and screen size. Table 2 presents the distribution, average age, and average screen size of these TVs by the TV type. Within the commercial sector, 94% of TVs are CRT, LCD, or LED. The remaining TVs are grouped into the “other” category, which includes projection, plasma, and other TV types. CRTs and LCDs are the predominant TV types, together making up 85% of TVs in California businesses. The average age of CRTs is 13 years, while the average age of LCDs and LEDs is 3 years, indicating a decade in average age difference between these types of TVs. The average screen size of TVs varies significantly by technology- 22 inches for CRTs, 35 inches for LCDs, 40 inches for LEDs, and 47 inches for other types of TVs.

Table 2. TV type distribution, average age, and screen size

TV Type	Share of TVs	Relative Precision	Average TV Age (Years)	Relative Precision	Average Screen Size (Inches)	Relative Precision
CRT	42%	13%	13	6%	22	5%
LCD	43%	12%	3	6%	35	3%
LED	8%	51%	3	26%	40	5%
Other	6%	24%	4	14%	47	3%
n	10,067		6,944		9,655	

The results presented above have been weighted by site weight. Totals represent the count of surveyed televisions included in the analysis.

Table 3 lists the distribution of year of TV installation by technology, including the share whose year of installation was unidentifiable or unknown. For CRTs, 25% of TVs were installed between 2000 and 2003. For LCD TVs, 65% were installed between 2009 and 2012. Only 1% of LCDs found on site were known to be installed prior to 2004. Similarly, 39% of LED TVs were installed between 2009 and 2012, while only 2% were installed before 2004. The age distributions for TVs in CSS businesses indicate a recent shift in technology from smaller sized CRT TVs to larger-sized LCD and LED TVs. For roughly one-third of the units, it was not possible to identify a year of installation.

Table 3. TV type distribution by year of installation

TV Type	Pre 2000	2000-2003	2004-2008	2009-2012	Year Unknown
CRT	21%	25%	15%	2%	37%
LCD	1%	0%	14%	65%	20%
LED	0%	2%	6%	39%	54%
Other	0%	0%	21%	52%	27%
n	2,457	1,222	916	2,349	3,123

The results presented above have been weighted by site weight. Totals represent the count of surveyed televisions included in the analysis.

Figure 1 shows the distributions of each TV technology type by business type for businesses

with TVs. For every business type except Schools, LCD TVs are the most prevalent technology type. Two-thirds of Restaurants have LCD TVs, as do 64% of Clinics. In Schools, CRTs comprise an overwhelming 87% of TVs, while other business types have more modest CRT proportions. Offices and Retail stores have the highest percentage of LED TVs, with 13% and 12%, respectively.

