THE *REAL* BARRIERS TO MOVING THE RESIDENTIAL LIGHTING MARKET: LESSONS FROM IN-HOME VISITS

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Introduction

Opinion Dynamics Corporation, in cooperation with Megdal & Associates, is currently conducting 150 in-home visits for the investor-owned electric utilities in Massachusetts. We are performing this work to better understand how much of the market for energy efficient light bulbs and fixtures in Massachusetts has been transformed. The Massachusetts investor-owned utilities (IOUs) have invested a great deal of energy efficiency dollars in their ENERGY STAR Residential Lighting Program—a program that seeks to encourage use of energy efficient lighting (namely, compact fluorescent lighting) in residences through customer, retailer, and manufacturer channels. The purpose of these in-home visits is to assess the saturation of energy-efficient compact fluorescent lighting (CFL) in the residential market. A secondary purpose of the visits is to determine an average number of lighting sockets in each home. Understanding this information allows us to better determine both how much of the market is left to transform, and what some of the barriers to transforming the market may be.

We identified "eligible sockets" (those that have ENERGY STAR alternatives available) and "perceived non-eligible sockets" (those where an ENERGY STAR option would not suffice) because customers desiring special aesthetic features such as a colored, clear, or decorated bulb cannot currently find a comparable energy efficient alternative.

Our findings related below are based on approximately 100 home visits that we have completed at the date of this paper submission. For final updated findings, please come to our presentation of this data on Tuesday, December 9, at 4:00pm.

Methodology and Sampling

ODC randomly selected—factoring in population density—50 towns and cities in Massachusetts. Three homes in each town or city were targeted for home visits—one taken from a database of past program participants and the other two taken from a sample of homeowners at-large. (Referred to throughout this paper as "random", these homes may or may not have purchased energy efficient bulbs or fixtures.)

Respondents were screened simply for the appropriate town and for whether they lived in a single-family residence, defined as a complex with four or fewer units. Participation was encouraged with a financial incentive, and homeowners were assured that the visit would take no longer than one hour.

We also asked respondents a few questions about their home during the initial phone call to schedule the visit. This served the purpose of making the actual site visit less onerous and allowing the site auditor to concentrate on collecting observed data, rather than reported data. These questions asked during the scheduling screener included mostly demographic-type questions about the home and the respondent's awareness about ENERGY STAR and whether he or she had previously participated in an energy efficient lighting program.

ODC site auditors collected information using ODC's customized EEsiteAuditor program based off of DDH Software's HanDBase program on a personal digital assistant (PDA), primarily for consistent reporting of data and for ease in the data collection process.

Demographic data analyzed so far seems to generally mirror the type of homes found across Massachusetts. According to the 2000 Census, 80.4% of Massachusetts homes are more than 20 years old, while 82.3% of homes we have visited so far in 2003 were 20 years or older; and most homes use natural gas for heating fuel (43.9% as reported by the Census, and 47% in our sample). One notable point of divergence from the general population occurs in homeownership rates. Homeownership data from 2002 finds that 61.7% in Massachusetts own their home in 2002; of those participating in our site visits, 82.3% say they own and 14.7% say they rent. This disparity is attributable to the fact that we screened for single-family homes, which are more likely to be owned rather than rented. A side-by-side comparison of census figures and the data collected on the homes in which we conducted site visits is shown below in Table 1.

Table 1. Comparison of Census and Study Home Data

	Massachusetts (Census)	Study (Site Visits)
AGE OF HOME*		
Less than 1 year (1999-2000)	0.9%	0.9%
1 year to less than 5 years (1995-1998)	3.3%	2.9%
5 years to less than 10 years (1990-1994)	4.1%	3.9%
10 years to less than 20 years (1980-1989)	11.2%	4.9%
20 years or more	80.4%	82.3%
HOMEOWNERSHIP	61.7%	82.3%
HEATING FUEL*		
Natural Gas	43.9%	47.0%
Oil (Fuel oil, kerosene, etc.)	39.4%	38.2%
Electricity	12.4%	9.8%
Propane (Bottled, tank, or LP gas)	2.6%	0.9%

Source: U.S. Census Bureau, Census 2000 Summary File 3, DP-4 Profile of Selected Housing Characteristics: 2000[1]; and Housing Vacancies and Homeownership Annual Statistics: 2002[2].

* Where categories differ, Census classifications are noted in parentheses.

