

Assessment of the Early Effects of EISA and AB 1109 in California



Prepared for the California Public Utilities Commission Energy Division
Work Order 13: Lighting Programs Process Evaluation and Market Characterization

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E. Executive Summary

E.1 Report Overview

The purpose of this report is to provide preliminary insights into the availability of general purpose lamp technologies (medium screw based incandescent and halogen A-lamps) and expected consumer purchasing behaviors as a result of changes in general purpose lamp availability. Key research questions include:

1. Has general purpose lamp availability changed after California Assembly Bill 1109 (AB 1109) and/or the Energy Independence and Security Act (EISA) have gone into effect?
2. Are consumers aware of EISA and/or AB 1109?
3. How will California and U.S. consumers respond when traditional general purpose incandescent lamps are no longer available? What will they purchase?
4. What can we learn from the response of international lighting markets with similar regulations in place?

This report provides information regarding the current state of the U.S. and California lighting markets as well as insights regarding the effects of similar lighting regulations in international markets.

E.2 Methods

This report draws on data from four key sources:

- (1) **Literature review** of secondary source materials with information on EISA, AB 1109, and/or similar international lighting regulations;
- (2) **Interviews** with nearly 40 representatives of lighting retailers, distributors, and manufacturers as well as other lighting market experts conducted in early 2012;
- (3) **Telephone surveys** with 800 California consumers conducted in mid-2012; and
- (4) **Lighting retail store shelf surveys** collected by DNV KEMA staff in California retail stores during the Fall of 2011 (184 stores) and Summer of 2012 (200 stores).

E.3 Key Findings

Below we summarize our findings regarding the early effects of EISA and AB 1109 on lamp availability, awareness of EISA and AB 1109, and consumer purchasing behavior as well as international response to similar regulations.

E.3.1 Lamp Availability

Based on available lamp shipment and market share data from 2011, there are no indications that the availability of incandescent lamps in the national market has decreased as a result of pending EISA regulations which began being phased in in 2012. Recent national lamp shipment data showed a spike in incandescent lamp imports in the last quarter before EISA regulations took effect which suggests that retailers may be stocking up on incandescent lamps before EISA is fully implemented for general purpose A-lamps.

In both California and the U.S. as a whole, EISA-compliant and non-compliant general purpose A-lamps remain widely available—however in California, the availability of non-compliant lamps is beginning to show signs of decline. During Fall 2011, the majority of general purpose A-lamps observed in a sample of California retail stores were not compliant with EISA or AB 1109 efficacy standards. By Summer 2012, however, there was a noticeable increase in the proportion of EISA-compliant lamps as well as the average number of EISA-compliant lamps available in California stores.

E.3.2 Awareness of EISA and AB 1109

Consumer awareness of both EISA in the U.S. and AB 1009 in California is moderate as of 2012, and awareness of EISA appears to be increasing over time at the national level. Four years ago, the lamp manufacturer OSRAM Sylvania began tracking consumer awareness of EISA nationally, and 2011 was the first year in which the majority of consumers indicated that they were aware of EISA regulations. As of mid-2012, DNV KEMA survey results in California indicated that less than half of California consumers were aware of EISA, and only around one in five California consumers surveyed at that time were aware of AB 1109.

E.3.3 Effects of Regulations on Consumer Purchasing Behaviors

The majority of consumers in California and in the U.S. as a whole indicate that they will switch to a new technology in response to the incandescent lamp phase-out. However, approximately

30 percent of consumers (both nationally and in California) report that they will move to a different incandescent lamp wattage rather than adopt a new lamp technology (a practice known as bin jumping).

E.3.4 International Regulations

In other countries with EISA-like regulations aimed at phasing out incandescent lamps over time, consumer response has been varied and unpredictable. For these reasons, it is challenging to use international market response to predict how EISA regulations will impact the U.S. lighting market. However, one trend worth noting is the unexpected increase of halogen lamp sales as a result of the phase-out of incandescent lamps. It is clear that monitoring the market share of halogen lamps (which are less efficient than CFLs which many regulators assumed would be the dominant replacement lamp technology) as well as monitoring the proportion of consumers who stockpile and hoard incandescent lamps will be important to understand the impacts of EISA and AB 1109 regulations.

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1. Background

1.1 Report Purpose

The California Public Utilities Commission (CPUC) requested that DNV KEMA Energy and Sustainability (DNV KEMA) perform a study to assess the possible early effects of the Energy Independence and Security Act (EISA) and California Assembly Bill 1109 (AB 1109), The Lighting Efficiency and Toxics Reduction Act, on California's market for general purpose replacement lamps. This work was performed under the auspices of CPUC Evaluation, Measurement, and Verification (EM&V) Work Order (WO) 13: Lighting Programs Process Evaluation and Market Characterization.

The purpose of this report is to provide preliminary insights into the availability of general purpose lamp technologies (i.e., medium screw based incandescent and halogen A-lamps) and expected consumer purchasing behaviors as a result of changes in incandescent lamp availability. Key research questions include:

1. Has general purpose lamp availability changed after California Assembly Bill 1109 (AB 1109) and/or the Energy Independence and Security Act (EISA) have gone into effect?
2. Are consumers aware of EISA and/or AB 1109?
3. How will California and U.S. consumers respond when traditional general purpose incandescent lamps are no longer available? What will they purchase?
4. What can we learn from the response of international lighting markets with similar regulations in place?

This report provides information regarding the current state of the U.S. and California lighting markets as well as insights regarding the effects of similar lighting regulations in international markets.

1.2 Overview of Lighting Regulations

1.2.1 Energy Independence and Security Act

EISA, passed by the U.S. Congress in 2007, requires general purpose lamps¹ to meet new efficacy standards (as detailed in Table 1-1). The standards do not ban incandescent lamps or lamps of a specific wattage, which are common misconceptions regarding EISA. Instead, it establishes minimum efficacy requirements that traditional incandescent lamps cannot meet, effectively pushing the most inefficient lamps out of the market. EISA's efficacy requirements target the most common general purpose lamps; thus, many lamp types are exempt from the standards (including three-way, high light output², shatter resistant, rough service, and vibration service lamps).³

**Table 1-1
Summary of EISA Efficacy Requirements**

EISA Effective Dates	Incandescent Lamp Wattage (W)	Typical Incandescent Light Output in Lumens (lm)	Typical Incandescent Efficacy (lm/W)	EISA Replacement Wattage (W)	EISA Light Output Ranges (lm)	EISA Minimum Efficacy Ranges (lm/W)
1/1/2012	100 W	1690 lm	17 lm/W	72 W	1490-2600 lm	21-36 lm/W
1/1/2013	75 W	1170 lm	16 lm/W	53 W	1050-1489 lm	20-28 lm/W
1/1/2014	60 W	840 lm	14 lm/W	43 W	750-1049 lm	17-24 lm/W
1/1/2014	40 W	490 lm	12 lm/W	29 W	310-749 lm	11-26 lm/W

Source: U.S. Environmental Protection Agency (EPA), 2011.

As demonstrated in Table 1-1 above, EISA standards are phasing in gradually; the law prohibits manufacture and importation of general purpose lamps above 72 watts with light output ranging

¹ EISA defines a *general purpose lamp* as a standard incandescent or halogen type lamp that is intended for general service applications; has a medium screw base; falls within a lumen range of 310 to 2,600 lumens; and is capable of being operated at a voltage at least partially within 110 and 130 volts. We apply this definition of general purpose lamps throughout this report.

² High light output lamps are defined by lumen levels greater than 2,600 lumens and are typically represented by 150-300W traditional incandescent bulbs.

³ According to the U.S. EPA (2011), the U.S. Department of Energy (DOE) will monitor sales of exempt lamp types going forward, and if sales increase substantially, the DOE has the authority to apply efficacy standards to those lamp types.

from 1490 to 2600 lumens (referred to as “high brightness” throughout this report) into the U.S. as of January 1, 2012.⁴ This first step began phasing many traditional 100 watt incandescent lamps out of the market. However, EISA does not regulate 100 watt incandescent lamps that fall outside of the 1490 to 2600 lumen range, creating a loophole that allows extremely inefficient lamps to linger on the market for at least an additional year until EISA affects the next lumen bin (1050-1489 lumens; see Section 3.1.2.3 below for more detail). In other words, traditional 100 watt incandescent lamps with brightness less than 1490 lumens were not affected by the first phase of EISA implemented in January 2012, but will instead be affected by later phases of EISA.

In addition to regulating manufacture and importation of general purpose incandescent lamps, EISA also includes efficacy standards for reflector lamps and fluorescent tube lamps (the latter of which were not included as part of this study) as well as a second phase of regulations set to start in 2020, which will require at least 45 lumens per watt (lm/W) for all general purpose lamps.⁵ However, enforcement of EISA was recently defunded and delayed by the U.S. House of Representatives, creating the potential for phased-out incandescent lamps to continue to enter the U.S. market (although research has provided no direct evidence that this is occurring).⁶

1.2.2 California Assembly Bill 1109: California Lighting Efficiency and Toxics Reduction Act

AB 1109, the California Lighting Efficiency and Toxics Reductions Act, was also passed in 2007 and required the California Energy Commission (CEC) to develop and implement a strategy that would reduce California’s energy consumption related to general purpose indoor lighting by 50 percent by 2018.⁷ California adopted the same efficacy standards as EISA, however, the effective dates for AB 1109 are one year earlier (Table 1-2).⁸ AB 1109 also requires the state to

⁴ H.R. 6--110th Congress, 2007.

⁵ *Ibid.*

⁶ *Cardwell, 2011.*

⁷ *Huffman, 2007.*

⁸ For example, 100 Watt incandescent light-bulbs were banned in California starting January 1, 2011 with 75W bulbs banned starting January 1, 2012.

set up a recycling program for lighting products and prohibits the sale of general purpose lamps that exceed certain levels of hazardous substances.⁹

**Table 1-2
Timing Comparison: EISA (U.S.) and AB 1109 (California)**

Affected Light Output Ranges (lm)	Effective Dates of Regulation	
	EISA (United States)	AB 1109 (California)
1490-2600 lm	1/1/2012	1/1/2011
1050-1489 lm	1/1/2013	1/1/2012
750-1049 lm	1/1/2014	1/1/2013
310-749 lm	1/1/2014	1/1/2013

1.2.3 International Regulations

Many nations have passed lighting efficacy requirements in an effort to save energy and reduce emissions by removing inefficient incandescent lamps from the market. Understanding the response of lighting markets in other countries to standards that phase out inefficient lamps over time may help us anticipate the potential response to EISA and AB 1109 in the U.S. and California, respectively.

Our analyses in this area focused on Australia, Austria, and the United Kingdom (UK)¹⁰ because of similarities of regulations in these countries to the EISA standards, the availability of pre-regulation lighting market data from the International Energy Agency, and their contrasting market response to pending lighting regulations.¹¹ Similar to EISA and AB 1109, the various

⁹ California prohibited the same levels of hazardous substances as the European Union pursuant to the Restriction of Hazardous Substances (RoHS) Directive. RoHS took effect in 2006 and restricts the use of six hazardous materials in electronics; lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ether.

¹⁰ EU and Australian lighting regulations took effect in September and November of 2009, respectively. Regulations in both regions are being phased in over time, similar to EISA and AB 1109. The UK market was the only market with data available for a complete year (2010) after regulations began.

¹¹ 2010 market data showing the possible effects of the first year of regulations was only available for the UK lighting market.

international regulations are not technology-specific, but are phrased as quantitative performance standards which will effectively ban most traditional incandescent lamps.¹² Also similar to EISA and AB 1109, all of the international regulations that we examined are being phased in over time and have exclusions for incandescent lamps of specific types for which viable, more efficient alternatives do not exist.

¹² International Energy Agency, 2010.

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2. Methodology

This report draws on data from four key sources:

- (1) **Literature review** of secondary source materials with information on EISA, AB 1109, and other similar international lighting regulations;
- (2) **Interviews** with nearly 40 lighting retailers, distributors, manufacturers, and market experts in early 2012;
- (3) **Telephone surveys** with 800 California consumers during mid-2012; and
- (4) **Lighting retail store shelf surveys** in 184 California retail stores collected by DNV KEMA staff during the third and fourth quarters of 2011 and in 200 California retail stores during the third quarter of 2012.

This section of the report summarizes the methods associated with each of the above sources.

2.1 Literature Review

The literature review involved gathering and reviewing secondary source materials regarding U.S., California, and international lighting regulations to help identify information related to the key research questions for this study. Because the number of potentially-relevant publications was relatively large, the first step in this task involved preparing a list of source materials that each met a set of specific criteria. To be included in the list, a publication had to be:

1. Published between 2007 and 2011, with emphasis on publications from 2010 and later;
2. Completed and available (i.e., not a “work in progress”);
3. Focused on EISA, AB 1109, and/or similar international lighting regulations, with specific attention toward the impact of lighting regulations on market and consumer behavior;
4. Unique/not redundant with another study on the list (e.g., if an evaluation report is included, a conference paper summarizing the results of this report was typically excluded); and
5. Available free of charge.

Table 2-1 lists the 25 relevant publications that met the criteria described above. Appendix A (Bibliography) includes complete citations for all sources included in the literature review and referenced throughout the report.