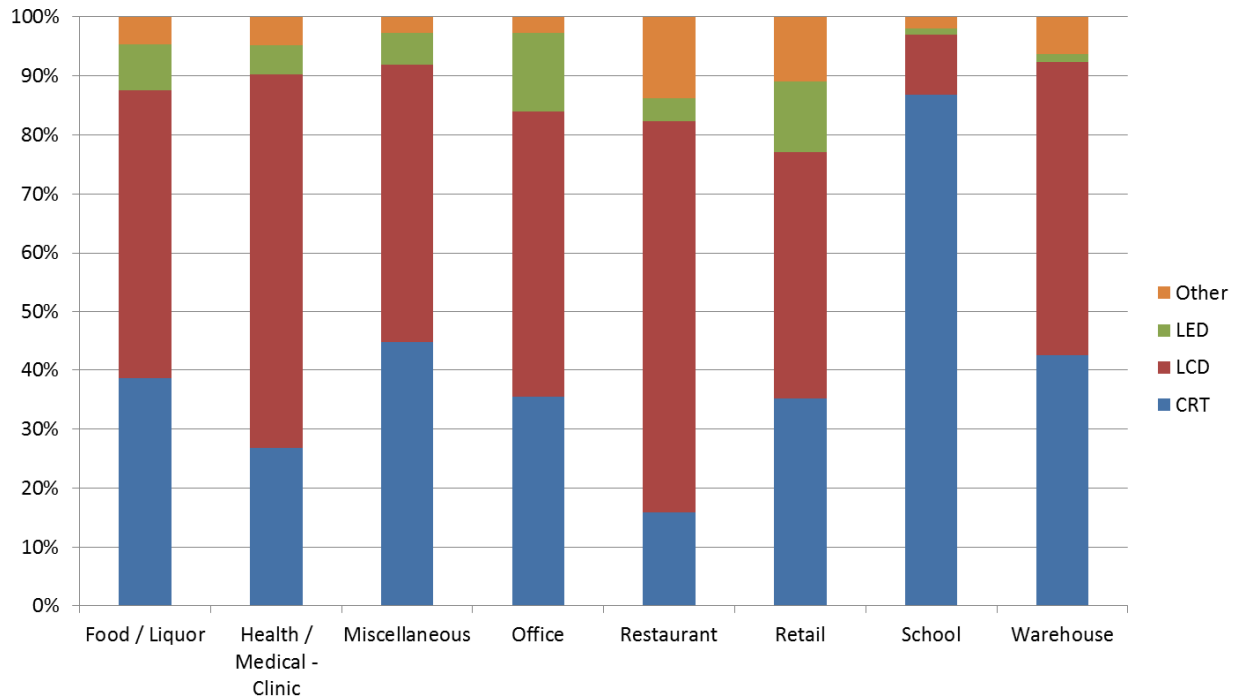


Figure 1. CSS businesses with TVs by TV type. The results presented above have been weighted by site weight.

Television Usage Characterization

The on-site survey found televisions in a wide variety of applications. Surveyors recorded the self-reported usage of each of the TVs they found at each business, and these descriptions were categorized into several groups.

Table 4 and Figure 2 present the distribution of TV usage by business type. These data show that the majority of televisions in Schools (72%) are used for educational or informational purposes. In Restaurants and Health Clinics, the TVs are overwhelmingly used for patrons' entertainment (83% and 86%, respectively). The only business type that has significant usage for meeting is Offices, with 22% of their TVs used for this purpose. Other findings of interest are that almost half of TVs in Food/Liquor stores and 30% of those in Warehouses are used for security monitoring, and that 13% of Retail stores' TVs are used for advertising, both significantly higher proportions than any other business type.

Table 4. TV usage by business type

Business Type	Educational / Informational Use	Entertainment / Customer Viewing	Meeting Use	Security Monitor	Advertising / Marketing Display	Other
Food/Liquor	13%	23%	1%	49%	5%	9%
Health/Medical Clinic	5%	86%	1%	0%	1%	8%
Miscellaneous	33%	52%	1%	2%	0%	11%
Office	26%	33%	22%	1%	1%	16%
Restaurant	6%	83%	0%	8%	1%	2%
Retail	27%	44%	0%	9%	13%	6%
School	72%	26%	0%	0%	0%	2%
Warehouse	9%	40%	8%	30%	1%	11%
n	6,060	2,963	231	192	124	497

The results presented above have been weighted by site weight. Totals represent the count of surveyed televisions included in the analysis.

