

T12 Phaseout Market Research

Final Report

Prepared by DNV GL

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1. EXECUTIVE SUMMARY

This section provides a summary of the detailed findings found elsewhere in this report.

Introduction

This report for the T12 Phaseout Market Research Project (Project 40) contains a lot of new information as well as a compilation of some earlier memoranda of findings that DNV GL had issued in February 2014 (Literature Review Memorandum) and June 2014 (Interim Findings from Massachusetts Lighting Distributor Interviews). The new findings include:

- T12-related findings from in-depth interviews that DNV GL completed with 17 lighting manufacturers and five retail buyers (purchasers of lighting products for large Massachusetts retail chains) who participated in the Massachusetts Energy Star residential lighting program;
- T12-related findings from Computer-Aided Telephone Interview (CATI) surveys with 54 managers of hardware and home improvement stores which participated in the Massachusetts Energy Star residential lighting program; and
- An updated summary of T12 data from other sources including the Massachusetts Existing Buildings Market Characterization Project (Project 21) C&I customer survey and data from recent research sponsored by the California Public Utilities Commission (CPUC) including data from their California Commercial Market Share Tracking (CMST) and California Commercial Saturation (CSS) studies that the EEAC Consultants had recommended that we review.¹ We had included some preliminary data from this CPUC research in our literary review memorandum.

This report does not contain findings from the one remaining data collection effort for this research effort: the collection of T12 information from onsite visits with Massachusetts C&I customers. A separate Massachusetts C&I research effort -- Project 41: Existing Buildings On-site Assessments -- is leading these C&I site visits. The results from these visits are not expected until 2015.

Because all other T12 phaseout data collection efforts were completed in July 2014, in that same month DNV GL proposed that it issue a report in the August-September timeframe containing the findings from these 2014 data collection efforts rather than waiting for the C&I onsite data to arrive in 2015. In July 2014, the Energy Efficiency Advisory Council (EEAC) and the Massachusetts Program Administrators (PAs) agreed with this proposal. DNV GL submitted a draft version of this report on September 12, 2014. This document is the final version of that report which addresses EEAC and PA representative comments on the draft report. On October 2, 2014 the EEAC and PA representatives agreed with a DNV GL proposal to make this the final

¹ *Massachusetts Existing Buildings Market Characterization: Commercial & Industrial Customer Telephone Survey*, prepared for the Massachusetts Energy Efficiency Program Administrators and EEAC Consultants by DNV GL, August 15, 2014; *California Commercial Market Share Tracking Study*, Prepared for the California Public Utilities Commission by Itron, Inc., July 18, 2014; and *California Commercial Saturation Survey*, Prepared for the California Public Utilities Commission by Itron, Inc, August 26, 2014.



report (instead of a preliminary finding report) and allow DNV GL to cover the C&I onsite findings in a subsequent memorandum in February 2015.

Awareness of the T12 Phaseout

One topic of interest for the T12 phaseout market research was how aware lighting market actors were of the phaseout. This topic is of interest partly because, as discussed later in this report, there is some evidence that awareness of the T12 phaseout has encouraged C&I customers to retrofit their T12 fixtures sooner than they otherwise would have.

Our research found that the large majority of the Massachusetts lighting distributors and the store managers participating in the Massachusetts residential lighting program reported being aware of the T12 phaseout. In addition, all the lighting manufacturers and retail buyers who participated in the Massachusetts residential lighting program and who reported selling linear fluorescent lamps and being familiar with these lamp sales, said that they were also aware of the T12 phaseout.

The information on the awareness of the T12 phaseout among the Massachusetts C&I customers is not yet available. The data collection instrument for the Existing Buildings On-site Assessments Project (Project 41) has a question asking C&I customers if they are aware of the T12 phaseout. But these data are still being collected and likely will not be available until 2015. A 2013 survey of participating C&I customers in California found that 53 percent reported being aware of the T12 phaseout. Table 1 shows all the key findings concerning awareness of the T12 phaseout.

Table 1: Summary of Findings Concerning Awareness of the T12 Phaseout

Market	Market Actor	Year Surveyed	Key Findings
Massachusetts	MA lighting distributors	2014	<ul style="list-style-type: none"> o 70% of the MA lighting distributors reported being aware of the T12 phaseout (n=10). o 5 of the 7 lighting distributors who reported awareness of the T12 phaseout said that their suppliers provided advice or assistance (e.g., presentations) on how to adopt to the T12 phaseout.
	MA lighting store managers	2014	76% of managers of home improvement and hardware stores participating in the MA residential lighting program reported being aware of the T12 phaseout (n=46).
	MA program-participating lighting manufacturers	2014	100% of the lighting manufacturers participating in the MA residential lighting program who sold linear fluorescent lamps and were familiar with these sales said they were aware of the T12 phaseout (n=6).
	MA program-participating retail lighting buyers	2014	100% of the retail lighting buyers participating in the MA residential lighting program who sold linear fluorescent lamps and were familiar with these sales said they were aware of the T12 phaseout (n=2).
	MA C&I customers	2014-2015	The data collection instrument for the Existing Buildings On-site Assessments Project (Project 41) has a question asking C&I customers if they are aware of the T12 phaseout. But these data are still being collected and likely will not be available until 2015.
California	CA lighting contractors	2013	o 86% of CA lighting contractors reported being aware of the T12 phaseout (n=95).
	CA C&I customers	2013	<ul style="list-style-type: none"> o 53% of CA participating C&I customers reported being aware of the T12 phaseout (n=263). o The phaseout-aware C&I customers (n=168) cited utility representatives (32%), contractors (14%), and lighting retailers/vendors (12%) most frequently as their sources of awareness of the T12 phaseout.

Sources: The Massachusetts findings come from primary data collection for this T12 Phaseout Market Research study. The California findings come from the CPUC's California Commercial Market Share Tracking (CMST) and California Commercial Saturation (CSS) studies cited above.

The Nature of the Current T12 Market

Other topics of interest that we explored through this research included what kinds of customers were purchasing these T12 lamps and how sustainable this T12 market is. We asked the Massachusetts market actors to make generalizations about the types of customers who were purchasing these T12 lamps. Some manufacturers made distinctions between the four-foot T12 market, which they view mostly as a residential market, and the eight-foot T12 market, which they viewed as a C&I market, especially for ceiling lighting in retail and industrial buildings.

The retailers who reported selling T12 lamps (31 store managers and one retail buyer) identified residential customers as their primary customers for these lamps. The lighting manufacturers mentioned a wider range of T12 purchasers including not only residential customers but also commercial building maintenance staff, small business customers, municipal customers, retailers and some industrial customers who use eight-foot fluorescents for ceiling lighting, small niche commercial markets/applications, customers in southeastern states which do not have strong energy efficiency rebate programs, and late adopters. The detailed findings section of this report contains more information about these customer types. While the manufacturers did identify a number of different customer groups that continue to purchase T12 lamps, it is important to note that many of these are niche markets and the lighting distributors and manufacturers identified the overall Massachusetts C&I market for T12 lamps to be a very small one.

Most of the manufacturers did not try to distinguish between lighting markets in general and the Massachusetts lighting market in particular in terms of characterizing the T12 market. However, a couple of them made the point that due to length of time that Massachusetts has been promoting T8 lighting, there is less of a C&I market for T12 lighting in that state, and in the northeastern United States in general, than in other regions of the United States, especially the southeastern United States.

The 2013 C&I customer telephone survey for the Massachusetts Existing Buildings Market Characterization Project (Project 21) did collect data indicating that certain Massachusetts C&I market segments (warehouse, food store, restaurant/food service, and industrial) did report higher-than-average prevalence of T12 fixtures. But these self-reports should be considered with caution since 58 percent of the respondents did not know what types of linear fluorescents were installed. The Existing Buildings On-site Assessments Project (Project 41) is currently collecting linear fluorescent inventory data from site visits that will be available in 2015.

While the market actors generally identified the T12 market as small, a number of them noted that they expected this market to continue for a while. The main reason for this is that even though the newer model T12 lamps are much more expensive than the pre-EPACT models, for residential customers with T12 fixtures it is still less expensive to purchase T12 lamps than to pay an electrician to upgrade the fixtures. In addition, as explained in the detailed findings, a residential program designed to encourage the replacement of these residential fixtures would likely not be cost effective. Finally the manufacturers who reported that they were still producing T12 lamps said that they had no plans to discontinue their production of these lamps as long as there was a market for them. Table 2 shows the full summary of the Massachusetts market actor responses.

Table 2: Summary of Findings on the Nature of the Current T12 Market from the Perspectives of Massachusetts Market Actors

Market Actor	Year Surveyed	Key Findings
MA lighting store managers	2014	<p>o We asked the store managers who reported selling T12s (n=31) whether they could make generalizations about the types of customers who were purchasing most of these T12 lamps. A majority (61%) of these store managers speculated that the T12 purchasers were mostly residential customers. Sixteen percent of these store managers said that small business customers were most of the T12 purchasers and seven percent said that contractors were most of the T12 purchasers .</p>
MA program-participating lighting manufacturers	2014	<p>o When asked to make generalizations about the types of customers who were purchasing T12 lamps, the lighting manufacturers identified the following customer types: residential customers, commercial building maintenance staff, small business customers, municipal customers, retailers and some industrial customers who use eight-foot fluorescents for ceiling lighting, small niche commercial markets/applications, customers in southeastern states which do not have strong energy efficiency rebate programs, and late adopters (n=6).</p> <p>o Some manufacturers made distinctions between the four-foot T12 market, which they view mostly as a residential market, and the eight-foot T12 market, which is a market for ceiling lighting in retail and industrial buildings.</p>
MA program-participating retail lighting buyers	2014	<p>The one retail buyer who reported still selling T12 lamps, who operated in the hardware retail channel, said that their T12 lamp purchasers were mostly residential customers.</p>
MA C&I customers	2013-2015	<p>o The 2013 C&I customer telephone survey for the Massachusetts Existing Buildings Market Characterization Project (Project 21) asked C&I customers who said that linear fluorescents accounted for the majority of their indoor fixtures whether their linear fluorescents were primarily T12, T8, or T5 technology. The customer segments which had the highest percentage of respondents indicating that their linear fluorescent lighting was primarily T12 technology included warehouse (24%), food store (24%), restaurant/food service (17%), and industrial (20%). But these self-reports should be considered with caution since 58% of the respondents did not know what types of linear fluorescents were installed (n=556).</p> <p>o The Existing Buildings On-site Assessments Project (Project 41) is conducting onsite inventories of linear fluorescent lamps, which should provide more accurate information on which building types or market sectors have the highest prevalence of T12 lamps. But these data are still being collected and likely will not be available until 2015.</p>

Sources: Primary data collection for this T12 Phaseout Market Research study and Massachusetts Existing Buildings Market Characterization Project (Project 21).

The Size of the Current T12 Market

One of the most important objectives for this T12 phaseout research was trying to gain an understanding of the size of the T12 lighting market in general and the Massachusetts T12 lighting market in particular. The market size information we were able to gather appears to confirm some of the market actor statements presented in the previous section about the nature of the Massachusetts T12 market. These market actors characterized the Massachusetts C&I T12 market – which is primarily served by lighting distributors -- as very small. They also reported that most of the remaining T12 market is driven by residential and small commercial customers who purchase their T12 lamps through home improvement and hardware stores.

The Massachusetts lighting distributors estimated that T12 lamps accounted for five percent of their MA linear fluorescent sales in 2014 and six percent of their MA linear fluorescent sales in 2013. Only one of the four manufacturers who reported to be still selling T12 lamps was willing to estimate what percentage of their current sales of linear fluorescents in Massachusetts were linear fluorescents. This manufacturer – a major supplier – estimated that currently only two percent of their Massachusetts linear fluorescent sales were T12 lamps, compared to 15 percent of their current national sales.

Yet the Massachusetts retail lighting picture was much different. Seventy-eight percent of managers of home improvement and hardware stores participating in the MA residential lighting program reported still selling T12 lamps. In addition, those home improvement and hardware store managers who reported still selling T12 lamps, and who were willing to provide an estimate of the T12 sales share, estimated that, on average, their T12 sales accounted for 32 percent of their 2014 linear fluorescent sales. As noted, the majority (61%) of these store managers characterized their T12 purchasers as mostly residential. Further evidence of this being a residential market was the fact that 90 percent of store managers said that most of their T12 customers were low-volume purchasers. Table 3 shows the full summary of the Massachusetts market actor responses.

Table 3: Summary of the Findings Concerning T12 Market Size from Massachusetts Market Actors

Market Actor	Year Surveyed	Key Findings
MA lighting distributors	2014	<ul style="list-style-type: none"> o 50% of the MA lighting distributors reported that they are still selling T12 lamps (n=10). o The lighting distributors estimated that T12 lamps accounted for 5% of their MA linear fluorescent sales in 2014 and 6% of their MA linear fluorescent sales in 2013. This was a sales weighted average incorporating responses from both the five distributors who reported still selling T12s and the five distributors who reported no longer selling these.
MA lighting store managers	2014	<ul style="list-style-type: none"> o 78% of managers of home improvement and hardware stores participating in the MA residential lighting program reported still selling T12 lamps (n=46). o 90% of store managers who reported selling T12 lamps (n=31) said that most of their T12 customers were low-volume purchasers. o Participating home improvement and hardware store managers who reported still selling T12 lamps, and who were willing to provide an estimate of the T12 sales share (n=26), reported that, on average, their T12 sales accounted for 32% of their 2014 linear fluorescent sales. This contrasted with an average estimated sales share for T12s in the pre-legislation period (2010) of 69 percent.
MA program-participating lighting manufacturers	2014	<ul style="list-style-type: none"> o Only three of the manufacturers we interviewed said that their company was still making T12 lamps and a fourth said they were distributing T12 lamps that were made by other manufacturers. Yet two of the three manufacturers who said that they were still producing T12 lamps were very large lighting manufacturers. o Only one of the four manufacturers who reported to be still selling T12 lamps was willing to estimate what percentage of their current sales of linear fluorescents in Massachusetts were linear fluorescents. This manufacturer – a major supplier – estimated that currently only two percent of their Massachusetts linear fluorescent sales were T12 lamps, compared to 15 percent of their current national sales.
MA program-participating retail lighting buyers	2014	<p>Of the five retail buyers that we interviewed, only one said that his company was still selling T12 lamps. Yet the other four retail buyers did not operate in the home improvement/hardware retail channel where most of the linear fluorescent sales occur.</p>

MA C&I customers	2013-2015	<p>o The 2013 C&I customer telephone survey for the Massachusetts Existing Buildings Market Characterization Project (Project 21) asked C&I customers what types of linear fluorescent lighting they had. For those customers who indicated linear fluorescents were the primary source of lighting in their facilities, 16% of respondents reported having T12s, 20% reported having T-8s, and 5% reported having T5s. But these self-reports should be considered with caution since 58% of the respondents did not know what types of linear fluorescents were installed (n=556).</p> <p>o The 2013 C&I customer telephone survey for the Massachusetts Existing Buildings Market Characterization Project (Project 21) asked C&I customers who said that linear fluorescents accounted for the majority of their indoor fixtures whether their linear fluorescents were primarily T12, T8, or T5 technology. The customer segments which had the highest percentage of respondents indicating that their linear fluorescent lighting was primarily T12 technology included warehouse (24%), food store (24%), restaurant/food service (17%), and industrial (20%) (n=556).</p> <p>o The Existing Buildings On-site Assessments Project (Project 41) is conducting onsite inventories of linear fluorescent lamps. But these data are still being collected and likely will not be available until 2015.</p>
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Sources: Primary data collection for this T12 Phaseout Market Research study and Massachusetts Existing Buildings Market Characterization Project (Project 21).

Table 4 summarizes the findings concerning T12 market size from recent CPUC studies as well as a few national studies. The California lighting contractors gave estimates of current T12 lighting sales and installations (0-4%) that were similar in scale to those reported by lighting manufacturers and lighting distributors for Massachusetts (2-6%). The percentage of California C&I customers reporting having T12 lighting (28%) was also not far from the percentage of Massachusetts C&I customers who reported having T12s as their primary linear fluorescent lighting (16%), especially considering that one would expect the qualifier of “primary” lighting to reduce the reported frequency from the Massachusetts customers.

Table 4: Summary of the Findings Concerning T12 Market Size from California Market Actors and National Studies

Market Actor	Year Surveyed	Key Findings
CA lighting contractors	2013	<ul style="list-style-type: none"> o California lighting contractors surveyed in 2013 reported that T12s accounted for 4% of all lighting sold and installed in southern California and 0% of the lighting sold and installed in northern California (n=95). o California lighting contractors reported that the percentage of their lighting revenue that was generated from C&I sales and installations of T12s in 2011-12 was 3%. o 20% of California lighting contractors reported installing T12 systems during 2011 and 2012.
CA C&I customers	2013	<ul style="list-style-type: none"> o 28% of California participating C&I customers surveyed in 2013 (n=418) reported using T12 fluorescent lamps for their lighting needs. o 69% of California participating C&I customers reported carrying an inventory of T12 linear fluorescent lamps to use when their existing ones burned out (n=122). When asked to estimate how long this inventory would last, 79% did not know. Those who were willing to provide estimates gave the following: 1 to 3 months: 3%, 3 to 6 months: 6%, 6 months to a year: 3%, 1 to 2 years: 5%, 2 to 5 years: 3%, and 5 to 10 years: 1%. o Onsite visits found that during the 2009-2012 period only 4% of the businesses installed T12 lamps and these T12 lamps only accounted for 1% of the fixtures installed during that period. o The CPUC-sponsored 2014 California Saturation Survey (CSS) found that only 12% of the linear lamps in businesses were T12s. This compared to a 36% T12 market share from a 2006 California Commercial End Use Study (CEUS). However, the 2014 CSS study found that the penetration of T12 lamps was much higher (29%) among small businesses and in the health/medical/clinic sector (27%). o The CSS study found that 42% of businesses had at least one T12 lamp.
National data, studies	2011-2013	<ul style="list-style-type: none"> o National Electrical Manufacturers Association (NEMA) sales data showed that at the end of 2013 T12 lamps accounted for 17% of national linear fluorescent lamp sales. o A 2011 National Lighting Bureau (NLB) report estimated that nearly 500 million T12 lamps were still installed in non-residential buildings nationwide. o A 2011 Philips report estimated that there were 900 million T12 lamps in C&I sockets including 500 million in commercial sockets (accounting for 70% of all commercial sockets) and 400 million in industrial sockets (accounting for 35-40% of all industrial sockets).

Sources: The CPUC's California Commercial Market Share Tracking (CMST) and California Commercial Saturation (CSS) studies; the National Electrical Manufacturers Association; the National Lighting Bureau; and Philips.

The Type of T12 Lamps Being Sold

The EPACT legislation allowed wholesalers and retailers to sell through their stocks of older non-EPACT-compliant T12 lamps in addition to selling newer EPACT-compliant T12 lamps. We asked the Massachusetts lighting distributors, retail buyers, and store managers whether they were selling the newer EPACT-compliant T12 lamps or the older non-compliant models.

Three of the five lighting distributors who reported selling T12 lamps said that they sold the models that complied with the new federal standards with the other two not knowing how to characterize the T12s they sold. Thirty-two percent of the store managers who reported selling T12 lamps said they only sold the newly-manufactured T12 lamps, with 16 percent saying that they only sold the older models and 42 percent saying that they sold a mixture of old and new types.

The one retail buyer who reported still selling T12 lamps, who operates in the hardware retail channel, indicated that his company was selling a combination of the older model and newer model T12 lamps. However, he said that his company had tried to “shut a lot of it [T12 lamps] off if it wasn't a compliant product” and to reduce their T12 purchases in general.