**Table 2-1
Publications with Information Relevant to EISA/AB 1109 Study**

Date	Author(s)	Title	Sponsor	Overview
Jun 2012	DNV KEMA	California LED Lamp Market Characterization Report	California Public Utilities Commission Energy Division (CPUC ED)	Report characterizes the current state of the LED replacement lamp market in California, including the availability, diversity, and pricing of LED lamps. This report also includes lighting supplier interviews with questions on the awareness and potential impact of lighting regulations (EISA and AB 1109) which were leveraged for this report.
May 2012	DNV KEMA	2011-2012 Northwest Residential Lighting Tracking and Monitoring Study	Northwest Energy Efficacy Alliance (NEEA)	Report includes results of consumer survey about awareness of EISA and expected purchasing decisions when incandescent lamps are not available. The report also has retailer and manufacturer forecasts for the lighting market after EISA.
May 2012	DNV KEMA	Fall 2011 California Lighting Retail Store Shelf Survey Report	CPUC ED	Report focused on the availability, diversity, and pricing of replacement lamps found at 184 California stores in Fall 2011.
Mar 2012	National Electrical Manufacturers Association (NEMA)	Shipments of Incandescent Lamps Illuminate at the Close of 2011		NEMA article presenting lamp import data which indicates an uptick in incandescent lamp imports in the final quarter of 2011, right before EISA took effect.
Dec 2011	Cardwell, Diane (NY Times)	Despite Delay, the 100-Watt Bulb Is on Its Way Out		NY Times article about recent House of Representatives vote to delay enforcement of EISA.
Dec 2011	National Electrical Manufacturers Association (NEMA)	NEMA Reiterates that Light bulb Efficacy Standard Remain, Consumers Retain Diverse Option for Efficient Light bulbs		NEMA article about the postponed enforcement of EISA and the potential negative impact on lighting manufacturers.
Nov 2011	United States Environmental Protection Agency (EPA)	Next Generation Lighting Programs: Opportunities to Advance Efficient Lighting for a Cleaner Environment		Report details the potential impact of EISA on lighting programs as well as some common misconceptions about the rules and impacts of EISA. This report also details the findings from IEA's report about the impact of lighting legislation in other countries.
Nov 2011	KRC Research	4th Annual Sylvania Socket Survey	OSRAM Sylvania	PowerPoint detailing results of the survey. Consumer awareness and product purchasing response to EISA are examined.
Nov 2011	NMR Group, Inc.	Connecticut Lighting Focus Groups: Exploration of Changes in the Lighting Market and Reactions to Various Efficient Lighting Choices	Connecticut Energy Efficacy Board	PowerPoint detailing results of consumer focus groups help in Connecticut in late 2011. The focus groups assessed consumer awareness and expected response to EISA.

Table 2-1 continued

Date	Author(s)	Title	Sponsor	Overview
Nov 2011	Reuters	China to Phase Out Incandescent Light Bulbs in 5 Years: Report		Online article about China's plan to phase out incandescent lamps.
Sep 2011	Buhr, Tami (Opinion Dynamics Corp.)	The Future of CFL Programs after EISA	Presentation prepared for ACEEE (Denver, 2011)	Summary of consumer survey about awareness, acceptance, and opposition to EISA.
Aug 2011	Ecos Consulting	Your Guide to More Efficient and Money-Saving Light Bulbs	Natural Resources Defense Council (NRDC)	Online resource for consumers to understand the costs and benefits associated with different lighting options
Jul 2011	International Energy Agency (IEA)	Draft Benchmarking Impact of "Phase-Out" Regulations on Lighting Markets	IEA's Mapping and Benchmarking Annex of the Efficacy End-use Electrical Equipment Implementing Agreement (4E)	IEA report analyses the impact of efficacy standards on international lighting markets. The report has detailed sales data and trends for countries that already passed EISA like legislation. Explains why some countries have been more successful than others and why certain trends occurred that were different from expectations.
May 2011	D&R International, Ltd.	Product Snapshot: LED Replacement Lamps	U.S. Dept. of Energy (DOE)	Updates the 2010 report. Presents an analysis of the dataset underlying the DOE Lighting Facts product list. Presents findings on LED replacement lamp market and its trajectory. Concludes that performance of LEDs remains highly variable for characteristics such as rated life, CRI, CCT, light distribution, etc. Report also concludes that while available light output has been rising among replacement lamps, they will not improve enough to replace 100W lamps by 2012. Findings show that 75W replacement lamps are expected to reach the market between mid 2011 and 2013, with 100W replacements reaching the market between mid 2013 and mid 2015.

Table 2-1 continued

Date	Author(s)	Title	Sponsor	Overview
May 2011	Hodgkiss, J.	Domestic Lighting Stage 2 Compliance Project	UK National Measurement Office and EuP	Report attempts to quantify the remaining banned incandescent lamps still available for purchase in the UK market. The availability of banned products is explored as well as the opportunities for banned products to continue to enter the market because of enforcements loopholes.
Apr 2011	The Cadmus Group	What will the Lighting Market Look Like Under EISA?	National Symposium on Market Transformation	Presentation on market expert forecasts for the lighting market post EISA.
Mar 2011	GE Lighting	Point of View: A transforming Global Lighting Industry		Paper offers GE's perspective on the rapidly changing lighting market and new efficient products that can fill the void left by the incandescent phase-out.
Mar 2011	Rubinstein, Francis (LBNL); Horowitz, Noah (NRDC); Harris, Jeff (NEEA)	What to do with the "Incandescent Phase-out"	American Energy Efficacy Economy (ACEEE)	Presentation prepared for ACEEE conference. Details the rules of EISA, and U.S. sales trends of incandescent lamps and CFLs.
Sep 2010	D&R International, Ltd.	Product Snapshot: LED Replacement Lamps 2010	U.S. Dept. of Energy	Outlines status of LED market and legislation that effects future of market. Presents data for current LED market diversity, with comparisons to CFL and Incandescent lamps. Presents multiple graphs showing LED market status compared to Energy Independence Security Act (EISA) benchmarks.
Sep 2010	D&R International, Ltd.	ENERGY STAR CFL Market Profile: Data Trends and Market Insights	U.S. Dept. of Energy	Report details the current state of the CFL market including market share, pricing, shipment trends, installed base, customer satisfaction, and impacts of EISA.
Jun 2010	Navigant Consulting Europe, Ltd.	Task 3: Review of Sales and Inventory Estimates	UK Department for Environment, Food and Rural Affairs, Swedish Energy Agency, and the European Council for an Energy Efficacy Economy	Report about EU regulations. Lighting market size and growth projections are analyzed to inform legislation.

Table 2-1 continued

Date	Author(s)	Title	Sponsor	Overview
Apr 2010	International Energy Agency	Phase Out of Incandescent Lamps – Implications for International Supply and Demand for Regulatory Compliant Lamps		Report analyzes the impact of new lighting regulations from around the world on the international supply and demand of compliant lamps, specifically CFLs and halogens. Summaries of EISA like regulations from other countries.
Mar 2009	Commission of the European Communities	Commission Staff Working Document, Full Impact Assessment, Accompanying document to the Commission Regulation implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to eco-design requirements for non-directional household lamps		Report details the lighting regulation in the UK as well as the voluntary agreement struck between the government and retailers prior to the new lighting standards taking effect.
Mar 2009	McDermott, Matthew	India to Phase Out 400 Million Incandescent Lightbulbs by 2012, Replace with CFLs		Online article about India's plan to remove 400 million incandescent bulbs. India did not pass lighting efficacy regulations. They are using CDM funding to buy-down the incremental cost of CFLs to make them the same price as incandescent lamps.
Mar 2007	Huffman, Jared	California Can Shine Across the Nation by Enacting Performance Based Lighting Efficacy Legislation		Online article detailing CA AB 1109.

2.2 In-Depth Interviews

This study was originally planned to include in-depth telephone interviews with up to 12 domestic and international lighting market experts. The purpose of the interviews was to elicit perspectives from lighting market experts regarding the current and expected effects of EISA and AB 1109 on the national and California lighting markets respectively. At the outset of the study, DNV KEMA staff anticipated that available information pertaining to the impact of lighting regulations on markets and consumer behavior was limited, and as such, DNV KEMA staff planned to probe lighting market experts about their awareness of relevant domestic and international studies. However, once DNV KEMA staff began the literature review task (described above in Section 2.1) it became apparent that there were numerous relevant studies about the impacts of lighting efficacy regulations on markets around the world. The quality of information obtained during the literature review thus lessened the need for scripted interviews.

After consulting with CPUC ED staff, DNV KEMA staff instead used the in-depth interviews on an as-needed basis to obtain clarification of market insights obtained from published reports and other materials. In this regard, DNV KEMA staff interviewed two lighting policy experts to clarify the rules and exceptions of AB 1109 and EISA and to ensure that an accurate understating of the regulations was applied to the analyses in this report.

Additionally, this report benefited from the results of recent interviews conducted with lighting market representatives for the *California LED Lamp Market Characterization* study (DNV KEMA, 2012). As part of this study, DNV KEMA staff completed 37 in-depth interviews with lighting market actors in early 2012 (Table 2-2). These interviews included a series questions related to EISA and AB 1109 and helped provide a robust picture of the awareness and projected impacts of EISA and AB 1109.

Table 2-2
Number of Completed In-Depth Interviews by Market Actor Type, 2012*

Market Actor Type	Number of Completed Interviews
Manufacturer	12
Distributor	8
Retailer – Brick and Mortar	9
Retailer – Online	6
Market Expert	2
Total Interviews	37

* Interviews completed for *California LED Lamp Market Characterization* study (DNV KEMA, 2012).

2.3 Consumer Surveys

As part of CPUC EM&V WO28 (Upstream and Residential Downstream Lighting Impact Evaluation), the DNV KEMA team has begun conducting telephone surveys with consumers who reside in the three California investor-owned electric utility service territories (Pacific Gas & Electric [PG&E], Southern California Edison [SCE], and San Diego Gas & Electric [SDG&E]). The primary purpose of these surveys is to gauge purchase and installation rates as well as other behaviors related to several lamp technologies (including compact fluorescent, light-emitting diode [LED], and energy-efficient incandescent lamps).

For the phase conducted in mid-2012, these surveys included a series of questions aimed at examining consumer awareness and understanding of EISA and its early implementation in California as part of AB 1109. The surveys also examined actual consumer purchases as well as planned purchasing decisions in response to the phase-out of traditional incandescent lamps. California consumers were asked whether they attempted to purchase 100 watt incandescent lamps in 2011 (after the AB 1109 standard went into effect for lamps in the 1490 to 2600 lumen bin), and if so, what they ultimately purchased (i.e., a 100 watt incandescent lamp, a different lamp wattage, or a different lamp type). California consumers were also probed about their anticipated response to changes in general purpose incandescent lamp availability.

Using a stratified sampling approach (based on utility service territory, rate class, climate zone, and high/medium/low average daily energy consumption), DNV KEMA is conducting the consumer surveys in phases. The team completed the first phase of 800 surveys in July, 2012, and will conduct additional phases later in 2012 and in 2013. Results from the July 2012 survey phase are included in this report.

2.4 California Lighting Retail Store Shelf Surveys

This report draws on data from three phases of lighting retail store shelf surveys in California: Summer 2012, Fall 2011, and Spring 2009.

2.4.1 Fall 2011 and Summer 2012

This report leverages data collected as part of the Fall 2011 California Lighting Retail Store Shelf Survey study published by DNV KEMA in 2012 as part of WO13 as well as data collected during shelf surveys conducted in Summer 2012 as part of WO28. Data from these shelf surveys provide the foundation for assessments of lamp availability and AB 1109 compliance in the California market as discussed in this report.

As part of the shelf survey work, field researchers conducted complete inventories (shelf surveys) of replacement lamps in 184 California retail stores in late August through November 2011 (referred to as the “Fall 2011” shelf surveys) and in 200 California retail stores during July and August 2012 (“Summer 2012;” see Table 2-3). Researchers conducted these surveys in seven retail channels (including discount, drug, grocery, hardware, large home improvement, mass merchandise, and membership club stores) and collected detailed information on product characteristics and prices. There were 34 instances of retail store overlap between the two shelf survey efforts, meaning that there were 34 stores in which field staff conducted shelf surveys in both Fall 2011 and Summer 2012.

**Table 2-3
Number of Stores by Retail Channel -
California Retail Lighting Store Shelf Surveys, Fall 2011 and Summer 2012**

Retail Channel	Number of Stores Surveyed Fall 2011	Number of Stores Surveyed Summer 2012
Discount	27	28
Drug	27	27
Grocery	27	30
Hardware	27	28
Large home improvement	26	29
Mass merchandise	24	29
Membership	26	29
Total Number of Stores	184	200

The Fall 2011 and Summer 2012 shelf survey databases each contain more than 20,000 records.¹³ Each record includes key information regarding each store visited (such as the retail channel, store name, IOU service territory, and store address) as well as information specific to each package of lamps in the store, including model number, lamp type, base type, lamp style, manufacturer, wattage, and number of lamps in each package. Additionally, field staff recorded

¹³ Each record in the database represents a particular lamp model and packaging configuration in a specific store during a shelf survey visit. Researchers may have found the same lamp model in multiple stores. As such, the number of unique models represented by the database is lower than the total number of records.

the number of packages, whether or not the lamps are 3-way or dimmable, full price, discounted price and discount provider (if relevant), rated life, color temperature, lamp coating, lumens, wattages, and whether each model was 3-way, dimmable, and/or Energy Star labeled for each package of lamps.¹⁴

2.4.2 Spring 2009

In support of the 2006-2008 California Upstream Lighting Program process and impact evaluations, DNV KEMA field researchers conducted 48 complete inventories of lamps on California retail store shelves in April and May of 2009. The Spring 2009 California comprehensive shelf survey database includes over 5,000 records.

As with the Fall 2011 and Summer 2012 shelf survey databases, the Spring 2009 shelf survey database includes key information for each record, including channel, store name, IOU territory, address, city, and zip code in which the lamps were found as well as the model number, lamp type, base type, lamp shape, manufacturer, wattage, and number of lamps in each package. Field staff conducting shelf surveys in Spring 2009 also recorded the number of packages, whether or not the lamps are 3-way or dimmable, and the price for each package of lamps.

Field staff recorded these data across the same seven retail channels as in the Fall 2011 and Summer 2012 research phases. However, to make meaningful comparisons between Spring 2009, Fall 2011, and Summer 2012, we have only included stores from “big box” channels (e.g., home improvement, mass merchandise, and membership club stores) in this report when presenting time-series data for both years. The reason for this is that heterogeneity within the discount, drug, grocery, and hardware channels is too great to make meaningful comparisons with such small sample sizes. Within the three “big box” channels, we have included only the chains surveyed in all three years. Thus, data presented in comparison tables include only a subset of the total home improvement, mass merchandise, and membership stores surveyed in Fall 2011 and Summer 2012. Table 2-4 below shows the number of stores included in these comparisons by channel and year.

¹⁴ For additional information regarding lighting retail store shelf survey methods – including sample design, overview of fieldwork conducted, and approach to data cleaning and analysis – please see the Fall 2011 California Lighting Retail Store Shelf Survey Report (DNV KEMA, 2012).