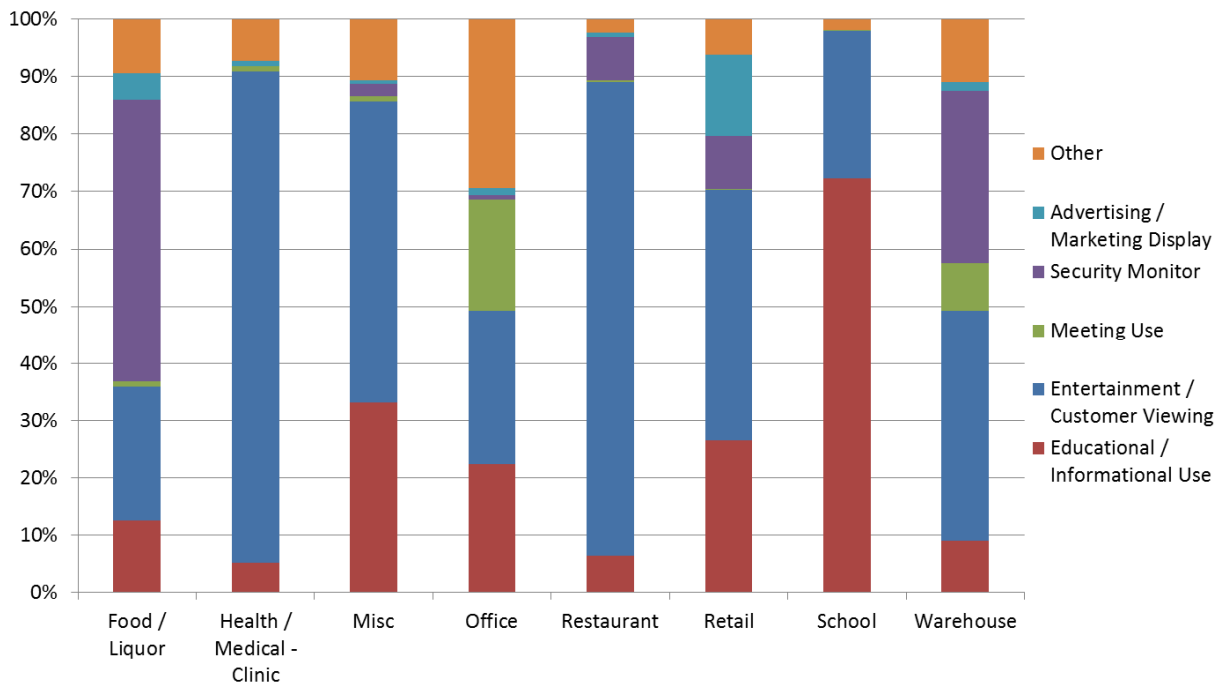


Figure 2. TV usage by business type. The results presented above have been weighted by site weight.

Efficiency Analysis

The CSS-TV study collected make and model number information during the on-site survey. For 13% of the TVs found on site it was not possible to collect these data.³ Occasionally during the online lookup effort we were not able to find a given make and model number collected during the on-site surveys. For 9% of the TVs found on site it was not possible to determine the ENERGY STAR classification from the make and model number collected on site.⁴ Given that the make and model number look up effort used the official ENERGY STAR classification lists, it is likely that nearly all of the 9% of unclassified TVs found on site are not ENERGY STAR qualified.⁵ For 78% or 7,864 out of 10,067 TVs found on site, the TV efficiency analysis was able to classify the ENERGY STAR efficiency level.

Efficiency Distribution

Table 5 lists the efficiency distribution of businesses and distribution of TV units using site count weights while Figure 4 and Figure 5 illustrate the distribution. The distribution of businesses includes CSS businesses where no TVs were found. These data indicate that 53% of businesses do not have a TV on site, but when businesses have TVs, 22% have base efficiency units, and 13% have high efficiency units.⁶ These data also imply that about half of the TVs in CSS businesses are non-ENERGY STAR base efficiency units (51%), while over a quarter are high efficiency units. Comparing the TV units and businesses, TV information implies that businesses with a higher number of TVs were more likely to have base efficiency TVs than businesses with fewer TVs.

The breakouts of the high efficiency distribution in Table 5 indicate that the ENERGY STAR 3.0 TVs are the most common high efficiency TV technology at CSS businesses. Looking at the site-level data, for businesses with high efficiency TVs, they are most likely to have Version 3.0 as well.

Table 5. CSS TV Efficiency Distribution

³ For most of the sites where it was not possible to collect make and model number information the televisions were mounted on the wall. For televisions mounted on the wall, the surveyors asked the site contact for the User's Guide but these were not always available. For some televisions, it is possible to determine the make and model number using the TV menus, for others this feature is not available. The 13% of TVs where the model number was not collected represents the unweighted actual count of TVs. The tables below will present statistics on the weighted TV counts.

⁴ The 9% of TVs where the model number was not found during make and model lookups represents the unweighted actual count of TVs. The tables below will present statistics on the weighted TV counts.

⁵ The unclassified or "Model not found" group are made up of televisions not on the ENERGY STAR qualified list. These measures were looked up on the Internet but they were either not found or energy usage information was not available. For those measures found, but without energy usage information, it is likely that these measures are not ENERGY STAR qualified as the ENERGY STAR lists are assumed to include all ENERGY STAR qualified units. For those measures not found on the internet, it is likely that the make and model number were recorded with error.

⁶ If a site has both an efficient TV and a base efficiency TV it will be counted as both an efficient and a base site.