Most of the lighting manufacturers indicated that they did not have enough information to comment on the mix of old and new model T12s being sold. One manufacturer, whose company continues to distribute T12 lamps produced by other manufacturers, claimed that the “Big 3” manufacturers produced a lot of T12 lamps in the period just before the legislation took effect and that there were a lot of these older model T12 lamps still around.² Yet another manufacturer expressed skepticism about the current availability of the non-compliant T12 lamps. He argued that enough time has elapsed since the legislation that most stockpiles should have been sold through.

We also asked the three manufacturers who said they continue to manufacture T12 lamps how they are complying with the new legislation. The literature review memorandum had indicated that most manufacturers were complying with the legislation by increasing the Color Rendering Index (CRI) of their lamps. Our interviews supported this theory since all three manufacturers cited the higher CRI as the way they achieved compliance. They mentioned that this higher CRI was achieved by using more rare earth elements like tri-phosphors. Two of the three lighting distributors who said that they were selling T12 lamps that complied with the new standard also said that their T12 lamps had a higher CRI. This reliance on higher CRIs to achieve compliance is of concern from an energy efficiency perspective because while a higher CRI produces a better quality of light, it does not improve the energy efficiency of the lamps.

Other Impacts of the T12 Phaseout

We asked the six lighting manufacturers who said they were familiar with their companies' sales of linear fluorescent lamps whether they thought that the federal legislation encouraged some C&I customers to upgrade their T12 lighting to more energy-efficient lighting sooner than they otherwise would have. All six of them provided responses (e.g., “Absolutely,” “Of course,” “For sure,” “No question about it,” “Definitely”) which indicated strong agreement with this theory.

² The term “Big 3 manufacturers” refers to General Electric, Osram Sylvania, and Philips.



One of the manufacturers theorized that the legislation was important in prodding the late adopters.

We asked the seven distributors who were aware of the T12 phaseout if the phaseout had influenced customers to replace T12 lighting sooner than they otherwise would have. A slight majority (56%) said that the phaseout had not accelerated T12 replacement. We also asked these seven lighting distributors whether they had made any changes in their stocking or sales practices in response to the T12 phaseout. The most common response (three of the seven distributors) was that the T12 phaseout did not lead to any changes in their stocking or sales.

One possible explanation for why the lighting manufacturers were much more likely than the lighting distributors to say that the T12 phaseout had accelerated the replacement of T12 lighting is that the manufacturers had more of a national perspective while the distributors had more of a Massachusetts and regional perspective. As discussed elsewhere in this report, some market actors said that the northeast region was ahead of many other areas of the country in shifting from T12 to T8 lighting technologies. Therefore lighting distributors who operate in this northeast region would be less likely to see T12 retrofit acceleration due to this T12 phaseout because most of the T12 retrofits in the region had occurred before the legislation went into effect.

The CPUC reports did provide some evidence that the T12 phaseout had accelerated some of the T12 retrofits:

- Sixty-three percent of the California lighting contractors that were surveyed in 2013 (n=95) thought that the T12 phase out had an influence on their customers' decisions to retrofit their existing T12 systems earlier than they otherwise would have.
- About half (53%) of the CPUC lighting contractors who were surveyed in 2013 said that the T12 phaseout had accelerated their customer T12 retrofits by a year or less.
- Sixty-one percent of participating California C&I customers who were surveyed in 2013 (n=145) said that they replaced their T12 lamps to higher efficiency linear fluorescent lighting because of the T12 phaseout.

2. PROJECT BACKGROUND AND REPORT SCOPE

In early October 2013 evaluation representatives of National Grid and Northeast Utilities expressed interest in DNV GL preparing a scoping memorandum for a research task to study the impact of federal legislation that has recently phased out less energy-efficient linear fluorescent lighting products. This legislation includes the Energy Policy Act (EPACT) of 2005 and the Energy Independence and Security Act (EISA) of 2007. Key mandates of this legislation include:

- Beginning in 2010 no T12 magnetic ballasts can be manufactured or imported for sale; and
- Beginning on July 14, 2012 all linear fluorescents manufactured or imported for sale in the U.S. must meet more stringent efficacy standards.

The conventional wisdom was that this legislation would result in a “T12 phaseout” due to the assumption that T12 fluorescent lamps would not be able to meet the more stringent efficacy standards. In fact some energy efficiency programs and many lighting contractors were using the T12 phaseout as a selling point for encouraging customers to upgrade their T12 lighting.

Yet there are many exceptions or exemptions that prevent this from being a total T12 phaseout including:

- While the import or manufacture of the less efficient linear fluorescent products has been prohibited, customers can still purchase these products until existing supplies have been exhausted;
- The “800” series of eight-foot long 60W T12 lamps is unaffected by the phaseout;
- There is an exemption in the federal rules which allows lamps with a CRI of 87 or greater still to be sold;
- There are additional exemptions for linear fluorescents that are used to promote plant growth, or for cold temperature applications, or for other specialized applications; and
- There was a delay in the phaseout of some of the less efficient linear fluorescent lamps due to shortages in rare earth minerals used in the production of the more efficient products.

The evaluation representatives of National Grid and Northeast Utilities were aware of some of these uncertainties about the scope and timing of the T12 phaseout and were interested in learning more. They noted that these issues have important implications for the Massachusetts small business direct install programs in particular, since these programs derive significant energy savings from T12 retrofits. If T12 lamps were truly phased out, then this would bring into question program assumptions about baseline lighting technologies. It could also raise questions about program attribution because there may be situations where the Massachusetts programs were claiming full attribution for T12 retrofits that may have been partly driven by this phaseout.

During an October 8th 2013 conference call the National Grid and Northeast Utilities representatives proposed that DNV GL develop a short memorandum with a preliminary scope of work for funding research on these topics. They then planned to submit this scoping memorandum to the Massachusetts Energy Efficiency Advisory Council (EEAC) consultants for



discussion about possibly funding this research. During this October 8th conference call it was agreed that the researchable questions of greatest interest included:

- Are lighting manufacturers still producing T12 lamps despite the phaseout initiated by the EPACT and EISA legislation?
 - [IF YES] How are manufacturers producing T12 lamps that meet the new efficacy requirements?
 - [IF YES] How big a market do these continuing T12 sales represent?

Of secondary interest was the question of how lighting distributors/contractors are reacting/adjusting to the T12 phaseout.

In late October and early November the evaluation team had a number of discussions of this T12 phaseout research with the EEAC consultants and the PA evaluation representatives. During these discussions the EEAC consultants recommended two additional data collection efforts:

- Collecting information relevant to the T12 phaseout from the C&I customer site visits that are being planned by the Existing Buildings Market Characterization – C&I Customer Survey (Project 21) team and its successor the Existing Buildings On-site Assessments (Project 41) team; and
- Collecting information from Massachusetts retailers who sell linear fluorescent lamps.

There was also discussion among the evaluation team and the EEAC/PA representatives about possibly conducting some retailer lighting shelf inventories to collect additional T12 information. Yet the Massachusetts Residential Evaluation team had just finished some retailer lighting shelf inventories in early November and did not plan any new ones in 2014. Therefore there was no opportunity to leverage an existing data collection effort and any new retailer shelf inventories would have to be funded solely by the T12 phaseout research effort. The EEAC/PA representatives decided that the benefits of doing an additional round of lighting shelf inventories solely for the T12 phaseout research did not justify the additional costs.

With the approval of the final work plan in December 2013, DNV GL began the first research task which was to conduct a literature review of recent studies, trade journal articles, lighting manufacturer information, etc. which may help answer the researchable questions. In February 2014 the evaluation team finalized this literature review memorandum. In June 2014 the evaluation team submitted a second memorandum which summarized the T12 phaseout-related interview responses of 10 Massachusetts lighting distributors.

Because all but one of the T12 phaseout data collection efforts were completed in July 2014, in that same month DNV GL proposed that it issue a report in the August-September timeframe containing the findings from these 2014 data collection efforts rather than waiting for the C&I onsite data to arrive in 2015. In July 2014, the Energy Efficiency Advisory Council (EEAC) and the Massachusetts Program Administrators (PAs) agreed with this proposal.³

³ The official notes from the July 23, 2014 Non-Impact Evaluation Meeting read: "There was general consensus that DNV GL will produce a report in Aug/Sept. which will include all responses but end-users (to be collected as part of P41). Once Jim's [Leahy, manager of Project 41] team wraps up and the data is made available, DNV GL will then report on those data."



DNV GL submitted a draft version of this report on September 12, 2014. This document is the final version of that report which addresses EEAC and PA representative comments on the draft report. On October 2, 2014 the EEAC and PA representatives agreed with a DNV GL proposal to make this the final report (instead of a preliminary finding report) and allow DNV GL to cover the C&I onsite findings in a subsequent memorandum in February 2015.

3. DETAILED FINDINGS FROM THE LIGHTING MANUFACTURERS AND RETAILERS

This section covers the responses of lighting manufacturers, retail buyers, and store managers to questions about the T12 phaseout. This is new information that was not covered in previous findings memoranda.

Familiarity with Linear Fluorescent Sales

The evaluation team interviewed three groups of Massachusetts lighting market actors: 17 manufacturers, 5 retail buyers and 54 store managers. The latter group included 24 home-improvement store managers and 30 hardware store managers.⁴ Retail buyers are representatives of large chain stores who purchase lighting products for their stores.

DNV GL conducted these interviews primarily for two Massachusetts residential lighting studies.⁵ We added the T12 questions to the market actor interviews being conducted for these residential studies in order to avoid the costs and respondent fatigue that would have resulted from a separate set of interviews with most of these same market actors.

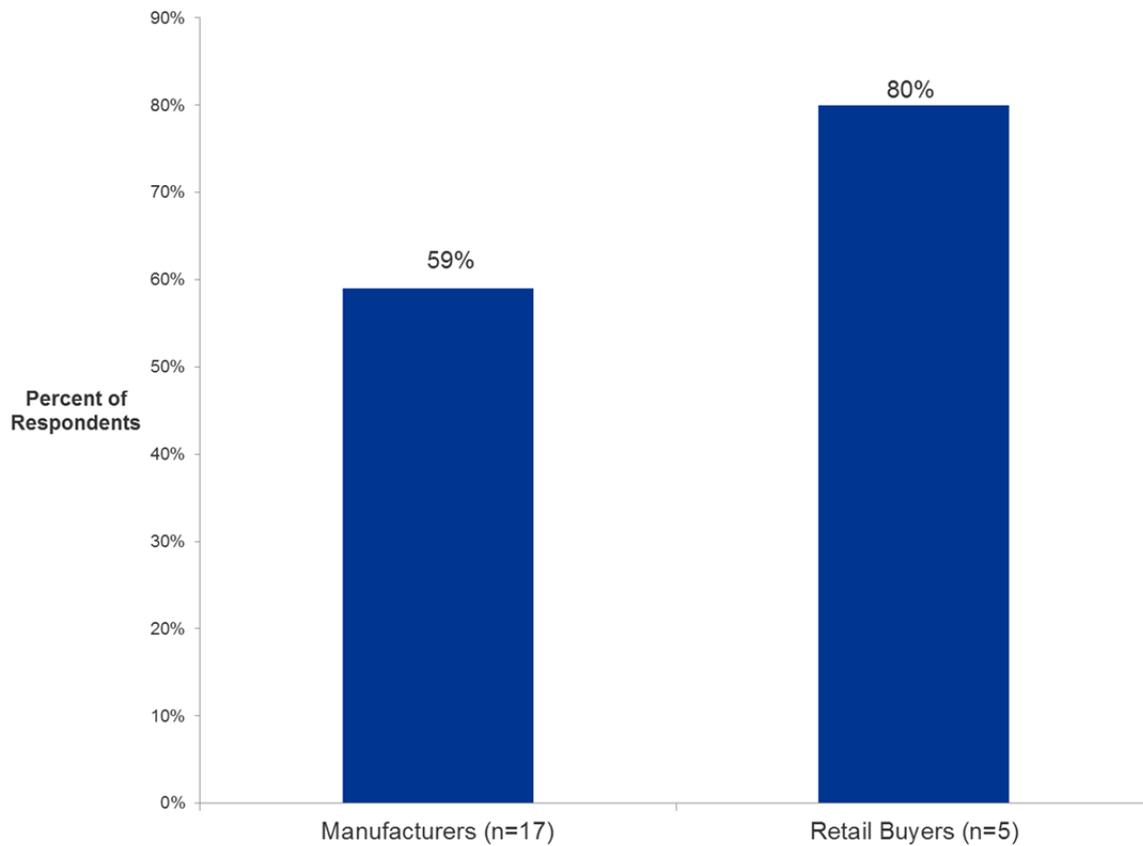
Because the sample frames for all three of these market actors categories came from lists of participants in the Massachusetts Energy Star lighting program – which is an upstream lighting program which focuses on sales of lighting products through retailers – we did not know ahead of time how many of these market actors would be familiar with sales of T12 lighting. However, for store manager surveys we did pose the T12 questions only to managers of hardware and home improvement stores because we assumed that other retailer types – e.g., grocery and drug stores – were unlikely to sell these linear fluorescent bulbs.

We asked the lighting manufacturers and retail buyers whether they were familiar with their company's sales of linear fluorescent lighting. Figure 1 shows that the majority of the lighting manufacturers (59%) and the large majority of the retail buyers (80%) said that they were. We also asked the managers of the hardware and home improvement stores whether their stores sold linear fluorescent bulbs. Eighty-five percent of the store managers said that they did.

⁴ A total of 224 store managers were interviewed, but T12 questions were only posed to managers of home improvement and hardware stores.

⁵ These residential lighting studies include the Lighting Market Assessment and the Multi-Stage Lighting Net-to-Gross Assessment.

Figure 1: Lighting Manufacturer & Retail Buyer Familiarity with Company's Sales of Linear Fluorescents



Awareness of T12 Legislation

We asked lighting manufacturers and retail buyers whose companies sold linear fluorescents and who claimed familiarity with these linear fluorescent sales if they were aware of federal laws that phased out the production of most types of T12 linear fluorescent lamps starting in July 2012. We also asked a similar question to all managers of hardware and home improvement stores who said that their stores sold linear fluorescents. Table 5 shows that all the manufacturers and retail buyers who claimed familiarity with their company's sales of linear fluorescents also reported awareness of the T12 phaseout. In addition, about three quarters of the store managers who said that they sold linear fluorescent lamps claimed awareness of the phaseout. Store managers who claimed not to sell T12 lamps, were much more likely (94%) than those who said they were selling them (68%) to claim awareness of the federal phaseout.

Table 5: Awareness of Federal T12 Phaseout

Response	Manufacturers (n=6)	Retail Buyers (n=2)	Store Managers (n=46)
Aware	100%	100%	76%
Unaware	0%	0%	24%

The Nature of the Current T12 Market

The EPACT legislation and related regulations phased out most varieties of T12 lamps and only allowed manufacturers and retailers to continue producing and selling certain limited types of T12 bulbs. We asked the lighting manufacturers whether they were still manufacturing or selling T12 lamps. Only three of the manufacturers said that they were still making T12 lamps and a fourth said they were distributing T12 lamps that were made by other manufacturers. Yet two of the three manufacturers who said that they were still producing T12 lamps were very large lighting manufacturers.

Of the five retail buyers that we interviewed, only one said that his company was still selling T12 lamps. However, the other four retail buyers did not operate in the home improvement/hardware retail channel where most of the linear fluorescent sales occur.

The three manufacturers who said they still produce the T12 lamps made a number of observations about why they continue to do so and which markets they serve. One representative of a major manufacturer reported that they continue to produce four-foot T12 lamps primarily for the residential market. He said that these T12 lamps are much more expensive than the pre-legislation ones due to the need to use more tri-phosphors to increase the CRI and comply with the new regulations. Yet he claimed that many residential customers will still buy these lamps despite the higher cost because they are still less expensive than having to pay an electrician to replace the T12 fixture. His detailed comments include the following:

There's a couple of exempted categories for four-foot T12 lamps, and one of them is designed for the consumer application, because consumers don't have a lot of good options. There's a lot of consumers that have two 4-foot lamps in their kitchen or laundry room or basement, and the fixtures are designed to operate T12 lamps. So they cannot easily, or they can't, operate a T8 lamp, and most consumers are not capable of retrofitting their own fixture. In general, a consumer would just go out and buy a brand-new fixture, which is a very expensive. And if the consumer, as most consumers can't replace their own fixture, they'd have to hire an electrician, and so this becomes a very expensive situation for a consumer. So to try and address this consumer issue, we continue to make a four-foot T12 lamp in one of the exempted categories for the consumer market. It's a much more expensive lamp than was traditionally offered. It's got a very high use of rare earth phosphors in it to meet ... one of the exemption criteria, but it is primarily used as a consumer lamp For the consumer customer [the higher lamp cost] is not as big a deal. Even though these lamps might have a lower light output, they have a very good color-rendering index and they actually would do quite a

nice job in your kitchen or in your laundry room. The only drawback to the consumer is its much higher price than he .. or she was used to. But if their option is to replace an entire fixture, it's much cheaper than doing that. So that's why a consumer ... faced with paying perhaps double for the lamp than they were used to, versus buying a whole new fixture, would more opt to pay double for the lamp. Plus consumers, they only put about 1,000 hours a year on these, so these will last about 15 to 20 years in their socket. So they get a really long life out of a four-foot fluorescent lamp in a residential application.

This same manufacturer mentioned that commercial customers could use this higher CRI lamp if they wanted to, as well as another "niche" T12 lamp they still produce: a "shatter resistant" lamp. Yet he said that these commercial uses would likely occur when there was an emergency need to replace a lamp, because the T12 lamps do not provide as much value as the T8 lamps. His detailed comments included:

[The higher-CRI four-foot T12 lamp designed for the residential market] can be used commercially ... if a commercial customer was in a pinch and really had to get some T12 lamps in on a short-term basis, they could use it, but it doesn't represent a good long-term commercial product. And, therefore, we're seeing most commercial users switch to T8 lamps and electronic ballasts. I would say very few commercial users are left that are trying to use T12 lamps in their applications. I mean the performance is not as good and the price is very high. The other option that we'll sell a T12 lamp in is a shatter-resistant, or shatter-coated lamp, which is also a fairly expensive lamp, but can also be used by a commercial customer if, again, they have a short-term need to get a lamp in a socket, because the lamps have burned out and they are not ready to do a big retrofit or something. They can use these as sort of band-aid types of products. But they are products that are niche products, they are high-cost products, and they don't represent good solutions, especially for the commercial customer

Another manufacturer who still produced T12 lamps said that their production of T12s was "tiny" and only in the form of "specialty T12s" exempted from the legislation. For example, he noted that they produce a "daylight" series of T12 lamps with higher CRIs that are used in paint stations in auto body shops to make it easier for them to see that they attained the correct paint color. He also said they sell expensive high CRI T12 products to some high-end clothes retailers and restaurants who can afford a lighting designer. "An incandescent is 100 CRI so in a lot of places you want to match that," he said. "You don't want to go into a dressing room trying on dresses and it being all fuzzy and yellow and all that. You've got your little niche [market] that does use that fluorescent designer."

Two of the manufacturers who were still producing T12 lamps said that while the commercial market for the four-foot T12 lamps was disappearing, there was still a commercial market for the eight-foot T12 lamps. "There are some eight-foot and eight-foot-high output [T12] lamps that are still available that pass the efficiency regulations, because those eight-foot lamps are very efficient and when you couple them with the tri-phosphors, they can meet the efficiency regulations," one of the manufacturers explained. "So with the eight-foot category it is not so much that they've pushed the eight-foot T12 lamps to T8 lamps, it's they've just pushed most users to a higher efficiency T12 lamp."



This manufacturer also claimed that another factor explaining the persistence of the eight-foot T12 lamps, besides the energy efficiency of the high output models, was that many retailers will not stock the eight-foot T8 lamps. "I don't know if they believe that an eight-foot T8 lamp is too skinny, too fragile, too long, they have trouble storing them, ... maybe they think they break too easy, I'm not sure what the reasons are," he said, "But they just never have liked using them."