Table 2-4
Number of Stores Included in Time-Series Comparisons by Channel,
Spring 2009, Fall 2011, and Summer 2012

Retail Channel	Research Phase			Total
	Spring 2009	Fall 2011	Summer 2012	
Home Improvement	14	21	21	56
Mass Merchandise	11	20	26	57
Membership Club	9	26	26	61
Total Stores	34	67	73	174

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3. Findings

In this section, we present the results of our research and analyses using information from the literature review; retailer, manufacturer and expert interviews; consumer surveys; and retail store shelf surveys.

As described in Section 1.2.1, recall that EISA began phasing in nationally on January 1, 2012, prohibiting general purpose lamps above 72 watts with light output ranging from 1490 to 2600 lumens from being manufactured and/or imported into the United States. Throughout this report, when referring to lamps that meet or do not meet the criteria described in the regulation, we will use the following terminology:

- **EISA-compliant:** refers to general purpose, medium screw base (MSB) A-lamps (incandescent and halogen lamp technologies) that complied with EISA and AB 1109 efficacy standards (as of 2011) -- or in some cases, lamps that will comply with future EISA and AB 1109 regulations; and
- **Non-compliant:** refers to those A-lamps that do not comply with the regulations – or in some cases, lamps that will not comply with any future phase of the regulations.¹⁵

We also categorize the EISA lumen bins presented in Table 1-1 above as follows:

- **High Brightness:** This general purpose lamp category refers to EISA-compliant and non-compliant MSB A-lamps with light output between 1490 and 2600 lumens, equivalent to the light output of many traditional 100 watt incandescent lamps. EISA-compliant lamps in this category have a maximum wattage of 72 watts. Non-compliant lamps in this category exceed 72 watts, the maximum wattage allowed by EISA (i.e. traditional 100 watt lamps would be non-compliant). The phase-out for these lamps in California began on January 1, 2011 (and nationally, on January 1, 2012).
- **Medium High Brightness:** This general purpose lamp category refers to EISA-compliant and non-compliant MSB A-lamps with light output between 1050 and 1489 lumens, equivalent to the light output of many traditional 75 watt incandescent lamps.

¹⁵ Throughout this report, use of the phrase “EISA compliance” (or “non-compliance”) does not imply any type of legal standing, as retailers are legally permitted to sell through their existing stock of regulated general purpose lamps.

EISA-compliant lamps in this category have a maximum wattage of 53 watts. Non-compliant lamps in this category exceed 53 watts, the maximum wattage allowed by EISA (i.e. traditional 75 watt lamps would be non-compliant). The phase-out for these lamps in California began on January 1, 2012 (and nationally, on January 1, 2013).

- **Medium Low Brightness:** This general purpose lamp category refers to EISA-compliant and non-compliant MSB A-lamps with light output between 750 and 1049 lumens, equivalent to the light output of many traditional 60 watt incandescent lamps. EISA-compliant lamps in this category have a maximum wattage of 43 watts. Non-compliant lamps in this category exceed 43 watts, the maximum wattage allowed by EISA (i.e. traditional 60 watt lamps would be non-compliant). The phase-out for these lamps in California began on January 1, 2013 (and nationally, on January 1, 2014).
- **Low Brightness:** This general purpose lamp category refers to EISA-compliant and non-compliant MSB A-lamps with light output between 310 and 749 lumens, equivalent to the light output of many traditional 40 watt incandescent lamps. EISA-compliant lamps in this category have a maximum wattage of 29 watts. Non-compliant lamps in this category exceed 29 watts, the maximum wattage allowed by EISA (i.e. traditional 40 watt lamps would be non-compliant). The phase-out for these lamps in California began on January 1, 2013 (and nationally, on January 1, 2014).

3.1 Lamp Availability

In this section we analyze the availability of EISA-compliant and non-compliant general purpose lamps in California based on field data collected by DNV KEMA staff as part of the Fall 2011 and Summer 2012 California Lighting Retailer Store Shelf Surveys. Shelf survey data were used to assess whether the availability of general purpose lamps has changed after AB 1109 took effect in California on January 1, 2011.

Using lamp import data (often used as a proxy for lamp sales), we also present information about the availability of incandescent lamps, as well as more efficient alternatives (halogen, CFL, and LED), in the national market for the period immediately prior to EISA regulations taking effect in January, 2012.

It should be noted that the California and national datasets are quite different in nature, making it difficult to draw comparisons between California and the rest of the country, but we believe both datasets are indicative of lamp availability despite their differences.

3.1.1 U.S. Market

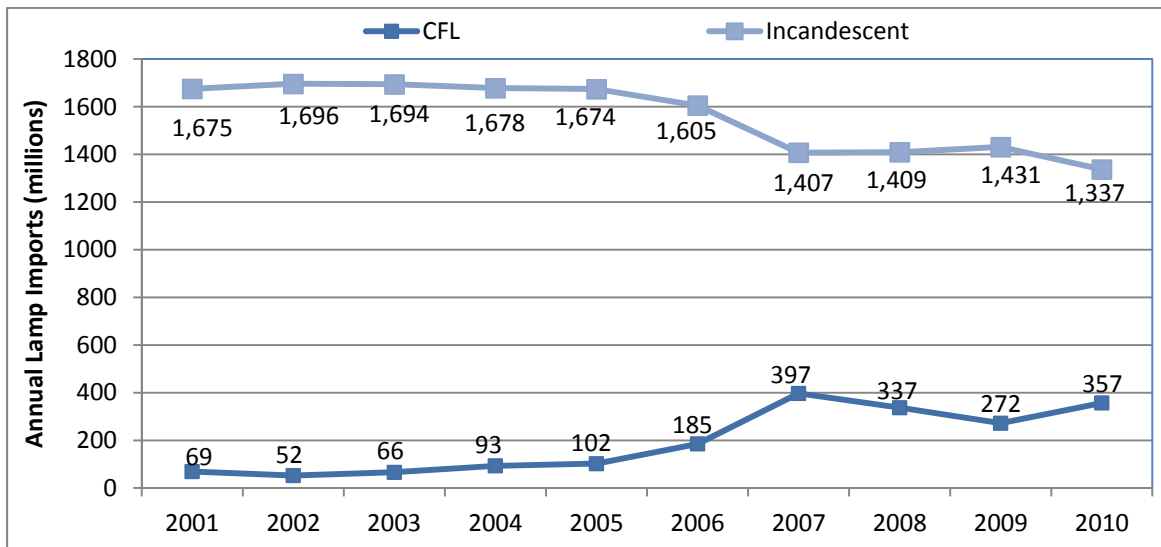
EISA was adopted in 2007, providing lighting manufacturers and retailers a few years of lead time to respond to more stringent efficacy standards before EISA regulations began to take effect nationally on January 1, 2012. As described above, EISA began with the phase-out of *high brightness* general purpose lamps above 72 watts. According to a 2011 International Energy Agency (IEA) report, the availability and diversity of EISA-compliant lamps has increased in recent years (with CFL and LED lamps widely available for purchase and new EISA-compliant halogen lamps coming to market). However, according to same report, there are no indications that the availability of incandescent lamps has decreased as a result of pending EISA regulations in the U.S.¹⁶

DNV KEMA examined the availability of incandescent lamps in the national market by analyzing lamp imports, which are commonly used as a proxy for sales (as the vast majority of lamps are manufactured abroad). Data from D&R International regarding 2010 incandescent lamp and CFL imports suggest that neither lamp type has experienced a significant change in imports as a result of pending lighting regulations. As shown in Figure 3-1, incandescent lamp imports have fluctuated between 2007 and 2010 but have not changed much, still accounting for over 1.3 billion lamps and almost 80 percent of combined incandescent lamp and CFL shipments to the U.S. in 2010.¹⁷

¹⁶ International Energy Agency, 2011.

¹⁷ D&R International, 2010b and 2011b.

**Figure 3-1
U.S. Lamp Imports**



Source: D&R International, 2010b and 2011b

In fact, lamp import data from March 2012 for incandescent lamps and CFLs (as tracked by the National Electrical Manufacturers Association [NEMA]) indicates that incandescent lamp shipments to the U.S. increased by approximately 16 percent from 2010 to 2011 compared to a nearly 7 percent decline in CFL shipments over the same time period.¹⁸ Over 62 percent of the 2011 increase in incandescent lamp shipments to the U.S. occurred in the fourth quarter of 2011, the last quarter during which it was still legal to import 100 watt incandescent lamps with brightness of between 1490 and 2600 lumens before regulations affecting lamps in this brightness range took effect at the beginning of 2012.¹⁹ While incandescent lamp shipments by wattage were not available for this time period, this large increase in shipments in the fourth quarter of 2011 suggests that retailers may have been stockpiling incandescent lamps prior to the start of EISA regulations. NEMA also notes that incandescent lamps increased their market

¹⁸ National Electrical Manufacturers Association, 2012.

¹⁹ *Ibid*

share (of total incandescent and CFL replacement lamp sales) in 2011 to over 82 percent, the highest market share of incandescent lamps in the U.S. since 2006.²⁰

While the incandescent lamp phase-out began in the U.S. on January 1, 2012, the phased-out lamps will remain available to consumers after regulations take effect, as retailers are legally permitted to sell through existing stock. Anecdotal evidence suggests that some retailers and consumers may have stocked up on incandescent lamps before the ban – for example, a Bulbs Unlimited Store in Los Angeles that urged customers to “stock up now” on 100 watt lamps and offered a 20 percent discount on cases during 2011, or a Bulbman lighting store in Nevada which reported at least a 50 percent annual increase of 100 watt incandescent lamp sales in 2011²¹ – but there are no data to suggest how prevalent that practice has been. As mentioned in Section 1.2.1, there are also potential opportunities for newly-banned incandescent lamps to enter the U.S. market as enforcement of EISA standards was recently put on hold by the U.S. House of Representatives. However, there is no direct evidence that this has occurred.²²

As previously stated, the national lighting market has not experienced any noticeable changes in the availability of incandescent lamps in advance of EISA regulations; however, there is a wide range of EISA-compliant lamps such as CFLs and LEDs available to consumers. Figure 3-2 shows a consumer replacement lamp guide from the Natural Resources Defense Council (NRDC) depicting the available replacement options for traditional incandescent lamps affected by EISA. The figure demonstrates that CFLs are typically 3 to 4 times more efficient than the minimum EISA requirements, meet or exceed the light output equivalencies of the lamps affected by EISA, and are widely available for purchase.²³ While the figure also includes LED options, LED replacement lamps are not available at light output levels high enough to replace 100 watt incandescent lamps (according to a recent report from the U.S. DOE).²⁴ However, LED lamps are available at all other incandescent equivalencies that are affected by EISA. While there are LED lamps that produce enough light to be considered replacements for traditional 60 and 75 watt incandescent lamps, a 2011 report suggests that two-thirds of LED

²⁰ *Ibid.*

²¹ Cardwell, 2011.

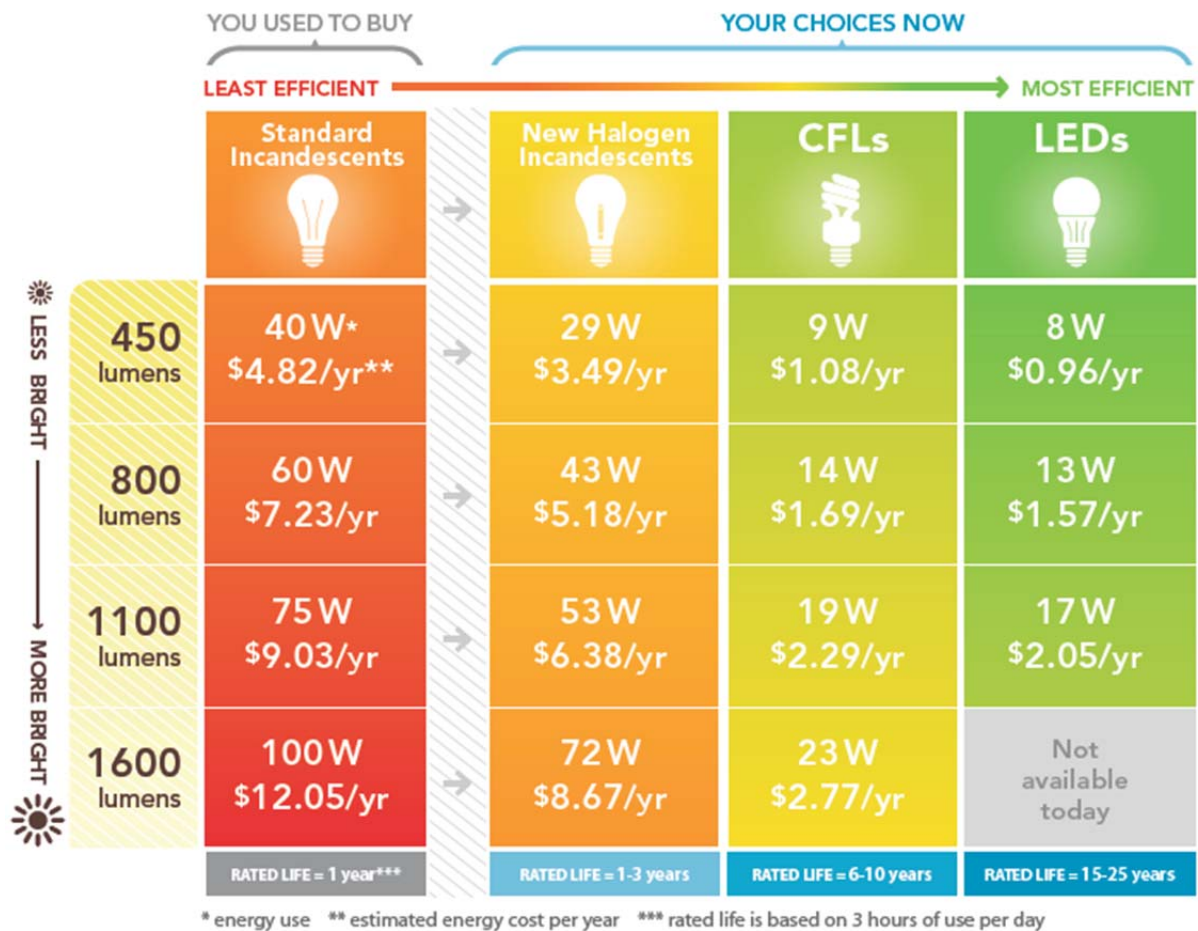
²² *Ibid.*

²³ D&R International, 2011a.

