Northeast Energy Efficiency Partnerships

The Impact of EISA on Residential A-Lamps

November 2014

About NEEP

Northeast Energy Efficiency Partnerships

NEEP was founded in 1996 as a non-profit whose mission is to serve the Northeast and Mid-Atlantic to accelerate energy efficiency in the building sector through public policy, program strategies and education. Our vision is that the region will fully embrace energy efficiency as a cornerstone of sustainable energy policy to help achieve a cleaner environment and a more reliable and affordable energy system.

About D&R International

Over its 29-year history, D&R International has helped introduce or re-introduce programs and marketing initiatives that compel consumers to action. The company’s vision and mission statements explain its primary purpose in business: to further the advancement of resource-efficient technologies with an eye to preserving natural resources. D&R has worked with retail supply chain, product manufacturers, utilities, the building industry, and energy-efficiency organizations to build strong environmental initiatives, while providing market-focused solutions that improve the client’s bottom line.

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Executive Summary

The Energy Independence and Security Act of 2007 (EISA) established new efficiency standards for general service lighting, phased in from 2012 to 2014. Since EISA was enacted, utility and energy efficiency program administrators, retailers, and manufacturers have been anticipating consumer response to the change in product availability. This response could have a substantial impact on energy savings attributable to lighting in the coming years, particularly in 2014, when new requirements for some of the most popular consumer products take effect.

As the market was in flux, NEEP and its member efficiency programs want to understand the A-lamp market and the ways it changed as a result of the introduction of EISA standards in 2012 and 2013. To address these questions, D&R developed a retrospective market model that simulates the interaction between the demand generated by lamp failures in the installed base and A-lamp sales of the available technologies (LED, compact fluorescent lamp [CFL], EISA-compliant halogen, and incandescent). Model inputs included empirical data from in-home inventories, CFL lamp imports, and national A-lamp market share, along with demographic and new construction data. The model makes the following assumptions:

- Lamp failure (i.e., burn-out) drives demand
- Failed lamps are replaced by lamps with equivalent lumen output
- Failed efficient lamps are replaced by efficient lamps of the same technology

Because current data on sales of lamps by lumen bin was not available, D&R evaluated the range of possible EISA impacts under three distribution and installation scenarios for surplus lamps (lamps sold beyond like-for-like technology replacement).

D&R's analysis found that EISA's impact on sales and saturation of energy-efficient lamps in 2012 and 2013 was very limited. In 2013, 79% of lamps sold were incandescent—just seven percentage points lower than in 2012.

This retrospective study provides a snapshot of the sales and associated range of impacts on the installed base of products for 2012 and 2013, based on the best empirical data available at the time of the analysis. Sales and installation trends observed for 2012 and 2013 might have continued into 2014, though recent data released by the National Electrical Manufacturers Association (NEMA) indicate that EISA's impact has grown substantially; the market share of incandescent A-lamps declined nearly 24% between 2014 Quarter 1 and Quarter 2.[1] Additionally, forthcoming on-site studies from the Northeast may show differing results from what is described here.

EISA

EISA sets maximum energy consumption levels for a series of lumen ranges roughly corresponding to 40, 60, 75, and 100+ watt general service lamps (i.e., Edison-shaped light bulbs or A-lamps). EISA also specifies dates after which manufacturing or importing lamps that do not meet the standard is illegal.

[1] National Electrical Manufacturers Association. *Incandescent A-Line Lamps Decline Sharply in Second Quarter.* 29 September 2014. http://www.nema.org/news/Pages/Incandescent-A-Line-Lamps-Decline-Sharply-in-Second-Quarter.aspx.

The standard went into effect beginning January 1, 2012 for the lumen range (1,490-2,600) that included traditional 100W incandescents, followed by the 75W-equivalent lumen range (1,050-1,489) on January 1, 2013, and the 40W-equivalent (310-749) and 60W-equivalent (750-1,049) lumen ranges on January 1, 2014. EISA does not restrict sales of incandescents, so retailers may continue to sell incandescent bulbs as long as they have stock available.

Impact on Programs

The question for program managers is this: How will EISA alter the technology mix of general service lamp sales and what impact will that sales mix have on actual (gross) and claimable (net) energy savings? The answer to this question depends on how long it takes for retail stocks of incandescent products to be exhausted, how consumers shift their purchasing once incandescents become unavailable for each lumen category, how much retailers and consumers have stockpiled incandescents, and whether incandescents continue to be imported despite EISA (Congress eliminated funding for enforcement).

Historically, a significant portion of residential programs' electricity savings (often more than 50 percent) has come from sales and installation of energy-efficient general service lighting. Prior to EISA, savings were calculated as the difference between the energy consumption of the inefficient baseline product (incandescent) and the efficient product (CFL or LED), usually with adjustments for free ridership, spill over, and in-service rates.

During the EISA phase-in the savings for efficient general service lighting were difficult to predict. Program administrators anticipated that inefficient product sales would represent a mix of incandescents and slightly more efficient EISA-complaint halogens, but what values should be used to project energy savings? The incandescent value, the EISA-compliant halogen level, or some weighted average of the two? Would sales of CFLs and LEDs also increase? How much savings could programs count from those sales? Energy efficiency program managers and/or their regulators have had to wait for the market to reveal whether their estimates were high, low, or on target.

Methods

This paper focuses on 2012 and 2013, drawing on the most current data available. It uses empirical data on socket saturation, product lifetimes and resulting natural rates of failure, and U.S. Department of Commerce import data, combined with general service lamp national market share and sales indices published by NEMA to populate a computational model of the interaction between the installed base of lighting and lighting sales. The model essentially represents a story of how the residential lighting market works.

Light bulb failures drive demand. The number of lamps that fail across the population of residential homes in a given period is a function of the relative proportions of different lamp technologies, their average hours of use, and their average lifetimes. With accurate knowledge of the installed base of residential lamps, it is possible to estimate the total demand for lamps of each EISA lumen bin. D&R created multiple scenarios to understand the impact of technology shifts in lumen bins. A basic assumption of the model is that consumer demand for light level will not change, and thus the total number of sockets occupied by a particular lumen level will change only with an increase in housing stock. In all scenarios, D&R first assumed like-for-like replacement (a failed lamp is replaced by a lamp of the same technology and lumen output), and the scenarios allocated only the surplus lamps – those lamps remaining after like-for-like replacement.

Another key assumption of the model is that CFL imports are an accurate representation of sales. There are currently no domestic manufacturers of CFLs. While there is likely a lag of approximately 2-6 months between import and sale, the model assumes that imported CFLs were installed the year they were imported. D&R performed a sensitivity analysis on the effect of this lag, and found that with a 6-month delay, year-end 2013 overall socket saturation by technology shifted only about 1.5%.

The model generates estimates of shifts in the sales mix and installed base of general service lamps for each of the four technology categories – incandescent, halogen, CFL, and LED – between 2012 and 2013, the years for which data was available. During this period, EISA affected the 1,050-1,489 lumen bin (75W-equivalent) and 1,490-2,600 lumen bin (100W-equivalent). With data for 2014, this analysis could be extended to estimate changes in the sales mix of products and socket saturation following the phase-in of EISA standards for 310-749 and 750-1,049 lumen bin (60W- and 40W-equivalent) products on January 1, 2014.

Analysis Results

D&R's analysis indicates that EISA reduced the sales of incandescent general service lamps by approximately 7 percentage points between 2012 and 2013. Unit sales of incandescent products fell from 2012 to 2013, but incandescents remained the overwhelmingly dominant technology type, accounting for 79% of product sold in 2013. Incandescents still dominate the installed base of general service lamps, filling approximately 55% of sockets down from 58% in 2012.

In the small number of cases in which consumers have had to choose among halogens, CFLs, LEDs, and perhaps lower-wattage incandescents, the analysis results for 2013 are consistent with roughly half purchasing halogens and half purchasing CFLs. While halogen and LED products grew in popularity in 2013, their overall socket saturation remained small, approximately 3% and less than 1%, respectively. Previous studies have shown that storage rates remain relatively constant and that consumers were not planning to stockpile incandescent lamps, so this model assumes a constant storage rate across 2012 and 2013.

Implications for the Energy Efficiency Community

In the short term, the high levels of incandescent sales are good news for some utility program managers — the weighted average wattage of inefficient lamps will likely be higher than expected, thereby increasing the energy savings they can claim for incentivized efficient lamp sales. In the medium and possibly the long term, the high incandescent sales levels could have more serious implications for utilities, their regulators, and independent system operators (ISOs), depending on the extent to which they have been counting on the gross energy savings from EISA-compliant halogens.

Although the per-unit savings from substituting an EISA-compliant halogen for an incandescent are only 11-28 watts (25-30%), depending on the lumen output bin, when multiplied across hundreds of millions of sockets that previously contained incandescents, the anticipated reductions in gross aggregate energy consumption and demand are substantial for the Northeast[2] region, the subject of this study's evaluation. The high levels of incandescent sales and saturation of 100W and 75W incandescents mean that consumption and capacity reductions are materializing much more slowly than was generally anticipated. Planners and policy makers at utilities, ISOs, and state regulatory bodies may want to adjust their assumptions when projecting electricity consumption and capacity requirements.

An extension of this analysis to assess sales, saturation, and residential lighting electricity consumption and demand for 2014 would provide a clearer view into the sales and resulting installation for 100W and 75W incandescent lamps and for 60W and 40W products. However, the full impact of EISA will likely not be clear until 2016, when consumers will have replaced the majority of their incandescent products with other technologies.

With some enhancement, the analytic approach could be adapted to evaluate how lighting energy consumption and contribution to peak load will change given a specific sales scenario. As data becomes available, the model can be used to estimate 2014 A-lamp sales volumes. Most valuable, perhaps, is its potential to empower program planners and managers to evaluate what retail sales volumes of LEDs and CFLs are needed to deliver energy savings and peak load.

The model can also be used to evaluate the impact of different market scenarios on residential lighting energy consumption and peak load. For example, what will happen if LED market share continues to grow at its current rate? Forthcoming studies from the Northeast are expected to provide more recent empirical data, which could be used to further improve the model's outputs.

[2] For the purposes of this study, the Northeast includes Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

Introduction

Utility and energy efficiency program administrators have been anticipating the market impacts of the Energy Independence and Security Act of 2007 (EISA), which established new efficiency standards for general service lighting. In the absence of retailer-supplied sales data, which is not available, the best approach is to use empirical data about lighting sales and saturation, lifetimes, and operation to estimate specific scenarios.

As part of its Market Lift® project, the Northeast Energy Efficiency Partnerships requested that D&R investigate the nature and extent of the impact of the first wave of EISA standards on sales and installation of residential A-lamps. EISA regulations went into effect for the 1,490-2,600 lumen bin, restricting manufacture and import of 100W incandescent lamps, in 2012, and for the 1,050-1,498 lumen bin, restricting manufacture and import of75W incandescents, in 2013.

To assess the impact of these restrictions, D&R constructed a computational model of the interaction between lighting sales and the installed base of residential lighting. Models for the state, regional (Northeast), and national level provide an understanding of how the effects of EISA differed among them. In addition, incentivized sales data allowed D&R to compare the number of products incentivized to estimated product sales. The goal of this study was to give program administrators a snapshot of the market, a sense of how quickly and in what ways the market was shifting, and an understanding of the need for continued incentives for efficient A-lamps.

Goals of this Study

The analysis described in this paper addresses several questions about EISA's impact on socket saturation and consumer preferences. NEEP requested that this study serve the following three primary purposes:

- Determine if an impact from EISA can be seen in the 1,490-2,600 (100W-equivalent) and the 1,050-1,498 (75W-equivalent) lumen bins for medium screw base A-lamps in the residential sector.
- Estimate 2012 and 2013 end-of-year installed inventory in the residential sector for medium screw base A-lamps by lumen range and technology.
- Estimate state, regional, and national sales of compact fluorescent lamp (CFL), light emitting diode (LED), incandescent, and halogen A-lamps in 2012 and 2013.

Overview of EISA Standards

EISA was signed into law on December 18, 2007. It focused on the supply and use of energy in the United States, created the Office of Federal High-Performance Green Buildings, established the Net-Zero Energy Commercial Building Initiative, and set new efficiency standards for appliances and lighting. One significant change was the introduction of a new two-phase standard for general service lighting products. The first stage, which set maximum wattages for specific lumen ranges, was phased in from 2012 to 2014, according to the schedule presented in Table 1.

Table 1: Phase 1 EISA Standards for General Service Bulbs

Effective Date	Maximum Wattage	Rated Lumen Range	Traditional Incandescent Affected
2012	72	1,490-2,600	100W
2013	53	1,050-1,489	75W
2014	43	750-1,049	60W
2014	29	310-749	40W

EISA set maximum energy consumption levels for a series of lumen ranges roughly corresponding to those of 40, 60, 75, and 100+ watt general service lamps (i.e., A-lamps). EISA also specified dates after which it would be illegal to manufacture or import lamps that did not meet the standard. The lumen ranges were structured in a way that allowed slightly dimmer lamps using halogen incandescent technology to meet the requirements. These products are typically called "EISA-compliant halogens," and in this report are referred to as "halogens." EISA does not restrict retail sales of incandescents, so retailers are free to sell them as long as they have stock available.

By January 2014, EISA effectively prevented the domestic manufacture and importation of traditional incandescent bulbs. Phase 2, scheduled to take effect in 2020, is considered a backstop; it requires that all general service bulbs have an efficacy of at least 45 lumens per watt, a standard that currently available halogen bulbs do not meet.

Methods

Model Structure

The model D&R developed is based on a failure-driven replacement structure, meaning as bulbs fail they are replaced by new bulbs. This is the major driving force for the lighting market overall, as consumers typically buy lamps only to fill failed sockets. There may be some early replacement and technology substitution, but they do not have a significant effect on the overall replacement market.

This study determined failures using existing A-lamp sockets and lamp saturation by technology and lumen category in the beginning of 2012 by dividing the average yearly usage by the average lifetime of the lamps, in hours per lamp:

$$Failures_{tech} = \frac{Average\ Usage_{\frac{hrs.}{day}} * 365}{Lifetimes_{hrs.}}$$

Failed lamps are replaced first with stored lamps (which are assumed to be stored for one year), and then with new lamps. This is consistent with the observation that, across the population, the volume of stored lamps has remained constant across numerous onsite studies, with the proportion of stored efficient lamps growing in parallel with the proportion of installed efficient lamps. Sales for CFLs are estimated based on the Federal Trade Commission's (FTC) data on CFL imports and the National Electric Manufacturers Association (NEMA) market share breakdown of lamp technology. CFL imports are used because there is no domestic CFL lamp manufacturer; in lieu of total category sales data, import data provides a very good approximation of CFLs that eventually flow through retail channels to the consumer. Halogen and LED sales are determined using CFL sales estimates and NEMA data on technology share of new A-lamp sales.

National sales are attributed to states based on their respective shares of national A-lamp sockets. Socket share is based on state-level data for the Northeast on A-lamp sockets and national data from the U.S. Department of Energy's (DOE) 2010 U.S. Lighting Market Characterization.

Stored lamp rates are assumed to be relatively constant through the period modeled and are assumed to be the same for all states. Significant changes to storage rates would impact the model, though onsite studies from the Northeast show that storage rates have remained relatively constant over the past 5 years.[3]

The dynamic relationship among the installed base, stored lamps, and new lamp sales progresses as follows:

- Lamps fail at the end of their average lifetime, which differs by technology.
- CFL import volumes and NEMA A-lamp market share indices are used to calculate sales volumes for each lamp technology.
- Sockets that contain failed efficient lamps (any technology other than incandescent) are filled first with identical efficient lamps from the pool of available replacements (i.e., stored lamps and newly sold lamps).
- For 2012 and 2013, estimated sales volumes of efficient lamp technologies exceeded the volumes needed to fill every failed efficient lamp socket, but left only a small surplus (~5% of the original volume). This "surplus" is the set of lamps responsible for shifts in socket saturation and in gross electricity and peak demand savings.