We asked the participating lighting manufacturers, whether or not they continued to sell T12 lamps themselves, to speculate on what types of customers or markets are still purchasing T12s. Those who were willing to speculate mentioned the following:

- *Residential customers:* As discussed above, a number of manufacturers claimed that the four-foot T12 market is primarily made up of residential customers who find it less costly to continue purchasing T12 lamps rather than paying an electrician to retrofit their fluorescent fixtures. These assumptions were echoed by the Massachusetts store managers and one retail buyer, as discussed below.
- *Commercial building maintenance staff:* "Most of them [customers still purchasing T12s] are the commercial users, you know, those schools, hospitals, offices," said one manufacturer. "Normally, the maintenance office would buy some stock just in case if some bulb burns out, they can replace it immediately. So for their convenience, they just keep buying the T12 because you have to use the same bulb in order to match the ballast."
- *Small commercial customers:* "It's the smaller commercial customers [who were still purchasing T12 lamps] so people that just had a pizza shop or a hairdresser or something that just had just a handful of fixtures," said one manufacturer. "So no distributor, no sales rep ever wanted to call on them to convert 20 fixtures and so they were sitting there."
- *Municipal customers:* "[The current T12 market] is also a lot of municipal stuff, like your police stations, fire stations, things like that, where those groups don't generally have a lot of money," said one manufacturer. "So they're always looking to do stuff with the least possible amount of funding, and so they're just continuing to just buy the lowest thing. ... We go in and we make our pitch to say: 'Hey, you're going to increase your profitability by reducing your energy costs,' but that story is really hard to sell to municipal governments, who are just saying: 'Hey, I could buy a cheap T12 lamp and that's what I've got in my budget so that's what I'm buying.'"
- *Retailers and some industrial customers who use eight-foot fluorescents for ceiling lighting:* As mentioned, some manufacturers still reported a viable market for eight-foot T12 lamps because these T12 lamps are energy-efficient enough to comply with the EPCACT regulations and some retailers do not stock eight-foot T8 lamps. "For the eight-footers it's retail [purchasers] primarily and some industrial," said one manufacturer. "Like your grocery stores and your drugstores, whenever you go in there you see a sea of [eight-foot] fluorescents in their ceilings ... There's some industrial use, but it's primarily a retailer ceiling lamp, that is the most common use for that lamp."
- *Small niche commercial markets/applications:* As noted, there are small niche markets such as auto body shops and high-end clothing stores which use high CRI T12s for better color rendering.

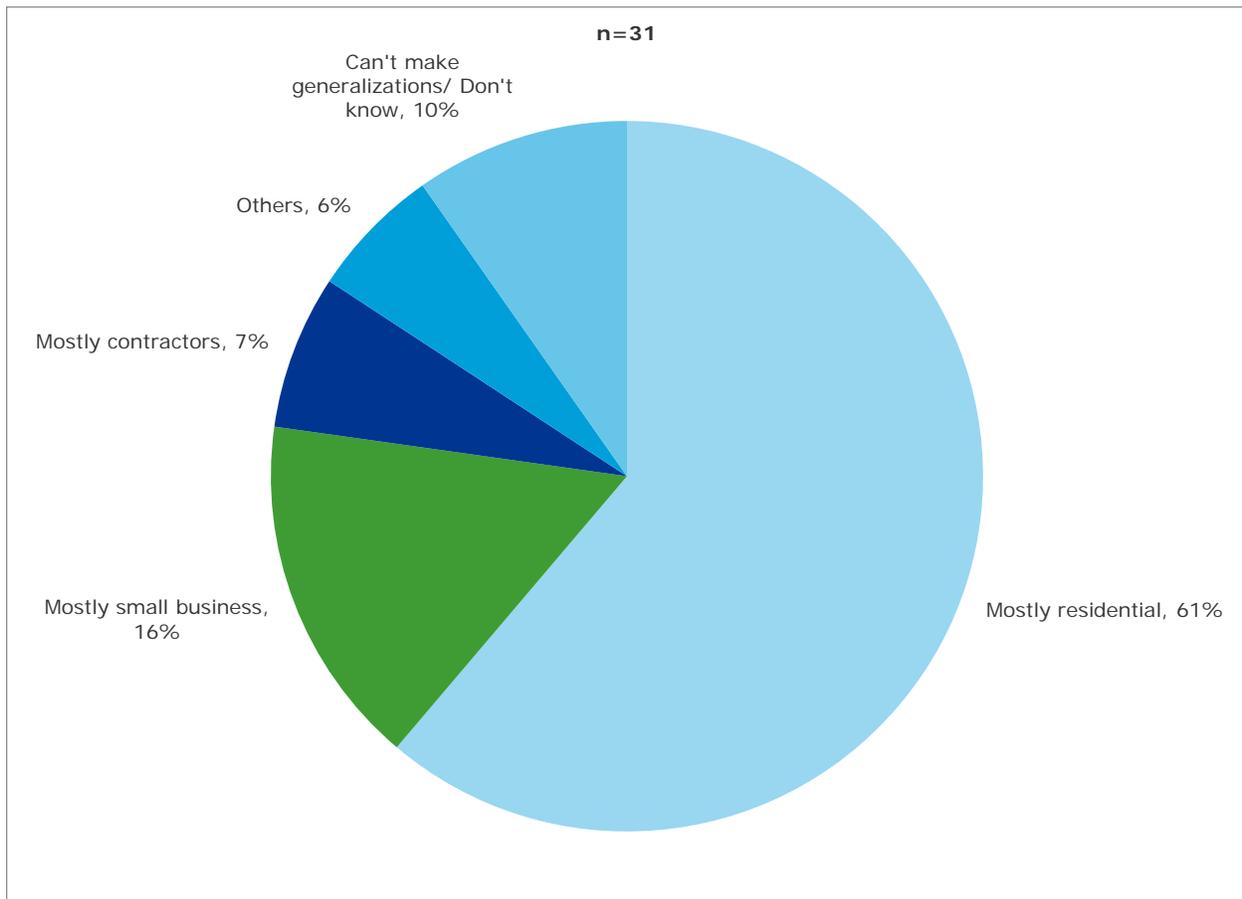
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- *Customers in southeastern states which do not have strong energy efficiency rebate programs:* “[The markets purchasing T12 lamps] are going to be markets that did not have strong rebate programs to push customers towards T8s and T5s,” said one manufacturer. “There’s certain markets where the utilities programs didn’t exist and that’s where you’re still going to find a lot of sales of T12s. ... I’m thinking about southeast states like Mississippi and Louisiana and even Georgia to a certain part.”
 - *Late adopters:* A couple of manufacturers said there will always be a segment of the market who will continue to purchase the T12 lamps because they are reluctant to adopt newer lighting technologies. “People don’t want to change, even if it’s for the better, they don’t want to change. They’re hoarders by nature,” said one manufacturer. Another manufacturer compared the customers who are still purchasing T12 lamps to those late adopters who are still purchasing incandescent bulbs. “You still have ... 35 million incandescents that were sold in 2013,” he said. “You know ... some people just hold onto that lamp. They don’t want to change, so you’ve got to force them.”

While the manufacturers did identify a number of different customer groups that continue to purchase T12 lamps, it is important to note that many of these are niche markets and the lighting distributors and manufacturers identified the overall Massachusetts C&I market for T12 lamps to be a very small one.

The one retail lighting buyer who reported selling T12 lamps said that most of the T12 lamps sold by his hardware chain were the “grandfathered” ones that EPCACT allowed to sell to serve the residential market. “It’s the ones that were grandfathered, because most of our business in LFL [linear fluorescent lamps] is going to be residential, not commercial,” he said.

We also asked the 31 store managers who said they sold T12 lamps the following question: “Can you make any generalizations about the types of customers who are purchasing most of these T12 lamps? For example, are they mostly residential customers? Mostly small business customers? Mostly contractors?” Figure 2 shows that a majority (61%) of the store managers speculated that the T12 purchasers were mostly residential customers with small business customers being a distant second (16%). The home improvement and hardware store managers were pretty similar in the frequency which they named residential or small business customers as the likely T12 purchasers. Yet the home improvement managers were much more likely to name contractors (14%) than the hardware store managers were (0%).

Figure 2: Store Manager Generalizations about T12 Purchasers



One manufacturer claimed that this small, mostly residential- and small commercial-driven market for T12 lamps will likely continue for some time. He said that this was not only because it is less expensive for these small customers to purchase a T12 lamp than to pay an electrician to replace the fixture, but also because it would be difficult to design a cost-effective energy efficiency program to get rid of these T12 fixtures. He noted that while the utilities could pay electricians to retrofit these residential T12 fixtures, it would likely not be cost effective because of the small energy savings. He explained:

If they [Connecticut and Massachusetts] are trying to understand ... what's left out there [in terms of T12 fixtures] and they're trying to figure out what programs they should be developing, if any, for this area, there's probably very little need for any type of commercial program to move people to T8s at this point. But if they, and I don't know how they would do this, but somehow they came up with some sort of residential program where they would send an electrician into your house to convert your T12 fixtures ... that would be the way. That's what's left to do ... But, it's so difficult. It's very expensive and they don't get a lot of energy savings from it because the hours of operation are very low. And they're going to have the same hard time justifying that as a consumer would paying 150 bucks to have someone retrofit a fixture, where they are only getting a very small, minimal energy savings. The other thing to understand about the residential market, from an energy use perspective, is that most T12 lamps operate

on these cheaper shop-light, residential ballasts. And those ballasts have a very low ballast factor, which means those lamps are, even though it might be a 40-watt lamp, it's only being driven at about 60% of power. And so that lamp, in and of itself, might be only running at 25 watts. ... And if you were to convert a T8 lamp, let's say with a .88 ballast factor, which is pretty typical, you would run at about 28 watts. ... Let's say you are going to move a 25-watt T12 lamp down to a 28-watt T8 lamp, you know, they're going to be operating about the same amount of wattage per lamp. The difference is the consumer is going to like it because he is going to get more out of a T8 system, he'll probably get 30% more light output of it, and he's probably going to like the color. ... But the utility is really not going to get any electrical load removed off their system, or very, very little. It's residential, it's low energy use, and that T12 lamp is being under-driven anyway, greatly under-driven by these cheaper residential shop-like ballasts. So I doubt they could even justify a program even if they wanted to do it for philosophical reasons."

The manufacturers who were producing or selling these T12 lamps also indicated that they had no intentions to stop selling them as long as consumers were still buying them. "It's simply the consumer market demand, we don't really decide what types of lamps we want to make, our consumers decide what lamps we want to make," said one manufacturer. "So if our big retailers say their customers are looking for a certain lamp type, then they ask us to produce it. ... We're in business to make our consumers happy. So our customers basically tell us when we're going to make something, and how long we're going to make it, and how many we're going to make."

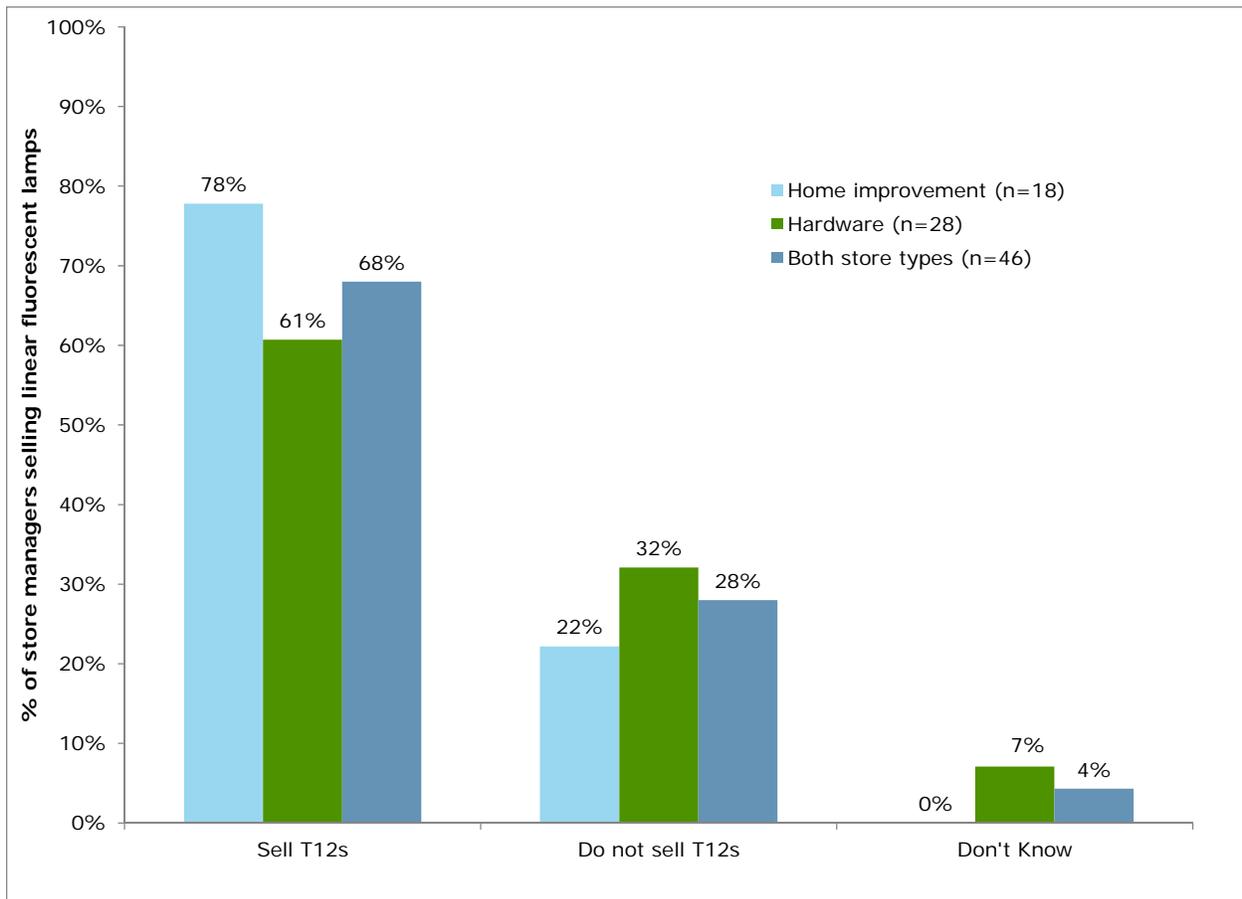
The Size of the Current T12 Market

We asked the three manufacturers who continued to produce T12 lamps: 1) what percentage of their current linear fluorescent production were T12 lamps; and 2) what would this percentage have been four years ago before the new legislation. One major manufacturer reported that at the time of the interview (June 2014) T12s accounted for 15 percent of their linear fluorescents compared to 35 percent four years previous. A second manufacturer said that their current T12 production was "tiny" (they were the ones that sold niche T12 products to auto body shops), but that T12s accounted for 50 percent of their linear fluorescent sales four years ago. The third manufacturer said the legislation reduced their T12 lamp sales by 40 percent overall.

Only one manufacturer was willing to estimate what percentage of their current sales of linear fluorescents in Massachusetts were linear fluorescents. This manufacturer – a major supplier – estimated that currently only two percent of their Massachusetts linear fluorescent sales were T12 lamps, compared to 15 percent of their current national sales. He attributed this lower T12 market share in Massachusetts to energy efficiency programs and higher electric rates in the northeast. "From a commercial standpoint, Massachusetts and the northeast corridor, converted faster to T8 lamps than ... say the middle of the country and that has to do primarily with energy rates and the availability of utility rebate funding," he said. "So I would doubt there is very many T12s being sold into commercial customers at all in Massachusetts at this time."

We asked the 46 Massachusetts home improvement and hardware store managers who said they sell linear fluorescents whether they sell T12 lamps. Over two-thirds (68%) of them said that they did. Figure 3 shows that the managers of the home improvement stores were more likely than the managers of the hardware stores to report selling the T12 lamps.

Figure 3: Massachusetts Store Managers Selling T12s

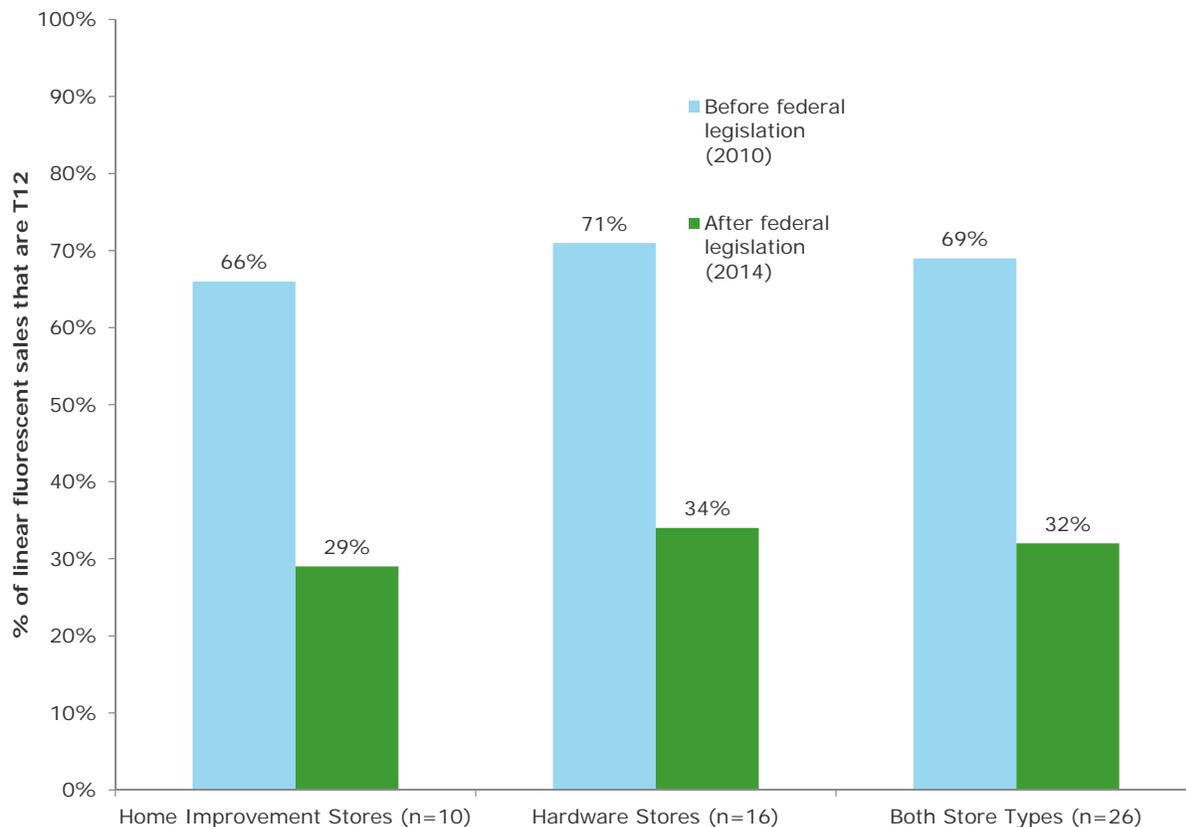


We asked the 31 store managers who reported selling T12 lamps to estimate:

- About what percent of the linear fluorescent lamps that they currently sell are T12 lamps; and
- What this percentage was four years ago before the new legislation.

Twenty-six of the 31 store managers were willing to provide sales share estimates. On average, they estimated the current T12 share of total linear fluorescent sales to be less than a third (32%). This contrasted with an average estimated sales share for T12 lamps in the pre-legislation period (2010) of 69 percent. Figure 4 shows that the sales share estimates from the home improvement and hardware store managers were pretty similar.