²⁴ *Ibid.*

products on the market at that time had light output levels less than 450 lumens, the equivalent of a traditional 40 watt incandescent lamp.²⁵

**Figure 3-2
Consumer Replacement Lamp Guide**



Source: Ecos Consulting, 2011

One element excluded from the figure above is the average retail cost of the different lamp technologies. While LEDs are shown to be the least expensive to operate, they are also the most expensive option by far (in terms of first cost), averaging around \$40 throughout the U.S.

²⁵ *Ibid.*

for a 60 W equivalent replacement lamp.²⁶ The lamps with the lowest first cost are the minimally compliant halogen lamps which all major lighting manufacturers have developed in response to EISA efficacy standards.²⁷ These lamps are available at all major lighting retailers, cost between \$1 and \$4, and look and operate the same as traditional general purpose incandescent lamps.²⁸ Availability of these EISA-compliant halogen lamps is expected to increase and prices are expected to decrease, potentially making halogens the preferred choice of consumers to replace phased out incandescent lamps from a cost perspective.²⁹ However, minimally compliant halogen products will not meet EISA's 2020 efficacy requirement of 45 lumens per watt, effectively giving them an 8 year window to impact the U.S. lighting market before they are also phased out.³⁰

3.1.2 California Market

During the Fall of 2011 and Summer of 2012, DNV KEMA field researchers collected comprehensive data on lamps and lamp packages available for sale at 184 and 200 stores, respectively, as part of the California Lighting Retail Store Shelf Surveys. The data gathered during the Fall 2011 and Summer 2012 shelf surveys provides an early assessment of how the availability of EISA-compliant high brightness (1490—2600 lumens) and medium high brightness (1050—1489 lumens) MSB general purpose A-lamps is changing as the market responds to lighting regulations. Recall that the phase-out for high brightness A-lamps started in California on January 1, 2011 and for medium high brightness A-lamps in California on January 1, 2012. Below we describe the results of the shelf survey analyses.

3.1.2.1 Proportion and Average Number of EISA-Compliant High Brightness General Purpose A-Lamps (1490—2600 lumens), Fall 2011 and Summer 2012

Figure 3-3 shows the proportion of EISA-compliant and non-compliant high brightness general purpose A-lamps observed during the Fall 2011 and Summer 2012 shelf surveys by retail

²⁶ D&R International, 2011a.

²⁷ United States Environmental Protection Agency (EPA), 2011.

²⁸ D&R International, 2011a.

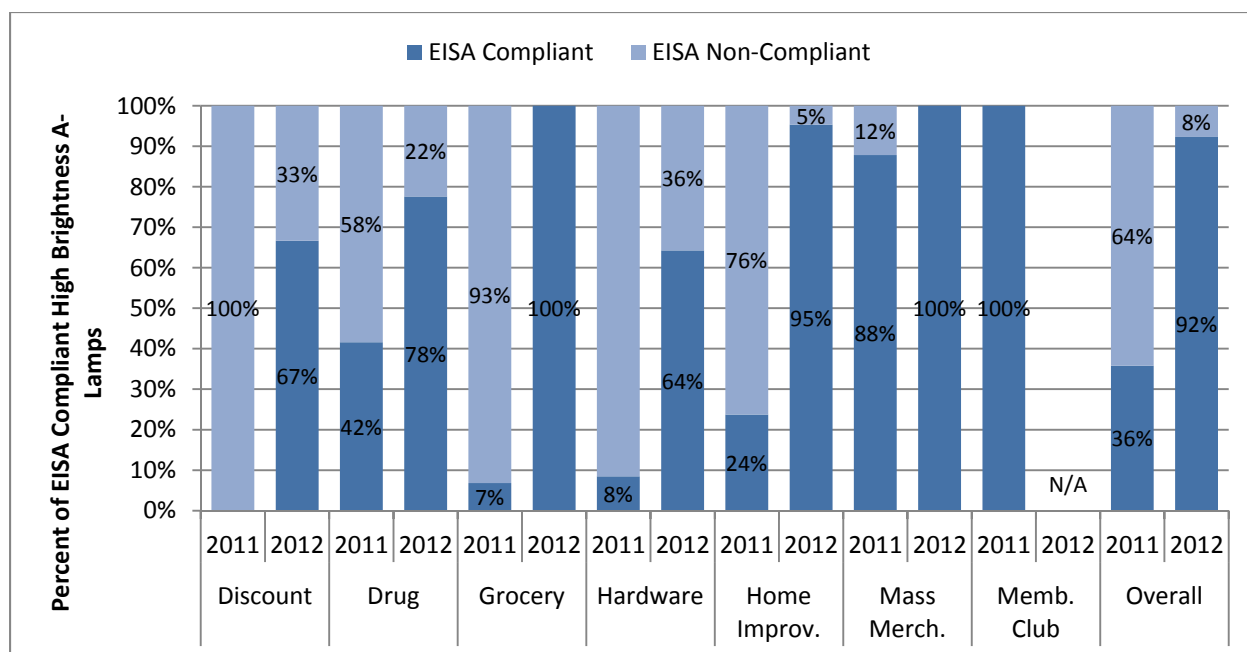
²⁹ *Ibid*

³⁰ International Energy Agency, 2010.

channel. Recall that this class of lamps was phased out in California starting on January 1, 2011 (and a year later in the rest of the U.S.).

Across all of the retail channels in our sample, the proportion of EISA-compliant high brightness general purpose A-lamps increased from just 36 percent of all high brightness general purpose A-lamps observed during Fall 2011 to 92 percent in Summer 2012. In discount stores, researchers did not observe any EISA-compliant high brightness general purpose A-lamps in Fall 2011 (thus, 100 percent of the high brightness A-lamps observed were non-compliant), however, by Summer 2012, two-thirds of general purpose high brightness lamps were EISA-compliant. Similarly, only 7 percent of high-brightness general purpose A-lamps observed in grocery stores in Fall 2011 were EISA-compliant and by Summer 2012, 100 percent of the high brightness general purpose A-lamps observed at grocery stores were EISA-compliant. The proportion of EISA-compliant high brightness general purpose A-lamps increased in every channel except membership clubs which did not stock any lamps in this category in Summer 2012 after carrying only EISA-compliant high brightness lamps in Fall 2011. These results indicate that EISA and AB 1109 regulations are changing the availability of general purpose lamps and successfully removing the most inefficient lamps from the California market.

Figure 3-3
Proportion of EISA-Compliant and Non-Compliant High Brightness General Purpose A-Lamps (1490—2600 lumens) by Channel, Fall 2011 and Summer 2012*



* See Table B-1 (2011) and Table B-2 (2012) in Appendix B for the number of EISA-compliant and non-compliant general purpose A-Lamps by retail channel.

Table 3-1 shows the average number of EISA-compliant and non-compliant high brightness general purpose A-lamps (1490—2600 lumens) per store by channel observed during the Fall 2011 and Summer 2012 shelf surveys. In other words, each cell represents the total number of high brightness general purpose A-lamps found in a given channel divided by the number of stores in that channel. Note that these findings relate to the actual number of lamps in the store versus the number of lamp packages or lamp models. Key findings include:

- Across all stores in our Fall 2011 sample, on average, there were almost twice as many non-compliant (49) high brightness general purpose A-lamps stocked per store as EISA-compliant (27) high brightness general purpose A-lamps.
- In contrast, in Summer 2012, there were 18 EISA-compliant and only 2 non-compliant high brightness general purpose A-lamps stocked per store, on average (see Table B-1 and Table B-2 in Appendix B for details on the total number of EISA-compliant and EISA non-compliant A-lamps stocked by channel).
- Comparing between channels, home improvement stores experienced the largest change between Fall 2011 and Summer 2012, where the average number of non-compliant high brightness general purpose A-lamps fell from 227 lamps per store in Fall 2011 to just 3 non-compliant lamps per store in Summer 2012.
- Grocery and hardware stores also experienced a significant decline in the average number of non-compliant high brightness general purpose lamps from Fall 2011 to Summer 2012. The average number of non-compliant lamps per grocery store dropped from 27 in Fall 2011 to 0 in Summer 2012, while the average number of non-compliant lamps in hardware stores fell from 78 lamps to 7 over the same time period.
- Membership stores carried the greatest average number of EISA-compliant high brightness general purpose A-lamps among the stores we visited in Fall 2011 (79 lamps per store), and did not carry any non-compliant high brightness general purpose A-lamps. However, in Summer 2012 membership stores changed their stocking practices and did not carry any high brightness general purpose lamps (EISA-compliant or non-compliant).

**Table 3-1
Average Number of EISA-Compliant and Non-Compliant High Brightness General Purpose A-Lamps (1490—2600 lumens) per Store by Channel, Fall 2011 and Summer 2012***

MSB General Purpose Incandescent/Halogen A-Lamps	Channel							Overall
	Discount	Drug	Grocery	Hardware	Home Improv.	Mass Merch.	Memb. Club	
Fall 2011								
EISA Compliant	0	3	2	7	71	34	79	27
EISA Non-Compliant	2	4	27	78	227	5	0	49
Summer 2012								
EISA Compliant	0	4	4	12	59	47	0	18
EISA Non-Compliant	0	1	0	7	3	0	0	2
Number of Stores								
Fall 2011	27	27	27	27	26	24	26	184
Summer 2012	28	27	30	28	29	29	29	200

* See Table B-3 (2011) and Table B-4 (2012) in Appendix B for the average number of EISA-compliant and non-compliant A-Lamps by retail channel.

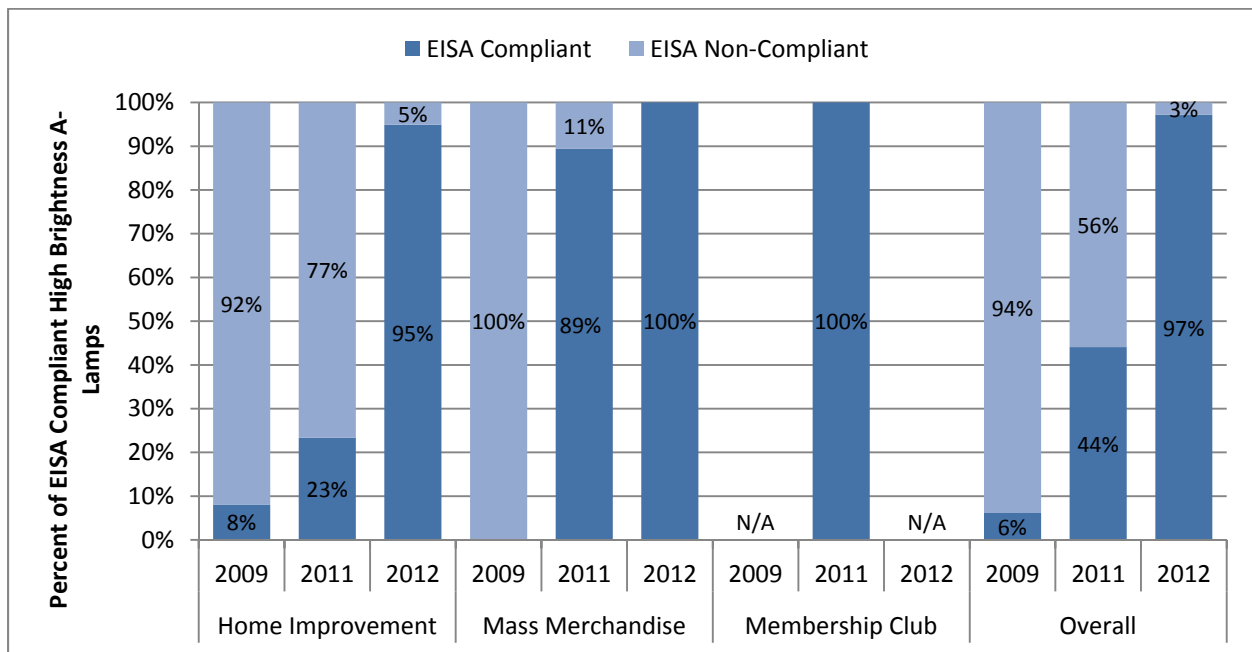
3.1.2.2 Proportion and Average Number of EISA-Compliant High Brightness General Purpose A-Lamps (1490—2600 lumens), Spring 2009, Fall 2011, and Summer 2012 Comparison

Figure 3-4 compares California shelf survey results from Spring 2009, Fall 2011, and Summer 2012 showing the proportion of EISA-compliant and non-compliant high brightness general purpose A-lamps (1490—2600 lumens) observed within each of the three big box channels – home improvement, mass merchandise, and membership clubs. The table includes the four home improvement chains in which DNV KEMA staff conducted shelf surveys in Spring 2009, Fall 2011 and Summer 2012, the four mass merchandise chains in which we conducted shelf surveys in all three years, and the two membership club chains in which we conducted shelf surveys in all three years.³¹ For details on the total number of EISA-compliant and non-compliant general purpose A-lamps per store in Spring 2009, Fall 2011, and Summer 2012 see Table B-5 in Appendix B.

Key findings include:

- Across all of the big box stores in our sample, EISA-compliant lamps represented 97 percent of high brightness general purpose A-lamps in Summer 2012 compared to only 6 percent in Spring 2009. These results suggest that AB 1109 and/or EISA regulations have impacted the stocking patterns of high brightness general purpose A-lamps in California big box stores.
- Home improvement stores experienced the largest change between Fall 2011 and Summer 2012, with the proportion of EISA-compliant high brightness general purpose A-lamps increasing from just 23 percent to 95 percent in less than a year.
- Membership club stores did not stock any high brightness general purpose A-lamps in Spring 2009, only stocked EISA-compliant high brightness general purpose A-lamps in Fall 2011, and once again did not stock any high brightness general purpose A-lamps in Summer 2012.