Efficiency Level	Percent of Businesses	Relative Precision	Percent of TVs	Relative Precision
Base Efficiency	22%	13%	51%	11%
High Efficiency	13%	18%	26%	16%
No TVs On Site	53%	7%	–	–
Model Missing	9%	21%	17%	25%
Model Not Found	2%	34%	5%	33%
High Efficiency ENERGY STAR Distribution				
ES Version 3.0	6%		12%	
ES Version 4.1	4%		9%	
ES Version 5.3	3%		6%	
n	1,439		10,067	

The results presented above have been weighted by site weight. The percent of sites with TVs includes those where no TVs were found on site.

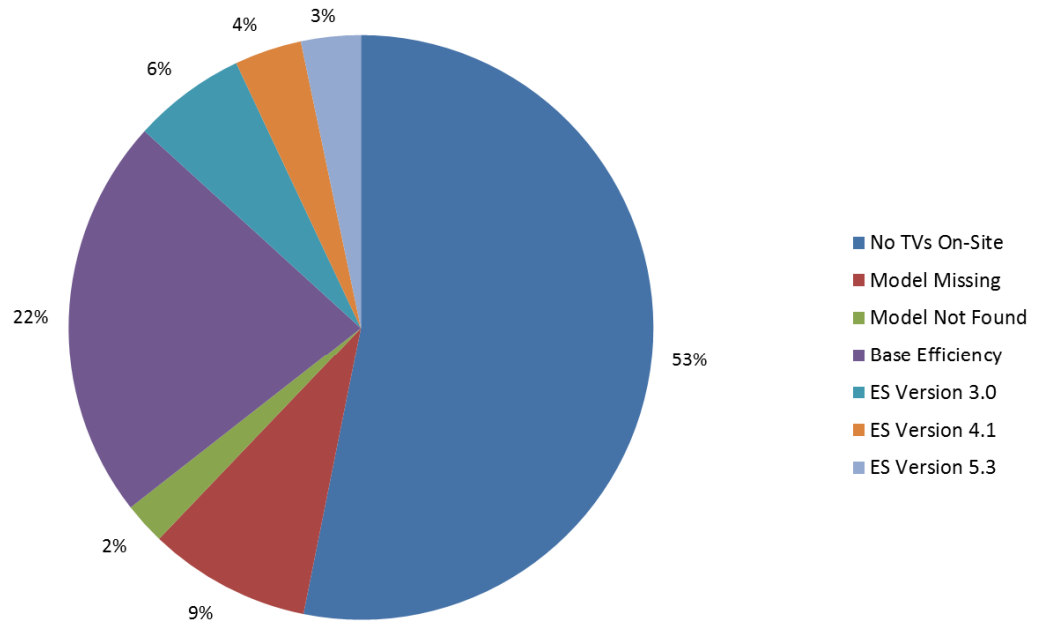


Figure 4. CSS TV efficiency distribution, site count shares. The results presented above have been weighted by site count.

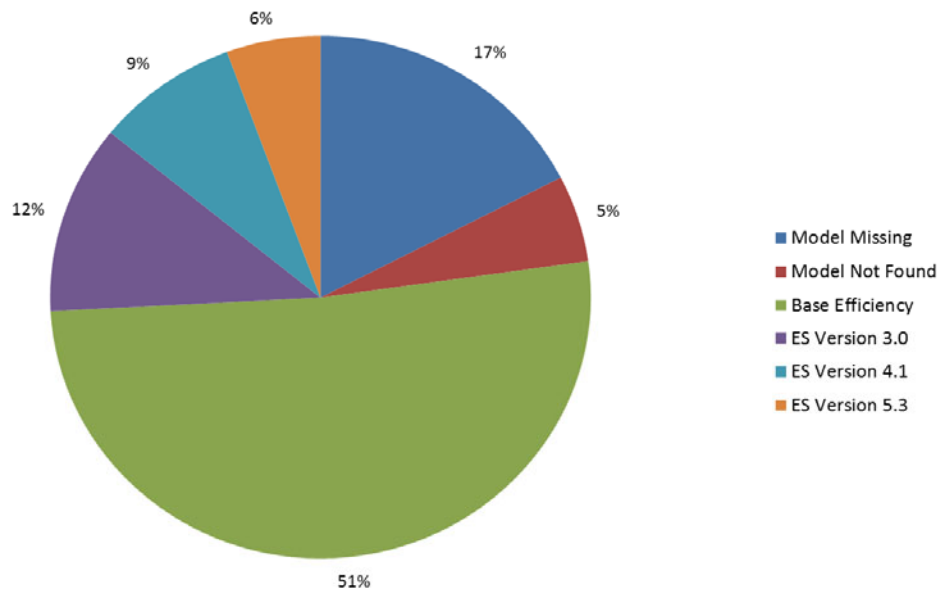


Figure 5. CSS TV efficiency distribution, TV count shares. The results presented above have been weighted by site count.