Figure 4: Massachusetts Store Manager Estimates of Their T12 Sales Share Currently vs. Pre-Legislation



We also asked the 31 store managers who reported selling T12 lamps the following question: “Are most of your T12 customers making low-volume purchases such as four bulbs or fewer per sale?” The vast majority (90%) said that most of their T12 customers were low-volume purchasers, which would likely be correlated with residential customers.

We asked the six lighting manufacturers who said they were familiar with their companies’ sales of linear fluorescent lamps the following question: “Do you think this federal legislation encouraged some C&I customers to upgrade their T12 lighting to more energy-efficient lighting sooner than they otherwise would have?” All six of them provided responses (e.g., “Absolutely,” “Of course,” “For sure,” “No question about it,” “Definitely”) which indicated strong agreement with this theory.

One of the manufacturers theorized that the legislation was important in prodding the late adopters. “I think it forced that last ... 15% that were still using a four-foot T12 in the commercial environment, I think it forced that last 15% to move to T8s,” he said. “They would have, I think, eventually gotten there over the next five to ten years, but the law basically required them to do it now versus wait any longer. Quite frankly, they’ve been waiting quite a long time, since the T8 technology has been available for a long time. So it kind of just forced the final final reluctant group to move to the newer technology.”

The Types of T12 Lamps Being Sold

Our interviews with lighting manufacturers also explored the types of T12 lamps that are being sold in the current market. As noted, the EPACK legislation allows wholesalers and retailers to sell through their stocks of older non-EPACK-compliant T12 lamps in addition to selling newer EPACK-compliant T12 lamps.

Most of the lighting manufacturers indicated that they did not have enough information to comment on the mix of old and new model T12s being sold. One manufacturer whose company continues to distribute T12 lamps produced by other manufacturers claimed that the “Big 3” manufacturers produced a lot of T12 lamps in the period just before the legislation took effect. “The suppliers that we have, you know, the “Big Three” if you will, they manufactured significant quantities of the T12 product in the anticipation of the legislation cutting off their ability to manufacture it,” he said. “So there’s plenty still in the marketplace and as long as there’s plenty in the marketplace, there’s going to be significant demand.”

Yet another manufacturer expressed skepticism about the current availability of the non-compliant T12 lamps. He argued that enough time has elapsed since the legislation that most stockpiles should have been sold through:

So that whole process probably took anywhere from 6 to 12 months to get rid of the old stock. ... I doubt you could find an old cool-white or warm-white product left and it's been over 18 months ... I guess we're approaching two years now. And I can't imagine that any retailer had bought enough inventory to keep them supplied for two years. That would be kind of crazy. ... You never know, you might find an oddball retailer with some still sitting around. But I would say all the big-box stores that have decent volume certainly don't have any of those old cool white or warm white type of lamps left in stock.

We also asked the three manufacturers who said they continue to manufacture T12 lamps how they are complying with the new legislation. The literature review memorandum had indicated that most manufacturers were complying with the legislation by increasing the CRI of their lamps. Our interviews supported this theory since all three manufacturers cited the higher CRI as the way they achieved compliance. They mentioned that this higher CRI was achieved by using more rare earth elements like tri-phosphors. This reliance on higher CRIs to achieve compliance is of concern from an energy efficiency perspective because while a higher CRI produces a better quality of light, it does not improve the energy efficiency of the lamps.

The one retail buyer who reported still selling T12 lamps, who operates in the hardware retail channel, indicated that his company was selling a combination of the older model and newer model T12 lamps. However, he said that his company had tried to “shut a lot of it [T12 lamps] off if it wasn't a compliant product” and to reduce their T12 purchases in general. “I think we've been ordering [T12 lamps] light, because we've tried to convert as much of the business over to the T8s,” he said. “We do try to shut that [T12 lamp sales] off eventually and make that full commitment to the new technologies.”

In addition, we asked the 31 store managers who said that they currently sell T12 lamps the following question:

“There are two categories of T12 lamps that still can be sold after the federal phaseout including:

1) Older model T12 lamps that retailers had in their stockpiles when the new legislation went into effect and which they are allowed to sell through; or

2) Newly-manufactured T12 lamps that meet the stricter federal standards.

Is your store selling the older model T12 lamps, the newly-manufactured T12 lamps, or a mixture of both?"

Only about a third (32%) of the store managers said they only sold the newly-manufactured T12 lamps, with 42 percent saying they sold a mixture of old and new types and 16 percent saying they only sold the older models. Table 6 shows that the hardware store managers were much more likely than the home improvement store managers to say that they sold a mixture of both. These responses run counter to the claim of the lighting manufacturer cited above that the big box stores should have sold through their stocks of the older model T12s by now.

We did not ask the store managers how they could distinguish between the older and new model T12s. Yet, as noted above, the new four-foot T12 lamps are likely mostly specialty products (e.g., high CRI, shatter-resistant glass) and this should make them easier to distinguish from the older models. Only 10 percent of the store managers said that they did not know the types of the T12 models they sold, which suggests some level of confidence in their knowledge, whether this is justified or not.

Table 6: Store Manager Estimates of Current T12 Lamp Types

Types of T12s Currently Sold	Home Improvement Store Managers (n=14)	Hardware Store Managers (n=17)	Both Store Types (n=31)
Both newly manufactured and older model T12s	21%	59%	42%
Only newly manufactured T12s	29%	35%	32%
Only older model T12s	29%	6%	16%
Don't Know	21%	0%	10%

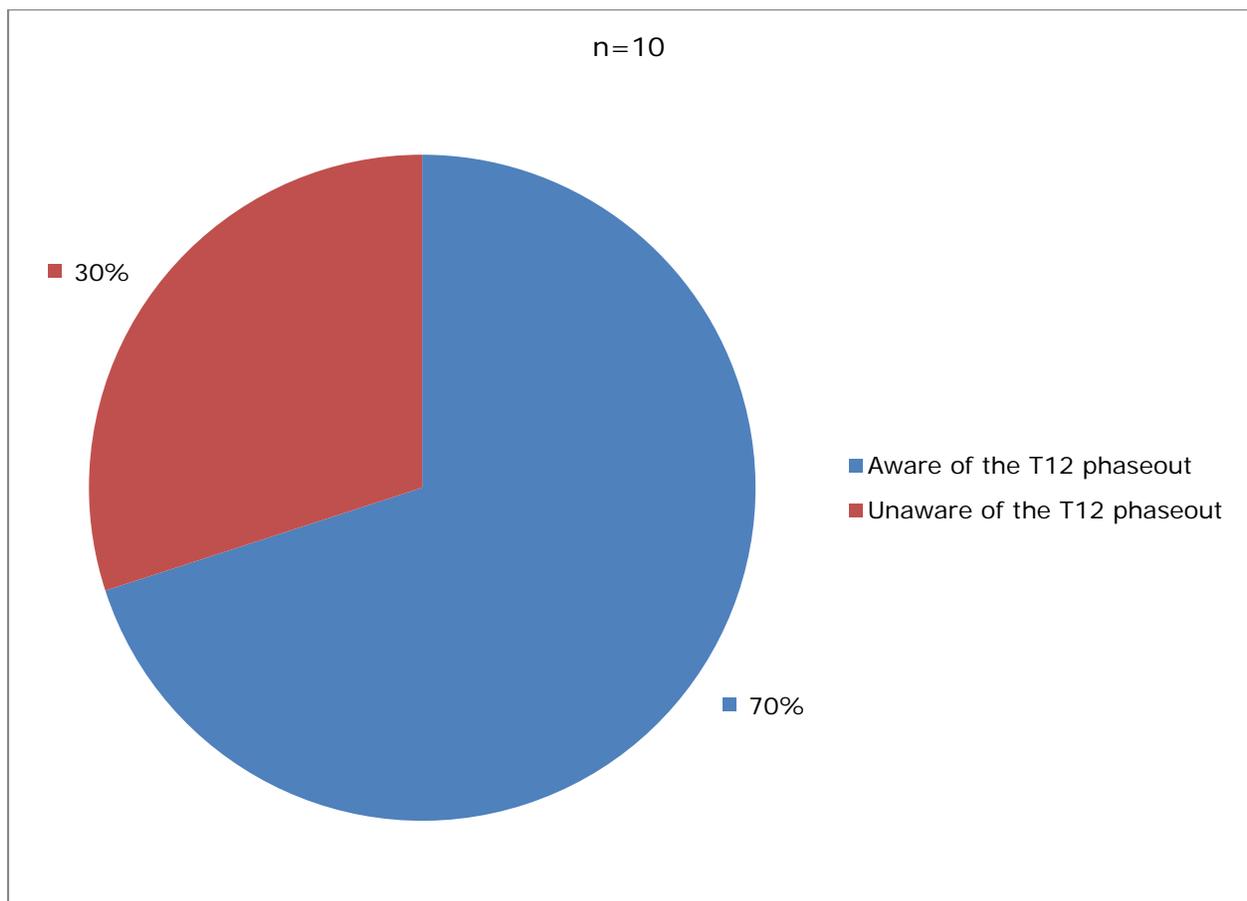
4. FINDINGS FROM THE LIGHTING DISTRIBUTOR INTERVIEWS

This chapter summarizes interview responses concerning T12 lighting from in-depth interviews with 10 Massachusetts lighting distributors that DNV GL completed in April 2014. These lighting distributor interviews were conducted as part of the data collection efforts of both the Massachusetts LED Market Effects Study (Project 27) and the T12 Phaseout Study (Project 40). This chapter only summarizes the distributor interview responses related to the T12 Phaseout Study. These findings were previously provided in a June 2014 memorandum.

Awareness of the T12 Phaseout

We first asked the lighting distributors whether they were aware of the federal rules that went into effect in July 2012 that phased out the import and production of many types of T12 Linear fluorescent lamps that do not meet higher efficiency standards. Nearly a third of the lighting distributors said they were unaware of the T12 phaseout (Figure 5). One likely explanation for this unawareness is the very small share that the T12 lamps represent of the Massachusetts linear fluorescent market (see discussion below).

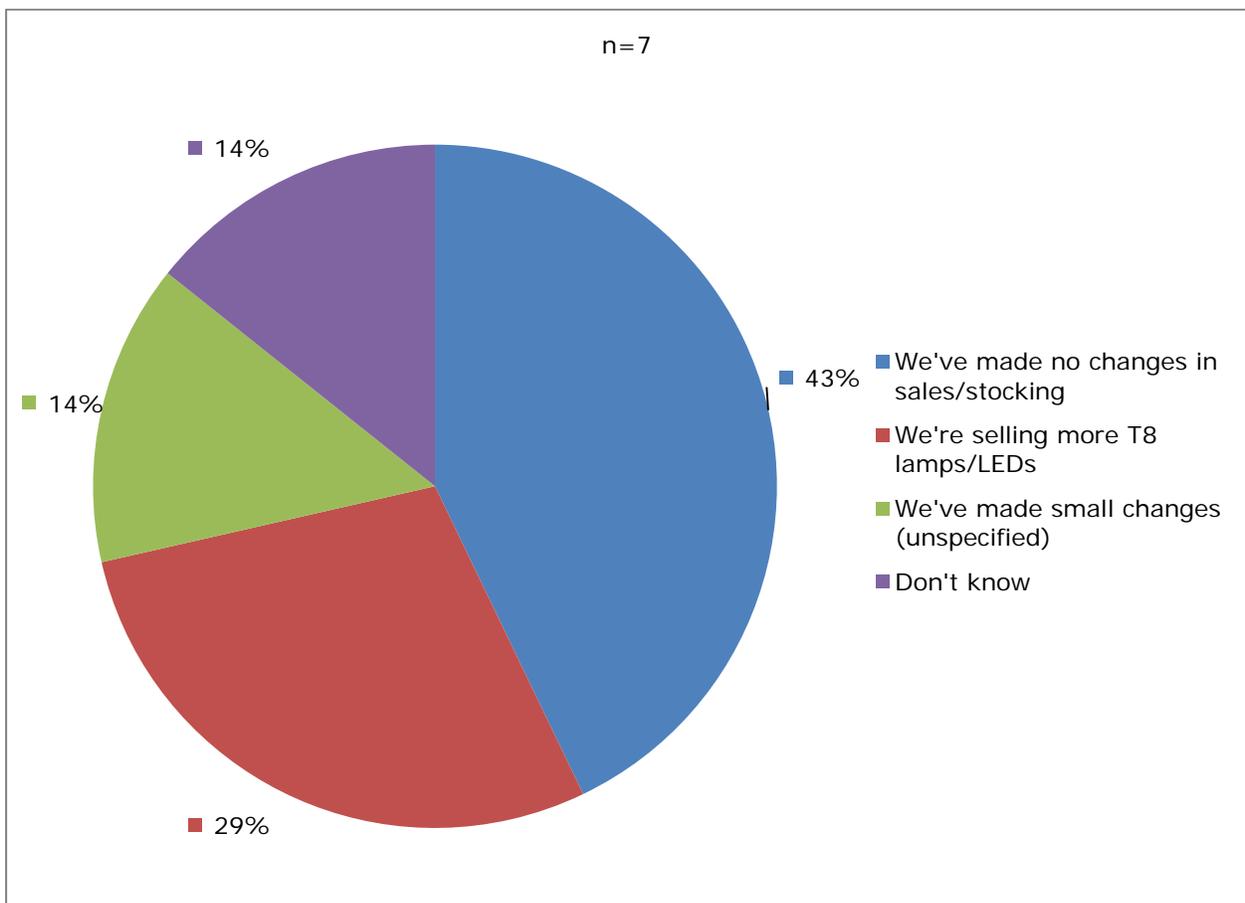
Figure 5: Awareness of the T12 Phaseout



We asked the seven lighting distributors who were aware of the T12 phaseout whether their lighting suppliers had provided them with any advice or assistance for dealing with this T12 phaseout. Five of the seven said that their suppliers had provided advice or assistance. Most reported that this assistance took the form of information such as PowerPoint presentations or pamphlets. This information described the phaseout requirements in detail and also explained the options for replacing existing T12 lamps. One distributor said that his/her supplier had been encouraging them to replace their T12 lamp sales with T8 lamps and LEDs.

We also asked the seven lighting distributors who were aware of the T12 phaseout whether they had made any changes in their stocking or sales practices in response to the T12 phaseout. The most common response (three of the seven distributors) was that the T12 phaseout did not lead to any changes in their stocking or sales. Figure 6 shows the full range of responses.

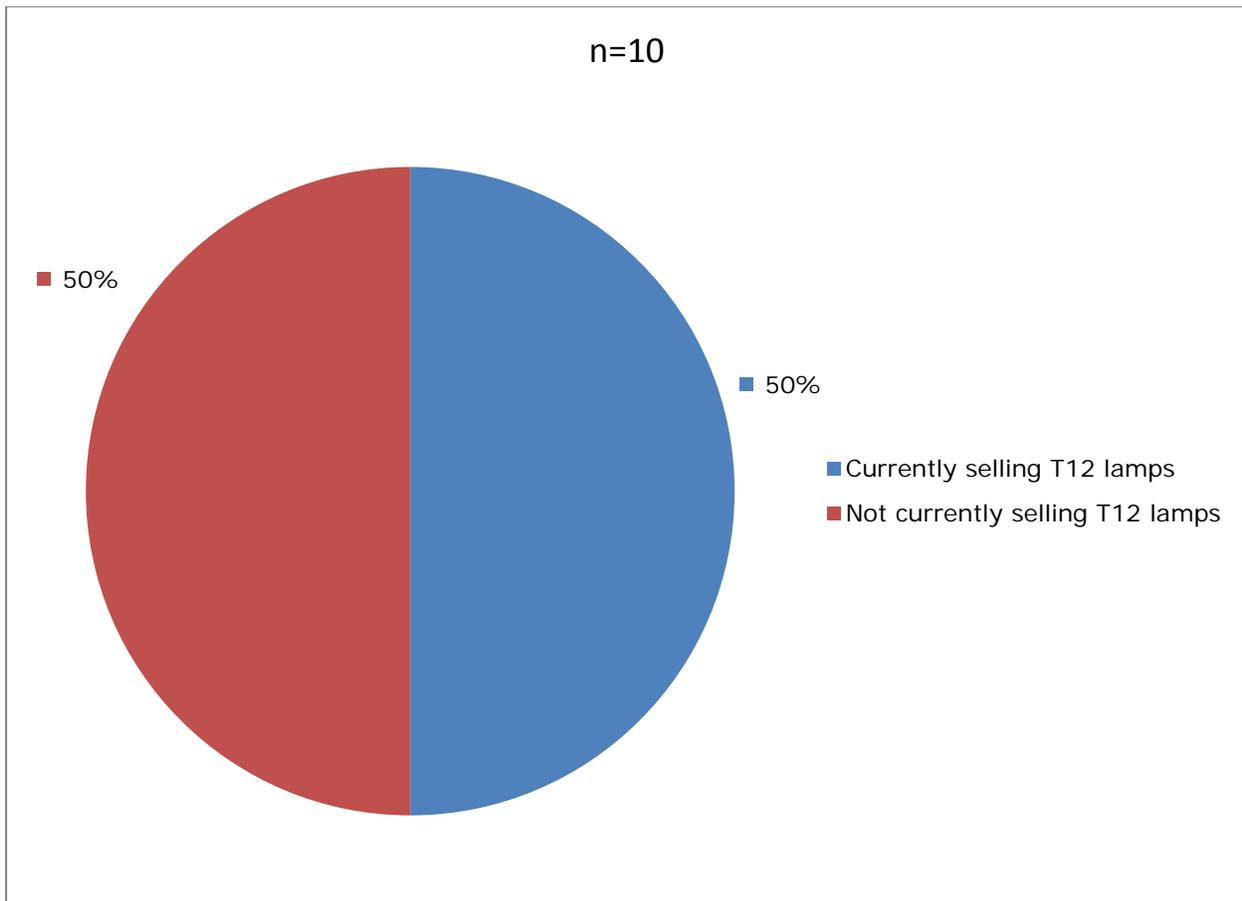
Figure 6: Changes Made to Stocking/Sales in Response to T12 Phaseout (Phaseout-Aware Distributors Only)



The T12 Market

We asked the distributors whether they were currently selling T12 lamps. Figure 7 shows that half of them reported selling the T12 lamps.

Figure 7: Whether Distributors Are Selling T12 Lighting



We asked the five distributors who were continuing to sell T12 lamps whether these were:

- T12 lamps that do not comply with the new federal standards but which they can sell because they acquired them before the federal rules went into effect;
- T12 lamps that comply with or are exempt from the new federal standards; or
- A combination of both.