1 http://factfinder.census.gov/bf/_lang=en_vt_name=DEC_2000_SF3_U_DP4_geo_id=04000US25.html

2 http://www.census.gov/hhes/www/housing/hvs/annual02/ann02t13.html

Key Findings

To date, the data from our study shows higher counts in bulbs per household and fixtures per household than approximated in previous reports in 1997 by Jennings *et. al*. which found that there are 35 to 50 bulbs per home in the United States that operate in 20 to 30 fixtures per home[3]. In our study, there is an average number of about 58 sockets per household, and an average number of fixtures per home of about 39, with the mean sockets per fixture being 1.5. Of the 3,947 fixtures we have reviewed to date, 75% are hardwired and 24% are portable. However, while most rooms reflect the preponderance of hardwired fixtures (which make up more than 80% of the lighting fixtures in various rooms), some important spaces stand out as the exception. Living rooms are the most likely to be outfitted with portable lighting (71%), followed by bedrooms and offices (55% for each), and den/family rooms (38%). These rooms especially represent an entry opportunity for energy efficient portable fixtures into the market, because they can be more easily replaced than hardwired fixtures.

Basements, bedrooms, and kitchens have the most number of fixtures per room type (7.0, 6.8, and 5.3. respectively). As expected, the mean number of sockets per room type is higher, at 10.3, 8.9, and 7.3, respectively. There are a greater number of sockets for den/family rooms (8.3), dining rooms (5.9), bathrooms (6.9), and garages (5.2), which indicates that the fixtures in such spaces tend to have multiple sockets.

The majority of bulbs found in people's homes are incandescent. The median wattage of all the bulbs we looked at is 60 watts. Seventy-one percent of sockets in homes among the random population contain an incandescent bulb, whereas standard fluorescents make up 14% and compact fluorescent, 7%. Compact fluorescent bulbs are only slightly more common than halogens among the random population (7% versus 6%) but are actually more commonly found than halogen lights in participant residences (19% versus 3%). Earlier, rough estimates of the proportion of installed CFLs to non-energy efficient lighting in Massachusetts indicated that only three to four percent of bulbs used in homes are energy efficient; this study's initial data shows there is a 7% saturation rate of CFL bulbs.

Barriers to Energy Efficient Lighting

Generally, close to half of the "random" population is at least somewhat familiar with ENERGY STAR; while, not surprisingly, most participants are familiar with ENERGY STAR. Table 2 below shows a breakdown of homeowners' recognizance of the brand.

Table 2. Familiarity with ENERGY STAR

	Overall	Random	Participant
Very familiar	39%	25%	70%
Somewhat	18%	19%	15%
Slightly	15%	19%	6%
Not at all familiar before being read description	23%	30%	6%

[3] Vorsatz, Diana, Leslie Shown, Jonathan Koomy, Mitra Moezzi, Andrea Denver, and Barbara Atkinson. *The Lighting Market Sourcebook for the U.S.*, prepared at Lawrence Berkeley National Laboratory, December, 1997. hyyp://endues.lbl.gov/info/LBNL-39102.pdf. Original source: Jennings et. al. "Residential Lighting: The Data to Date," *Journal of the Illumination Engineering Society*. Vol. 26, No. 2, Summer 1997. With number of households from the 1997 RECS survey at 106,989,000 from http://www.eia.doe.gov/emeu/recs/recs2001/append_a.html.

When we originally set out to collect lighting data, we assumed that "perceived non-eligible sockets"—defined as those where there is no comparable ENERGY STAR alternative—meant limitations by any of the following:

- Bulb shape: specialty, small globe, small flood
- Non-standard-sized screw base: candelabra base
- Fixture controls: dimmers, 3-way, motion detectors, photocell, timers
- Special features: clear, frosted, colored, decorative

The threat of perceived non-eligible sockets as a barrier is lessening with a greater variety of compact fluorescent bulbs, as the options have widened to include more shapes (especially specialty and capsule shaped bulbs), sizes (non standard-sized screw base), and capabilities (i.e., dimmable). Since the start of our research, we have learned that ENERGY STAR-approved small specialty bulbs with two screw base sizes (including a candelabra screw base) are now available, in addition to other types. One feature that compact fluorescent lamps have not yet overcome is a clear bulb, which comprises 7% of all bulbs observed through our research.

However, even though manufacturers do offer a wide array of ENERGY STAR-approved lighting products, CFLs are not used in these special circumstances, most likely because they are recent innovations that have not yet caught on among customers. Consumers may not be aware these options exist. The saturation rate of CFLs may have increased to approximately 7%, but penetration into these specific "perceived non-eligible sockets" where an ENERGY STAR alternative *is* available is still low. This is a key indicator that is often overlooked—CFLs need to be manufactured, adopted, and accepted for more specialized lighting, and not merely as replacements for simple incandescent bulbs of standard shape and size.

Aside from barriers such as customer unwillingness to replace a working bulb or fixture with an energy efficient one (customers often cite the need to replace a broken or dead bulb as a reason for purchasing an energy efficient alternative), the ultimate barrier, of course, is sockets for which specific energy efficient lighting is not available due to limitations in technology.

From an evaluation point of view, the question exists as to how to best define the marketplace—should "perceived non-eligible sockets" be included in the overall potential market, or should they be excluded and considered beyond the technological innovations that currently exist?