D&R designed the model to evaluate how surplus volumes of efficient lamps shifted socket saturation under three scenarios. Had the surplus been large, the effect might have been substantial. However, because incandescent sales represented approximately 80% of total sales, the surplus of efficient lamps was very small and the scenarios produced very similar results.

Scenario Analysis

One factor that could have a significant influence on the estimated impact of EISA in 2012 and 2013 was the proportion of surplus efficient lamps that are in the 1,050-1,489 and 1,490-2,600 lumen categories. Unfortunately, the distribution of sales by lumen bin is unknown for all technologies; we know how many CFLs were sold, but we don't know what proportion fell within each lumen bin.

D&R developed three scenarios to evaluate the impact of this potential shift in lumen bins by technology. The three scenarios vary in the proportion of total lamps sales assumed to fall into the 1,050-1,489 and 1,490-2,600 lumen bins of efficient lamps. The greater the proportion of efficient bulb

[3] NMR Group, Inc. Results of the Massachusetts Onsite Lighting Inventory Final. Prepared for Cape Light Compact, NSTAR, National Grid, Unitil, Western Massachusetts Electric, Energy Efficiency Advisory Council Consultants. June 2013.

sales in those lumen bins, the greater the possible increase in saturation and the greater the impact of EISA.

Three Scenarios

- **EISA-Low Replacement**: This "business as usual" scenario assumes that EISA has no impact on technology selection by lumen bin. In this scenario, the distribution of purchased lamps among lumen bins for all efficient lamp technologies is assumed to match the distribution of those bins in the installed base.
- **EISA-High Replacement:** The greatest increase in efficiency of the installed base occurs when all surplus efficient lamps are assumed to replace 75W and 100W incandescents, with half assigned to each bin. Under this scenario, efficient lamp saturation for 310-749 lumen and 750-1,049 lumen categories do not change. This scenario is a theoretical maximum; it is unlikely to have occurred.
- **EISA-Reference Replacement:** Given the decline in incandescent sales and the growth in market share for efficient lamps, the actual impact of EISA in 2012 and 2013 was likely somewhere between the EISA-Low Replacement and EISA-High Replacement scenarios. The EISA-Reference scenario assumes that consumers' likelihood of purchasing an efficient 75W or 100W replacement lamp was higher than it would have been under the EISA-Low Replacement scenario. In the Reference Replacement scenario, surplus lamps are first allocated to replace 75W and 100W lamps (as they are under the EISA-Low Replacement scenario) and the remaining surplus lamps are allocated to the other lumen bins.

For all three scenarios, after the surplus lamps are placed into failed incandescent sockets, the remaining failed sockets are filled with incandescent lamps. The model is then completed by accounting for housing growth on a state-by-state basis.

Additional Scenario – CFL Low Lifetime

At the request of NEEP and utility members, D&R ran an additional scenario to analyze the effect of a shorter lifetime for CFL lamps. This model run used the reference scenario, described above, for replacement, but reduced CFL lifetime from 8,000 hours to 6,700 hours. This reduced the number of surplus CFLs available to displace incandescent lamps because, under this scenario, CFL lamps fail and have to be replaced more frequently from the fixed pool of imported CFLs. The net result is that efficient lamp saturation and savings increase less and incandescent lamp saturation is higher (approximately 2 percentage points) than in the EISA-Reference Replacement scenario. For full results of this model run, please see Table 16 in Appendix A.

Influential Inputs

While all inputs affect the model, several had a far greater effect on the overall sales and replacement picture than others.

Starting A-lamp socket breakdown

The starting A-lamp socket breakdown was derived from onsite studies in the Northeast.[4] Because this level of detail was available for only some states and most states in the Northeast have run lighting programs for many years, D&R assumed that the states' breakdowns would not vary substantially from one another. Table 2 presents the starting socket saturation for 2012 and 2013.

Table 2: 2012 Starting A-Lamp Socket Saturation by Technology and Lumen Bin, Northeast States

	Lumen Bin						
Technology	**<310**	**310-749**	**750-1049**	**1050-1489**	**1490-2600**	**2600+**	**Total**
Incandescent	0.0%	10.2%	35.2%	5.3%	7.5%	0.1%	58.3%
CFL	0.0%	2.1%	25.7%	4.8%	8.6%	0.1%	41.3%
Halogen	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.2%
LED	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.2%
Total	0.1%	12.3%	61%	10.2%	16.2%	0.2%	100%

Source: NMR Group, Inc. Results of the Massachusetts Onsite Lighting Inventory Final.

Replacement Technology Scenarios

None of the replacement scenarios discussed above has an effect on the overall sale of technologies, but they all have substantial effects on lumen bin shares.

Imports of CFLs

Imports of CFLs are the starting point for determining national and individual state sales of all efficient lamps, so they have significant influence on overall lamp replacement calculations. While efficient lamp sales are a good approximation of national CFL sales, accounting for local incentive programs and existing saturation required state-level adjustments. To do this, D&R derived a CFL scaling factor by comparing the existing saturation in Northeast states to the overall technology share of sales demonstrated by the NEMA data.

The model does not incorporate a lag to account for the time difference between import and sale. D&R has heard anecdotally that the vast majority of A-lamps sell through in 3-5 months from import.[5] For model sensitivity purposes, D&R tested incorporating a 6-month lag and found that year-end 2013 overall socket saturation by technology shifted only about 1.5% for any one technology.

[4] NMR Group, Inc. Results of the Massachusetts Onsite Lighting Inventory Final. Prepared for Cape Light Compact, NSTAR, National Grid, Unitil, Western Massachusetts Electric, Energy Efficiency Advisory Council Consultants. June 2013.

[5] Based on anecdotal information provided by a former employee of a major retailer.

Other Model Inputs and Sources

D&R developed models for Connecticut, the District of Columbia, Maryland, Massachusetts, Rhode Island, and Vermont; Massachusetts elected to not have its data presented at the state level. In addition, D&R developed models for the Northeast region as a whole – which included Delaware, Maine, New Hampshire, New Jersey, New York, and Pennsylvania, in addition to the states listed above – and the United States as a whole.

Other model inputs changed by state, including the following; state-specific information can be found in Appendix A.

Type	Source
Number of Housing Units (State)	Census, Occupied Housing; Annual Estimates of Housing Units for the United States, Regions, Divisions, States, and Counties: April 1, 2010 to July 1, 2013
Number of Housing Units (National)	Census, Occupied Housing; Annual Estimates of Housing Units for the United States, Regions, Divisions, States, and Counties: April 1, 2010 to July 1, 2013
Total Sockets: A-lamp/ House	Northeast onsite data and national socket data (Navigant 2010)
Total A-lamp Sockets	Calculated by D&R based on NEEP member onsite saturation data
Screw Base A-lamp Sockets	Calculated based on Northeast onsite data and occupied households

Storage Rate (lamps per household)	
CFL	Review of Northeast onsite survey data
Incandescent	Review of Northeast onsite survey data
Halogen	Review of Northeast onsite survey data
LED	Review of Northeast onsite survey data

Housing Growth	Calculated from Census annual household estimates

Rated Lifetime	
Incandescent	D&R compiled major manufacturer and retailers technology comparison
CFL	D&R compiled ENERGY STAR technology comparison
Halogen	D&R compiled major manufacturer and retailers technology comparison
LED	D&R compiled ENERGY STAR technology comparison

Technology Share of Sales	NEMA Quarterly Reports

FTC CFL Imports - National	Federal Trade Commission data query - CFL Imports

Share of Shipments by Technology, by Sector

CFL Residential Share of Shipments	2010 U.S. Lighting Market Characterization - Calculated
CFL Commercial Share of Shipments	2010 U.S. Lighting Market Characterization - Calculated
Halogen and Incandescent - Residential Share of Shipments	2010 U.S. Lighting Market Characterization - Calculated
Halogen and Incandescent - Commercial Share of Shipments	2010 U.S. Lighting Market Characterization - Calculated

Starting Saturation by Lumen and Type	Calculated based on A-lamp and Twist CFL data from on-site Northeast saturation surveys

Usage by Technology Type (Hours/Day)

Incandescent	Northeast Residential Lighting Hours-of-Use Study (2014)
CFL	Northeast Residential Lighting Hours-of-Use Study (2014)
Halogen	Northeast Residential Lighting Hours-of-Use Study (2014)
LED	Northeast Residential Lighting Hours-of-Use Study (2014)

Results and Discussion

Installed A-Lamp Base

D&R modeled the end-of-year residential installed base of A-lamps in Connecticut, the District of Columbia, Maryland, Rhode Island, and Vermont for 2012 and 2013, in addition to modeling the Northeast region and the United States as a whole. The analysis presented below, including the model for the United States as a whole, is based on these modeled results.

Technology

In the years modeled, 2012 and 2013, incandescents are the majority technology in the installed base across the Northeast states included in this study. However, in the Northeast from year-end 2012 to year-end 2013, A-lamp incandescents' share of the installed base shrunk from approximately 58% to 55%. This shows that incandescent products still represent a large portion of installations and retiring them will result in energy savings.

CFLs are the next most common technology, representing approximately 40% of the installed base across the states modeled, in the Northeast region as a whole. CFL share of the installed base grew slightly from 2012 to 2013 – from 41% to 42%.[6]

[6] These results may differ from other Northeast studies because this model focuses exclusively on A-lamps and not residential lighting as a whole.

One of the big questions after EISA went into effect was which technologies consumers would adopt in place of incandescent lamps. Consumers are adopting halogen and LED products at higher rates than before, though their shares in the overall installed base are small. Halogens' share of the installed base grew from 1% in 2012 to 3% in 2013; while the LED share is growing rapidly, it still accounts for less than 1% of the installed base (see Figure 2 and Figure 3).

Figure 1: Installed A-Lamps by Technology by State

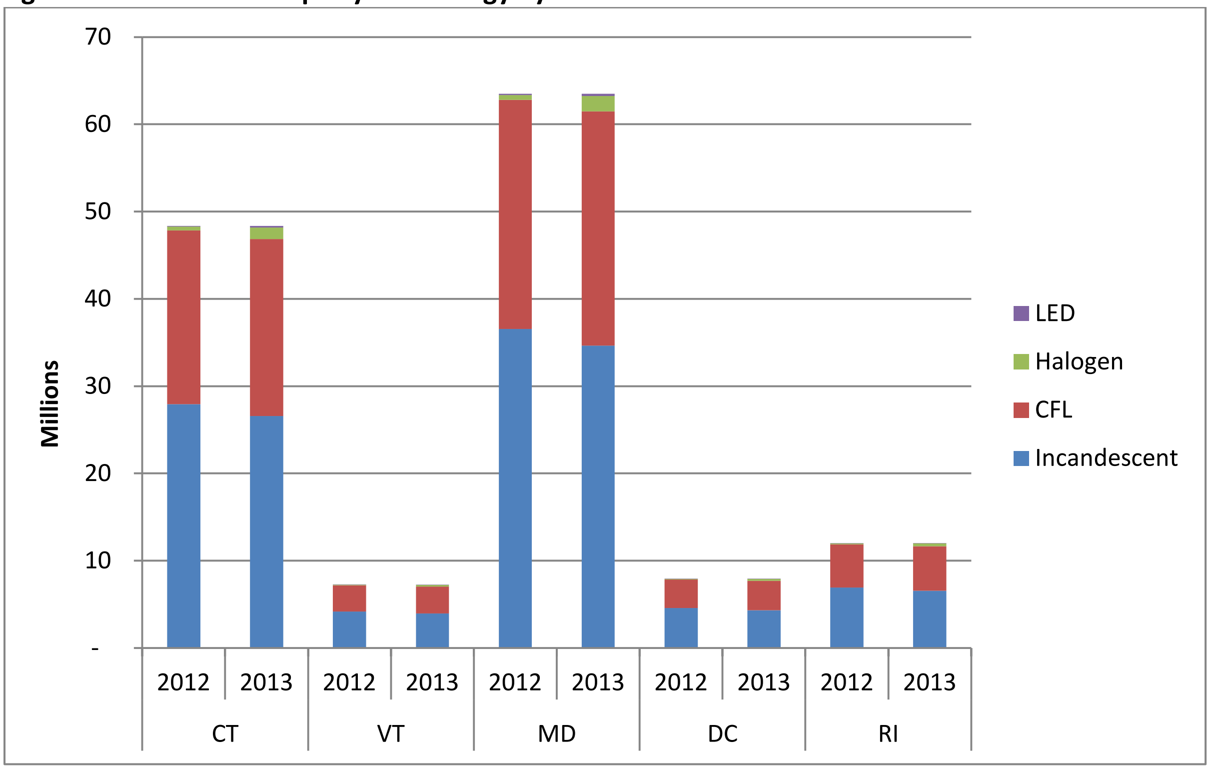
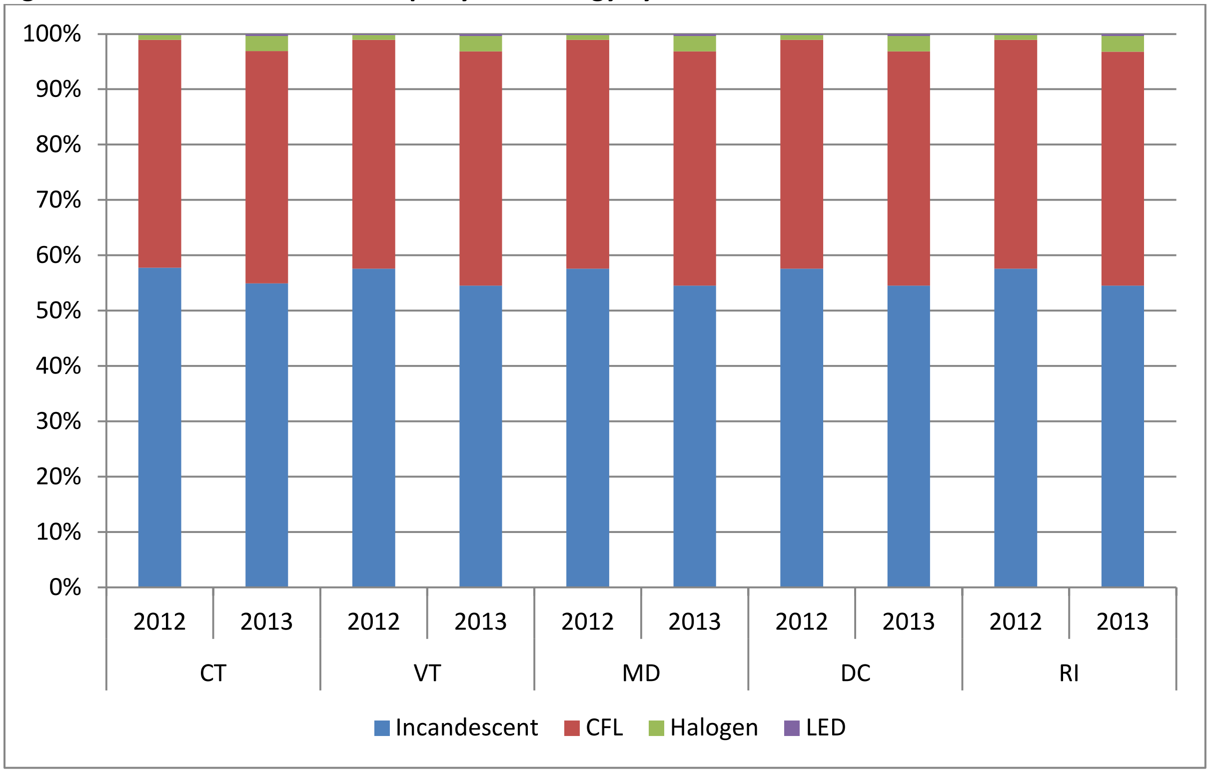


Figure 2: Share of Installed A-Lamps by Technology by State



Not surprisingly, the distribution of installed technologies at the state level mirrors the installation rates at the regional level, with small growth for CFLs, halogens, and LEDs, and a small decline in incandescents.