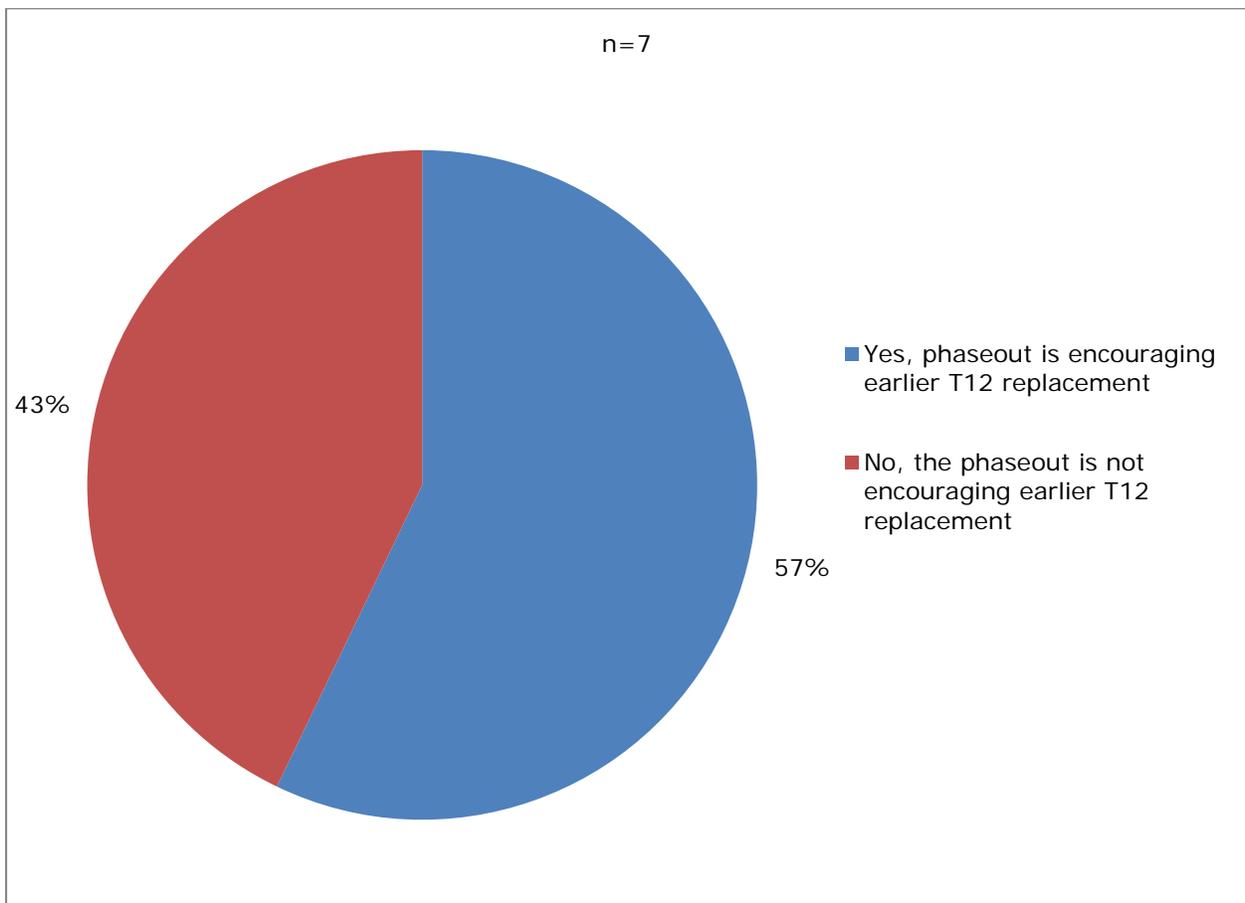
Three of five indicated that the T12 lamps they sold complied with the new federal standards. Two of five did not know how to characterize the T12 lamps that they sold. One guessed that they complied with new standards but could not confirm and the other did not know if they were compliant or not. Interestingly four of the five distributors who said they were selling T12 lamps reported having the same supplier.

We asked the three distributors who said that they were selling T12 lamps that complied with the new standard what characteristics of the T12 lamps they were selling allowed them to comply with or be exempt from the federal rules. Two of the three said that their T12 lamps had a higher CRI. These responses correspond with what we found in our February 2014 literature review memorandum – that many manufacturers were using a higher CRI as the easiest way to make their T12 lamps compliant. One of the distributors also said that their T12 lamps were more energy-efficient than previous models. Finally one of the distributors reported that their T12

lamps had been “revamped” but did providing additional information on the nature of this revamping.

We asked the seven distributors who were aware of the T12 phaseout if the phaseout had influenced customers to replace T12 lighting sooner than they otherwise would have. A slight majority said that the phaseout had not accelerated T12 replacement (Figure 8). We also asked these seven distributors to rate the importance of the phaseout in encouraging earlier T12 replacement using a five-point scale where 5 equalled “very important” and 1 equalled “not very important at all.” Five of them were willing to provide importance ratings with two giving ratings of “1”, two giving ratings of “2,” and one giving a rating of “5.”

Figure 8: Whether C&I Customers Are Replacing T12s Sooner Due to the T12 Phaseout (Phaseout-Aware Distributors Only)



We also queried the distributors as to how many T12 lighting retrofits they had performed in the last year. Of the seven we asked, most stated ‘none’ or too few to recall. Only one could claim any projects, stating they had performed approximately 20 T12 retrofits. Others claimed that T12 retrofits in Massachusetts were rare, as T12 had not been a standard lamp in the Northeast for ‘decades’.

Finally we asked all ten lighting distributors what percentage of their linear fluorescent lamp sales they estimated were composed of T12 lamp sales currently and in the previous year. Table 7 shows their responses.

Table 7: Massachusetts T12 Sales as a Proportion of Overall Massachusetts Linear Fluorescent Lighting Sales

Distributor	Current Year Sales	Previous Year Sales	Annual Commercial Projects
A	0%	0%	24
B	0%	0%	DK
C	25%	40%	100
D	10%	20%	100
E	1%	1%	150
F	0%	0%	100
G	0%	0%	40
H	4%	4%	1000
I	0%	0%	50
J	5%	5%	1000
Weighted Average	5%	6%	~2564

Overall, the interviews found that the portion of overall Massachusetts linear fluorescent sales that were T12 lamps was 5 percent in the current year (2014) down from 6 percent in the previous year. This was not evenly distributed, as some distributors did not sell in either year, and others sold only small levels across both years. In fact, it was only two of the ten firms that appear to have experienced any significant impacts, with both seeing their T12 lamp projects and sales in half. Based on this, it appears that T12 sales for commercial projects are currently not only a very small but also a shrinking portion of the market.

Conclusion

A majority of our very small sample of Massachusetts lighting distributors reported that they were continuing to sell T12 lamps provided by a small number of large manufacturers. The lamps that they reported selling appear to be compliant with new federal regulations with a higher CRI being the most-cited way that the T12 lamps were compliant. However, the volume of T12 sales they reported was very small (5% of total linear fluorescent lamps). When asked if the phaseout had influenced customers to replace T12 lighting sooner than they otherwise would have, a slight majority said that the phaseout had not accelerated T12 replacement. Given the low T12 market share estimates from the distributors and their statements that it has been a long time since sold in T12 lamps in significant numbers, this lack of T12 retrofit acceleration impacts from the legislation is likely due to the fact that many T12 lamps had already been retrofitted by the time the phaseout took effect.

5. THE LITERATURE REVIEW

This chapter contains updated findings from the Literature Review Memorandum that DNV GL submitted in February 2014. At the time of the February 2014 memorandum, we only had access to preliminary unweighted results from the CPUC evaluations. This chapter contains the final weighted results. It also add some findings from the CPUC California Market Share Tracking (CMST) and California Commercial Saturation Survey (CSS) studies that did not appear in the February 2014 memorandum.

Introduction and Summary

With the approval of the final work plan in December 2013, DNV GL began the first research task which was to conduct a literature review of recent studies, trade journal articles, lighting manufacturer information, etc. which may help answer the researchable questions outlined above as well as provide other useful information on this topic. This chapter contains the findings from this literature review.

In addition to the literature review and the analysis of this CPUC survey data, on January 10, 2014 we also conducted one interview with a Northeast Utilities C&I lighting program manager on the topic of the T12 phaseout. Northeast Utilities had requested this interview because it was their understanding that the program manager of their lighting retrofit programs had already done some research on the T12 phaseout topic and they wanted to make sure that the evaluators were not collecting information which had already been gathered.

The following is a high-level summary of our findings from this literature review:

- *T12 lamps are still being produced:* The most recent National Electrical Manufacturers Association (NEMA) sales data shows that at the end of 2013 T12 lamps accounted for about 17 percent of national linear fluorescent lamp sales. This is down from 26 percent in 2010. However, while T12 lamps sales dropped dramatically from 2012 to the beginning of 2013, for the remainder of 2013 the sales trend for T12 lamps has been fairly flat. This might indicate that there are a segment of C&I customers who declined to replace their T12 lighting once the legislation went into effect and have continued to purchase T12 lamps once the EPACK-compliant lamps became available.
- *There are likely some regional differences in T12 sales trends:* For example a 2013 Bonneville Power Administration (BPA) study estimated that T12 sales in the Pacific Northwest were declining more rapidly than the national average as reflected in the NEMA data. In reviewing the draft version of this memorandum, one of the EEAC consultants also commented that the then unpublished Commercial Market Share Tracking (CMST) study being sponsored by the CPUC is finding that sales of T12 lamps in California have virtually disappeared. The EEAC consultant speculated that similarities between the program histories, demographics, and firmographics of California and Massachusetts would indicate that the evaluators are likely to find a similar trend in the Massachusetts lighting market.⁶
- *There are still a lot of T12 lamps in place.* A 2011 National Lighting Bureau (NLB) report estimated that nearly 500 million T12 lamps were still installed in non-residential buildings nationwide. A

⁶ February 5, 2014 communication from Ralph Prael.

2011 Philips report estimated that there were 900 million T12 lamps in C&I sockets including 500 million in commercial sockets (accounting for 70% of all commercial sockets) and 400 million in industrial sockets (accounting for 35-40% of all industrial sockets).

- *Manufacturers are able to continue producing T12 lamps despite the phaseout by meeting an exemption for lamps with a Color Rendering Index (CRI) of 87 or higher and meeting efficacy requirements by increasing lumens rather than reducing watts.*
- *C&I customer awareness of the T12 phaseout is low: A 2013 CPUC survey of C&I customers participating in California C&I energy-efficient lighting programs found that only 53% percent were aware of T12 phaseout law.*

Our Literature Review

This section summarizes the information we gathered from this literature review with the information organized around the key researchable questions.

Whether and how lighting manufacturers are still producing T12 lamps despite the phaseout

As noted above, two of the key researchable questions were:

- Are lighting manufacturers still producing T12 lamps despite the phaseout initiated by the EPACT and EISA legislation?
- [IF YES] How are manufacturers producing T12 lamps that meet the new efficacy requirements?

The simple answer to the first question is “yes.” Our review of recent lighting specification sheets and T12 replacement guidance documents from lighting manufacturers found that lighting manufacturers are still producing many T12 lamp types.⁷ As discussed later in this memorandum, national linear fluorescent sales data also confirms that these T12 lamps are still being sold.

To understand why this is happening, it is necessary to understand that the federal regulations allowed certain exceptions/exemptions to the phaseout of T12 lamp production. The regulations allow the following types of T12 lamps to be continued to be produced:

- The “800” series of eight-foot long 60W T12 lamps;
- Lamps with a Color Rendering Index (CRI) of 87 or greater; and
- Linear fluorescents that are used to promote plant growth, or for cold temperature applications, or for other specialized applications.
- In addition to these T12 lamp production exemptions, there are also other exemptions that have helped keep a supply of T12 lamps and magnetic ballasts in the lighting market including:
- Existing T12 lamps that are in inventory or purchased from factory stock prior to the July 14, 2012 can continue to be sold;

⁷ It is interesting to note that while these replacement guides usually do label the more energy-efficient replacement options (e.g. T8s, LEDs) as the better options, they also list T12 replacement options and in some cases provide information (e.g., that T12 to T12 replacements would require no ballast replacements) that might encourage customers to stick with the T12 option to avoid additional hassle costs.

- 
- Magnetic replacement ballasts can continue to be purchased from dealer stock for up to five years from the July 2010 ballast phaseout date or until inventory is exhausted; and
 - There was also a delay in the phaseout of some of the less efficient linear fluorescent lamps due to shortages in rare earth minerals used in the production of the more efficient products which occurred during the 2011-2012 period.

Some preliminary information we collected from our research and our interview with the Northeast Utilities program manager indicated that manufacturers are continuing to manufacture T12 lamps despite the phaseout by doing the following:

- Producing lamps that have a CRI of 87 or greater; and
- Achieving efficacy standards not by reducing wattage but by increasing lumens.⁸

However, we plan to confirm this information through our interviews with lighting manufacturers and distributors.

How big a market do these continuing T12 sales represent?

This section summarizes recent sales data and information from interviews with lighting trade allies and C&I customers on the size of the market for continuing T12 sales.

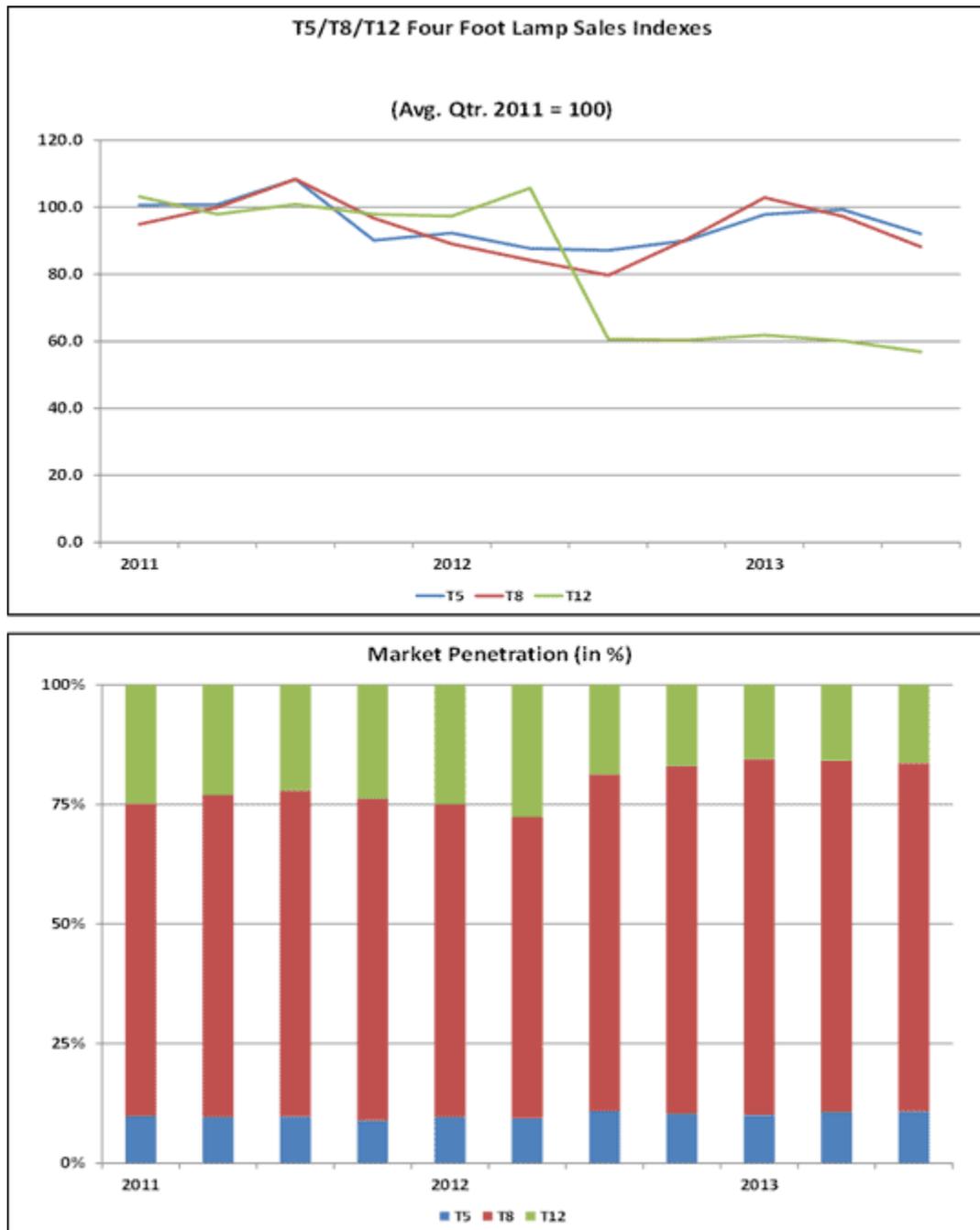
National Trends

The national manufacturing sales data for linear fluorescent lamps indicate that T12 sales definitely declined in 2013 but still represent a noticeable share of these lamp types. The National Electrical Manufacturers Association (NEMA) provides sales information for T5, T8 and T12 lighting systems. According to NEMA, in August 2010 the breakdown of fluorescent lighting sales was 5% for T5s, 65% for T8s and 26% for T12s. Through the end of 2013 the breakdown of fluorescent lighting sales was 11% for T5s, 73% for T8s and 17% for T12s. Figure 9 shows the trend in T12 sales over the last three years. One interesting sales trend is that while T12 market share declined sharply in the first quarter of 2013, this decline has been much less steep in the remainder of 2013. This might indicate that there are a segment of C&I customers who declined to replace their T12 lighting once the legislation went into effect and have continued to purchase T12 lamps once the EPCACT-compliant lamps became available.

It is important to also note that there are still a lot of T12 lamps in place. A 2011 National Lighting Bureau (NLB) report estimated that nearly 500 million T12 lamps were still installed in non-residential buildings nationwide. A 2011 Philips report estimated that there were 900 million T12 lamps in C&I sockets including 500 million in commercial sockets (accounting for 70% of all commercial sockets) and 400 million in industrial sockets (accounting for 35-40% of all industrial sockets).

⁸ John Wilson, Bonneville Power Administration, *BPA's Plan for Implementing GSFL Standard (aka new baseline for T12s)*, June 20, 2012 presentation; Gabe Arnold, Optimal Energy, *Understanding The Impact Of Recent GSFL Federal Lighting Standard On Lighting Market And Commercial Energy Efficiency Programs*, presentation given at January 25, 2012 CEE Winter Program Meeting; 1/10/14 interview with Rishi Sondhi, Northeast Utilities, and 10/28/13 communication from Gabe Arnold. A number of lighting manufacturer lighting specification sheets and lamp replacement guidance documents we reviewed also emphasized the higher CRI.

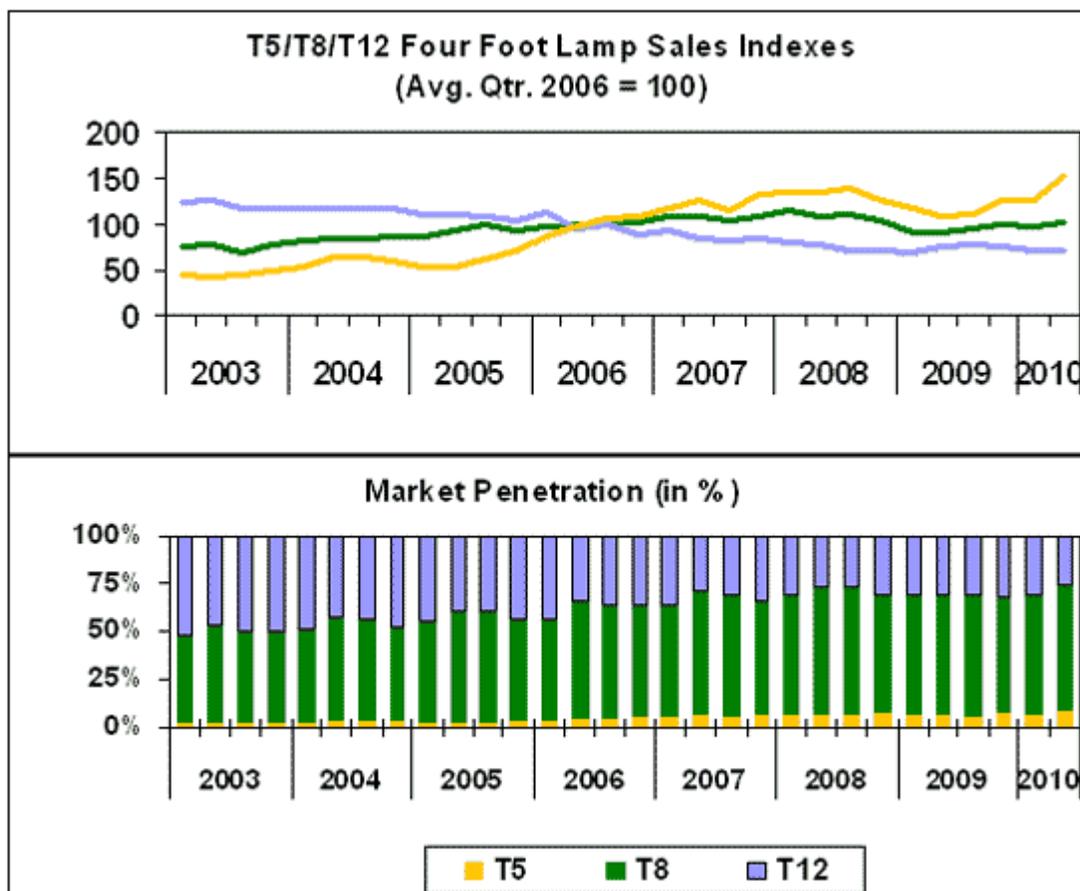
Figure 9: NEMA Sales Information for T5, T8 and T12 Lighting 2011-2013



Source: National Electrical Manufacturers Association

Figure 10 shows the trend in linear fluorescent sales from 2003 to 2010. It shows that before the T12 phaseout there was a natural decline in T12 sales although clearly not as steep as the legislation-induced decline.