Figure 3-4
Proportion of EISA-Compliant and Non-Compliant High Brightness General Purpose A-Lamps (1490—2600 lumens) by Big Box Channel, Spring 2009, Fall 2011, and Summer 2012*



* See Table B-6 in Appendix B for the number of EISA-compliant and non-compliant A-lamps by retail channel for 2009, 2011, and 2012.

Table 3-2 compares the average number of EISA-compliant and non-compliant high brightness general purpose A-lamps (1490—2600 lumens) carried per store by channel during DNV KEMA’s shelf survey visits in Spring 2009, Fall 2011, and Summer 2012. Key findings include:

- In Spring 2009, the 34 stores in our sample in the three comparison channels averaged 175 non-compliant high brightness general purpose A-lamps stocked per store. The average number of non-compliant lamps dropped to 88 per store in Fall 2011 and by Summer 2012, the average number of non-compliant lamps observed per store fell to just 1 lamp. Again, this suggests that AB 1109 and/or EISA regulations have impacted lamp availability in these channels.
- Home improvement stores carried the highest average number of EISA-compliant and non-compliant high brightness A-lamps per store in all three years. From Fall 2011 to Summer 2012, the average number of non-compliant high brightness general purpose lamps fell from 275 lamps per store to 4 lamps per store.

**Table 3-2
Average Number of EISA-Compliant and Non-Compliant High Brightness General Purpose A-Lamps (1490—2600 lumens) per Store by Big Box Channel, Spring 2009, Fall 2011, and Summer 2012***

MSB General Purpose Incandescent/Halogen A-Lamps	Big Box Channel											
	Home Improvement			Mass Merchandise			Membership Club			Overall		
	2009	2011	2012	2009	2011	2012	2009	2011	2012	2009	2011	2012
EISA Compliant	28	84	74	0	41	52	0	79	0	11	69	40
EISA Non-Compliant	317	275	4	139	5	0	0	0	0	175	88	1
Number of Stores	14	21	21	11	20	26	9	26	26	34	67	73

* See Table B-6 in Appendix B for the average number of EISA-compliant and non-compliant A-lamps by retail channel for 2009, 2011, and 2012.

3.1.2.3 Proportion of 100 Watt Lamps with Lumen Output Equivalent to High Brightness Lamps

The above analyses of high brightness general purpose lamps (Section 3.1.2.2) examined the proportion of EISA-compliant lamps as well as the average number of EISA-compliant lamps found per store by retail channel. A common misconception about the first phase of EISA and AB 1109 regulations is that all 100 watt general purpose incandescent lamps are covered under the high brightness (1490—2600 lumens) lamp category and will be phased out first. Based on

the media coverage of the topic (for example, a New York Times article from December 16, 2011, titled “Despite Delay, the 100-Watt Bulb Is On Its Way Out”), it is easy to understand why there is confusion.

After clarifying our understanding of the efficacy standards with two lighting policy experts, it became clear that there was the potential for 100 watt incandescent lamps to avoid the first phase of regulations if they fell outside of the high brightness lumen range. DNV KEMA analysts found that 38 percent of the 100 watt lamps observed in California during Fall 2011 had light output below the lumen range defined by the high brightness category (of the 4,654 100 watt lamps in the sample that had lumen information available). This means that 100 watt incandescent lamps with light output below 1490 lumens were not affected by EISA and AB 1109 regulations until the second year of implementation began in January, 2012. This apparent loophole for the most inefficient lamps to remain on the market for an additional year was not covered in any of the sources reviewed by DNV KEMA under the literature review.

When the DNV KEMA team again investigated the proportion of 100 watt lamps available in California with brightness outside of the high brightness category of 1490—2600 lumens in Summer 2012, researchers found not only a far smaller quantity of 100 watt general purpose lamps in the stores, but also that the majority of these fell within the high brightness category. Researchers determined that only 5 percent of the 100 watt lamps observed in California during Summer 2012 had light output below the lumen range defined by the high brightness category (of the 482 100 watt lamps that had lumen information available). So while this loophole may have been an issue during the Fall 2011 timeframe, it appears to have been largely resolved by Summer 2012.

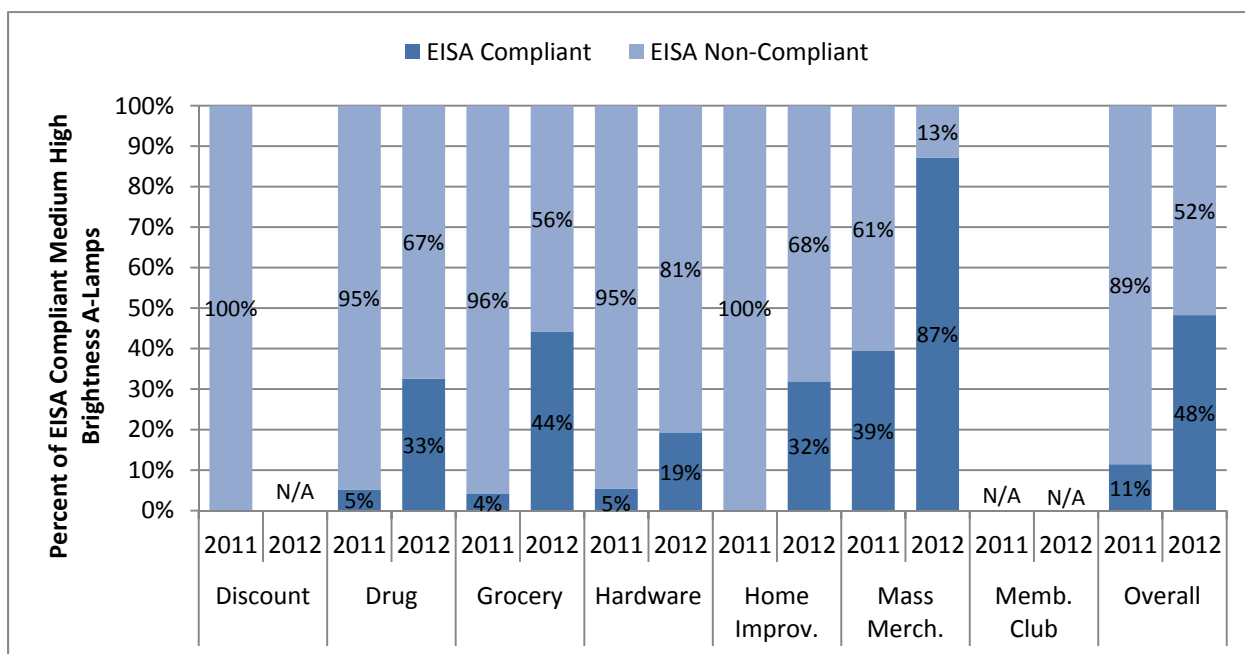
3.1.2.4 Proportion and Average Number of EISA-Compliant Medium High Brightness General Purpose A-Lamps (1050—1489 lumens), Fall 2011 and Summer 2012

Figure 3-5 shows the proportion of EISA-compliant and non-compliant medium high brightness general purpose A-lamps (1050—1489 lumens) stocked by channel in Fall 2011 and Summer 2012. Recall that the phase-out for this lamp category began in California on January 1, 2012 and will begin a year later in the rest of the United States.

Overall, EISA-compliant medium high brightness general purpose A-lamps represented 48 percent of all medium high brightness general purpose A-lamps observed during the Summer 2012 shelf surveys, up from 11 percent in Fall 2011. Field researchers observed the greatest proportion EISA-compliant medium high brightness general purpose A-lamps in mass merchandise stores in both Fall 2011 and Summer 2012, at 39 percent and 87 percent, respectively. In other retail channels, EISA-compliant medium high brightness general purpose

A-lamps represented no more than 5 percent of lamps in this lumen category in Fall 2011 and no more than 45 percent in Summer 2012. Field researchers did not observe any medium high brightness general purpose A-lamps in membership stores during the Fall 2011 or Summer 2012 shelf surveys (EISA-compliant or non-compliant).

Figure 3-5
Proportion of EISA-Compliant and Non-Compliant Medium High Brightness General Purpose A-Lamps (1050—1489 lumens) by Channel, Fall 2011 and Summer 2012*



* See Table B-1 (2011) and Table B-2 (2012) in Appendix B for the number of EISA-compliant and non-compliant A-Lamps by retail channel.

Table 3-3 shows the average number of EISA-compliant and non-compliant medium high brightness general purpose A-lamps (1050—1489 lumens) observed per store by field researchers during the Fall 2011 and Summer 2012 shelf surveys within each retail channel. Key findings include:

- Across all stores in our Fall 2011 sample, there was an average of 5 EISA-compliant medium high brightness general purpose A-lamps stocked per store, compared to an average of 42 non-compliant medium high brightness A-lamps per store.
- In Summer 2012, we began to notice an increase in stock of medium high brightness general purpose A-lamps with average of 8 EISA-compliant and 9 non-compliant medium high brightness general purpose A-lamps per store.

- Mass merchandise stores carried the highest number of EISA-compliant medium high brightness general purpose A-lamps (32 lamps per store, on average, in Fall 2011 and 39 per store, on average, in Summer 2012).
- In contrast, home improvement and hardware stores stocked the highest number of non-compliant medium high brightness lamps during Fall 2011: 87 and 89 lamps per store, respectively. However, in Summer 2012, the average number of non-compliant medium high brightness general purpose A-lamps stocked per store in Home Improvement stores dropped to 6, falling into line with several other channels, while hardware stores still stocked an average of 42 non-compliant medium high brightness general purpose A-lamps – at least 6 times as many (on average) as any other retail channel. This may result from slower stock turnover in hardware stores compared to home improvement stores and the greater diversity of stores within the hardware channel versus the home improvement channel.

Table 3-3
Average Number of EISA-Compliant and Non-Compliant Medium High Brightness General Purpose A-Lamps (1050—1489 lumens) per Store by Channel, Fall 2011 and Summer 2012*

MSB General Purpose Incandescent/Halogen A-Lamps	Channel							Overall
	Discount	Drug	Grocery	Hardware	Home Improv.	Mass Merch.	Memb. Club	
Fall 2011								
EISA Compliant	0	2	1	5	0	32	0	5
EISA Non-Compliant	1	38	31	89	87	49	0	42
Summer 2012								
EISA Compliant	0	3	3	10	3	39	0	8
EISA Non-Compliant	0	7	3	42	6	6	0	9
Number of Stores								
Fall 2011	27	27	27	27	26	24	26	184
Summer 2012	28	27	30	28	29	29	29	200

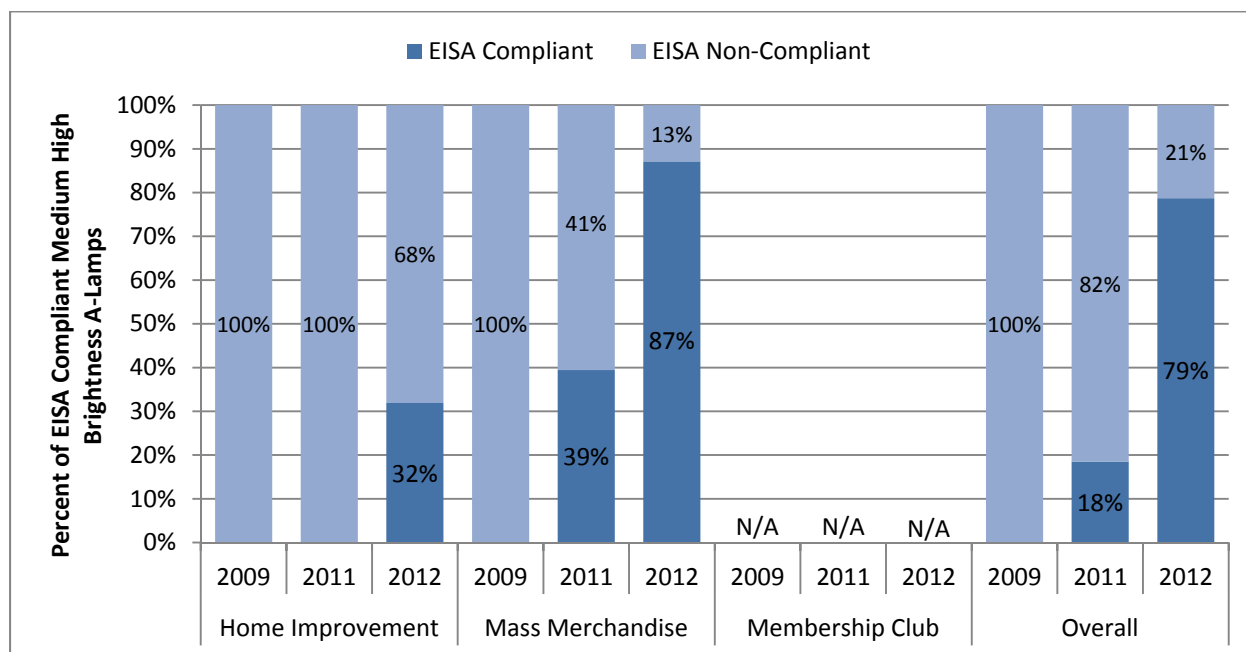
* See Table B-3 and Table B-4 in Appendix B for the average number of EISA-compliant and non-compliant A-lamps by retail channel for 2011 and 2012.

3.1.2.5 Proportion and Average Number of EISA-Compliant Medium High Brightness General Purpose MSB A-Lamps (1050—1489 lumens), Spring 2009, Fall 2011, and Summer 2012 Comparison

Figure 3-6 shows a comparison of the proportion of EISA-compliant and non-compliant medium high brightness general purpose A-lamps stocked by channel for Spring 2009, Fall 2011, and Summer 2012. Key findings include:

- Across all stores in our sample, EISA-compliant medium high brightness general purpose A-lamps represented 79 percent of medium high brightness A-lamps in Summer 2012 compared to just 18 percent in Fall 2011 and zero percent in Spring 2009. These results suggest that AB 1109 and/or EISA regulations have impacted the stocking patterns of medium high brightness general purpose A-lamps in California big box stores.
- Mass merchandise stores increased their stocking of EISA-compliant medium high brightness general purpose A-lamps from zero percent in Spring 2009 to 39 percent of medium high brightness general purpose A-lamps in Fall 2011. By Summer 2012, the proportion of EISA-compliant lamps was up to 87 percent of all lamps in this lumen category.
- We observed no change in stocking patterns of medium high brightness general purpose A-lamps in home improvement stores between Spring 2009 and Fall 2011; however, by Summer 2012, almost one-third of all medium high brightness A-lamps in this channel in California were EISA-compliant.
- Membership stores did not stock medium high brightness A-lamps in Spring 2009, Fall 2011, or Summer 2012.