Figure 3: Northeast Region Installed A-Lamps by Technology

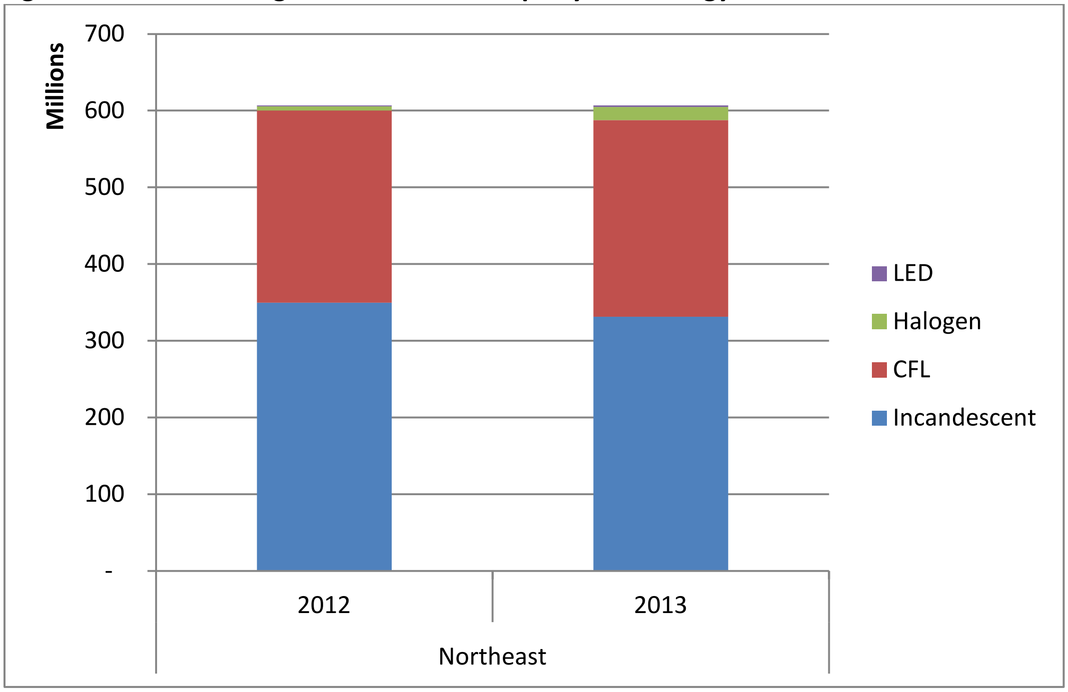
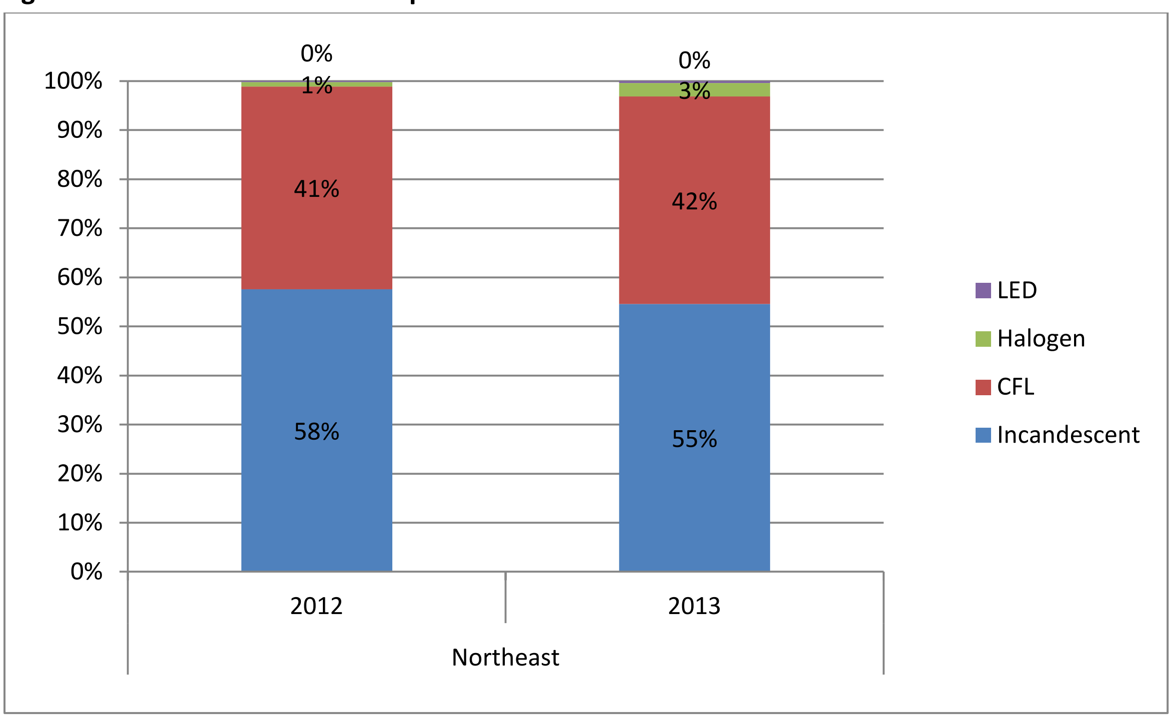


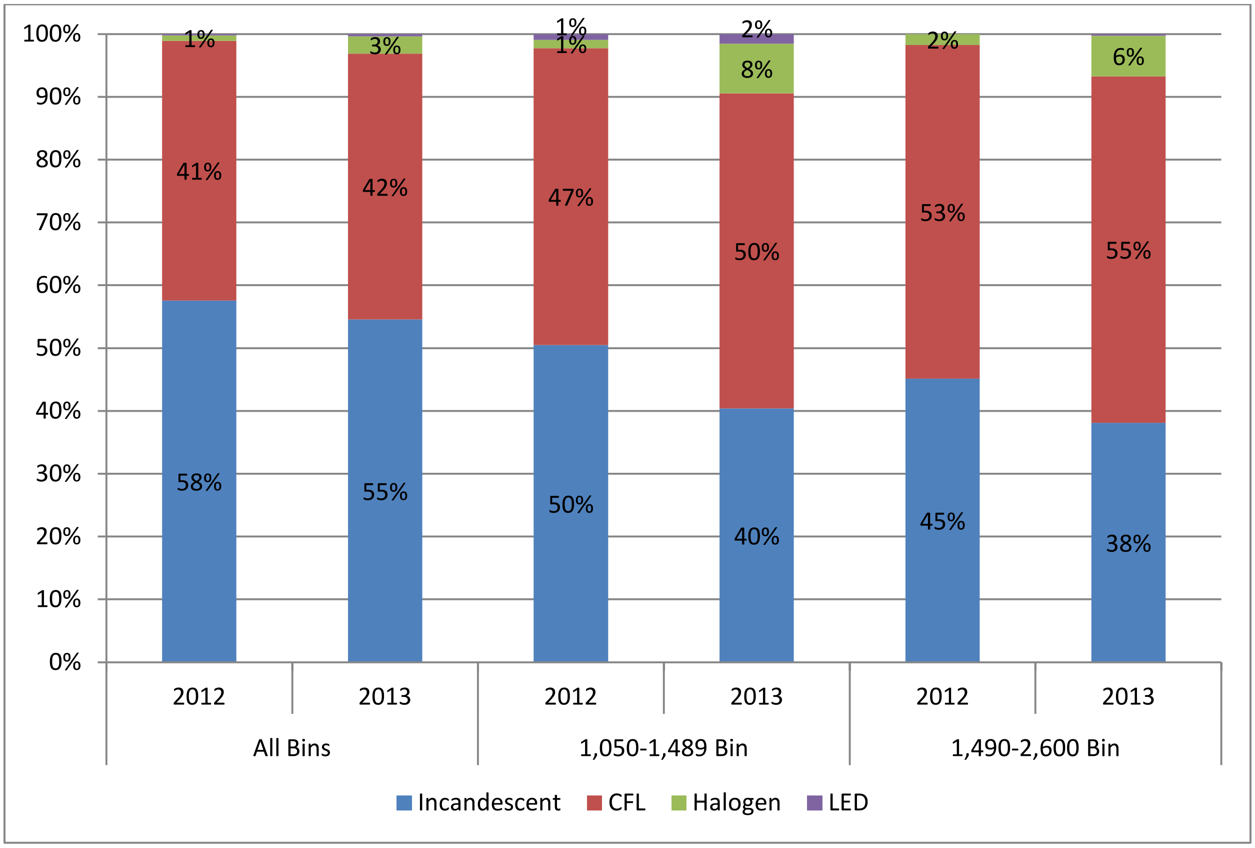
Figure 4: Share of Installed A-Lamps – Northeast



Overall saturation differs from saturation levels in lumen bins affected by EISA — 1,050-1,489 and 1,490-2,600. There is a slightly larger share of efficient lamps installed in the 1,490-2,600 bin, likely because EISA's effects on that bin began in 2012. At the end of 2013 in the Northeast, for example, 38% of installed lamps in the 1,490-2,600 bin are incandescent, compared to 55% of all lumen bins, a 17 percentage-point difference.

Similarly, EISA-affected bins show a shift in the growth of CFLs and halogens (see Figure 5). Installed CFLs grew 2-3 percentage points from 2012 to 2013, while halogen socket saturation increased from 1%-2% in 2012 to 6%-8% in 2013. This suggests that consumers saw halogen products as the primary substitute for incandescents, because a majority of the decrease in incandescent saturation is offset by the increase in halogen saturation.

Figure 5: Northeast Region Installed A-Lamp Lumen Bin Comparison



From 2012 to 2013, the incandescent socket saturation for the 1,050-1,489 lumen bin declined by 20% and saturation for the 1,490-2,600 lumen bin fell by 15%. As shown in Table 4, approximately 61% of installed lamps fall in the 750-1,049 lumen (60W-equivalent) bin, so this bin represents the largest source of potential savings and the drops 2012 to 2013 provide some insights into the potential pace of change for the 60W-equivalent. The 310-749, 1,050-1,489 and 1,490-2,600 bins have roughly equivalent shares (12%, 10%, and 16%, respectively).

Only 16% and 26% of installed lamps in 2012 and 2013, respectively, fell within EISA-affected lumen bins (see Figure 6 and Figure 7), which helps to explain why the saturation levels for all of the lumen bins combined shifted at much smaller rates, though these bins saw incandescent saturation fall below 50%.

As the vast majority of products are in the 310-749 and the 750-1,049 lumen bins, the transition to more-efficient lamps in these bins will likely shift overall socket saturation more significantly, even in 2014.

Table 3: 2013 Installed A-Lamps by Lumen Range by State

	Lamps Installed					Total*
Lumen Range	**Connecticut**	**Vermont**	**Maryland**	**District of Columbia**	**Rhode Island**	**% Share**
<310	40,548	6,084	53,230	6,654	10,074	0%
310-749	5,947,028	892,313	7,807,076	975,975	1,477,506	12%
750-1049	29,518,885	4,429,115	38,751,487	4,844,384	7,333,801	61%
1050-1489	4,906,298	736,158	6,440,838	805,179	1,218,942	10%
1490-2600	7,839,264	1,176,230	10,291,146	1,286,512	1,947,621	16%
2600+	108,128	16,224	141,947	17,745	26,864	0%
Total	48,360,151	7,256,123	63,485,723	7,936,450	12,014,808	100%

*Percent share is the same across all states, region, and nationally; it includes Massachusetts.

Table 4: 2013 Installed A-Lamps by Lumen Range Nationally and the Northeast Region

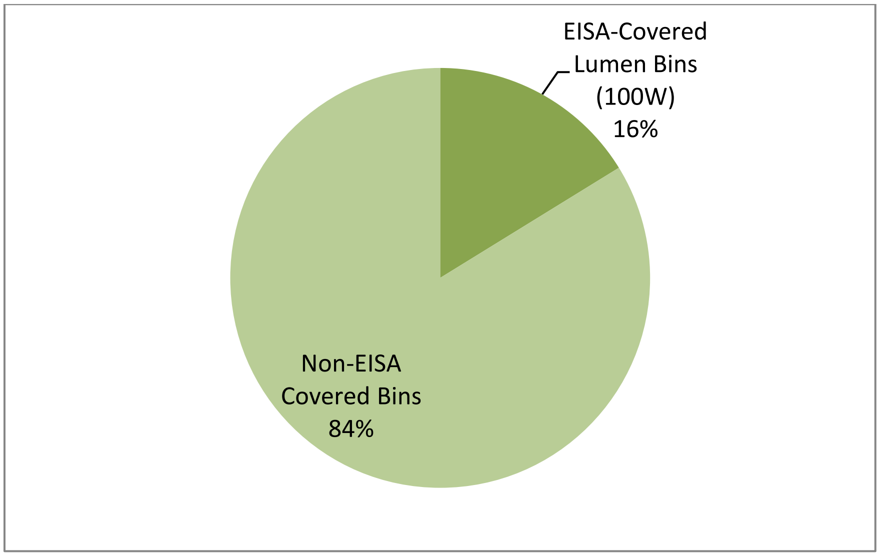
	Lamps Installed		Total*
Lumen Range	**Northeast***	**National****	**% Share*****
<310	508,834	2,883,118	0%
310-749	74,628,985	422,857,323	12%
750-1049	70,431,142	2,098,909,987	61%
1050-1489	61,568,912	348,857,292	10%
1490-2600	98,374,571	557,402,835	16%
2600+	1,356,891	7,688,315	0%
Total	606,869,334	3,438,598,871	100%

*Northeast includes Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

**National results are modeled. National model assumptions can be found in Appendix A.

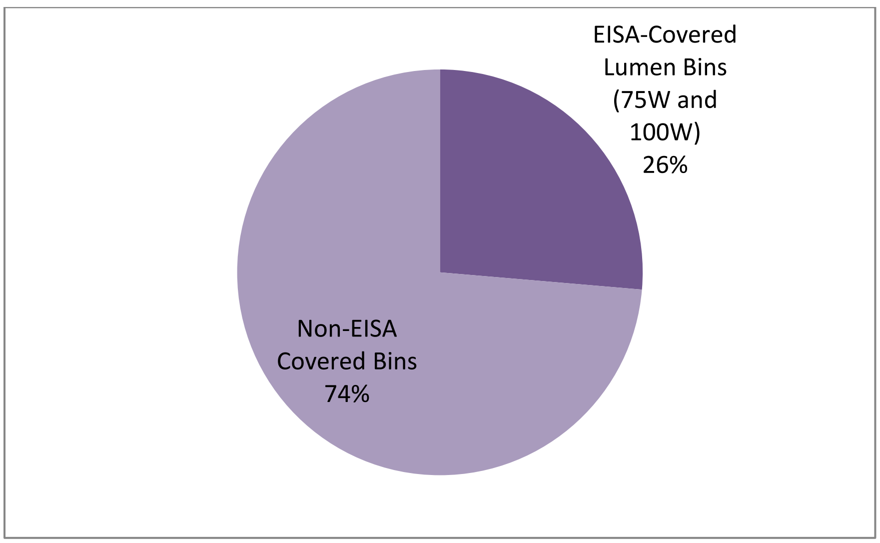
***Percent share is the same across Northeast region and nationally; it includes Massachusetts.