Figure 10: NEMA Sales Information for T5, T8 and T12 Lighting 2003-2010



Source: National Electrical Manufacturers Association

Regional Trends

The NEMA data reflect national sales, but there is likely some variation in these sales trends among regional lighting markets. The following subsections summarize some recent research from the Pacific Northwest and California.

The Pacific Northwest

In 2013 both the Bonneville Power Association (BPA) and the Northwest Energy Efficiency Alliance (NEEA) issued studies on the impact of the T12 phaseout on the Pacific Northwest lighting market.⁹ The BPA study found a much sharper decline in T12 sales among lighting distributors and manufacturers in the Pacific Northwest region than the NEMA national sale data was indicating. The BPA study estimated a 43 percent decline in regional T12 shipments from 2011 to 2012 and predicted a further 67 percent decrease from 2012 to 2013. This was based on in-depth interviews with 20 regional lighting distributors and three lighting manufacturers as well

⁹ Carrie Cobb and John Wilson, BPA; Rob Carmichael, Navigant; *Non-residential GSFL Lighting Baseline Market Research Findings and Implications*; July 31, 2013 presentation. *The Current State of Lighting Retrofit Programs and Standard Project Practices in the Northwest Region*, prepared by the Hescong Mahone Group, Inc. for the Northwest Energy Efficiency Alliance, April 12, 2013.



as sales data from 11 of these distributors. Other findings from these distributor and manufacturer interviews included:

- Many distributors do not plan to stock T12s in the near future;
- All remaining sales of T12s are considered to be for maintenance of current lighting systems;
- Currently, big box stores are not selling a high volume of T12s to the C&I market and retailers and manufacturers are not thought to be interested in maintaining T12s in stock;
- The T8 market is picking up a substantial piece of the T12 sales decline; and
- Even though LEDs sales are increasing and should be monitored, it still only comprises a small share of the market.

Yet the NEEA study found more mixed evidence for significant impacts by the T12 phaseout. The NEEA study also conducted interviews with 76 lighting trade allies in 2012. Findings from these trade ally interviews included:

- Forty-five percent of respondents (27 of 60, excluding 5 who did not know) did not expect the T12 phaseout to significantly affect their business in the near future. Most of them believed that most buildings have already replaced their T12s, and those that have not will probably continue to resist changing.
- Forty-nine percent of respondents (33 of 67) were unsure how they might modify their businesses in response to the T12 phaseout.

The NEEA study also conducted a detailed review of a sample of lighting retrofit projects completed between 2010 and 2012. The study found that 87 percent of retrofit projects over the past three years included T12 change-outs. The study was unsure whether this was evidence that “T12s are still widely used in existing buildings, contrary to popular belief in the energy efficiency and lighting industries” or that “trade allies have effectively sold T12 change-outs to their customers in recent years in anticipation of the upcoming T12 phaseout.”

Finally the NEEA study conducted interviews in 2012 with 40 utility program managers/staff who manage energy efficiency programs to rebate lighting in the Pacific Northwest. Findings from these utility program manager/staff interviews that were relevant to the T12 phaseout included:

- Utility program managers in the Pacific Northwest were aware that their lighting retrofit programs will have to change to address new federal regulations and the loss of savings from T12 change-outs, but most utility program manager/staff interviewees (58%) had no specific plans as to how their programs will change to meet these future challenges;
- Nine of twenty-four utility program manager/staff interviewees (38%, excluding 16 who did not know) expected that their programs would lose at least 50 percent of their energy savings due to program and baseline changes resulting from the T12 phaseout;
- The majority (58%) of utility program manager/staff interviewees were unsure how their program incentives would change in response to the T12 phaseout; and
- Less than half of the utility program manager/staff interviewees had specific plans about how their programs would calculate savings from T12 retrofits following the implementation of the new federal rules.

California

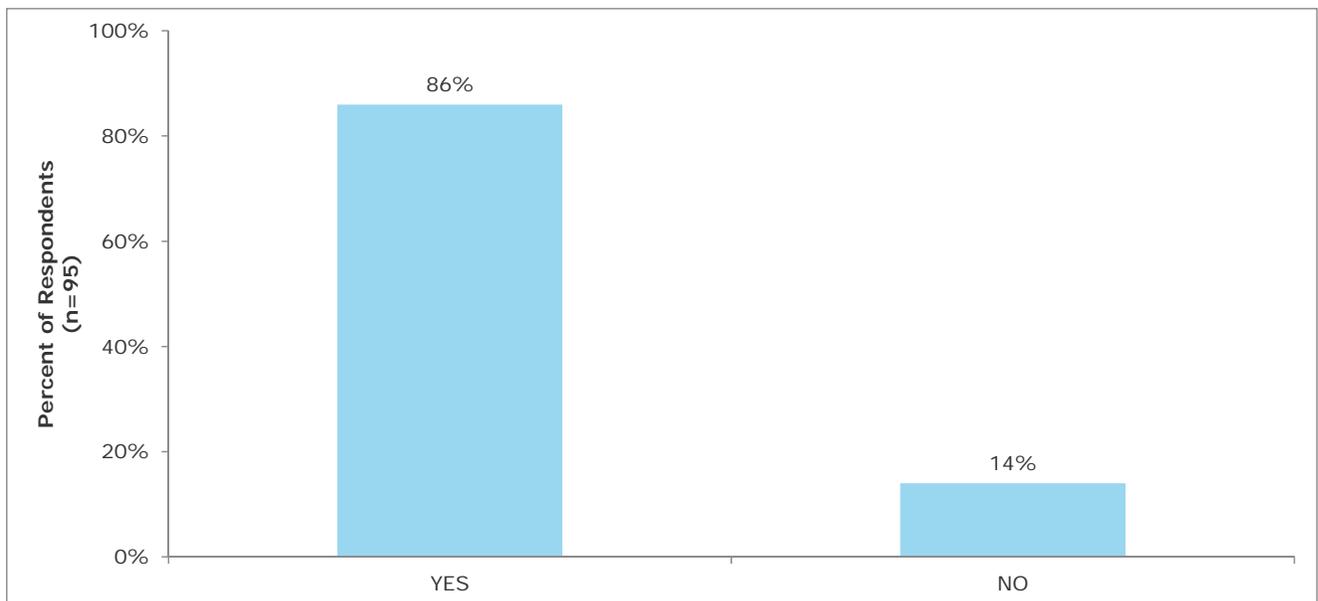
As part of a CPUC evaluation of the 2010-2012 California C&I lighting programs (for Work Orders 17, 24, 29 and 54), Itron completed phone surveys with 1) 95 lighting contractors located in California; and 2) over 200 C&I customers who had participated in these lighting programs. It also completed 1,439 onsite visits with California businesses. This subsection only summarizes the responses to those survey questions relevant to the T12 phaseout.

The CPUC-sponsored 2014 Commercial Market Share Tracking (CMST) study compiled data from onsite visits to conclude that during the 2009-2012 period only 4% of the businesses installed T12 lamps and these T12 lamps only accounted for 1% of the fixtures installed during that period.

The CPUC-sponsored 2014 California Saturation Survey (CSS) found that only 12% of the linear lamps in businesses were T12s. This compared to a 36% T12 market share from a 2006 California Commercial End Use Study (CEUS). However, the 2014 CSS study found that the penetration of T12 lamps was much higher (29%) among small businesses and in the health/medical/clinic sector (27%). The CSS study also found that 42% of businesses had at least one T12 lamp.

The CPUC lighting contractor surveys in the CMST study asked the contractors if they were aware of the new law that came into effect in July of 2012 that has phased out the production of most T12 linear fluorescent lamps. Figure 11 shows that the large majority of contractors said that they were aware of the T12 phaseout legislation.

Figure 11: Contractor Awareness of July 2012 Law Phasing Out Most T12 Lamps



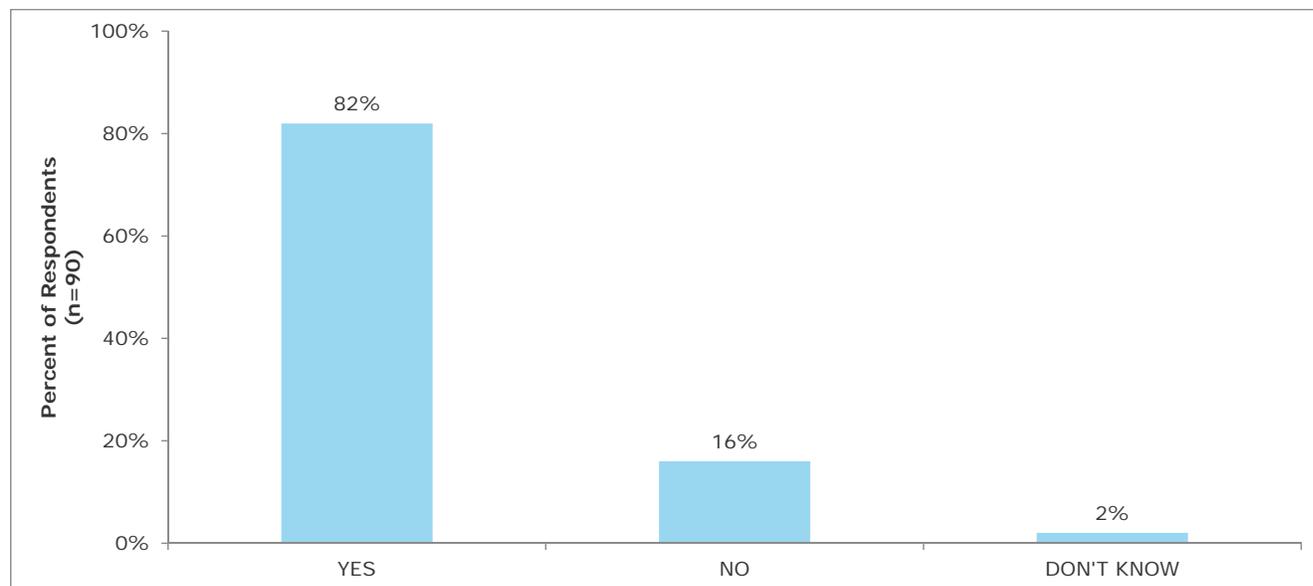
Source: CPUC

The CPUC survey asked the lighting contractors who said they were not aware of the T12 phaseout law if they had heard that the Department of Energy (DOE) issued a mandate for July of 2012 that prohibits the production of less efficient fluorescent lighting systems. Sixty-six percent of the contractors in this subgroup reported hearing about the July 2012 mandate.

Therefore all but a handful of the lighting contractors were aware of this T12 phaseout, whether this awareness came from the original federal legislation or from the subsequent DOE rulemaking.

The CPUC survey asked the lighting contractors who were aware of either the federal legislation or the DOE mandate if they informed their customers of the T12 linear fluorescent lamp phase-out. Figure 12 shows that the large majority reported mentioning the T12 phaseout to their customers.

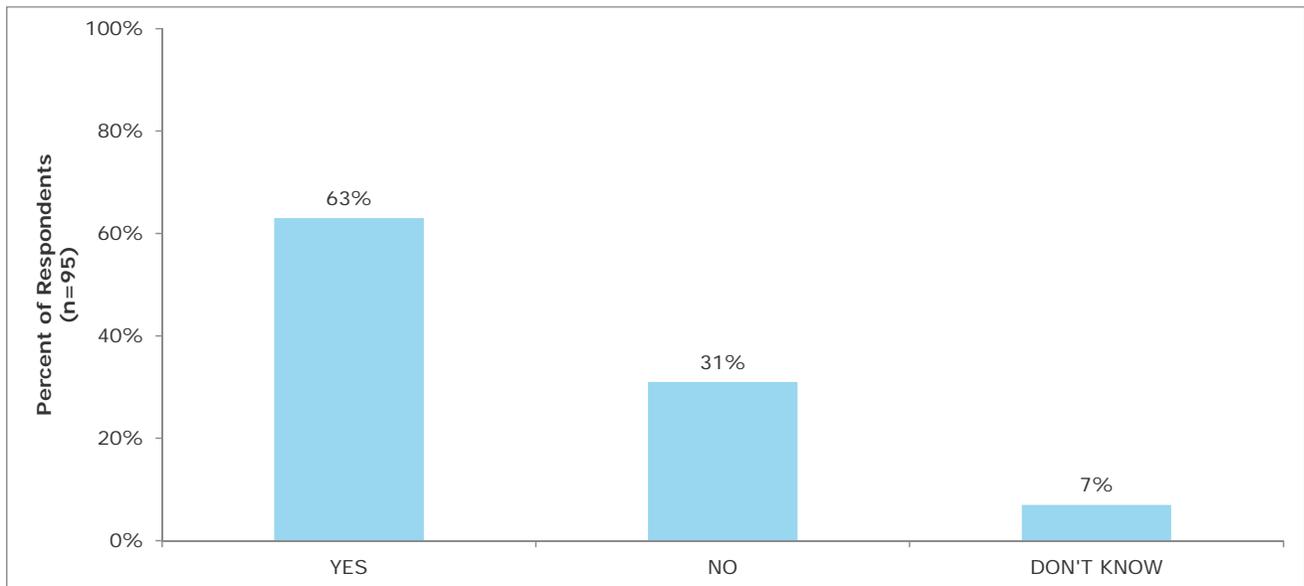
Figure 12: Did Contractors Inform Customers about T12 Phaseout?



Source: CPUC

Some have speculated that the T12 phaseout might spur an increase in lighting retrofit activity. The CPUC survey asked all 95 lighting contractors if they thought that the T12 phaseout had an influence on their customers' decisions to retrofit their existing T12 systems earlier than they otherwise would have. Figure 13 shows that almost two-thirds (63%) of the contractors thought the T12 phaseout had influenced their customers to accelerate the retrofit of their current T12 systems.

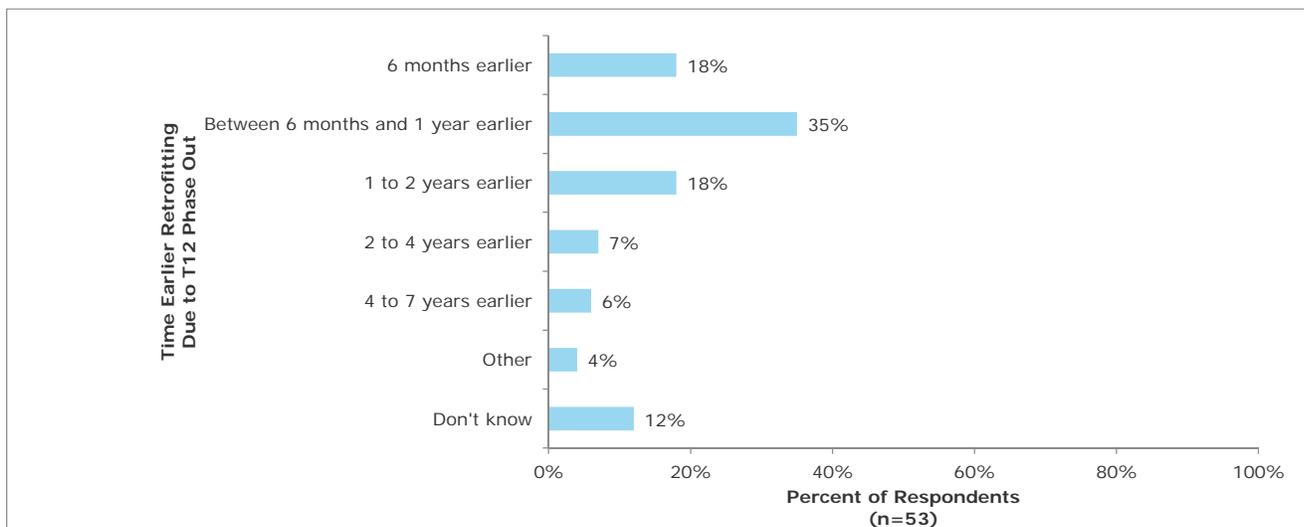
Figure 13: Influence of T12 Phaseout on Customers' Decisions to Retrofit Existing T12 Systems Earlier than Expected



Source: CPUC

The CPUC survey asked lighting contractors who had indicated that their customers were influenced by the T12 phaseout to retrofit their existing T12 systems earlier than they otherwise would have how much earlier these customers retrofitted their lighting systems. About half (53%) of the contractors in this group said that the T12 phaseout had accelerated their customer T12 retrofits by a year or less. Figure 14 shows the full range of responses.

Figure 14: T12 Retrofit Acceleration Effects Due to T12 Phaseout



Source: CPUC

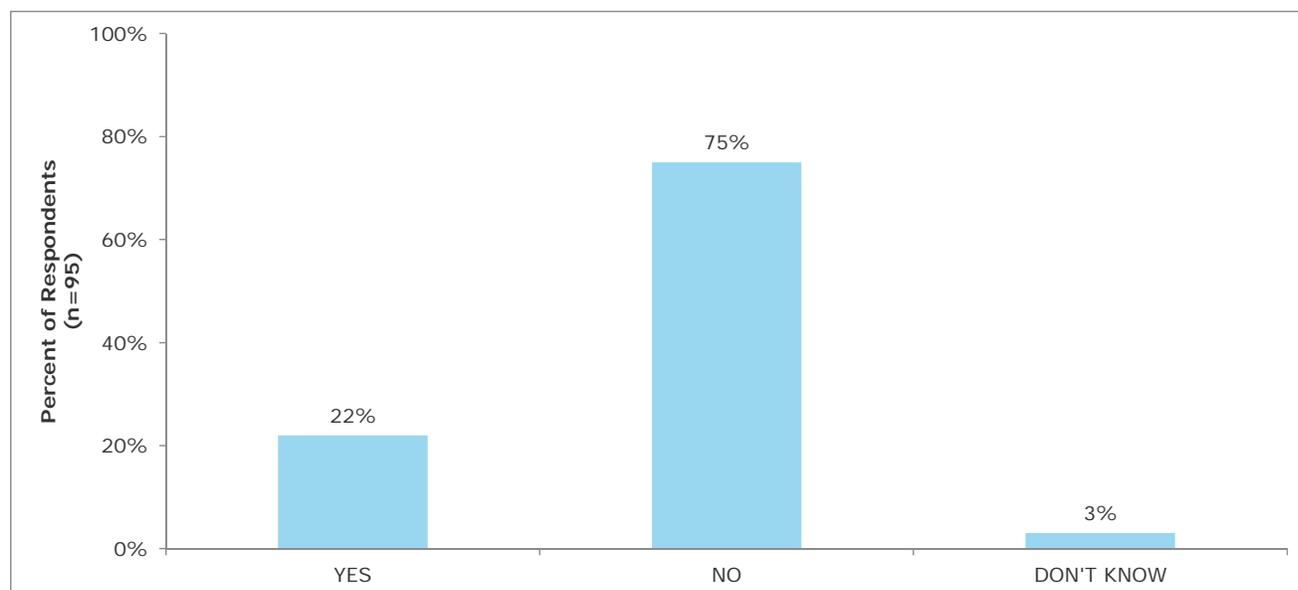
Yet the CPUC survey also asked all 95 lighting contractors if they felt they were doing more lighting projects over the past six months compared to before the T12 phaseout in July 2012.