Figure 3-6
Proportion of EISA-Compliant and Non-Compliant Medium High Brightness General Purpose A-Lamps (1050—1489 lumens) by Big Box Channel, Spring 2009, Fall 2011, and Summer 2012*



* See Table B-6 in Appendix B for the number of EISA-compliant and non-compliant A-lamps by retail channel for 2009, 2011, and 2012.

Table 3-4 compares the average number of EISA-compliant and non-compliant medium high brightness general purpose A-lamps (1050—1489 lumens) observed per store in big box channels during Spring 2009, Fall 2011, and Summer 2012. Key findings include:

- Researchers only observed EISA-compliant medium high brightness general purpose A-lamps in mass merchandise stores during Fall 2011—not in any other channels. In Spring 2009, researchers did not observe medium high brightness general purpose A-lamps in any big box channel.
- In Summer 2012, researchers observed EISA-compliant medium high brightness general purpose A-lamps in both home improvement and mass merchandise stores (averaging 4 and 44 per store, respectively), but did not observe any in the mass merchandise stores in our sample.

Table 3-4
Average Number of EISA-Compliant and Non-Compliant Medium High Brightness
General Purpose A-Lamps (1050—1489 lumens) per Store by Big Box Channel, Spring
2009, Fall 2011, and Summer 2012*

MSB General Purpose Incandescent/Halogen A-Lamps	Big Box Channel											
	Home Improvement			Mass Merchandise			Membership Club			Overall		
	2009	2011	2012	2009	2011	2012	2009	2011	2012	2009	2011	2012
EISA Compliant	0	0	4	0	38	44	0	0	0	0	11	17
EISA Non-Compliant	288	105	8	55	59	6	0	0	0	136	50	4
Number of Stores	14	21	21	11	20	26	9	26	26	34	67	73

* See Table B-6 in Appendix B for the average number of EISA-compliant and non-compliant A-lamps by retail channel for 2009, 2011, and 2012.

3.2 Awareness of EISA and AB 1109

In this section we examine awareness of national (EISA) and California (AB 1109) lighting regulations among consumers and lighting suppliers. The findings for this section are based on the results of 800 consumer surveys conducted in California by DNV KEMA in support of CPUC EM&V WO28, the in-depth interviews conducted as part of the 2012 LED study conducted by DNV KEMA in support of CPUC EM&V WO13, and other data collection efforts undertaken by various organizations around the country (as identified during the literature review for this study). Appendix D includes the exact phrasing of consumer telephone survey questions referenced throughout this section.

3.2.1 EISA

This section reviews awareness of EISA among consumers and lighting suppliers.

3.2.1.1 Consumers

The literature review revealed two sources with details on consumer awareness of EISA at the national level, including the Fourth Annual Sylvania Socket Survey conducted by KRC Research and the 2011-2012 Northwest Residential Lighting Tracking and Monitoring Study conducted by DNV KEMA for the Northwest Energy Efficiency Alliance (NEEA). These sources complement

the 800 California consumer surveys conducted by DNV KEMA to provide good insight into consumer awareness of EISA. The three surveys used almost identical questions to assess consumer awareness of EISA such that results could be compared between California, the Northwest, and the U.S. as a whole.³²

United States. Consumer awareness of EISA regulations appears to have improved nationally over the past four years as the majority of lighting consumers are now aware of EISA. According to the Annual Sylvania Socket Surveys conducted in 2008 through 2011:

- Fifty-five percent of the consumers surveyed in 2011 were aware of legislation that will ban most incandescent lamps by 2014.^{33, 34} This percentage has increased annually since 2008 (Figure 3-7).
- Nearly half (45 percent) of 2011 respondents indicated that they were aware that as part of future legislation, additional traditional 100 watt lamps will begin to be phased out over the next few years and will no longer be available;³⁵
- However, only 29 percent of 2011 respondents were aware that traditional 100 watt lamps will no longer be sold after January 1, 2012.³⁶

³² Questions used in both the NEEA and California survey efforts were modeled after those in the national surveys conducted by KRC Research for Sylvania. Refer to Appendix D for phrasing of the questions used in each data collection effort.

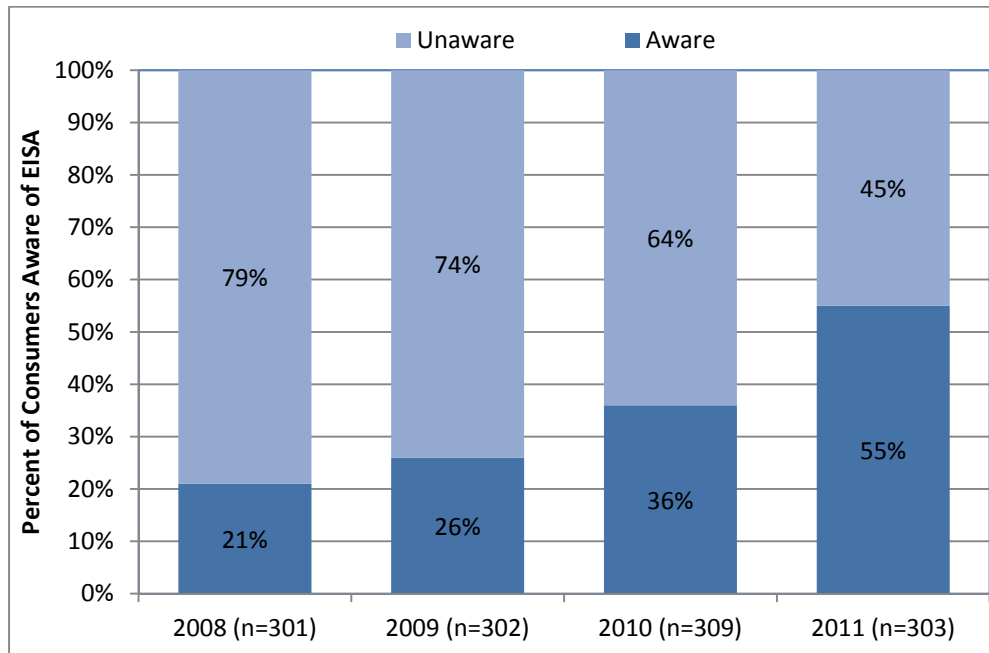
³³ Note that the question employed by KRC Research for Sylvania's surveys does use the word "ban" despite its inaccuracy with regard to the EISA regulations.

³⁴ KRC Research, 2011.

³⁵ *Ibid.*

³⁶ *Ibid.*

Figure 3-7
Consumer Awareness of Legislation That Will Ban Most Incandescent Lamps by 2014,
National Results – 2008—2011



Source: KRC Research, 2011.

Pacific Northwest. In January 2012, DNV KEMA conducted consumer surveys in Idaho, Montana, Oregon and Washington as part of a lighting market study for Northwest Energy Efficacy Alliance (NEEA). Among the 606 survey respondents in 2012, results suggest that awareness of EISA in the Pacific Northwest is closely aligned with awareness levels among consumers in the U.S. as a whole.

- In 2012, 46 percent of Northwest survey respondents reported that they were aware of legislation in the United States that may affect the availability of certain types of light bulbs;³⁷
- Fifty-eight percent of respondents reported that they were aware of legislation that will phase out most traditional incandescent lamps by 2014, up from 33 percent in 2011;³⁸ and

³⁷ DNV KEMA, 2012a.

-
- Forty-one percent of respondents were aware that traditional 100 watt incandescent lamps are being phased out (up from only 18 percent in 2011).³⁹

California. DNV KEMA observed slightly lower consumer awareness of EISA in California, where 800 consumers were surveyed during the first two quarters of 2012, as compared to the most recent results from the Pacific Northwest and national surveys described above.⁴⁰

- Thirty-seven percent of California respondents indicated that they were aware of legislation in the United States that may affect the availability of certain types of light bulbs;
- Forty-three percent of respondents said that they were aware of legislation that would phase out most traditional incandescent lamps by 2014;⁴¹ and
- Thirty-two percent of respondents indicated that they were aware that traditional 100 watt incandescent lamps are being phased out in California.

3.2.1.2 Lighting Suppliers

As part of the research conducted for the *California LED Lamp Market Characterization Report*⁴² in early 2012, DNV KEMA staff asked 37 representatives of LED manufacturers, retailers, and distributors whether they were aware of EISA. Of the 34 LED supplier representatives who responded to the question, 22 were aware of EISA.⁴³ This means that roughly one-third of the interview respondents were not aware of EISA shortly after it began phasing in during January, 2012.

³⁸ While modeled after the survey questions employed by KRC Research for Sylvania, surveys conducted for NEEA did not use the phrasing related to legislation that will “ban” certain types of lamps (as in the Sylvania surveys) but instead referred to legislation that will “phase out” certain types of lamps.

³⁹ *Ibid.*

⁴⁰ These survey results (from CPUC EM&V WO28) have not yet been reported elsewhere.

⁴¹ Note that the California surveys included the same phrasing as the NEEA surveys (regarding legislation that will “phase out” certain types of lamps and made no reference to legislation that will “ban” certain types of lamps as in the Sylvania surveys).

⁴² DNV KEMA, 2012b. While the report was focused on LED lamps, the majority of manufacturers, and all of the distributors and retailers interviewed sold other lamp types (incandescent, CFL, etc.) as well as LED lamps.

⁴³ Survey questions: “Have you heard about the Energy Independence and Security Act, or EISA?” If no, “Are you aware of any new federal regulations that require higher efficiency for certain types of lighting?”

3.2.2 AB 1109

This section reviews awareness of AB 1109 among California consumers and lighting suppliers that serve the California market.

3.2.2.1 Consumers

DNV KEMA researchers surveyed California consumers regarding their awareness of AB 1109 as part of the WO28 consumer surveys conducted in mid-2012. These results suggest that consumer awareness of AB1109 is significantly lower than their awareness of EISA:

- Only 21 percent of respondents were aware that California adopted legislation that will ban most traditional incandescent lamps a year earlier than the rest of the country; and
- About one-third of respondents indicated that they were aware that traditional 100 watt incandescent lamps are being phased out in California (32%).

3.2.2.2 Lighting Suppliers

The following interview findings from the same group of LED market actors interviewed in the first quarter of 2012 are focused on the market actors' awareness of AB 1109. Only 12 of the 30 manufacturers, retailers, and distributors who responded to this set of interview questions were aware of AB 1109.⁴⁴ Thus, awareness of AB 1109 appeared to be much lower than awareness of EISA among lighting suppliers who responded to the survey questions. These results are not surprising, as many of the respondents were representatives of national (or international) companies and thus are not focused exclusively on California.

⁴⁴ Survey question: "Have you heard about California's Lighting Efficiency and Toxics Reduction Act, or AB 1109? [IF NO] Are you aware of any new regulations in California that require higher efficiency for certain types of lighting?"

3.3 Effects of Regulation on Consumer Purchasing Behaviors

In this section we analyze the effects of lighting regulations on consumer purchasing behaviors in the U.S. and California. Lamp sales data that may reflect consumer purchasing behavior in light of EISA and/or AB 1109 is currently unavailable, but numerous studies have examined consumers' planned purchasing behaviors once traditional general purpose incandescent lamps are no longer available.

In California, DNV KEMA staff gathered information on expected consumer purchasing decisions when 100 watt general purpose incandescent lamps are no longer available through two efforts. These include the 800 consumer surveys conducted as part of WO28 as well as interviews with manufacturers, retailers, and lighting market experts. As in Section 3.2 above, survey questions are included verbatim in Appendix D.

3.3.1 U.S. Market

Although EISA took effect on January 1, 2012, the U.S. DOE has no funding to enforce the regulations.⁴⁵ The lack of funding for enforcement coupled with the fact that retailers can legally sell through their existing stock of incandescent lamps affected by EISA suggests that it may be some time before noticeable impacts on the national lighting market are observed.

GE Lighting estimates that more than 200 million 100 watt incandescent lamps are sold in the U.S. annually.⁴⁶ As many traditional general purpose lamps are phased out and are no longer available in the market, consumers will have to choose replacements for these lamps. Below we present the results of consumer research on expected consumer response to the incandescent lamp phase-out, including technology switching, bin jumping and hoarding.

⁴⁵ Cardwell, 2011.

⁴⁶ GE Lighting, 2011.

3.3.1.1 Technology Switching

“Technology switching” in the context of projected consumer response to EISA or AB 1109 refers to consumers who anticipate switching to a different lamp technology (i.e. CFL, LED, halogen, etc.) when they can no longer purchase general purpose incandescent lamps.

- In a national telephone survey of 303 respondents conducted for OSRAM Sylvania in 2011, 53 percent of consumers reported that they will switch to a new lamp technology (such as compact fluorescent, LED, or halogen) when they can no longer buy 100 watt incandescent lamps. These results are down slightly from 60 percent in 2010.⁴⁷
- Similar to the national results, almost half of the 606 consumers surveyed in the Pacific Northwest in early 2012 reported that they are most likely to switch to a different lamp technology to replace their 100 watt incandescent lamps once they are phased out (45%).⁴⁸

3.3.1.2 Bin Jumping

The concept of “bin jumping” generally refers to the practice of switching from one EISA “lumen bin” to another. For example, if a consumer can no longer find a 100 watt incandescent lamp, he or she may choose another incandescent lamp with lower lumen output (such as a 75 watt incandescent lamp) rather than move to a new technology. The U.S. Environmental Protection Agency also describes cases in which a consumer may purchase a minimally compliant lamp that has a lower light output than the incandescent lamp they are trying to replace.⁴⁹ When the consumer becomes dissatisfied, he or she will “jump” to the next-highest bin of EISA-compliant lamps, negating most of the savings.⁵⁰

Two different survey efforts (one national and the other in the Pacific Northwest) found that a noteworthy portion of consumers anticipate bin-jumping as a response to EISA regulations:

⁴⁷ KRC Research, 2011.