Efficiency by Year

As part of the CSS on-site data collection, the on-site surveyor collects self-reported information from the site contact on the year of installation of the TV. When this information is unavailable, the year of manufacture is used to determine the approximate age of the television.

Figure 6 is site-weighted and represents the distribution of TV efficiency within each year grouping. Our estimates show that the overwhelming majority of televisions installed before 2004 have specifications that fall under base efficiency. For TVs purchased from 2004 onwards, the prevalence of ENERGY STAR-qualified televisions steadily increases. The share of base efficiency TVs drops from 97% in 2000-2003 to 63% for TVs purchased in 2004 to 2008. The share of high efficiency TVs purchased in the latter year range rises from 0.4% to 21%. For TVs purchased from 2009 to 2012, base efficiency TVs only comprise 16% of units, while high efficiency TVs make up 53% of purchased units. It should be noted that the incidence of TVs with missing or unidentifiable model numbers increases as TVs have a more recent purchase or manufacture date. The increase in missing or unidentifiable model numbers is most likely due to the fact that newer televisions have the ability to be mounted to a wall or otherwise placed in locations where older TVs would be impractical. This placement often prevented the surveyors from successfully collecting the model numbers.

Turning to the disaggregated high efficiency shares, these data indicate that ENERGY STAR Version 3.0 is the most common high efficiency TV in the 2004-2008 range while Version 4.1 is the most common high efficiency TV in the 2009-2012 range. This progression of high efficiency shares is largely a function of the timing of the ENERGY STAR classification. Some

TVs that qualified for ENERGY STAR Version 3.0 certification at the time of manufacture did not meet the later ENERGY STAR criteria for Versions 4.1 and 5.3. Fewer of these TVs may have been manufactured in 2011 and later. The specifications for Version 5.3 were not yet announced in 2009 so a limited amount of TVs would have been built to these higher efficiency specifications.

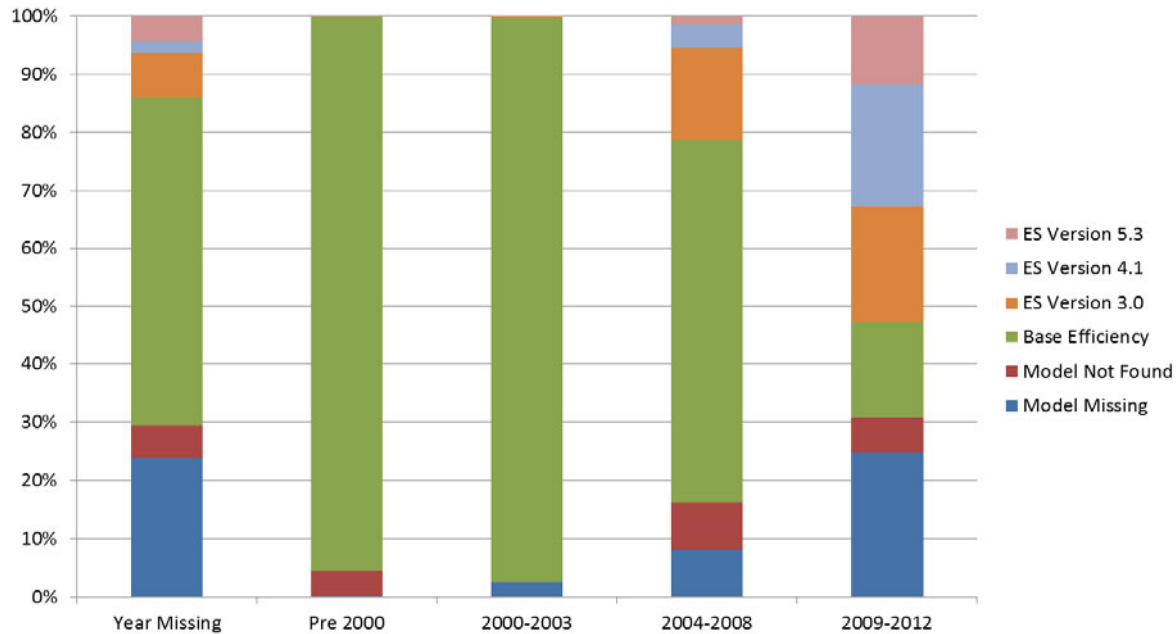


Figure 6. CSS TV efficiency distribution by year. The results presented above have been weighted by site weight.