Figure 6: Share of EISA-Affected Installed A-Lamps in 2012*



*Same for all states, Northeast region, and nation.

Figure 7: Share of EISA-Affected Installed A-Lamps in 2013*



*Same for all states, Northeast region, and nation.

Sensitivity Analysis

Developing any model requires making assumptions about a wide variety of inputs. To test the sensitivity of the model, D&R developed four scenarios: EISA-Low, EISA-Reference, EISA-High, and CFL Low Lifetime. The Replacement Technology Scenarios section (above) discusses these scenarios in greater detail. The scenarios provide an indication of the upper and lower ranges for the saturation of incandescent products in the EISA-compliant bins.

The 2012 saturation was the same for EISA-Low, EISA-Reference, and EISA-High scenarios. According to the model, non-incandescent lighting represents at most 65% of socket saturation in both the 1,050-1,489 and 1,490-2,600 bins. At the very least, non-incandescent socket saturation is 49% in the 1,050-1,489 bin and 55% in the 1,490-2,600 bin. The difference between the incandescent shares in the EISA-High and EISA–Low scenarios is nine percentage points for the 1,050-1,489 bin and four percentage points for the 1,490-2,600 bin.

The biggest differences between the scenarios, particularly for the 1,050-1,489 bin, is in halogen saturation, which ranges from 5% in the EISA-Low scenario to 11% in the High-EISA scenario. The differences are smaller in the 1,490-2,600 bin, with the difference in halogen saturation ranging from a low of 5% to a high of 8%.

Figure 8: EISA Scenarios Northeast Region Socket Saturation – 1,050-1,489 Bin

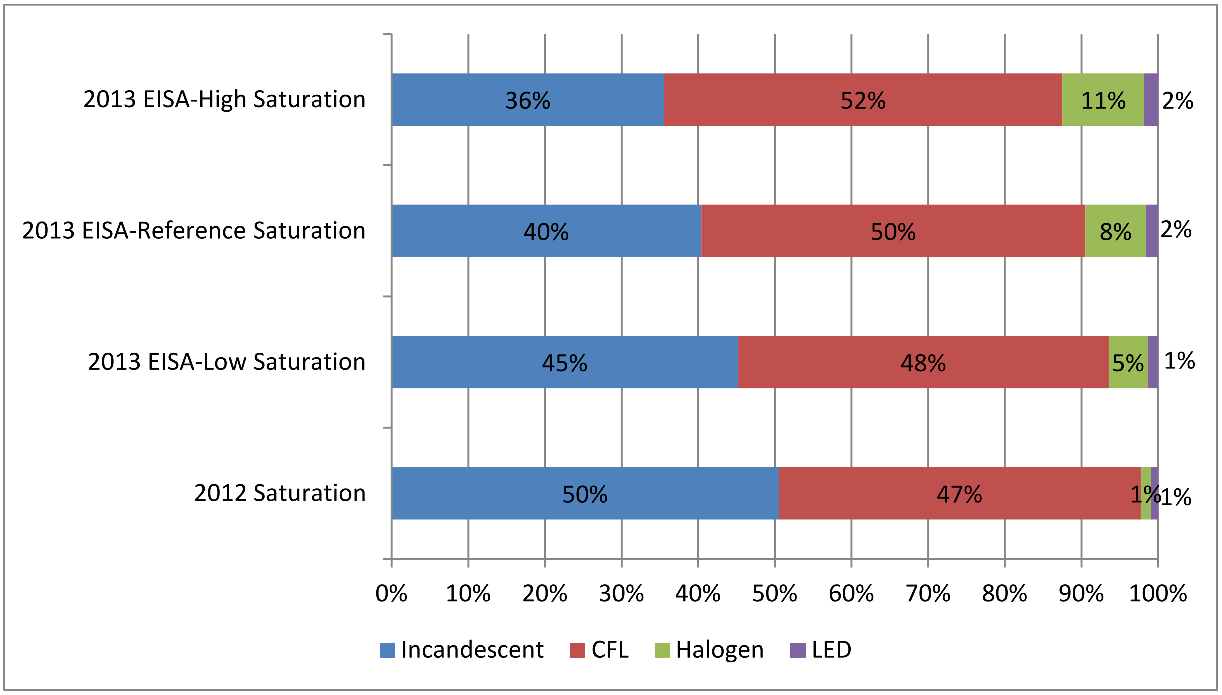
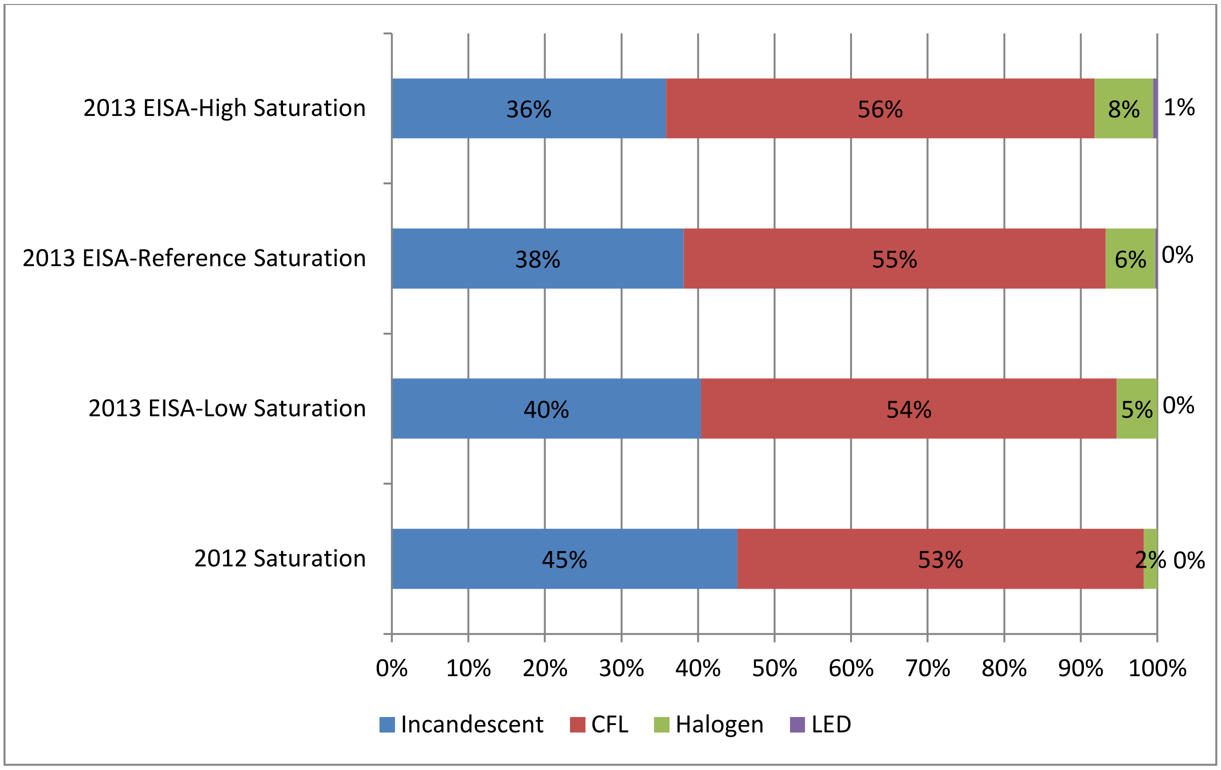


Figure 9: EISA Scenarios Northeast Region Socket Saturation – 1,490-2,600 Bin



For the EISA-Reference and CFL Low Lifetime scenarios comparison (Figure 10 and Figure 11), the transition from incandescent to other technologies is slower because there are fewer surplus CFLs. The CFL Low Lifetime scenario assumes a shorter CFL lifetime (6,700 hours compared to 8,000 hours in the EISA scenarios), which means CFLs fail more frequently, creating less surplus and filling remaining failed incandescent sockets with incandescents at higher rates than under the EISA scenarios. NEEP and Program administrators asked D&R to conduct this sensitivity analysis because the ENERGY STAR CFL V4.3 Specification used a minimum lifetime of 8,000 hours, but not all CFLs installed are ENERGY STAR certified, and some CFLs may meet only the former ENERGY STAR CFL V3.0 criteria of a 6,000-hour lifetime.

The socket saturation levels in the CFL Low Lifetime scenario are close to the levels in the EISA-Low scenario, and there is only a 4 percentage point difference in incandescent socket saturation between the EISA-Reference case and the CFL Low Lifetime scenario. This is due to the difference in CFL saturation. The CFL Low Lifetime scenario provides insight into the impact of different assumptions about product lifetime on saturation rates and the rate of transition away from incandescent products in bins affected by EISA.

Figure 10: CFL Low Lifetime and EISA-Reference Scenarios, Northeast Region Socket Saturation – 1,050-1,489 Lumen Bin

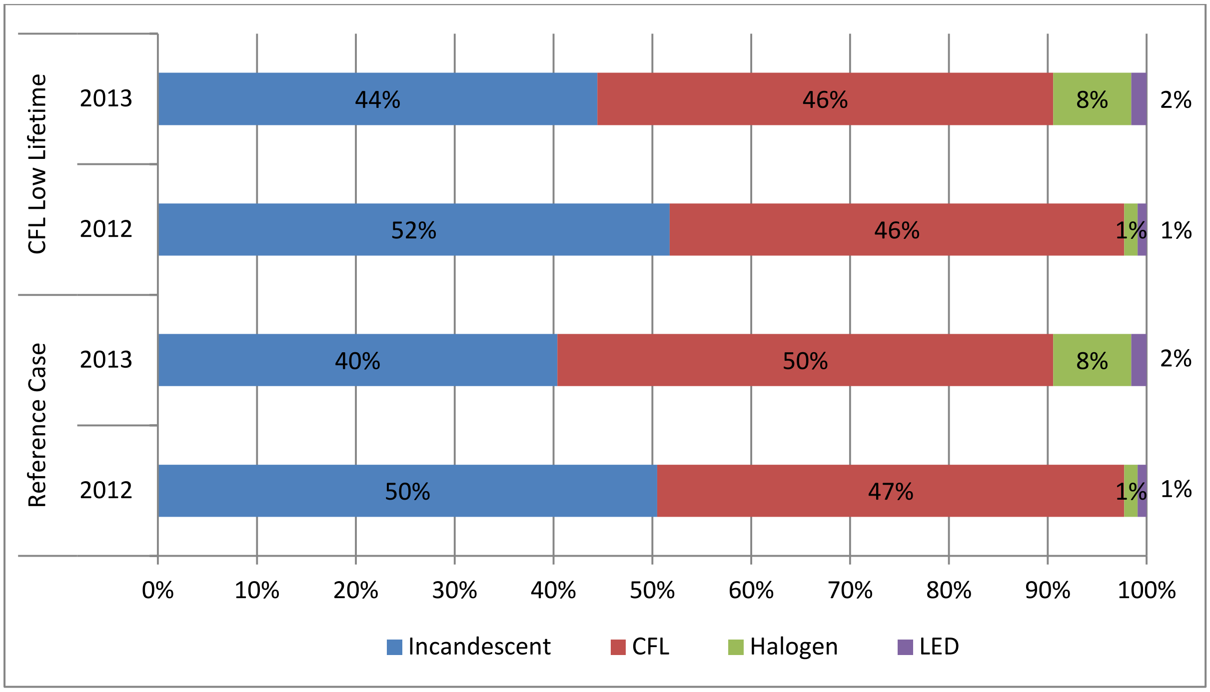
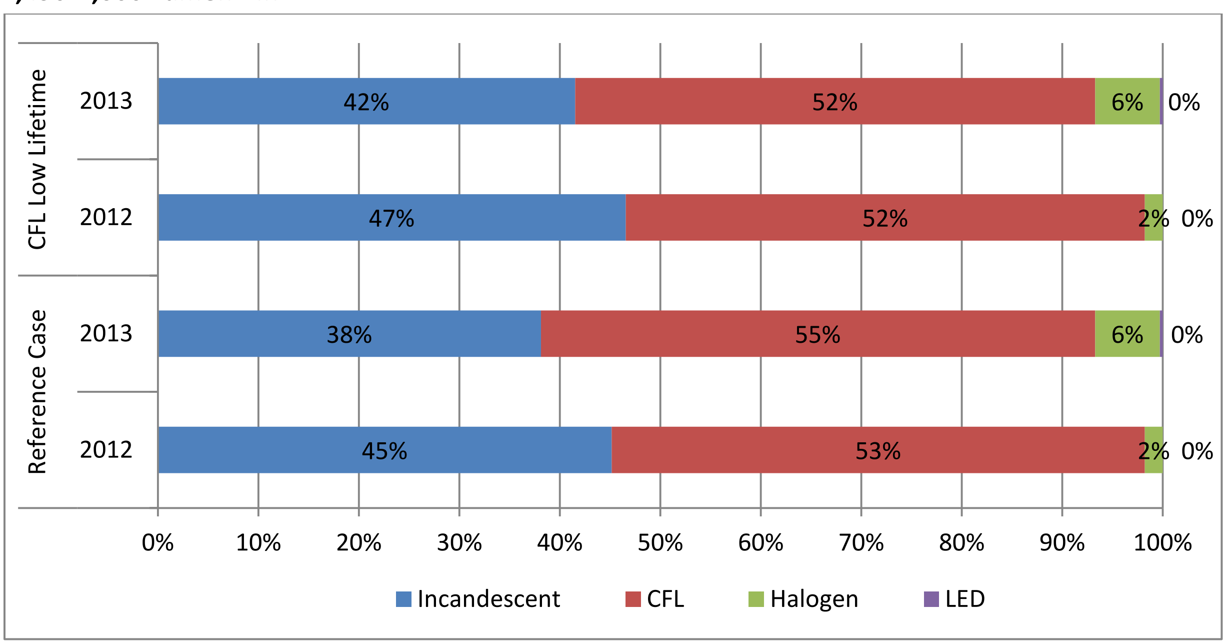


Figure 11: CFL Low Lifetime and EISA-Reference Scenarios, Northeast Region Socket Saturation – 1,490-2,600 Lumen Bin



Overall, there was some shift in adoption of technologies from 2012 to 2013, but incandescent still had the greatest socket saturation at year-end 2013. Not surprisingly, the technology socket saturation shifts are greatest in the bins affected by EISA. In 2013, incandescent saturation in the 1,050-1,489 and 1,490-

2,600 lumen bins differed from overall socket saturation by 32% and 37%, respectively. This transition resulted in more installations of CFLs, as well as growing socket saturation for halogens and (to a lesser extent) LEDs. The differences between socket saturation overall and in the bins affected by EISA point to the likely transition for the 310-749 and the 750-1,049 bins in 2014 and likely overall socket saturation of A-lamps, as those bins make up nearly all the installed base.

Estimated Residential Unit Sales

According to the model, the vast majority of products sold in 2012 and 2013 were incandescent bulbs (approximately 85% in 2012 and 79% in 2013 across all states, the Northeast region, and the United States). There was small growth in CFLs, which moved from approximately 13% to 15%, while halogens grew from 2% to 6% of products sold.

Because the 750-1,049 lumen bin represents 61% of products installed, it is logical that a large proportion of sales through the end of 2013 were incandescent. Sales of incandescents will likely decline more substantially by the end of 2014; they will certainly shift in 2015, when retailers will have sold through their remaining stock of 60W and 40W incandescent products.