⁴⁸ DNV KEMA, 2012a.

⁴⁹ The U.S. EPA predicts that some degree of bin jumping will occur due to EISA lumen ranges being so wide (U.S. EPA, 2011).

⁵⁰ *Ibid.*

-
- Thirty percent of U.S. consumers surveyed during Sylvania's 2011 Socket Survey reported that they are most likely to keep using traditional incandescent lamps but switch to lower wattage lamps (such as 75 watt lamps) when traditional 100 watt incandescent lamps are eliminated. The percent of consumers indicating that they would bin jump increased slightly between 2010 and 2011 (from 23% to 30%).⁵¹
 - More than one-fourth of consumers surveyed in the Pacific Northwest in early 2012 reported that they are most likely to keep using traditional incandescent lamps but switch to a lower wattage once 100-Watt incandescent lamps are no longer available, a statistically significant increase over 2011 (27%).⁵²

3.3.1.3 Hoarding

“Hoarding” refers to the consumer practice of stockpiling general purpose incandescent lamps in anticipation of the phase-out. By hoarding general purpose incandescent lamps, those consumers can effectively sidestep the regulations by having a stockpile of phased-out lamps on hand to satisfy their replacement needs. Survey efforts around the country found a wide range of consumer responses pertaining to anticipated hoarding of incandescent lamps as a result of EISA.

- Thirteen percent of consumers surveyed during OSRAM Sylvania's 2011 Socket Survey indicated that they would buy a lot of traditional 100 watt incandescent lamps while they are still produced and continue using them.⁵³
- In the Pacific Northwest, only 1 percent of consumers surveyed on behalf of NEEA in early 2012 indicated that they would stock up on 100 watt incandescent lamps before the phase-out.⁵⁴
- Six consumer focus groups held in Connecticut in late 2011 found a higher propensity of incandescent lamp hoarding, with 10 out of 23 participants indicating that they are currently hoarding or would consider hoarding incandescent lamps.⁵⁵

⁵¹ KRC Research, 2011.

⁵² DNV KEMA, 2012a.

⁵³ KRC Research, 2011.

⁵⁴ DNV KEMA, 2012a.

-
- In another national evaluation, once EISA was described to respondents, the most frequently mentioned action to replace 100 watt incandescent lamps was to stockpile incandescent lamps.⁵⁶

3.3.2 California Market

DNV KEMA staff conducted telephone surveys with 800 California consumers during the first half of 2012 to solicit information on lamp purchasing decisions and anticipated consumer response to changes in general purpose incandescent lamp availability as a result of AB 1109. We have organized the results of this survey effort into two sections: (1) actual purchases, which highlights California consumers purchase attempts for phased-out 100 watt incandescent lamps; and (2) planned purchases, which highlights consumers anticipated behavior once 100 watt incandescent lamps are no longer available. Comparable national data for actual purchases did not exist at the time of this report—however, we were able to draw high-level comparisons between the planned purchases of California consumers with consumers from around the country based on the survey results presented in Section 3.3.1.

3.3.2.1 Actual Purchases

In California, the phase-out of 100 watt incandescent lamps started at the beginning of 2011 as part of AB 1109, one year earlier than the rest of the country. To assess whether any consumers attempted to purchase traditional 100 watt incandescent lamps but were unable to find them, interviewers for the WO28 consumer survey asked, “did you shop for any traditional 100 watt incandescent light bulbs in California during 2011?” and if yes, “did you end up purchasing any 100 watt incandescent light bulbs?” If they did not, interviewers asked why, whether they purchased a different lamp type or wattage, and if so, what they purchased. Based on these questions:

- Eighteen percent of California consumers surveyed by DNV KEMA indicated that they shopped for traditional 100 watt incandescent lamps in 2011.
 - As shown in Figure 3-8, sixty-five percent of those consumers ended up purchasing 100 watt incandescent lamps in 2011. These results align well with

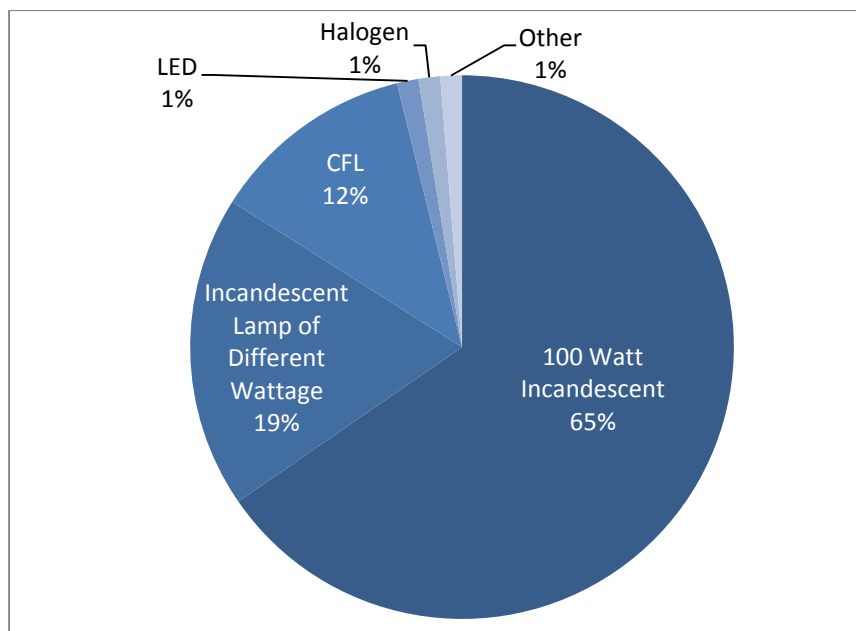
⁵⁵ NMR Group, 2011.

⁵⁶ Buhr, 2011.

Fall 2011 shelf survey results that suggest 100 watt incandescent lamps were available in the majority of California retail stores during that timeframe.

- Another 19 percent of consumers who shopped for 100 watt incandescent lamps in 2011 ended up purchasing an incandescent lamp of a different wattage (i.e. bin jumped). When these results are combined with the 65 percent who purchased 100 watt incandescent lamps above, the result is that 84 percent of survey respondents who shopped for a 100 watt incandescent lamp in 2011 purchased an incandescent lamp of one wattage or another.
- Around 15 percent of consumers who shopped for 100 watt incandescent lamps in 2011 decided to purchase a more efficient lamp with 12 percent of those consumers opting for a CFL while only around 1 percent of consumers ended up purchasing a LED or halogen lamp, respectively.
- Less than one-third (27 percent) of California consumers who shopped for 100 watt incandescent lamps in 2011 indicated that they did not buy a 100 watt lamp because they could not find them (i.e., because these lamps were unavailable). Again, these results align well with Fall 2011 shelf survey results.

Figure 3-8
Actual Purchases of California Consumers Who Shopped For 100 Watt Incandescent Lamps in 2011



n=156. Source: DNV KEMA WO28 consumer surveys (2012).

3.3.2.2 Planned Purchases

DNV KEMA staff also asked California consumers about their anticipated response to the phase-out of incandescent lamps during the telephone surveys conducted in the first half of 2012. Interviewers asked consumers, “when traditional 100 watt light bulbs are no longer available, which one of the following things are you most likely to do? Will you switch to a new type of light bulb, keep using traditional bulbs but switch to a lower wattage, or something else?” When respondents indicated that they intended to switch to another lamp type, interviewers asked them a follow up question to understand the technology to which they were most likely to switch (LED, halogen, CFL, or efficient incandescent). While these questions are not identical to those used in the other survey efforts mentioned above (e.g., Sylvania, NEEA.), the information is similar and allows for a rough comparison of California consumers’ planned purchases in response to EISA/AB 1109 with consumers planned purchases in other parts of the country. Results suggest the following:

- Fifty-four percent of California respondents indicated that they would most likely switch to a new lamp type when traditional 100 watt incandescent lamps are no longer available. These results are similar to the Sylvania and NEEA survey results, which found that 53 percent and 45 percent of respondents would most likely switch to a new technology, respectively.
 - Almost half (47%) of California consumers who indicated that they would switch to a new technology said that they would most likely switch to CFLs.
 - Twenty-two percent of California consumers said that they would most likely switch to LED lamps when traditional 100 watt incandescent lamps are no longer available.
 - Seventeen percent of California consumers indicated that they would switch to efficient incandescent lamps and 4 percent of consumers said that they would most likely switch to halogen lamps when 100 watt incandescent lamps became unavailable.
- Twenty-seven percent of California survey respondents said that they would most likely keep using traditional incandescent lamps but would switch to a lower wattage when 100 watt lamps were no longer available (i.e. bin jumping). The percent of California consumers who anticipate bin jumping in response to EISA/AB 1109 per mid-2012 survey results also similar to the national Sylvania and Pacific Northwest NEEA survey results conducted in 2011 and early 2012, respectively (30% and 33%).

3.4 International Regulations

In this section we examine the divergent responses of 3 international lighting markets to pending EISA-like regulations in an effort to gain insight into possible market responses to lighting regulations in California and the United States. DNV KEMA staff analyzed lamp sales in United Kingdom (UK), Australia, and Austria for the period immediately prior to regulations taking effect to understand the consumer response to pending lighting regulations in those markets. We selected these countries because their regulations, while not identical to EISA, are similar, as they are focused on phasing out incandescent lamps over a multi-year period and they highlight both the variability and unpredictable nature of market responses to regulations. The UK also offered an opportunity to analyze the impact of regulations on lamp sales after regulations were in place for at least one year, as that was the only region with sales data available for the year following the implementation of regulations.

3.4.1 United Kingdom

In the UK, lighting regulations aimed at removing the most inefficient lamps from the market began in September, 2009 with a ban on sales of general purpose incandescent lamps with light output over 950 lumens (equivalent to an 80 watt lamp). Similar to EISA and AB 1109, the regulations are focused on general purpose lamps, establish efficacy requirements that most traditional incandescent lamps cannot meet, are phased in over time, and include exceptions for many specialty bulbs.⁵⁷

A unique aspect of the UK's experience with incandescent lamp phase-out regulations is the voluntary agreement reached between lighting retailers and the government to remove the most inefficient incandescent lamps from store shelves before regulations officially took effect. In 2007, major UK lamp retailers agreed to stop replenishing their stock of the most inefficient general purpose A-lamps prior to formal efficacy standards taking effect. According to a 2011 study by the International Energy Agency, the UK market experienced a significant decline in incandescent lamp sales before lighting regulations officially took effect in 2009, suggesting that

⁵⁷ International Energy Agency, 2010.

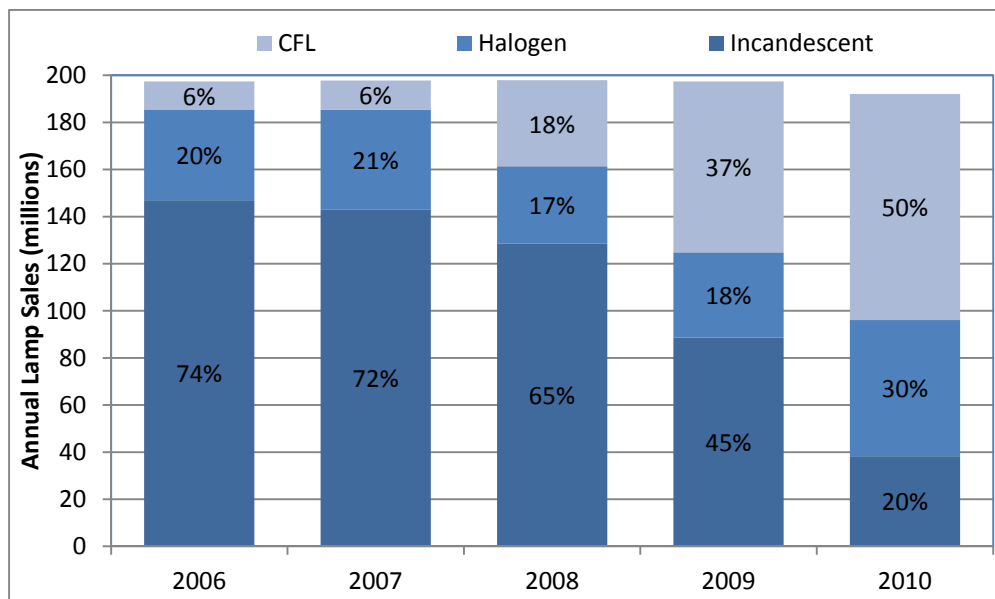
the voluntary retailer agreement was successful in decreasing the availability of incandescent lamps to consumers.⁵⁸

As shown in Figure 3-9, there was a substantial decline in incandescent lamp sales in the UK, from over 140 million incandescent lamps sold annually in 2007 to less than 90 million lamps sold in 2009. This decline is likely a result of decreased availability of incandescent lamps achieved by the voluntary agreement between retailers and the UK government which started in 2007. In 2010, a full year after regulations began to be phased in, incandescent lamp sales fell by more than 50 percent from the prior year to less than 40 million lamps.

It is also interesting to note the lamp types purchased by UK consumers as the availability of traditional incandescent lamps began to decline. In 2010, UK consumers purchased 50 million fewer incandescent lamps than in 2009. Those displaced lamp sales were evenly divided between CFLs and halogen lamps, which increased in sales by 23.4 million and 21.6 million lamps, respectively, from 2009 to 2010. The market share of incandescent lamps in the domestic lamp market (i.e. residential replacement lamp market) fell from 72 percent in 2007 to only 20 percent in 2010. Over the same time period, the market share of halogen lamps increased to 30 percent (from 21% in 2007) and CFL increased to 50 percent (from 6% in 2007). Overall, there were over 5 million fewer lamps sold in 2010 compared to 2009, a trend that is expected to continue as more longer-lasting lamps penetrate the market (thus reducing the annual demand for replacement lamps).

⁵⁸ International Energy Agency, 2011.

Figure 3-9
UK: Annual Lamp Sales and Market Share by Lamp Type, 2006-2010



Source: IEA, 2011.