Efficiency by Business Size

Figure 7 presents the CSS TV efficiency distribution by business size using site weights for TV counts. When looking at the efficiency distribution by TV counts, the distribution of high efficiency units is relatively even across business sizes, ranging from 23% of units in Medium-sized businesses to 29% of units in Very Small businesses. Of the ENERGY STAR-qualified units in these Very Small businesses, most TVs are Version 3.0. In Small and Medium CSS businesses, the distribution of Version 3.0 and Version 4.1 is even, at 10% of all units for both. Most of the high efficiency TVs at Large businesses are Version 5.3, comprising 18% of all units at these businesses.

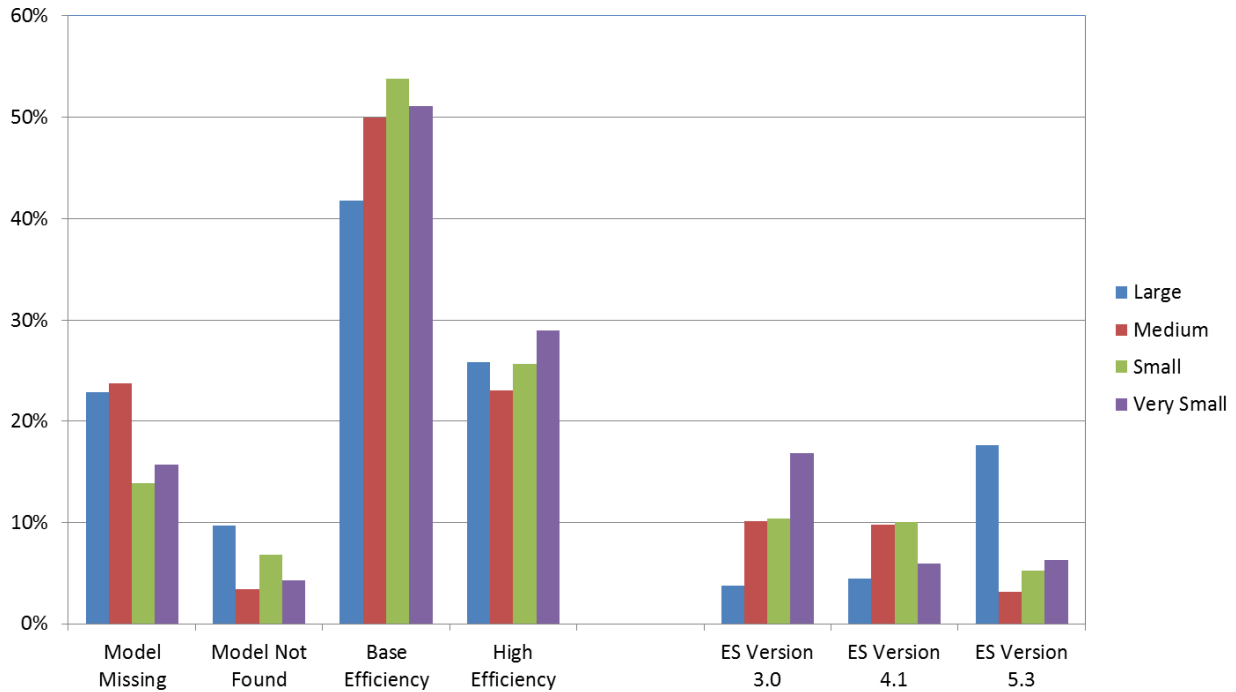


Figure 7. CSS TV efficiency distribution by business size. The results presented above have been weighted by site weight. Large sites have annual usage over 1,750,000 kWh, Medium have greater than 300,000 kWh and less than or equal to 1,750,000, Small have max annual usage greater than 40,000 kWh and less than or equal to 300,000, Very Small have annual usage less than or equal to 40,000 kWh.