LED sales increased more than 300% between 2012 and 2013, but their overall market share remains extremely small. The technology sales trends seen at the state and regional level carry over to the national level as well, but with slightly greater shares of incandescent products (82% nationally compared to 79% in the Northeast in 2013) and slightly fewer CFL and halogen products sold than at the state and Northeast regional level.

Figure 12: Estimated Unit Sales

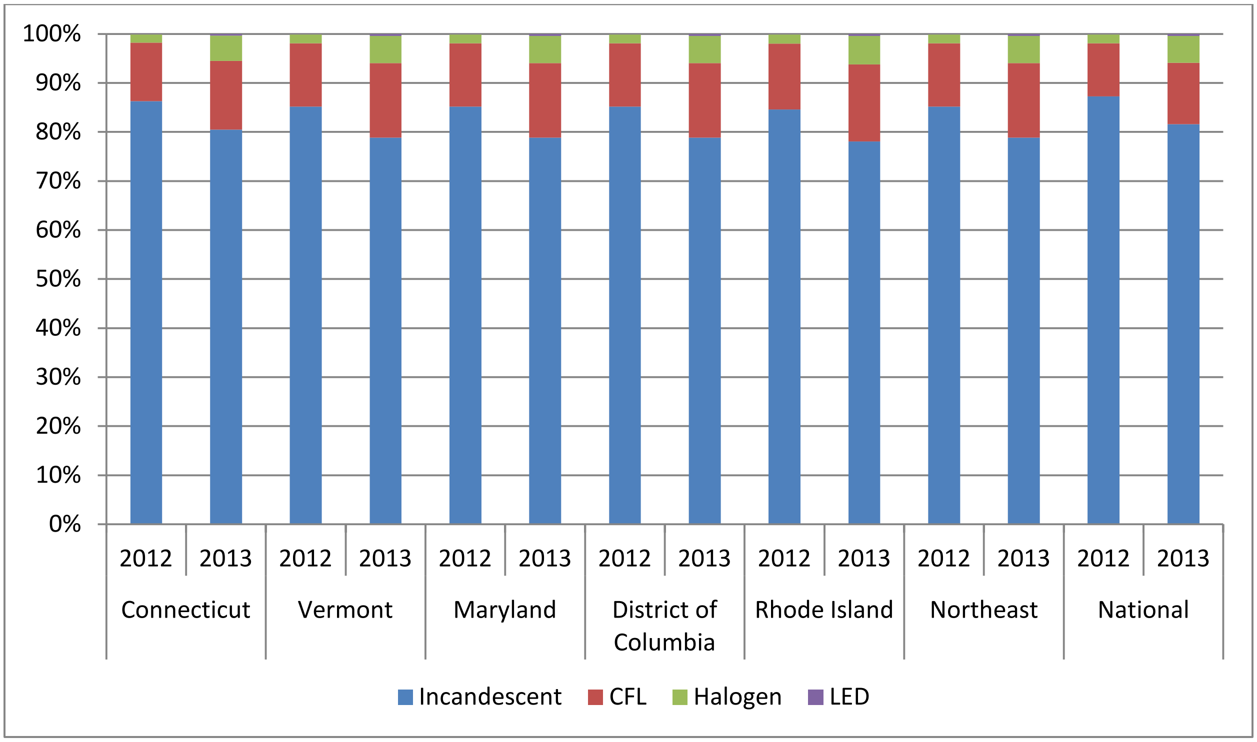
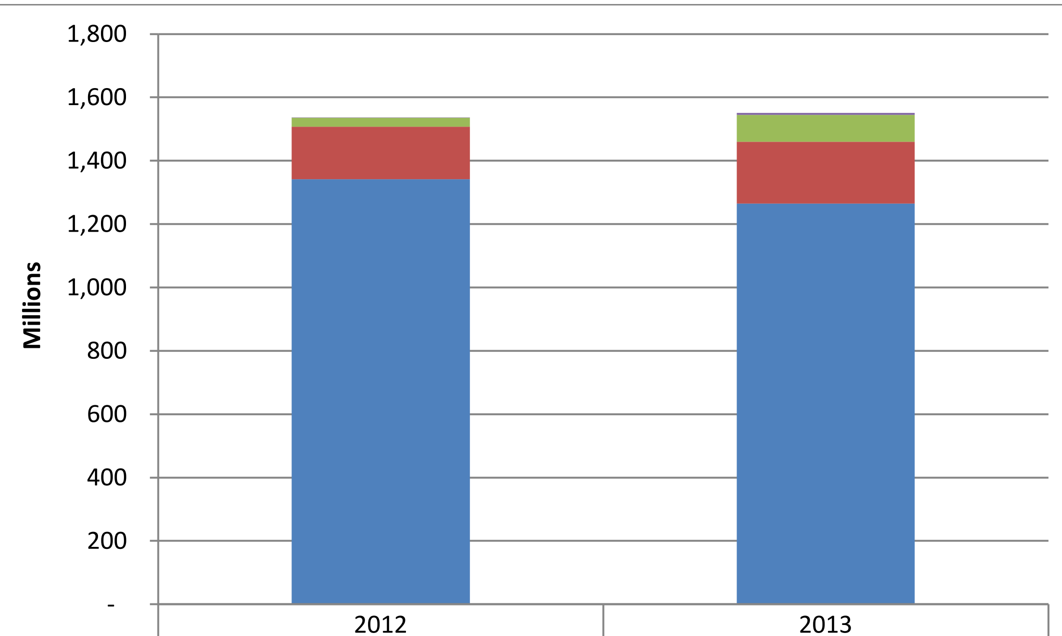


Figure 13: Estimated Residential A-Lamp National Lamp Sales



	2012	2013
LED	1,559,872	6,314,108
Halogen	27,687,735	85,188,418
CFL	166,456,444	194,573,023
Incandescent	1,341,276,771	1,265,102,201

Incentivized Sales

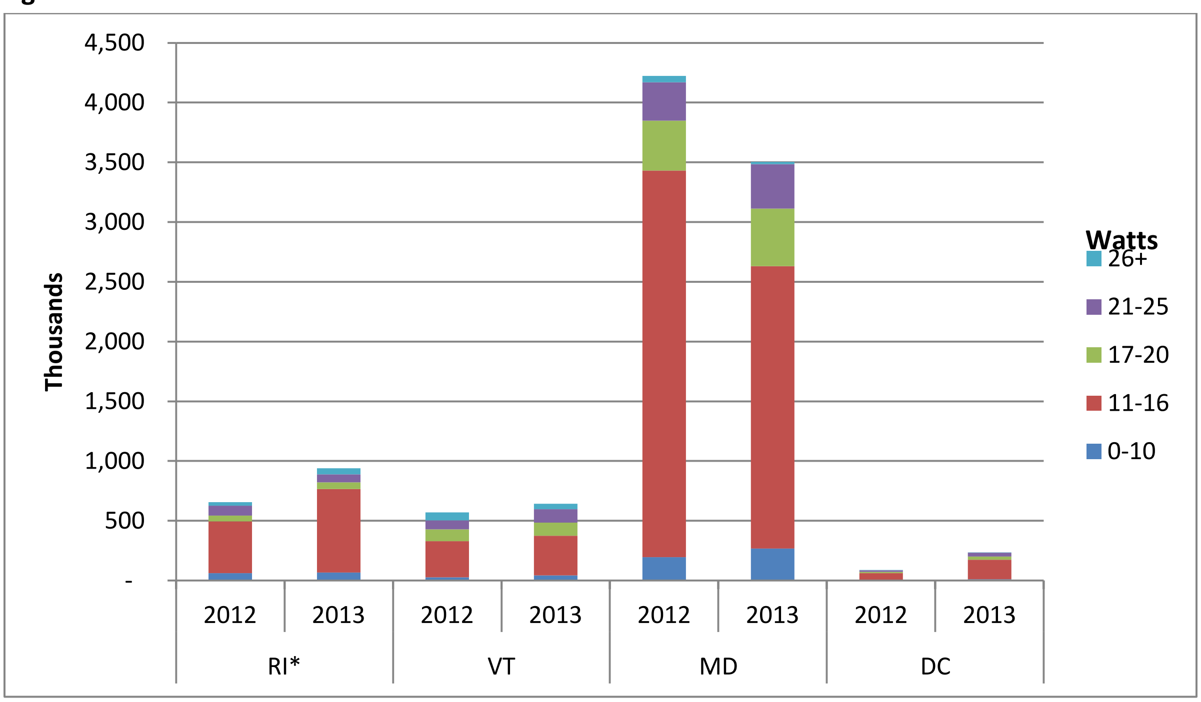
The majority of incentivized CFL and LED sales (71%) were for lamps in the 11-16W bin (60W-equivalent). This varied by state, with a high of 77% and a low of 52% of sales falling in this bin. Overall, the distribution of incentivized products roughly mirrors the distribution of products in the installed base by lumen bin.

Table 5: 2013 Average Incentivized Sales and Installed Base Comparison

Wattage (Lumen Bin)	Installed Base	Incentivized Sales
0-10 (<310, 310-749)	12%	6%
11-16 (750-1,049)	61%	71%
17-20 (1,050-1,489)	10%	8%
21-25 (1,490-2,600)	16%	9%
26+ (2,600+)	0%	5%

As shown in Figure 14 and Figure 15, some states increased their incentivized sales from 2012 to 2013, while others reduced them in the same period. This is likely a function of available incentive funding. In some cases, estimated residential unit sales were lower than incentivized sales. Because roughly 44% of CFLs end up in the commercial sector, the discrepancy between unit sales and incentivized sales suggests that some of the incentives went to products being installed in the commercial sector.[7]

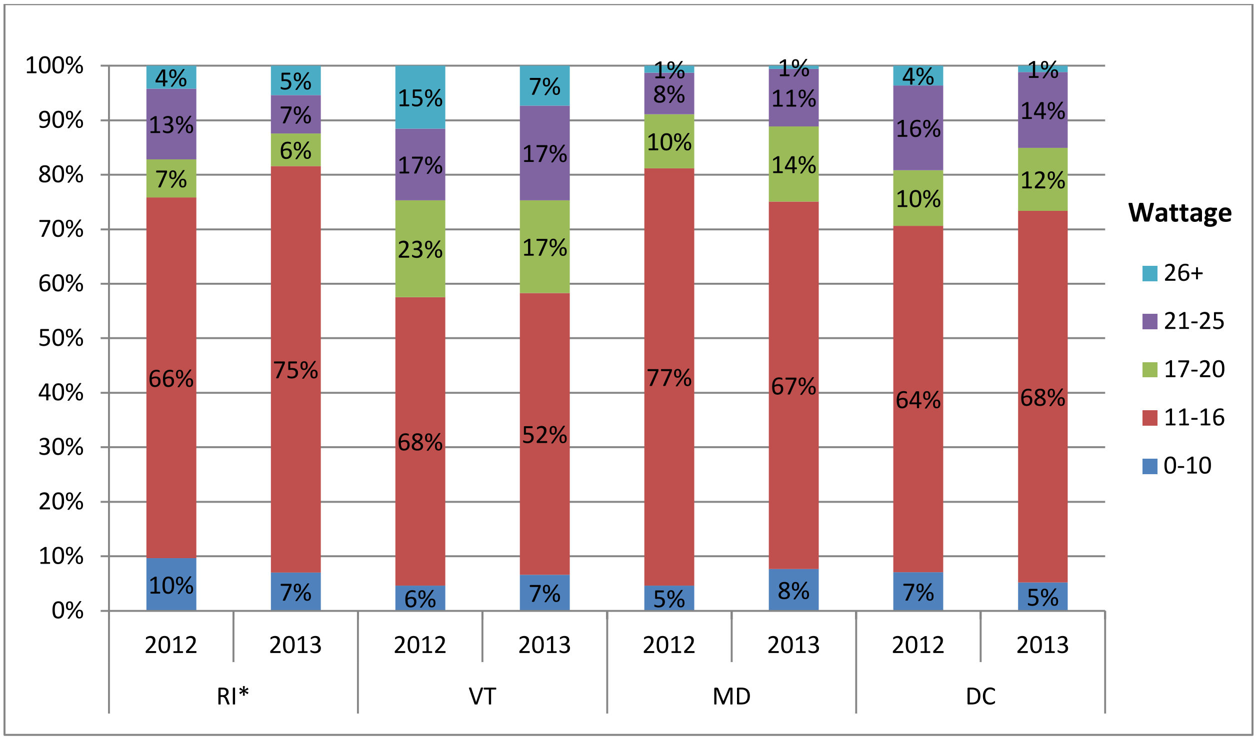
Figure 14: State Incentivized Sales



*Includes non-A line, specialty, and LED.

[7] Navigant Consulting, Inc. 2010 U.S. Lighting Market Characterization. Prepared for the U.S. Department of Energy. January 2012.

Figure 15: Share of Incentivized Sales by Wattage



*Includes non-A line, specialty, and LED.

Lamp Failures

In both 2012 and 2013, the majority of lamps failing were incandescents. Incandescents represented 85%-87% of failures, with CFLs a distant second at 12%-13%. High incandescent failure rates and availability of incandescent products in the bin with the largest market share led to high rates of incandescent installation in 2012 and 2013.