And Figure 15 shows that three-quarters of the contractors indicated that they are not performing more lighting projects over the past six months than before the T12 phaseout in July 2012.

On the surface, these survey responses appears to run counter to the survey responses shown previously that almost two thirds of the lighting contractors thought the T12 phaseout had influenced their customers to retrofit their T12 systems sooner than they otherwise would have. Yet these survey responses are not necessarily contradictory. For example, it is reasonable to assume that there is a continuum of C&I customer responses to the T12 phaseout. At one end of this continuum are the customers who decide to change out their T12 systems well in advance of the legislation while at the other end are those customers who insist on retaining their T12 systems long after the legislation and regulations have gone into effect. If the numbers of customers doing T12 retrofits before the July 2012 phaseout date and after this date are fairly similar, then most lighting contractors would not see an increase in their project activity after the phaseout date. Yet this would not have changed the fact that the legislation influenced many C&I customers to retrofit their T12 lighting much sooner than they otherwise would have.

Another possible explanation is that the T12 retrofit business accounts for only a small percentage of these lighting contractors' business. As discussed below, even among C&I customers who were participating in California energy-efficient lighting programs, the level of awareness of the T12 phaseout was fairly low. This would indicate that the lighting contractors are not getting much legislation-driven customer demand for T12 retrofits. If this is true, then any changes in the volume of T12 retrofits due to the phaseout might be offset or swamped by larger market trends like an increase in new construction due to an improving economy or other types of retrofits.

Figure 15: Comparison of Projects Conducted Last 6 Months vs. Before T12 Phaseout (July 2012)



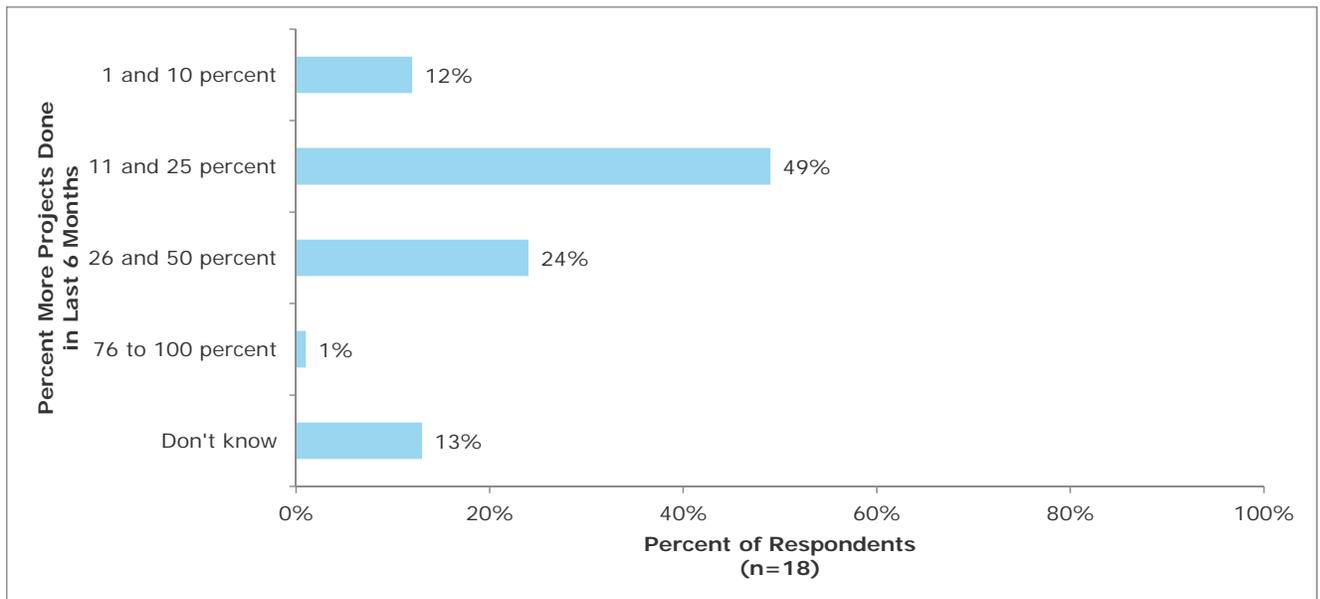
Source: CPUC

The CPUC survey did ask the few lighting contractors who had reported an increase in project activity after the July 2012 T12 phaseout date to estimate the percentage increase in their



project activity. Figure 16 shows that for contractors in this group, almost a quarter (24%) reported currently doing 26 to 50 percent more lighting projects compared to July 2012 and nearly half (49%) report doing between 11 to 25 percent more projects.

Figure 16: Percent More Projects Conducted Last 6 Months vs. Before T12 Phaseout (July 2012)

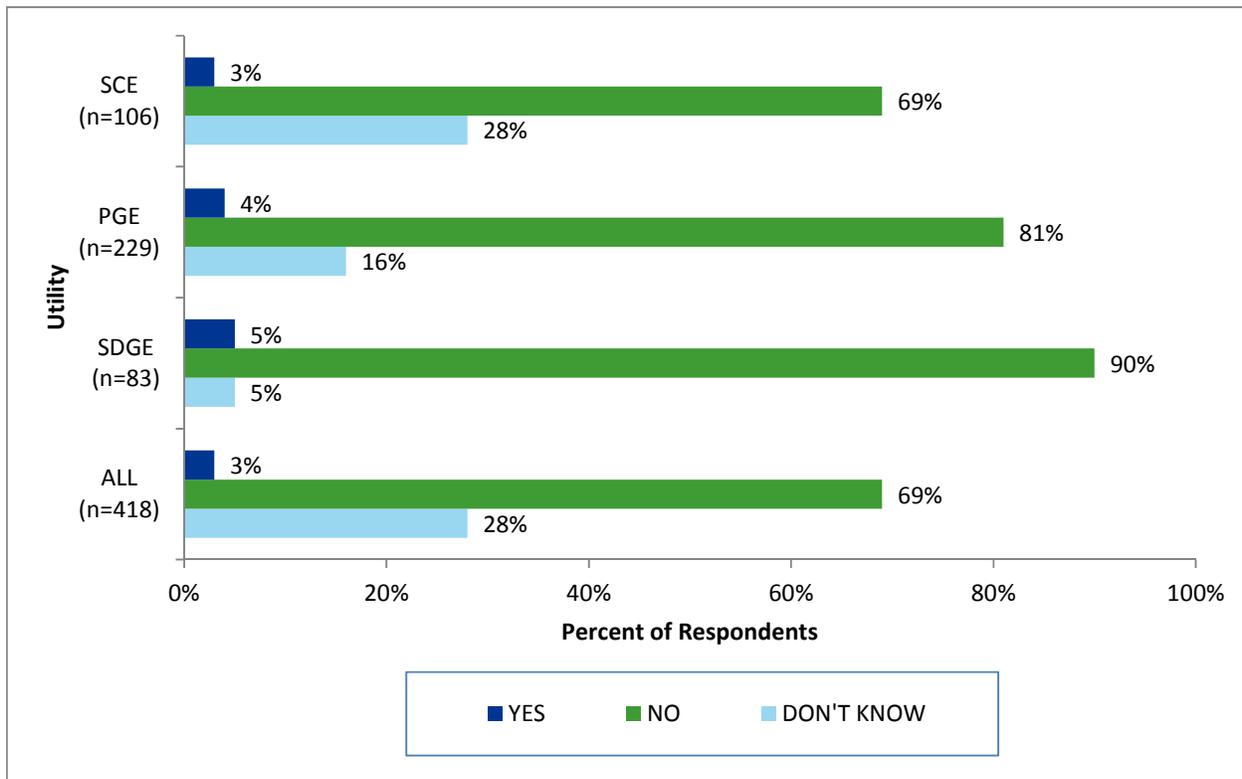


Source: CPUC

The CPUC study not only surveyed California lighting contractors, but also 418 California participating C&I customers. It is important to note that this was a participant survey rather than a general population survey. Since these C&I customers had recently participated in an energy-efficient lighting program, it is reasonable to assume that they had embraced the “value proposition” of energy efficiency more than an average C&I customer.

The CPUC survey asked these participating customers whether they currently use T12 fluorescent lamps for any of their lighting needs. Figure 17 shows that over a quarter of customers (28%) reported still using T12 lamps in their facility. It also should be noted that the question was asking if they had *any* T12s and so the percentage of T12s as a percentage of total lamps stocks would likely be much lower.

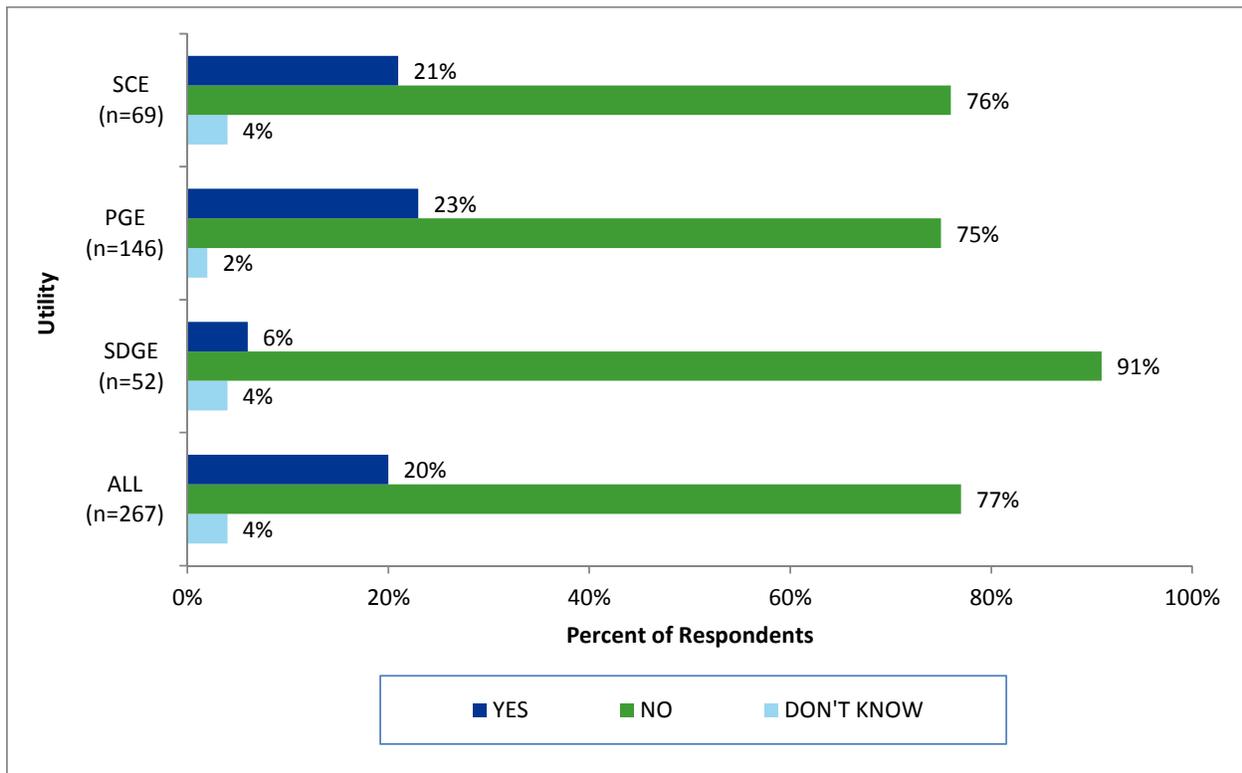
Figure 17: Current Usage of T12 Fluorescent Lamps



Source: CPUC

The CPUC survey asked the C&I customers who had reported using T12 lamps in their facility in the past whether they had retrofitted any T12 linear fluorescent lighting systems to more energy-efficient linear fluorescent lighting such as T8 or T5 lamps within the last year. Figure 18 shows that only a small percentage of customers (20%) retrofitted any T12 lighting systems to more energy efficient lighting.

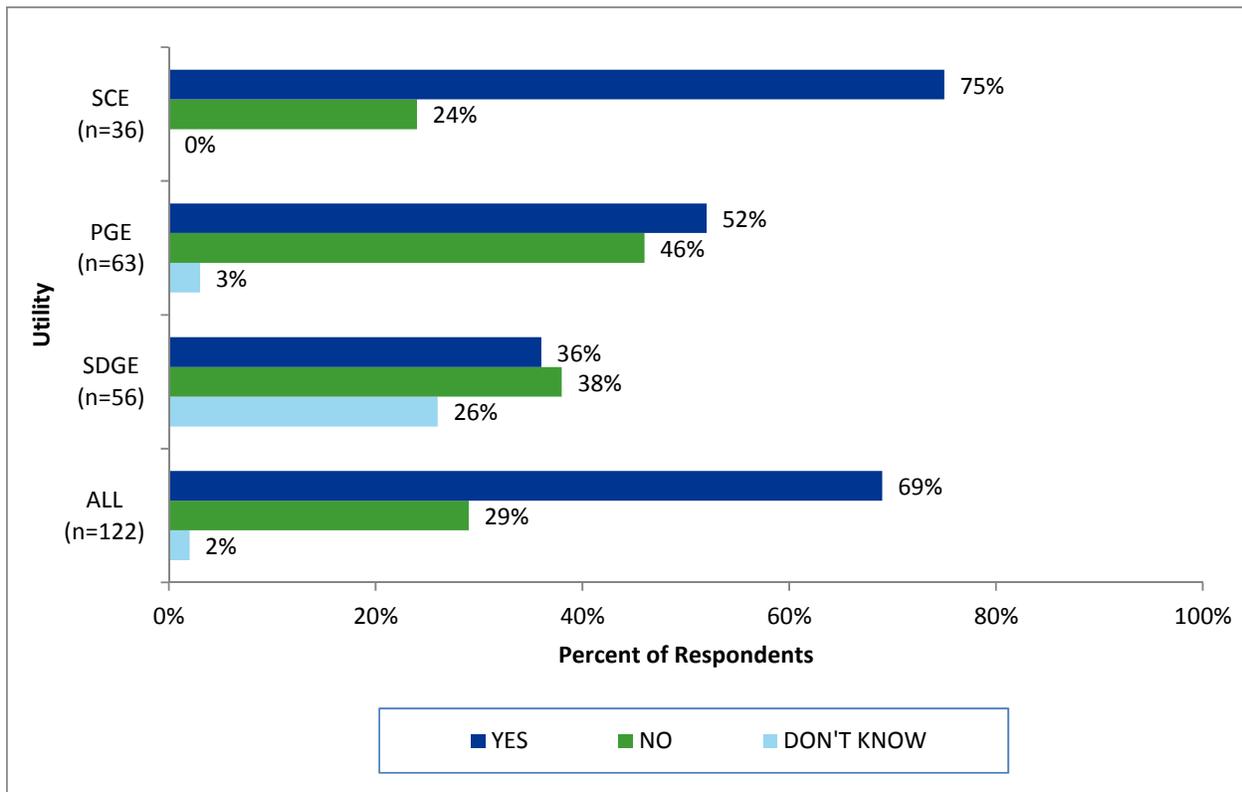
Figure 18: % Retrofitting T12 Lighting Systems in Past Year



Source: CPUC

The CPUC survey asked the customers who reported still having T12 lighting if they carry an inventory of T12 fluorescent lamps to use when their existing T12s burn out. Figure 19 shows that over two-thirds of customers (69%) reported that they carry an inventory of T12 lighting that can be used to replace current T12s that are exhausted.

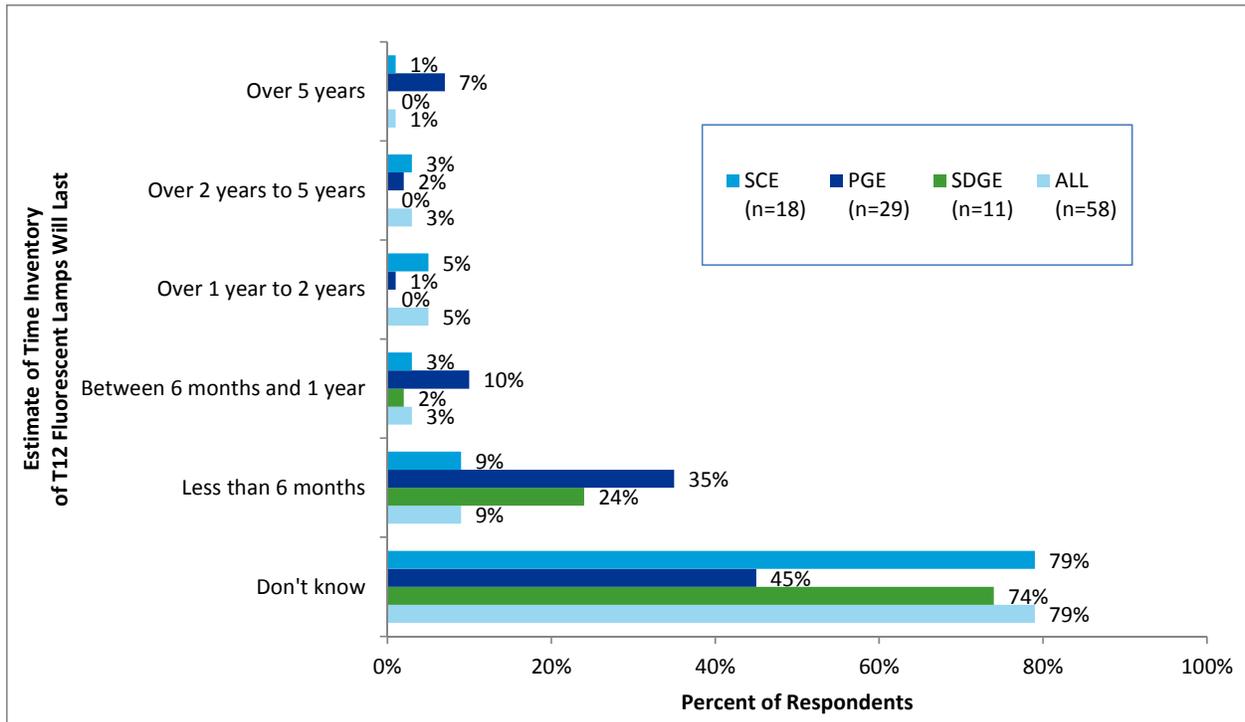
Figure 19: Inventory of T12 Lamps to Use When Existing T12s Burn Out



Source: CPUC

Customers who reported carrying an inventory of T12 lighting were asked how long they estimate their inventory will last. Figure 20 shows that very few of these customers (4%) estimated their inventory will last over two years. Yet over three-quarters (79%) said they did not know how long their T12 surplus would last.