Efficiency by Business Type

Figure 8 shows the distribution of TV efficiency by business type for TV unit counts using site weights. Overall, the highest proportions of high efficiency TVs can be found in Health/Medical Clinics and Retail stores, with 45% and 44% of TVs, respectively. Schools, on the other hand, have an overwhelming majority of base efficiency measures, comprising 89% of the units found on site. Over half of the televisions in Restaurants had model numbers that were either not collected or unable to be found in the make/model lookups. This is likely due to the communal placement of TVs in restaurants for either customer viewing or menu display, often making it difficult to collect model numbers without interfering with diners or business operations.

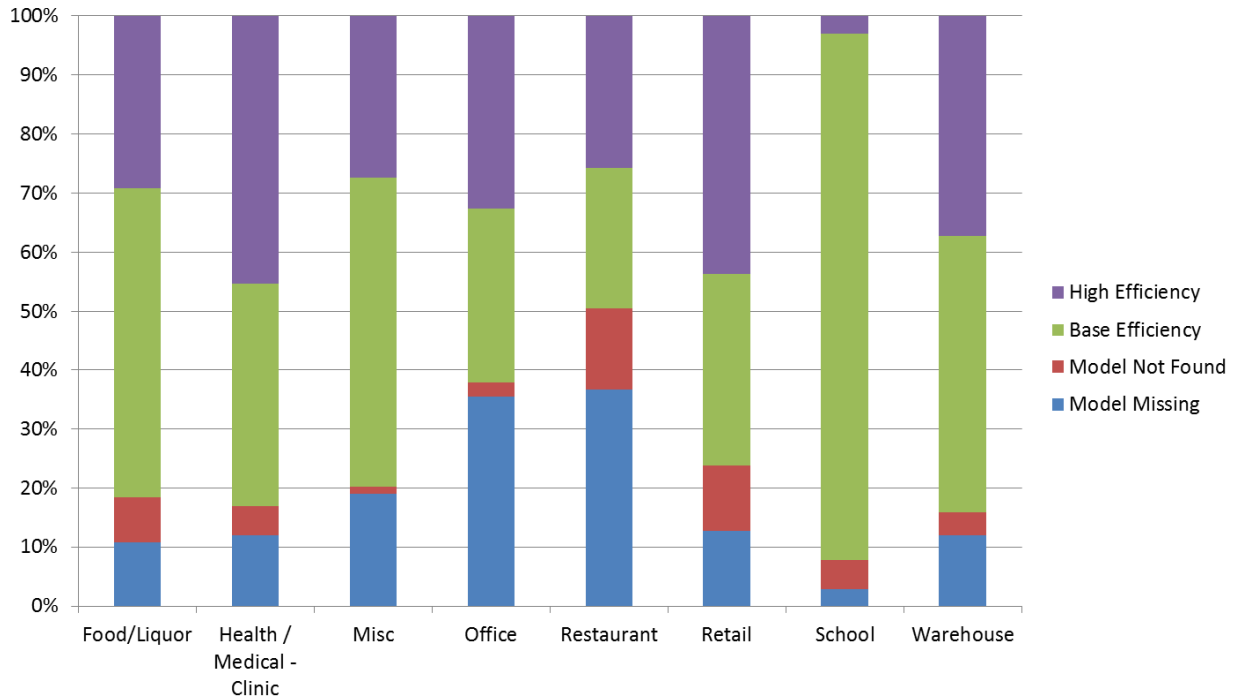


Figure 8. CSS TV efficiency distribution by business type. The results presented above have been weighted by site count.

Conclusion

Rapid technology improvements have led to dramatic reductions in energy usage for newer LCD and LED TVs. The CSS analysis provides a better understanding of all TVs within the commercial sector, both those that are recently purchased (from 2009-2012) and older TVs. These data indicate that TVs are nearly evenly split between older CRT TVs and newer LCD/LED TVs. The average size of the newer LCD/LED TVs is 35-40 inches while older CRT TVs average 22 inches. The data also indicate that 47% of commercial sites have TVs and that larger businesses are significantly more likely to have TVs than smaller businesses. To summarize, TVs are found in approximately half of California businesses and their saturation is growing. The CMST (2014) found that 60% of recently purchased TVs are new, not replacement TVs. The average age of TVs in CSS businesses is approximately 6 years, with the distribution of TVs nearly evenly split between older, smaller, less efficient CRT (average 13 years) and newer, bigger, more efficient LCD/LED TVs (average age 3 years).

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