Figure 16: Share of A-Lamp Failures by Technology by State

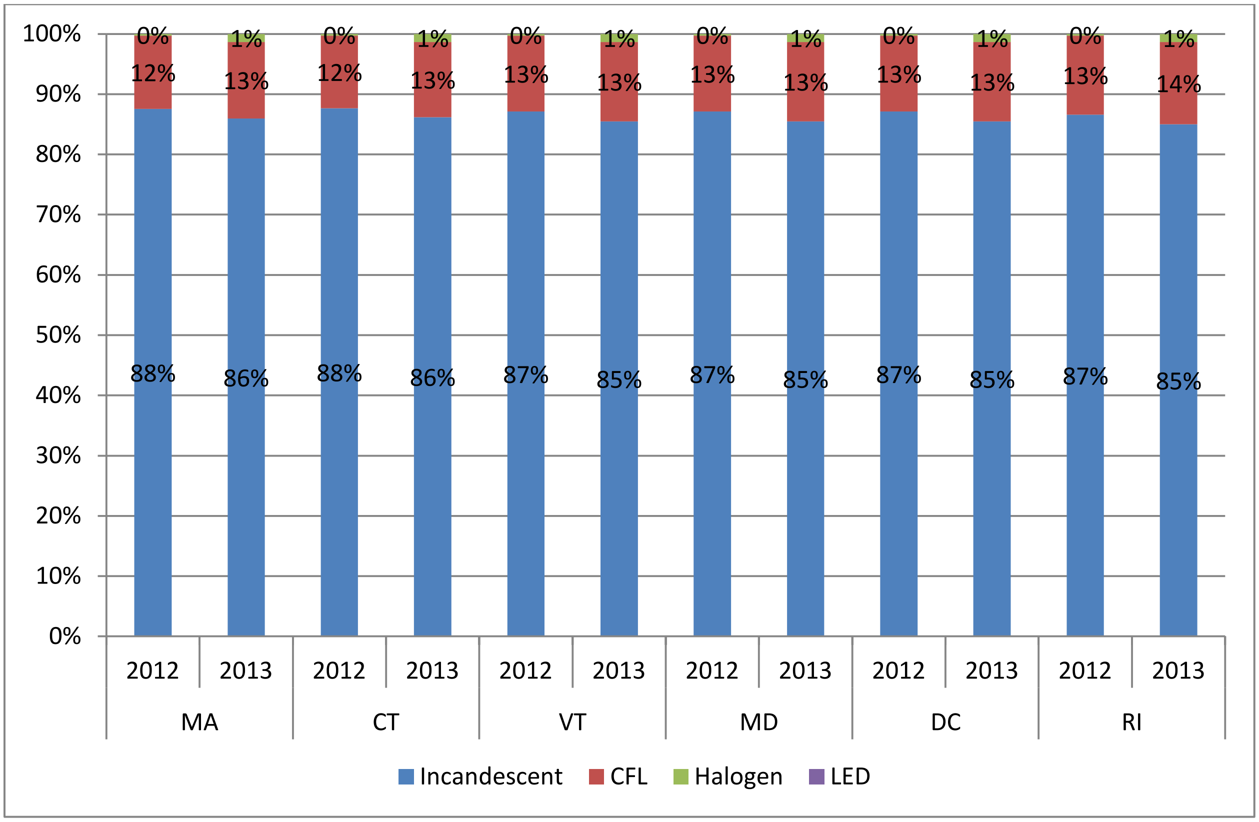
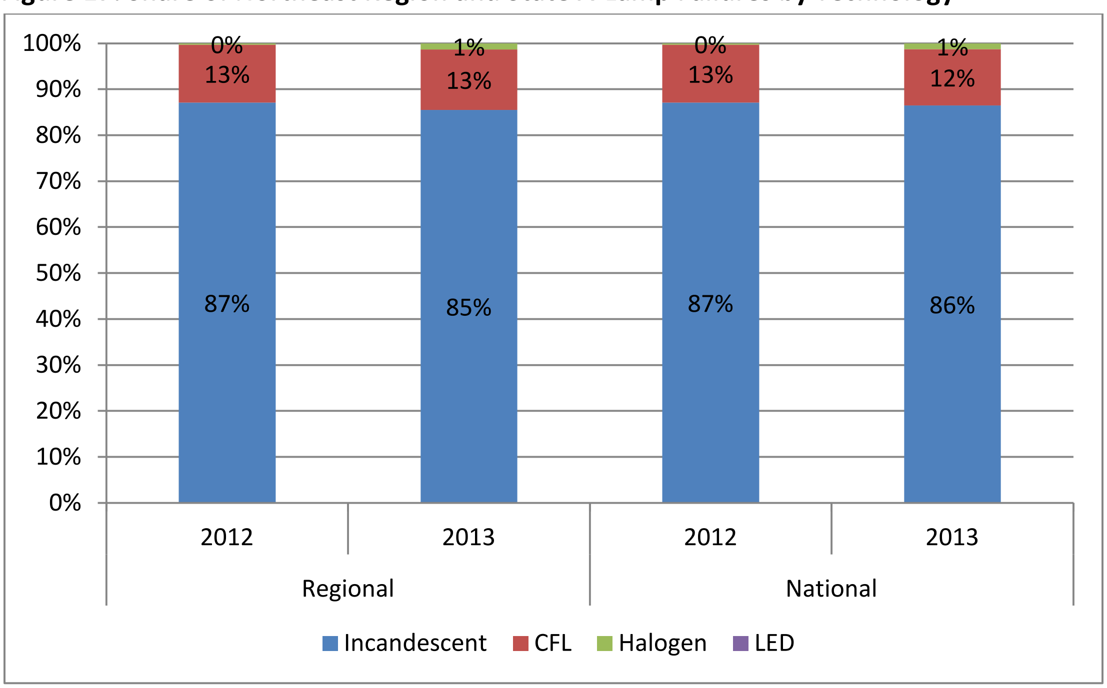


Figure 17: Share of Northeast Region and State A-Lamp Failures by Technology



Conclusions

Impact of EISA

The results of the model lead to several key conclusions about the impact of EISA on the lighting market.

EISA had an effect on the sales and installation of affected lumen ranges through the end of 2013

There are differences in the types of lamps being sold in the non-EISA-covered lumen bins and the 1,050-1,489 and 1,490-2,600 lumen bins. Under all replacement scenarios, EISA-covered bins had a 10%-30% reduction in incandescent saturation, while the overall saturation reduction is closer to 5%. Note that while EISA did help increase sales of efficient lamps, incandescent lamp saturation for EISA-covered bins at the end of 2013 was approximately 35%-40% in the Northeast, meaning that incandescent sales in the marketplace were still significant.

The largest transition has been to EISA-compliant halogens

While there has been some transition away from incandescent lamps in the 1,050-1,489 and 1,490-2,600 lumen bins, according to this model, consumers were most likely to replace them with EISA-compliant halogen lamps under all scenarios. Forthcoming studies in the Northeast may better address current A-lamp residential saturation and the rate of halogen saturation growth. This uncertainty about socket saturation has short-term effects on utility program administrators' ability to claim energy savings using incandescents or a combination of incandescents and halogens as a baseline. In the long term, the slower transition away from incandescent products may have implications for planning and capacity estimates for utilities as a whole.

It is too soon to understand the full impacts of EISA

While the market is showing effects of EISA, it is still far too early to understand the full impact of the legislation. EISA did not go into effect for the 750-1,049 lumen bin until 2014. This bin, which covers traditional 60W incandescent lamps, represents the most significant share of existing saturation for A-lamps (more than 60% of A-lamps in 2012). Conversations with retailers and manufacturers indicate that sales of incandescent lamp technology will likely continue into early 2015.

The rate of change and change in saturation in the 1,050-1,489 and 1,490-2,600 lumen bins during 2012 and 2013 provide a potential picture of consumer technology preferences for the regulations now in effect for 2014 for the 310-749 and 750-1,490 lumen bins, but because the regulations taking effect in 2014 affect the majority of A-lamps, the pace at which this change occurs is likely to accelerate.
As data becomes available, this model could be used to estimate 2014 A-lamp sales volumes and could be altered to project future sales and saturation levels. It could also be used to enable program managers to determine the sales volumes needed to reach energy savings and peak load reduction goals.

Key Takeaways and Recommendations

Program Administrators and Evaluators

Consumers who have not already transitioned to CFLs are favoring halogen replacements. If the modeled trend for the 1,050-1,489 and 1,490-2,600 bins is any indication, many more halogen products will be installed in 2014 as EISA regulations for the 310-749 and 750-1,049 bins take effect, even if there is also growth in adoption of CFL and LED products.

Based on current transition rates, EISA-compliant halogens are likely to be the new baseline technology for savings programs in the future. Halogens have shown growth rates of 200%-700% over the past several years in all lumen bins in all replacement scenarios. Halogens have also shown absolute gains in overall saturation of about 2 percentage points from 2012 to 2013, more than any other technology. However, as of 2013, incandescent products were still being widely installed, meaning program administrators may need to revisit their choice of baseline technology or blend of technologies frequently in the next few years.

Incentive programs for efficient lighting are likely to remain an important avenue to achieve energy savings for utilities at least through the end of 2016. Because halogen technology is likely the new baseline, incentive programs can still capture 40-50 watts of gross reduction per unit. While this means less opportunity for savings than before the passage of EISA, the potentials savings for utility programs are still significant.

Market saturation surveys can help determine the long-term viability of A-lamp programs. The remaining savings available through 2020 will depend largely on the natural market adoption of LEDs. While halogens are the current replacement technology, LED prices have been falling rapidly, which could lead to increased adoption rates over the next several years. The only way for program administrators to understand the growth in LED saturation is to continue to perform market saturation surveys or track full-category retail sales data.

Regulators

Programs for energy-efficient lighting technologies should continue for at least several more years. Transition to the most energy-efficient products (CFL and LED) does not appear to be happening on its own in the short term. While it is always difficult to know what would happen in the absence of an incentive, halogen adoption would likely be even higher without current utility and energy efficiency programs incentivizing CFLs and LEDs.

Outstanding Research Questions

Several outstanding research questions will need to be investigated to understand fully EISA's effect on the market. This model can be updated or slightly adapted to address many of the questions outlined below.

What happened in 2014 with the largest-volume lumen bins now affected by EISA?

The most immediate question about the impact of EISA is the technology transition rate through the end of 2014. While market activity in 2012 and 2013 gives some indication about the likely transition rates of the 750-1,049 and 310-749 lumen bins, the transition may occur much more quickly due to the relative size of these bins.

Are consumers adopting halogen products as substitutes for incandescents, rather than CFLs or LEDs?

One important issue for future lighting programs is understanding if and why consumers are choosing halogens as opposed to other, more-efficient alternatives. The wide reach of incentive programs in the Northeast has generally brought CFLs to price parity with lower-cost alternatives, yet adoption rates have remained relatively flat. Price may still be an important factor with LED technology. Having a better understanding of how consumers make purchasing decisions in a lighting market that has more choices than in previous years will be critical to designing and implementing effective future programs.

What will residential A-lamp sales and socket saturation look like in 2015 and 2016, after incandescent products have been sold through?

What will the market look like when the full incandescent stockpile has been sold through the market? At that point, consumers will likely have three lighting technology choices: halogen, CFL, and LED. How saturation and technology adoption rates change under these new market conditions will be important for lighting programs, as well as demand management programs and capacity planning.

Appendix A

Table 6: Technology Lifetime

Technology	Lifetime (hours)
Incandescent	1,255
Halogen	1,255
CFL	8,000
LED	25,000

Sources: Incandescent and halogen lifetime figures are based on D&R review of major lighting manufacturer catalogs. CFL and LED lifetime values determined from D&R review of the ENERGY STAR® Lamps Certified Products List.

Table 7: Average Hours of Use

Technology	Average Hours of Use
Incandescent	2.4
Halogen	2.4
CFL	3.0
LED	3.0

Source: Northeast Residential Lighting Hours-of-Use Study

Table 8: Replacement Scenario Assumptions

	EISA-Low Replacement		EISA-Reference Replacement		EISA-High Replacement	
CFL	2012	2013	2012	2013	2012	2013
<310	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
310-749	5.02%	5.02%	5.02%	2.51%	5.02%	0.00%
750-1049	62.37%	62.37%	62.37%	31.19%	62.37%	0.00%
1050-1489	11.59%	11.59%	11.59%	34.55%	11.59%	50.00%
1490-2600	20.81%	20.81%	20.81%	29.02%	20.81%	50.00%
2600+	0.20%	0.20%	0.20%	0.10%	0.20%	0.00%
Halogen						
<310	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
310-749	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
750-1049	50.00%	50.00%	50.00%	25.00%	50.00%	0.00%
1050-1489	20.00%	20.00%	20.00%	35.00%	20.00%	50.00%
1490-2600	30.00%	30.00%	30.00%	40.00%	30.00%	50.00%
2600+	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
LED						
<310	12.50%	12.50%	12.50%	6.25%	12.50%	0.00%
310-749	25.00%	25.00%	25.00%	12.50%	25.00%	0.00%
750-1049	37.50%	37.50%	37.50%	18.75%	37.50%	0.00%
1050-1489	25.00%	25.00%	25.00%	37.50%	25.00%	50.00%
1490-2600	0.00%	0.00%	0.00%	25.00%	0.00%	50.00%
2600+	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 9: Connecticut Starting Assumptions

Type	Data	Source
Number of Housing Units (State)	1,370,456	Census, Occupied Housing; Annual Estimates of Housing Units for the United States, Regions, Divisions, States, and Counties: April 1, 2010 to July 1, 2013
Number of Housing Units (National)	117,219,214	Census, Occupied Housing; Annual Estimates of Housing Units for the United States, Regions, Divisions, States, and Counties: April 1, 2010 to July 1, 2013
Total Sockets: A-line/House	35.27	Based on CT and MA Onsite data (NMR studies) - A-line and twist screw base only
Total A-line Sockets	Varies by State	Calculated
Screw Based A-line Sockets	Varies by State	Calculated based on MA data and total households

Storage Rate (lamps per household)

CFL	18.5%	Review of Northeast onsite survey data
Incandescent	24.9%	Review of Northeast onsite survey data
Halogen	0%	Review of Northeast onsite survey data
LED	0%	Review of Northeast onsite survey data

Housing Growth	0.05%	Calculated from 2012 to 2013 all housing change by state (Census)

Lifetimes (hours)

Incandescent	1,255	D&R compiled major manufacturer and retailers technology comparison
CFL	8,000	D&R compiled ENERGY STAR technology comparison
Halogen	1,255	D&R compiled major manufacturer and retailers technology comparison
LED	25,000	D&R compiled ENERGY STAR technology comparison

Technology Share of Sales	Varies by year	NEMA Quarterly Reports

FTC CFL Imports - National	Varies by Year	Federal Trade Commission - Imports

Share of Shipments by Technology, by Sector

CFL Residential Share of Shipments	53%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
CFL Commercial Share of Shipments	47%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
Halogen and Incandescent - Residential Share of Shipments	85%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
Halogen and Incandescent - Commercial Share of Shipments	15%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated

Starting Saturation by Lumen and Type	See Table 2	Calculated based on A-lamp and Twist data from 2013 MA NMR Study

Usage by Technology Type (Hours/Day)

Incandescent	2.5	CT data from Northeast Residential Lighting Hours-of-Use Study (2014)
CFL	3.1	CT data from Northeast Residential Lighting Hours-of-Use Study (2014)
Halogen	2.5	CT data from Northeast Residential Lighting Hours-of-Use Study (2014)
LED	3.1	CT data from Northeast Residential Lighting Hours-of-Use Study (2014)

Table 10: Vermont Starting Assumptions

Type	Data	Source
Number of Housing Units (State)	257,406	Census, Occupied Housing; Annual Estimates of Housing Units for the United States, Regions, Divisions, States, and Counties: April 1, 2010 to July 1, 2013
Number of Housing Units (National)	117,219,214	Census, Occupied Housing; Annual Estimates of Housing Units for the United States, Regions, Divisions, States, and Counties: April 1, 2010 to July 1, 2013
Total Sockets: A-line/House	28.15	Based on VT (2011) and MA Onsite data (NMR studies) - A-line and twist screw base only
Total A-line Sockets	Varies by State	Calculated
Screw Based A-line Sockets	Varies by State	Calculated based on MA data and total households
Storage Rate (lamps per household)		
CFL	18.5%	Review of Northeast onsite survey data
Incandescent	24.9%	Review of Northeast onsite survey data
Halogen	0.0%	Review of Northeast onsite survey data
LED	0.0%	Review of Northeast onsite survey data
Housing Growth	0.14%	Calculated from 2012 to 2013 all housing change by state (Census)
Rated Lifetimes (hours)		
Incandescent	1,255	D&R compiled major manufacturer and retailers technology comparison
CFL	8,000	D&R compiled ENERGY STAR technology comparison
Halogen	1,255	D&R compiled major manufacturer and retailers technology comparison
LED	25,000	D&R compiled ENERGY STAR technology comparison
Technology Share of Sales	Varies by year	NEMA Quarterly Reports
FTC CFL Imports - National	Varies by Year	Federal Trade Commission - Imports

Share of Shipments by Technology, by Sector

CFL Residential Share of Shipments	53%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
CFL Commercial Share of Shipments	47%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
Halogen and Incandescent - Residential Share of Shipments	85%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
Halogen and Incandescent - Commercial Share of Shipments	15%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated

Starting Saturation by Lumen and Type	See Table 2	Calculated based on A-lamp and Twist data from 2013 MA NMR Study (See table in model page)

Usage by Technology Type (Hours/Day)

Incandescent	2.3	Overall data from Northeast Residential Lighting Hours-of-Use Study (2014)
CFL	3.0	Overall data from Northeast Residential Lighting Hours-of-Use Study (2014)
Halogen	2.3	Overall data from Northeast Residential Lighting Hours-of-Use Study (2014)
LED	3.0	Overall data from Northeast Residential Lighting Hours-of-Use Study (2014)