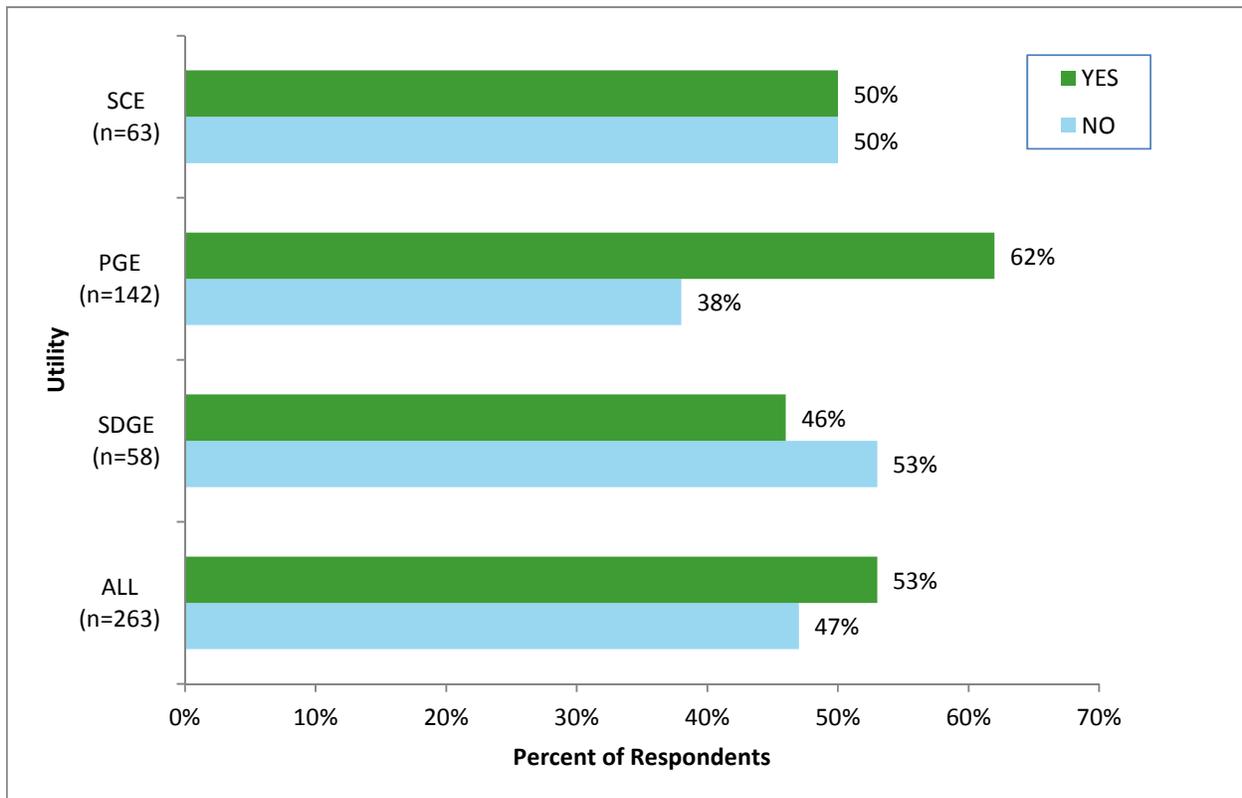
Figure 20: Estimation of How Long T12 Lamp Inventory Will Last



Source: CPUC

After asking all these questions about their T12 usage, the CPUC survey then asked them a series of questions about the T12 phaseout. The survey first asked them whether they were aware of the new law that came into effect in July of 2012 that phased out the production of most T12 linear fluorescent lamps. Figure 21 shows that over half of the customers (53%) were not aware of the July 2012 T12 phaseout mandate.

Figure 21: Customer Awareness of July 2012 Law Phasing Out Most T12 Lamps

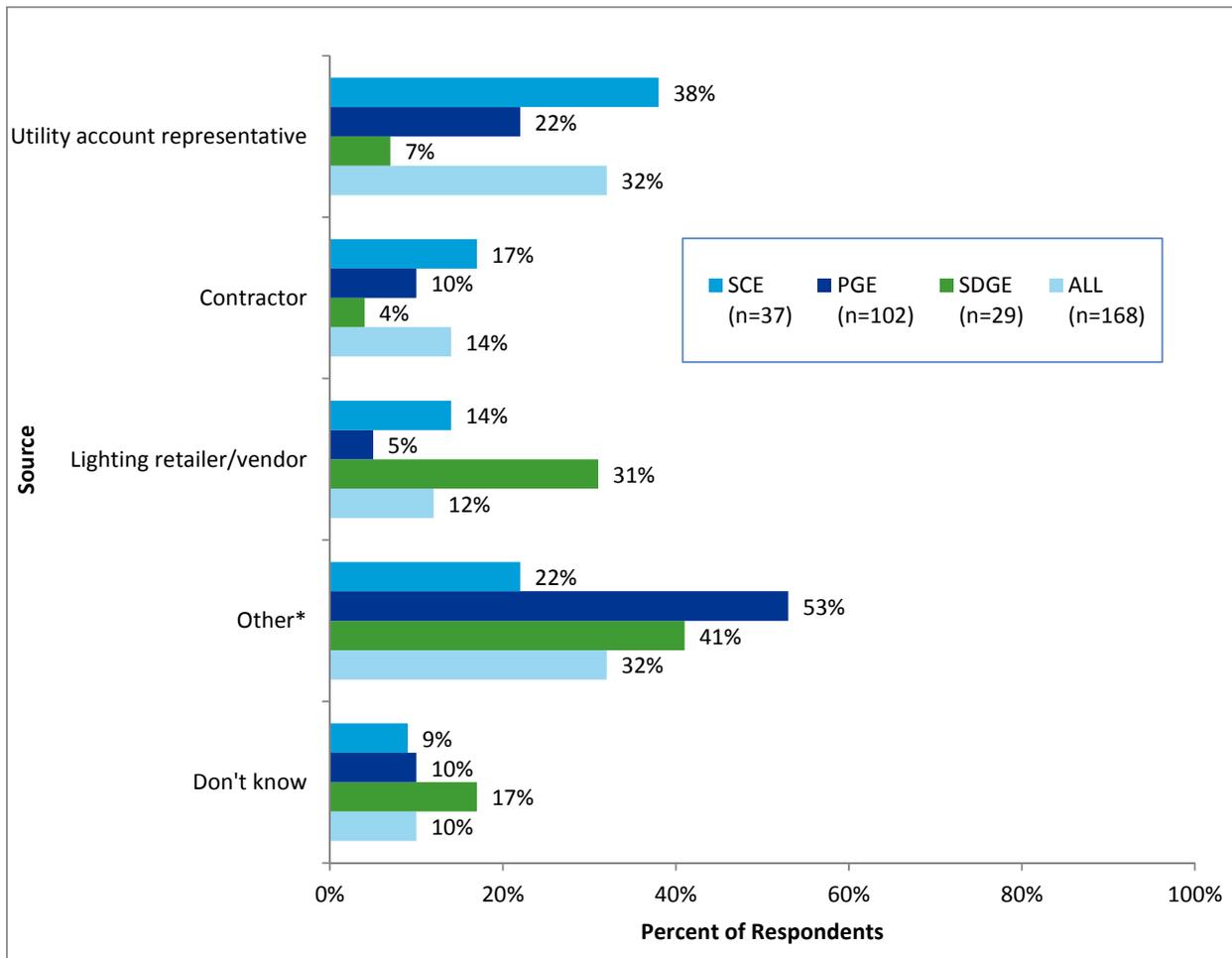


Source: CPUC

As had been done with the lighting contractors, the C&I customers who were not aware of the T12 phaseout law were asked if they had heard that the Department of Energy had issued a mandate for July of 2012 that prohibits the production of less efficient fluorescent lighting systems. Only about a quarter of the C&I customers (27%) who had been unaware of the federal legislation were aware of the DOE mandate.

The customers who were aware of the T12 phaseout were asked how they become aware of it. Figure 22 shows customers were most likely to hear about the T12 phaseout from contractors, with almost a third (32%) indicating that utility account representatives were their source for learning about the T12 phaseout.

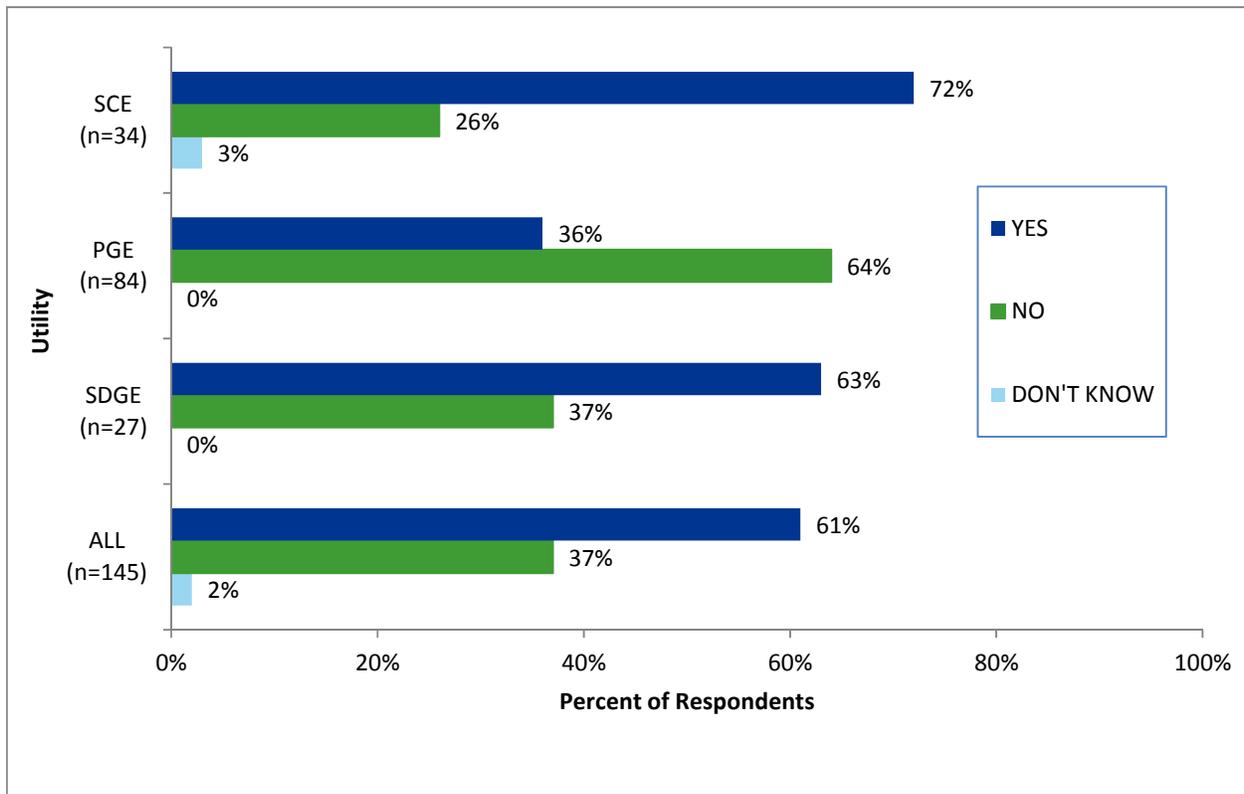
Figure 22: How C&I Customers Became Aware of T12 Phaseout



* Other responses for becoming aware of T12 phaseout includes word of mouth, utility program representative, newspaper articles, trade publication, family member/friend and television.

C&I customers with T12 lighting and awareness of the T12 phaseout were asked if they chose to replace their T12 lamps with higher efficiency linear fluorescent lighting because of the T12 phaseout. Figure 23 shows that almost two-thirds (61%) of these customers said that they chose to replace the T12 lamps in their facility with higher efficiency linear fluorescent lighting because of the T12 phaseout.

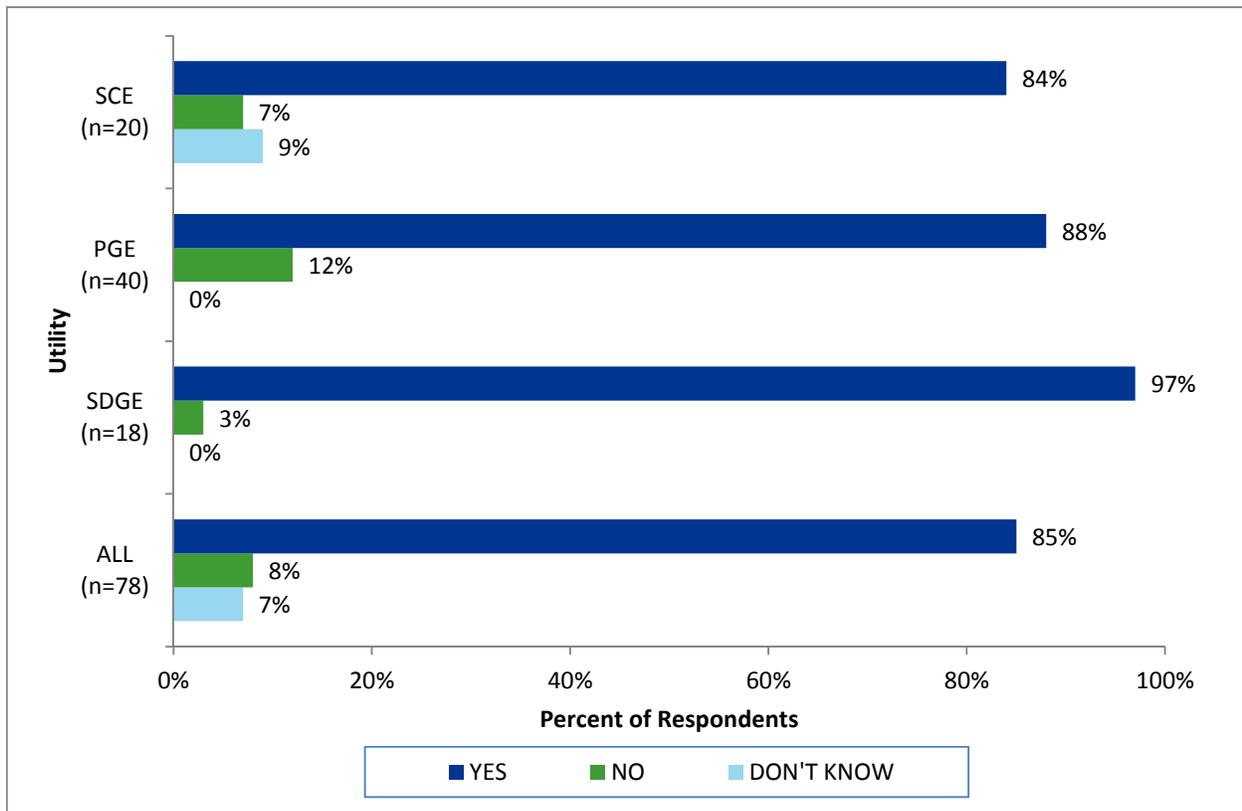
Figure 23: Influence of T12 Phaseout on Customer Decisions to Replace T12 Lamps with Higher Efficiency Lighting



Source: CPUC

The CPUC survey asked the C&I customers who said that they had replaced their T12 lamps with higher-efficiency linear fluorescent lighting because of the T12 phaseout if the phaseout had an influence on their decision to retrofit their T12 systems earlier than they otherwise would have. Figure 24 shows that the large majority (85%) of these customers reported that the T12 phaseout did accelerate their lighting project.

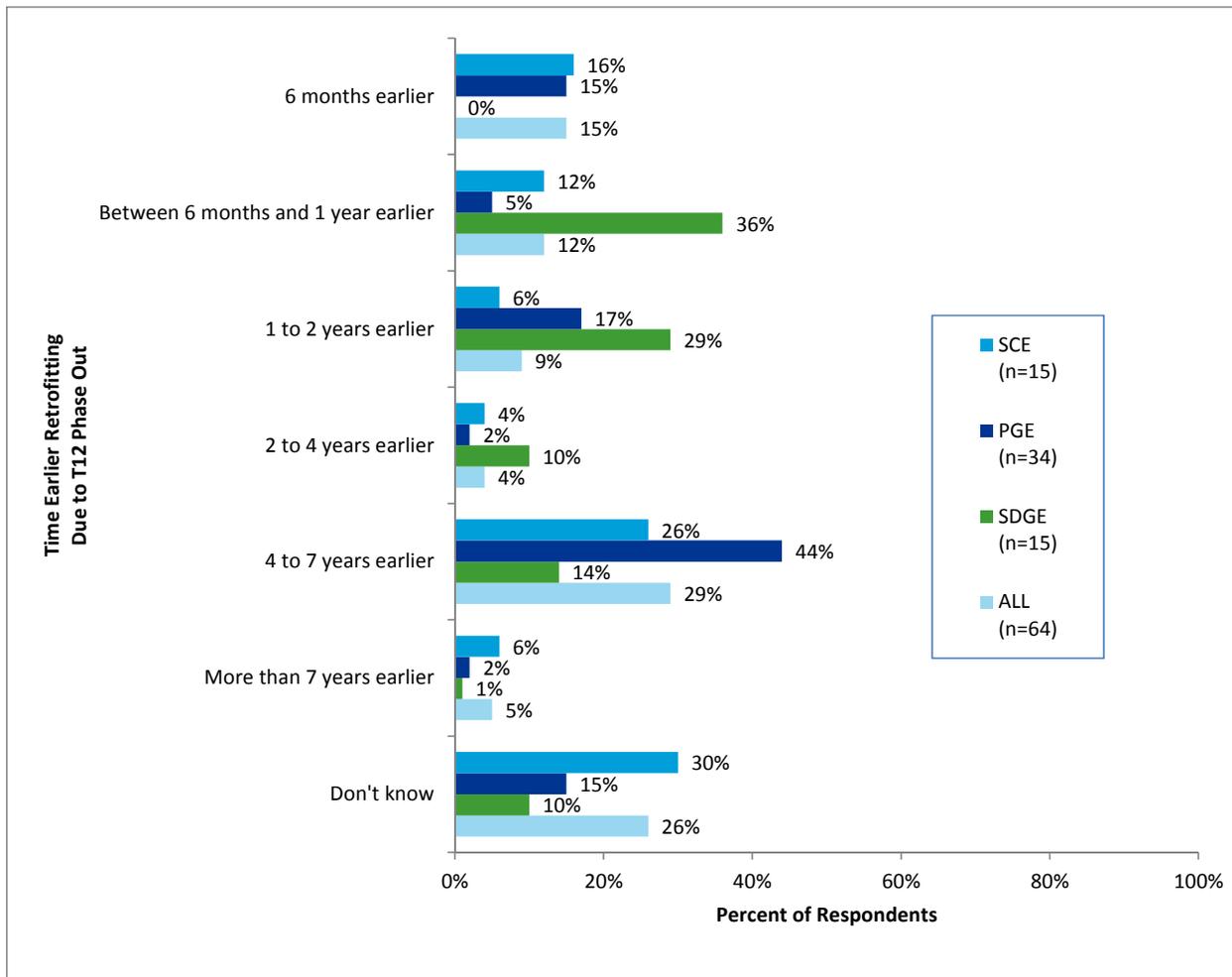
Figure 24: Influence of T12 Phaseout on Decisions to Retrofit Existing T12 Systems Earlier than Expected



Source: CPUC

The CPUC survey asked the customers who had reported that the T12 phaseout had an influence in the decision to retrofit T12 systems for their facility earlier than they otherwise would have how much earlier they retrofitted their T12 lighting due to the phaseout. Figure 25 shows their responses.

Figure 25: T12 Retrofit Acceleration Effects Due to T12 Phaseout



Source: CPUC

Customers who said that the T12 phaseout had an influence on their decision to retrofit T12 systems for their facility earlier than they otherwise would have were asked how influential the T12 phaseout was on the decision to retrofit their T12 lighting system. The survey asked them to use a scale of 0 to 10 where 10 meant “completely influential” and 0 means “not at all influential.” Fifty nine percent of these customers rated the influence of the phaseout at a score of 7 or higher, with over one-third (37%) providing a rating of 10.

The CPUC survey asked these same customers how likely they were to replace their remaining T12 fixtures in the next year with a lighting system that provides only minimum allowable level of efficiency vs. one that was better than the minimum allowable level of efficiency. They were told to use a 0 to 10 scale where a rating of 10 meant “very likely” and a rating of 0 meant “very unlikely.” Almost half (46%) of these customers gave a score of 7 or higher for the likelihood of their replacing their T12 fixtures with minimum level efficiency lighting in the next year. Again almost half (47%), of these customers gave a score of 7 or higher for the likelihood of their replacing their T12 fixtures with a lighting system that is better than the minimum allowable level of efficiency within the next year.





About DNV GL

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