Table 11: Maryland Starting Assumptions

Type	Data	Source
State Housing	2,169,221	Census, Occupied Housing; Annual Estimates of Housing Units for the United States, Regions, Divisions, States, and Counties: April 1, 2010 to July 1, 2013
Number of Housing Units (State)	117,219,214	Census, Occupied Housing; Annual Estimates of Housing Units for the United States, Regions, Divisions, States, and Counties: April 1, 2010 to July 1, 2013
Number of Housing Units (National)	29.15	Average of onsite from northeast
Total Sockets: A-line/House	Varies by State	Calculated
Screw Based Socket %	Varies by State	Calculated based on MA data and total households
Storage Rate (lamps per household)		
CFL	18.5%	Review of Northeast onsite survey data
Incandescent	24.9%	Review of Northeast onsite survey data
Halogen	0.0%	Review of Northeast onsite survey data
LED	0.0%	Review of Northeast onsite survey data
Housing Growth	0.40%	Calculated from 2012 to 2013 all housing change by state (Census)
Lifetimes (hours)		
Incandescent	1,255	D&R compiled major manufacturer and retailers technology comparison
CFL	8,000	D&R compiled ENERGY STAR technology comparison
Halogen	1,255	D&R compiled major manufacturer and retailers technology comparison
LED	25,000	D&R compiled ENERGY STAR technology comparison
Technology Share of Sales	Varies by year	NEMA Quarterly Reports
FTC CFL Imports - National	Varies by Year	Federal Trade Commission - Imports

Share of Shipments by Technology, by Sector

CFL Residential Share of Shipments	53%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
CFL Commercial Share of Shipments	47%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
Halogen and Incandescent - Residential Share of Shipments	85%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
Halogen and Incandescent - Commercial Share of Shipments	15%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated

Starting Saturation by Lumen and Type	See Table 2	Calculated based on A-lamp and Twist data from 2013 MA NMR Study (See table in model page)

Usage by Technology Type (Hours/Day)

Incandescent	2.3	Overall data from Northeast Residential Lighting Hours-of-Use Study (2014)
CFL	3.0	Overall data from Northeast Residential Lighting Hours-of-Use Study (2014)
Halogen	2.3	Overall data from Northeast Residential Lighting Hours-of-Use Study (2014)
LED	3.0	Overall data from Northeast Residential Lighting Hours-of-Use Study (2014)

Table 12: District of Columbia Starting Assumptions

Type	Data	Source
Number of Housing Units (State)	269,727	Census, Occupied Housing; Annual Estimates of Housing Units for the United States, Regions, Divisions, States, and Counties: April 1, 2010 to July 1, 2013
Number of Housing Units (National)	117,219,214	Census, Occupied Housing; Annual Estimates of Housing Units for the United States, Regions, Divisions, States, and Counties: April 1, 2010 to July 1, 2013
Total Sockets: A-line/House	29.15	Average of onsite from northeast
Total A-line Sockets	Varies by State	Calculated
Screw Based A-line Sockets	Varies by State	Calculated based on MA data and total households
Storage Rate (lamps per household)		
CFL	18.5%	Review of Northeast onsite survey data
Incandescent	24.9%	Review of Northeast onsite survey data
Halogen	0.0%	Review of Northeast onsite survey data
LED	0.0%	Review of Northeast onsite survey data
Housing Growth	0.94%	Calculated from 2012 to 2013 all housing change by state (Census)
Lifetimes (hours)		
Incandescent	1,255	D&R compiled major manufacturer and retailers technology comparison
CFL	8,000	D&R compiled ENERGY STAR technology comparison
Halogen	1,255	D&R compiled major manufacturer and retailers technology comparison
LED	25,000	D&R compiled ENERGY STAR technology comparison
Technology Share of Sales	Varies by year	NEMA Quarterly Reports
FTC CFL Imports - National	Varies by Year	Federal Trade Commission - Imports

Share of Shipments by Technology, by Sector

CFL Residential Share of Shipments	53%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
CFL Commercial Share of Shipments	47%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
Halogen and Incandescent - Residential Share of Shipments	85%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
Halogen and Incandescent - Commercial Share of Shipments	15%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated

Starting Saturation by Lumen and Type	See Table 2	Calculated based on A-lamp and Twist data from 2013 MA NMR Study

Usage by Technology Type (Hours/Day)

Incandescent	2.3	Overall data from Northeast Residential Lighting Hours-of-Use Study (2014)
CFL	3.0	Overall data from Northeast Residential Lighting Hours-of-Use Study (2014)
Halogen	2.3	Overall data from Northeast Residential Lighting Hours-of-Use Study (2014)
LED	3.0	Overall data from Northeast Residential Lighting Hours-of-Use Study (2014)

Table 13: Rhode Island Starting Assumptions

Type	Data	Source
Number of Housing Units (State)	412,667	Census, Occupied Housing; Annual Estimates of Housing Units for the United States, Regions, Divisions, States, and Counties: April 1, 2010 to July 1, 2013
Number of Housing Units (National)	117,219,214	Census, Occupied Housing; Annual Estimates of Housing Units for the United States, Regions, Divisions, States, and Counties: April 1, 2010 to July 1, 2013
Total Sockets: A-line/House	29.15	Average of onsite from northeast
Total A-line Sockets	Varies by State	Calculated
Screw Based Socket %	100%	Adjustment Factor (not used)
Screw Based A-line Sockets	Varies by State	Calculated based on MA data and total households

Storage Rate (lamps per household)

CFL	18.5%	Review of Northeast onsite survey data
Incandescent	24.9%	Review of Northeast onsite survey data
Halogen	0.0%	Review of Northeast onsite survey data
LED	0.0%	Review of Northeast onsite survey data

Housing Growth	-0.12%	Calculated from 2012 to 2013 all housing change by state (Census)

Lifetimes (hours)

Incandescent	1,255	D&R compiled major manufacturer and retailers technology comparison
CFL	8,000	D&R compiled ENERGY STAR technology comparison
Halogen	1,255	D&R compiled major manufacturer and retailers technology comparison
LED	25,000	D&R compiled ENERGY STAR technology comparison

Technology Share of Sales	Varies by year	NEMA Quarterly Reports

FTC CFL Imports - National	Varies by Year	Federal Trade Commission - Imports

Share of Shipments by Technology, by Sector

CFL Residential Share of Shipments	53%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
CFL Commercial Share of Shipments	47%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
Halogen and Incandescent - Residential Share of Shipments	85%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
Halogen and Incandescent - Commercial Share of Shipments	15%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated

Starting Saturation by Lumen and Type	See Table 2	Calculated based on A-lamp and Twist data from 2013 MA NMR Study

Usage by Technology Type (Hours/Day)

Incandescent	2.2	RI data from Northeast Residential Lighting Hours-of-Use Study (2014)
CFL	3.0	RI data from Northeast Residential Lighting Hours-of-Use Study (2014)
Halogen	2.2	RI data from Northeast Residential Lighting Hours-of-Use Study (2014)
LED	3.0	RI data from Northeast Residential Lighting Hours-of-Use Study (2014)

Table 14: United States Starting Assumptions

Type	Data	Source
Number of Housing Units (State)	117,219,214	Census, Occupied Housing; Annual Estimates of Housing Units for the United States, Regions, Divisions, States, and Counties: April 1, 2010 to July 1, 2013
Number of Housing Units (National)	117,219,214	Census, Occupied Housing; Annual Estimates of Housing Units for the United States, Regions, Divisions, States, and Counties: April 1, 2010 to July 1, 2013
Total Sockets: A-line/House	29.23	MA Onsite data and National socket data (Navigant 2010)
Total A-line Sockets	Varies by State	Calculated
Screw Based Socket %	100%	Adjustment Factor (not used)
Screw Based A-line Sockets	Varies by State	Calculated based on MA data and total households
Storage Rate (lamps per household)		
CFL	18.5%	Review of Northeast onsite survey data
Incandescent	24.9%	Review of Northeast onsite survey data
Halogen	0.0%	Review of Northeast onsite survey data
LED	0.0%	Review of Northeast onsite survey data
Housing Growth	0.35%	Calculated from 2012 to 2013 all housing change by state (Census)
Lifetimes (hours)		
Incandescent	1,255	D&R compiled major manufacturer and retailers technology comparison
CFL	8,000	D&R compiled ENERGY STAR technology comparison
Halogen	1,255	D&R compiled major manufacturer and retailers technology comparison
LED	25,000	D&R compiled ENERGY STAR technology comparison
Technology Share of Sales	Varies by year	NEMA Quarterly Reports
FTC CFL Imports - National	Varies by Year	Federal Trade Commission - Imports

Share of shipments by technology, by sector

CFL Residential Share of Shipments	53%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
CFL Commercial Share of Shipments	47%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
Halogen and Incandescent - Residential Share of Shipments	85%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated
Halogen and Incandescent - Commercial Share of Shipments	15%	DOE (Navigant) 2010 Lighting Market Characterization - Calculated

Starting Saturation by lumen and type	See Table 2	Calculated based on A-lamp and Twist data from 2013 MA NMR Study

Usage by Technology Type (Hours/Day)

Incandescent	2.3	MA data from Northeast Residential Lighting Hours-of-Use Study (2014)
CFL	3.0	MA data from Northeast Residential Lighting Hours-of-Use Study (2014)
Halogen	2.3	MA data from Northeast Residential Lighting Hours-of-Use Study (2014)
LED	3.0	MA data from Northeast Residential Lighting Hours-of-Use Study (2014)

Installed A-Lamps by Technology

Table 15: Installed A-Lamps by Technology and State

	CT				VT				MD			
Technology	2012	% Share	2013	% Share	2012	% Share	2013	% Share	2012	% Share	2013	% Share
Incandescent	27,940,763	58%	26,575,652	55%	4,177,837	58%	3,958,149	55%	36,552,990	58%	34,630,884	55%
CFL	19,903,367	41%	20,284,484	42%	3,000,017	41%	3,068,959	42%	26,247,937	41%	26,851,123	42%
Halogen	416,581	1%	1,315,964	3%	63,331	1%	201,361	3%	554,099	1%	1,761,760	3%
LED	99,440	0%	184,051	0%	14,938	0%	27,654	0%	130,697	0%	241,956	0%
Total	48,360,151	100%	48,360,151	100%	7,256,123	100%	7,256,123	100%	63,485,723	100%	63,485,723	100%

	DC				RI			
Technology	2012	% Share	2013	% Share	2012	% Share	2013	% Share
Incandescent	4,569,547	58%	4,329,261	55%	6,917,047	58%	6,550,672	55%
CFL	3,281,296	41%	3,356,701	42%	4,967,478	41%	5,081,632	42%
Halogen	69,269	1%	220,240	3%	105,548	1%	336,713	3%
LED	16,339	0%	30,247	0%	24,735	0%	45,791	0%
Total	7,936,450	100%	7,936,450	100%	12,014,808	100%	12,014,808	100%

	Regional				National				Total*	
Technology	2012	% Share	2013	% Share	2012	% Share	2013	% Share	2012 - % Share	2013 - % Share
Incandescent	349,415,385	58%	331,041,700	55%	2,012,294,208	59%	1,940,971,539	56%	56%	52%
CFL	250,907,875	41%	256,673,823	42%	1,389,213,777	40%	1,389,099,397	40%	42%	45%
Halogen	5,296,718	1%	16,840,917	3%	30,011,879	1%	95,422,781	3%	1%	3%
LED	1,249,355	0%	2,312,894	0%	7,079,007	0%	13,105,154	0%	0%	0%
Total	606,869,334	100%	606,869,334	100%	3,438,598,871	100%	3,438,598,871	100%	100%	100%

*Percent share is the same across all states, the Northeast region and nationally.

Installed A-Lamps by Technology by Reference Scenario

Table 16: Installed A-Lamps by Technology by Reference Scenario

Connecticut	EISA-Reference Case				CFL Low Lifetime Case			
Technology	**2012**	**% Share**	**2013**	**% Share**	**2012**	**% Share**	**2013**	**% Share**
Incandescent	27,940,763	58%	26,575,652	55%	28,487,870	59%	27,576,573	57%
CFL	19,903,367	41%	20,284,484	42%	19,356,260	40%	19,283,562	40%
Halogen	416,581	1%	1,315,964	3%	416,581	1%	1,315,964	3%
LED	99,440	0%	184,051	0%	99,440	0%	184,051	0%
Total	48,360,151	100%	48,360,151	100%	48,360,151	100%	48,360,151	100%

Vermont	EISA-Reference Case				CFL Low Lifetime Case			
Technology	**2012**	**% Share**	**2013**	**% Share**	**2012**	**% Share**	**2013**	**% Share**
Incandescent	4,177,837	58%	3,958,149	55%	4,257,279	59%	4,104,282	57%
CFL	3,000,017	41%	3,068,959	42%	2,920,575	40%	2,922,826	40%
Halogen	63,331	1%	201,361	3%	63,331	1%	201,361	3%
LED	14,938	0%	27,654	0%	14,938	0%	27,654	0%
Total	7,256,123	100%	7,256,123	100%	7,256,123	100%	7,256,123	100%

Maryland	EISA-Reference Case				CFL Low Lifetime Case			
Technology	**2012**	**% Share**	**2013**	**% Share**	**2012**	**% Share**	**2013**	**% Share**
Incandescent	36,552,990	58%	34,630,884	55%	37,248,047	59%	35,909,435	57%
CFL	26,247,937	41%	26,851,123	42%	25,552,880	40%	25,572,573	40%
Halogen	554,099	1%	1,761,760	3%	554,099	1%	1,761,760	3%
LED	130,697	0%	241,956	0%	130,697	0%	241,956	0%
Total	63,485,723	100%	63,485,723	100%	63,485,723	100%	63,485,723	100%

District of Columbia	EISA-Reference Case				CFL Low Lifetime Case			
Technology	2012	% Share	2013	% Share	2012	% Share	2013	% Share
Incandescent	4,569,547	58%	4,329,261	55%	4,656,437	59%	4,489,095	57%
CFL	3,281,296	41%	3,356,701	42%	3,194,406	40%	3,196,867	40%
Halogen	69,269	1%	220,240	3%	69,269	1%	220,240	3%
LED	16,339	0%	30,247	0%	16,339	0%	30,247	0%
Total	7,936,450	100%	7,936,450	100%	7,936,450	100%	7,936,450	100%

Rhode Island	EISA-Reference Case				CFL Low Lifetime Case			
Technology	2012	% Share	2013	% Share	2012	% Share	2013	% Share
Incandescent	6,917,047	58%	6,550,672	55%	7,048,588	59%	6,792,641	57%
CFL	4,967,478	41%	5,081,632	42%	4,835,937	40%	4,839,664	40%
Halogen	105,548	1%	336,713	3%	105,548	1%	336,713	3%
LED	24,735	0%	45,791	0%	24,735	0%	45,791	0%
Total	12,014,808	100%	12,014,808	100%	12,014,808	100%	12,014,808	100%

United States	EISA-Reference Case				CFL Low Lifetime Case			
Technology	2012	% Share	2013	% Share	2012	% Share	2013	% Share
Incandescent	2,012,294,208	59%	1,940,971,539	56%	2,049,940,819	60%	2,009,359,969	58%
CFL	1,389,213,777	40%	1,389,099,397	40%	1,351,567,166	39%	1,320,710,967	38%
Halogen	30,011,879	1%	95,422,781	3%	30,011,879	1%	95,422,781	3%
LED	7,079,007	0%	13,105,154	0%	7,079,007	0%	13,105,154	0%
Total	3,438,598,871	100%	3,438,598,871	100%	3,438,598,871	100%	3,438,598,871	100%

Northeast	Reference Case				CFL Low Lifetime Case			
Technology	2012	% Share	2013	% Share	2012	% Share	2013	% Share
Incandescent	349,415,385	58%	331,041,700	56%	356,059,537	59%	343,263,549	57%
CFL	250,907,875	41%	256,673,823	40%	244,263,723	40%	244,451,973	40%
Halogen	5,296,718	1%	16,840,917	3%	5,296,718	1%	16,840,917	3%
LED	1,249,355	0%	2,312,894	0%	1,249,355	0%	2,312,894	0%
Total	606,869,334	100%	606,869,334	100%	606,869,334	100%	606,869,334	100%

Connecticut	EISA-Low Case				EISA-High Case			
Technology	2012	% Share	2013	% Share	2012	% Share	2013	% Share
Incandescent	27,940,763	58%	26,575,652	55%	27,940,763	58%	26,575,652	55%
CFL	19,903,367	41%	20,284,484	42%	19,903,367	41%	20,284,484	42%
Halogen	416,581	1%	1,315,964	3%	416,581	1%	1,315,964	3%
LED	99,440	0%	184,051	0%	99,440	0%	184,051	0%
Total	48,360,151	100%	48,360,151	100%	48,360,151	100%	48,360,151	100%

Vermont	EISA-Low Case				EISA-High Case			
Technology	2012	% Share	2013	% Share	2012	% Share	2013	% Share
Incandescent	4,177,837	58%	3,958,149	55%	4,177,837	58%	3,958,149	55%
CFL	3,000,017	41%	3,068,959	42%	3,000,017	41%	3,068,959	42%
Halogen	63,331	1%	201,361	3%	63,331	1%	201,361	3%
LED	14,938	0%	27,654	0%	14,938	0%	27,654	0%
Total	7,256,123	100%	7,256,123	100%	7,256,123	100%	7,256,123	100%

Maryland	EISA-Low Case				EISA-High Case			
Technology	**2012**	**% Share**	**2013**	**% Share**	**2012**	**% Share**	**2013**	**% Share**
Incandescent	36,552,990	58%	34,630,884	55%	36,552,990	58%	34,630,884	55%
CFL	26,247,937	41%	26,851,123	42%	26,247,937	41%	26,851,123	42%
Halogen	554,099	1%	1,761,760	3%	554,099	1%	1,761,760	3%
LED	130,697	0%	241,956	0%	130,697	0%	241,956	0%
Total	63,485,723	100%	63,485,723	100%	63,485,723	100%	63,485,723	100%

District of Columbia	EISA-Low Case				EISA-High Case			
Technology	**2012**	**% Share**	**2013**	**% Share**	**2012**	**% Share**	**2013**	**% Share**
Incandescent	4,569,547	58%	4,329,261	55%	4,569,547	58%	4,329,261	55%
CFL	3,281,296	41%	3,356,701	42%	3,281,296	41%	3,356,701	42%
Halogen	69,269	1%	220,240	3%	69,269	1%	220,240	3%
LED	16,339	0%	30,247	0%	16,339	0%	30,247	0%
Total	7,936,450	100%	7,936,450	100%	7,936,450	100%	7,936,450	100%

Rhode Island	EISA-Low Case				EISA-High Case			
Technology	**2012**	**% Share**	**2013**	**% Share**	**2012**	**% Share**	**2013**	**% Share**
Incandescent	6,917,047	58%	6,550,672	55%	6,917,047	58%	6,550,672	55%
CFL	4,967,478	41%	5,081,632	42%	4,967,478	41%	5,081,632	42%
Halogen	105,548	1%	336,713	3%	105,548	1%	336,713	3%
LED	24,735	0%	45,791	0%	24,735	0%	45,791	0%
Total	12,014,808	100%	12,014,808	100%	12,014,808	100%	12,014,808	100%

United States	EISA-Low Case				EISA-High Case			
Technology	**2012**	**% Share**	**2013**	**% Share**	**2012**	**% Share**	**2013**	**% Share**
Incandescent	2,012,294,208	59%	1,940,971,539	56%	2,012,294,208	59%	1,940,971,539	56%
CFL	1,389,213,777	40%	1,389,099,397	40%	1,389,213,777	40%	1,389,099,397	40%
Halogen	30,011,879	1%	95,422,781	3%	30,011,879	1%	95,422,781	3%
LED	7,079,007	0%	13,105,154	0%	7,079,007	0%	13,105,154	0%
Total	3,438,598,871	100%	3,438,598,871	100%	3,438,598,871	100%	3,438,598,871	100%

Northeast	EISA-Low Case				EISA-High Case			
Technology	**2012**	**% Share**	**2013**	**% Share**	**2012**	**% Share**	**2013**	**% Share**
Incandescent	349,415,385	58%	331,041,700	55%	349,415,385	58%	331,041,700	55%
CFL	250,907,875	41%	256,673,823	42%	250,907,875	41%	256,673,823	42%
Halogen	5,296,718	1%	16,840,917	3%	5,296,718	1%	16,840,917	3%
LED	1,249,355	0%	2,312,894	0%	1,249,355	0%	2,312,894	0%
Total	606,869,334	100%	606,869,334	100%	606,869,334	100%	606,869,334	100%

Installed Lamps by Technology and Lumen Range

Table 17: Connecticut Installed A-Lamps by Technology and Lumen Range

Connecticut		EISA-Reference Case			
Technology	**Lumen**	**2012**	**2013**	**Difference**	**Percent Change**
Incandescent	<310	7,531	2,870	(4,660)	-61.88%
	310-749	3,582,246	3,562,923	(19,323)	-0.54%
	750-1049	12,228,876	11,909,714	(319,161)	-2.61%
	1050-1489	1,791,284	1,345,413	(445,871)	-24.89%
	1490-2600	2,562,317	2,071,219	(491,098)	-19.17%
	2600+	49,179	48,773	(406)	-0.82%
CFL	<310	-	-	-	N/A
	310-749	139,753	150,716	10,963	7.84%
	750-1049	1,737,472	1,873,768	136,296	7.84%
	1050-1489	322,943	443,508	120,565	37.33%
	1490-2600	579,787	720,500	140,713	24.27%
	2600+	5,666	6,110	444	7.84%
Halogen	<310	-	-	-	N/A
	310-749	-	-	-	N/A
	750-1049	200,194	381,015	180,821	90.32%
	1050-1489	64,362	361,424	297,062	461.55%
	1490-2600	126,010	459,236	333,226	264.44%
	2600+	-	-	-	N/A
LED	<310	3,515	6,612	3,097	88.13%
	310-749	5,195	11,390	6,195	119.24%
	750-1049	6,876	16,168	9,292	135.15%
	1050-1489	6,418	33,755	27,337	425.94%
	1490-2600	-	21,142	21,142	N/A
	2600+	-	-	-	N/A

Table 18: Vermont Installed A-Lamps by Technology and Lumen Range

Vermont		EISA-Reference Case			
Technology	Lumen	2012	2013	Difference	Percent Change
Incandescent	<310	1,682	887	(795)	-47.26%
	310-749	739,083	735,764	(3,319)	-0.45%
	750-1049	2,524,199	2,465,807	(58,392)	-2.31%
	1050-1489	371,756	297,445	(74,311)	-19.99%
	1490-2600	530,995	448,194	(82,801)	-15.59%
	2600+	10,122	10,052	(70)	-0.69%
CFL	<310	-	-	-	
	310-749	150,509	152,239	1,729	1.15%
	750-1049	1,871,197	1,892,698	21,500	1.15%
	1050-1489	347,799	369,030	21,232	6.10%
	1490-2600	624,410	648,820	24,410	3.91%
	2600+	6,102	6,172	70	1.15%
Halogen	<310	-	-	-	
	310-749	-	-	-	
	750-1049	32,679	67,187	34,507	105.59%
	1050-1489	9,827	58,137	48,310	491.61%
	1490-2600	20,824	76,036	55,212	265.13%
	2600+	-	-	-	
LED	<310	4,402	5,197	795	18.05%
	310-749	2,721	4,310	1,590	58.43%
	750-1049	1,039	3,423	2,384	229.52%
	1050-1489	6,777	11,545	4,769	70.37%
	1490-2600	-	3,179	3,179	
	2600+	-	-	-	

Table 19: Maryland Installed A-Lamps by Technology and Lumen Range

Maryland		EISA-Reference Case			
Technology	Lumen	2012	2013	Difference	Percent Change
Incandescent	<310	14,714	7,760	(6,954)	-47.26%
	310-749	6,466,428	6,437,390	(29,038)	-0.45%
	750-1049	22,084,882	21,573,994	(510,888)	-2.31%
	1050-1489	3,252,588	2,602,424	(650,164)	-19.99%
	1490-2600	4,645,817	3,921,369	(724,448)	-15.59%
	2600+	88,561	87,948	(613)	-0.69%
CFL	<310	-	-	-	
	310-749	1,316,846	1,331,976	15,131	1.15%
	750-1049	16,371,594	16,559,707	188,112	1.15%
	1050-1489	3,042,981	3,228,742	185,761	6.10%
	1490-2600	5,463,130	5,676,699	213,569	3.91%
	2600+	53,386	53,999	613	1.15%
Halogen	<310	-	-	-	
	310-749	-	-	-	
	750-1049	285,921	587,836	301,915	105.59%
	1050-1489	85,979	508,660	422,681	491.61%
	1490-2600	182,199	665,263	483,064	265.13%
	2600+	-	-	-	
LED	<310	38,516	45,470	6,954	18.05%
	310-749	23,803	37,710	13,907	58.43%
	750-1049	9,089	29,950	20,861	229.52%
	1050-1489	59,289	101,011	41,722	70.37%
	1490-2600	-	27,815	27,815	
	2600+	-	-	-	

Table 20: District of Columbia Installed A-Lamps by Technology and Lumen Range

District of Columbia		EISA-Reference Case			
Technology	Lumen	2012	2013	Difference	Percent Change
Incandescent	<310	1,839	970	(869)	-47.26%
	310-749	808,378	804,748	(3,630)	-0.45%
	750-1049	2,760,866	2,696,999	(63,867)	-2.31%
	1050-1489	406,611	325,333	(81,278)	-19.99%
	1490-2600	580,781	490,217	(90,564)	-15.59%
	2600+	11,071	10,994	(77)	-0.69%
CFL	<310	-	-	-	
	310-749	164,621	166,512	1,892	1.15%
	750-1049	2,046,639	2,070,155	23,516	1.15%
	1050-1489	380,408	403,630	23,222	6.10%
	1490-2600	682,954	709,653	26,699	3.91%
	2600+	6,674	6,751	77	1.15%
Halogen	<310	-	-	-	
	310-749	-	-	-	
	750-1049	35,743	73,486	37,743	105.59%
	1050-1489	10,748	63,588	52,840	491.61%
	1490-2600	22,777	83,166	60,389	265.13%
	2600+	-	-	-	
LED	<310	4,815	5,684	869	18.05%
	310-749	2,976	4,714	1,739	58.43%
	750-1049	1,136	3,744	2,608	229.52%
	1050-1489	7,412	12,628	5,216	70.37%
	1490-2600	-	3,477	3,477	
	2600+	-	-	-	

Table 21: Rhode Island Installed A-Lamps by Technology and Lumen Range

Rhode Island		EISA-Reference Case			
Technology	**Lumen**	**2012**	**2013**	**Difference**	**Percent Change**
Incandescent	<310	2,785	1,469	(1,316)	-47.26%
	310-749	1,223,785	1,218,290	(5,496)	-0.45%
	750-1049	4,179,269	4,081,929	(97,340)	-2.33%
	1050-1489	615,422	491,463	(123,959)	-20.14%
	1490-2600	879,026	740,877	(138,148)	-15.72%
	2600+	16,760	16,644	(116)	-0.69%
CFL	<310	-	-	-	
	310-749	249,216	252,079	2,864	1.15%
	750-1049	3,098,359	3,133,960	35,601	1.15%
	1050-1489	575,891	611,046	35,156	6.10%
	1490-2600	1,033,909	1,074,327	40,418	3.91%
	2600+	10,103	10,219	116	1.15%
Halogen	<310	-	-	-	
	310-749	-	-	-	
	750-1049	54,453	112,244	57,791	106.13%
	1050-1489	16,408	97,316	80,908	493.08%
	1490-2600	34,687	127,152	92,466	266.58%
	2600+	-	-	-	
LED	<310	7,289	8,605	1,316	18.05%
	310-749	4,505	7,137	2,632	58.43%
	750-1049	1,720	5,668	3,948	229.52%
	1050-1489	11,221	19,117	7,896	70.37%
	1490-2600	-	5,264	5,264	
	2600+	-	-	-	

Table 22: Northeast Region Installed A-Lamps by Technology and Lumen Range

Northeast		EISA-Reference Case			
Technology	**Lumen**	**2012**	**2013**	**Difference**	**Percent Change**
Incandescent	<310	140,650	74,179	(66,471)	-47.26%
	310-749	61,813,531	61,535,951	(277,580)	-0.45%
	750-1049	211,112,623	206,228,966	(4,883,657)	-2.31%
	1050-1489	31,091,966	24,876,953	(6,215,013)	-19.99%
	1490-2600	44,410,046	37,484,945	(6,925,101)	-15.59%
	2600+	846,570	840,706	(5,864)	-0.69%
CFL	<310	-	-	-	
	310-749	12,587,921	12,732,558	144,637	1.15%
	750-1049	156,498,471	158,296,665	1,798,194	1.15%
	1050-1489	29,088,303	30,864,019	1,775,716	6.10%
	1490-2600	52,222,859	54,264,396	2,041,536	3.91%
	2600+	510,321	516,185	5,864	1.15%
Halogen	<310	-	-	-	
	310-749	-	-	-	
	750-1049	2,733,165	5,619,215	2,886,050	105.59%
	1050-1489	821,888	4,862,358	4,040,470	491.61%
	1490-2600	1,741,666	6,359,345	4,617,680	265.13%
	2600+	-	-	-	
LED	<310	368,184	434,655	66,471	18.05%
	310-749	227,533	360,476	132,942	58.43%
	750-1049	86,883	286,296	199,414	229.52%
	1050-1489	566,756	965,583	398,827	70.37%
	1490-2600	-	265,885	265,885	
	2600+	-	-	-	

Table 23: United States Installed A-Lamps by Technology and Lumen Range

United States		EISA-Reference Case			
Technology	**Lumen**	**2012**	**2013**	**Difference**	**Percent Change**
Incandescent	<310	796,943	420,309	(376,634)	-47.26%
	310-749	351,871,943	351,121,543	(750,399)	-0.21%
	750-1049	1,216,438,578	1,198,991,621	(17,446,957)	-1.43%
	1050-1489	179,934,446	154,816,051	(25,118,396)	-13.96%
	1490-2600	258,389,503	230,759,103	(27,630,399)	-10.69%
	2600+	4,862,795	4,862,912	116	0.00%
CFL	<310	-	-	-	
	310-749	69,696,149	69,693,280	(2,869)	0.00%
	750-1049	866,492,661	866,456,990	(35,671)	0.00%
	1050-1489	161,054,614	161,019,389	(35,225)	-0.02%
	1490-2600	289,144,834	289,104,335	(40,498)	-0.01%
	2600+	2,825,520	2,825,403	(116)	0.00%
Halogen	<310	-	-	-	
	310-749	-	-	-	
	750-1049	15,486,459	31,839,185	16,352,726	105.59%
	1050-1489	4,656,921	27,550,736	22,893,816	491.61%
	1490-2600	9,868,499	36,032,860	26,164,361	265.13%
	2600+	-	-	-	
LED	<310	2,086,175	2,462,809	376,634	18.05%
	310-749	1,289,232	2,042,500	753,268	58.43%
	750-1049	492,289	1,622,192	1,129,903	229.52%
	1050-1489	3,211,311	5,471,116	2,259,805	70.37%
	1490-2600	-	1,506,537	1,506,537	
	2600+	-	-	-	

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