3.4.2 Australia

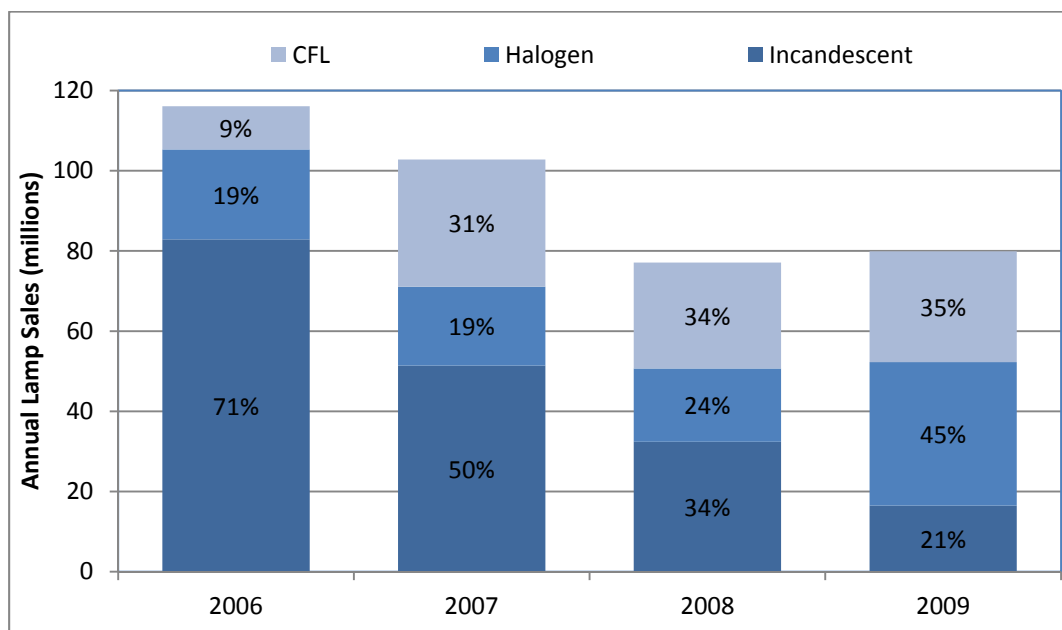
The lighting market in Australia began to change in 2007, when the Australian government formally announced regulations to phase out incandescent lamps. While the intent of the Australian regulations is similar to EISA and AB 1109, one major difference worth noting is the fact that sales restrictions on all general purpose incandescent lamps below 150 watts were implemented in November, 2009, rather than the multi-year phase-out included in EISA and AB 1109. In 2010, the second year of regulations in Australia, the sale of many specialty bulbs such as candelabra-style lamps over 40 watts, other decorative lamps, and halogen reflector lamps.

As shown in Figure 3-10, sales of incandescent lamps dropped from almost 83 million in 2006 to less than 52 million in 2007, while sales of CFLs increased from around 11 million in 2006 to over 31 million in 2007. By the end of 2009, when sales of incandescent lamps began to be regulated in Australia, incandescent lamp sales were reduced to 16.5 million lamps, and the market share of incandescent lamps in the Australian residential replacement lamp market dropped from 71 percent in 2006 to 21 percent in 2009.

The data show that incandescent lamp sales declined steadily in the years leading up to the regulations taking effect in 2009, however, the consumer response to the phase-out of general purpose incandescent lamps in Australia appears to be much different from the response documented in the UK. While sales of the displaced incandescent lamps were more or less

evenly divided between halogen lamps and CFLs in the UK, Australia saw a disproportionate increase in halogen lamp sales accompanied by a relatively small uptick in CFL sales during the first year of regulation. From 2008 to 2009, incandescent lamp sales decreased by around 50 percent, or roughly 16 million lamps. Those displaced incandescent lamp sales went almost entirely to halogen lamps, which increased sales from 18.3 million lamps in 2008 to 35.8 million lamps in 2009, capturing 45 percent of Australia’s domestic lamp market, almost doubling from the 24 percent market share in 2008. During that same time period, CFL sales only increased by a little more than one million lamps and CFL market share stayed relatively flat at 35 percent.

Figure 3-10
Australia: Annual Lamp Sales and Market Share by Lamp Type, 2006-2009



Source: IEA, 2011.

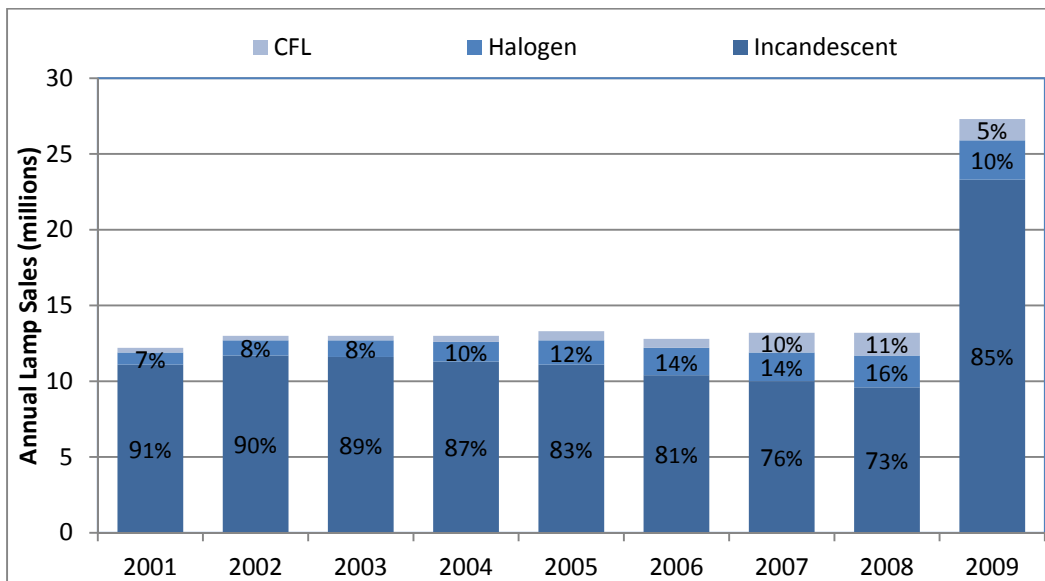
3.4.3 Austria

In 2009, Austria enacted the same lamp efficacy regulations as the UK (described above). The consumer response to pending lighting regulations in Austria presents an interesting example of a market response that is quite the opposite from the goals of the lighting regulations.

Figure 3-11 shows annual lamp sales in Austria from 2001 to 2009, when EU-wide lighting regulations began to take effect. Strong consumer backlash in Austria, which has the highest historical level of incandescent market share of all the countries reporting data to IEA, resulted in a more than doubling of incandescent lamp sales from 2008 to 2009. This backlash caused incandescent lamp sales to jump from about 10 million lamps in 2008 to over 23 million lamps in 2009. The spike of incandescent lamp sales in 2009 will delay the desired impact of regulations:

efficient replacement lamps will enter the installed stock much later than anticipated because consumers are likely to first install the inefficient incandescent lamps they hoarded.⁵⁹

Figure 3-11
Austria: Annual Lamp Sales by Lamp Type, 2001-2009



Source: IEA, 2011.

⁵⁹ *Ibid.*

4. Summary of Findings

In this section, we review key findings on consumer awareness of EISA and AB 1109, availability of EISA-compliant and non-compliant lamps, and consumer response, both actual and anticipated, to the phase-out of most incandescent lamps.

4.1 Lamp Availability

Based on available lamp shipment and market share data from 2011, there are no indications that the availability of incandescent lamps in the national market has decreased as a result of pending EISA regulations which began being phased in in 2012. Recent national lamp shipment data showed a spike in incandescent lamp imports in the last quarter before EISA regulations took effect which suggests that retailers may be stocking up on incandescent lamps before EISA is fully implemented for general purpose A-lamps.

In both California and the U.S. as a whole, EISA-compliant and non-compliant general purpose A-lamps remain widely available—however in California, the availability of non-compliant lamps is beginning to show signs of decline. During Fall 2011, the majority of general purpose A-lamps observed in a sample of California retail stores were not compliant with EISA or AB 1109 efficacy standards. By Summer 2012, however, there was a noticeable increase in the proportion of EISA-compliant lamps as well as the average number of EISA-compliant lamps available in California stores.

- Recent lamp shipment data from NEMA showed a noteworthy spike in incandescent lamp imports in the last quarter of 2011 prior to EISA regulations taking effect in 2012. These data suggest that retailers stocked up on incandescent lamps in anticipation of EISA.
- In California, where AB 1109 began taking effect at the beginning of 2011, almost two-thirds of general purpose incandescent A-lamps in the first lumen bin affected by the standard (high brightness/1490-2600 lumens) were not compliant as of Fall 2011. In Summer 2012, the proportion of EISA-compliant high brightness general purpose lamps increased to 92 percent, indicating that lighting regulations are yielding the desired result of removing the most inefficient lamps from California's retail market for replacement lamps.
- Only 11 percent of medium high brightness general purpose lamps (1050-1489 lumens) observed in California in Fall 2011 were compliant with AB 1109 efficacy standards. The regulation for these lamps began in January, 2012 in California. By summer 2012, the

percentage of compliant lamps in this lumen bin increased to nearly half of the medium high brightness general purpose lamps observed in stores (48 percent).

- On average, across all California retail channels, there were almost twice as many non-compliant high brightness general purpose lamps per store in our Fall 2011 sample as EISA-compliant lamps, and more than eight times as many non-compliant medium high brightness general purpose lamps per store. Stocking practices changed dramatically by Summer 2012, when there were nine times as many EISA-compliant high brightness general purpose A-lamps per store as non-compliant lamps and a relatively even number of EISA-compliant and non-compliant medium high brightness general purpose A-lamps.
- In California big box stores (mass merchandise, home improvement, and warehouse clubs), comparable data allowed us to analyze shelf survey results from Spring 2009, Fall 2011, and Summer 2012. The percentage of EISA-compliant high brightness lamps increased from 6 percent in 2009 to 44 percent in 2011. By summer 2012, this percentage increased to nearly all high brightness A-lamps (97%), suggesting that the lamp efficacy regulations have impacted stocking practices in big box stores.

4.2 Awareness of EISA and AB 1109

Consumer awareness of both EISA in the U.S. and AB 1009 in California is moderate as of 2012, and awareness of EISA appears to be increasing over time at the national level. Four years ago, the lamp manufacturer OSRAM Sylvania began tracking consumer awareness of EISA nationally, and 2011 was the first year in which the majority of consumers indicated that they were aware of EISA regulations. As of mid-2012, DNV KEMA survey results in California indicated that less than half of California consumers were aware of EISA, and only around one in five California consumers surveyed at that time were aware of AB 1109.

- For the first time in four years, the majority (55 percent) of respondents to Sylvania's 2011 national survey were aware of regulations that will ban most traditional incandescent lamps.
- Consumer awareness was not as high in California in mid-2012, with 43 percent of consumers surveyed by DNV KEMA indicating that they were aware of regulations that would ban most traditional incandescent lamps.
- Data suggest that lighting manufacturers and retailers are more aware of EISA than consumers. However, there is still not ubiquitous awareness amongst this group even

though incandescent lamp manufacturers are legally required to alter their manufacturing practices as a result of EISA regulations.

- Awareness of AB 1109 by consumers in California is even lower than their awareness of EISA despite the fact that AB1109 regulations began affecting the California market one year earlier than EISA began affecting the national market.

4.3 Effects of Regulation on Consumer Purchasing Behaviors

The majority of consumers in California and in the U.S. as a whole indicate that they will switch to a new technology in response to the incandescent lamp phase-out. However, approximately 30 percent of consumers (both nationally and in California) report that they will move to a different incandescent lamp wattage rather than adopt a new lamp technology (a practice known as bin jumping).

- While sales data is not yet available to reveal actual consumer purchasing habits after EISA and AB 1109 have gone into effect, both national and California telephone survey efforts (from 2011 and 2012, respectively) indicate that slightly more than half of consumers are likely to switch to a new technology (CFL, LED, or halogen) when they can no longer buy traditional incandescent lamps.
- Thirty percent of national consumers surveyed in 2011 and 27 percent of California consumers surveyed in 2012 reported that when traditional 100 watt incandescent lamps are no longer available, they will continue to use incandescent lamps and bin jump, which implies that they will move to a lower wattage (such as 75W). While fewer consumers in national survey indicated that they would switch to a new technology as a result of EISA in 2011 than in 2010, more reported that they would likely bin jump when they needed to replace phased-out lamps.
- Thirteen percent of consumers surveyed nationally in 2011 reported that they would stockpile or hoard incandescent lamps in response to EISA regulations, the same percentage as the prior survey from 2010.
- In California, 65 percent of consumers who shopped for 100 watt incandescent lamps in 2011 were able to buy them (according to mid-2012 survey results). More than half of the remaining consumers who shopped for 100 watt lamps and did not purchase them ended up bin jumping and purchasing an incandescent lamp of a different wattage.

4.4 International Regulations

In other countries with EISA-like regulations aimed at phasing out incandescent lamps over time, consumer response has been varied and unpredictable. For these reasons, it is challenging to use international market response to predict how EISA regulations will impact the U.S. lighting market. However, one trend worth noting is the unexpected increase of halogen lamp sales as a result of the phase-out of incandescent lamps. It is clear that monitoring the market share of halogen lamps (which are less efficient than CFLs and which many regulators assumed would be the dominant replacement lamp technology) as well as monitoring the proportion of consumers who stockpile and hoard incandescent lamps will be important to understand the impacts of EISA and AB 1109 regulations.

- In the UK, where the incandescent phase-out officially began in 2009, there was a voluntary agreement (starting in 2007) between lighting retailers and the government to remove the most inefficient incandescent lamps from store shelves prior to regulations taking effect. As a result, there was evidence of decreased incandescent lamp availability in retail stores by the time the regulations were implemented along with declining incandescent lamp sales prior to implementation.
- In Australia, where lighting regulations began in 2009 with the phase-out of most general service incandescent lamps, the lighting market experienced a large shift to halogen lamps during the first year of the incandescent lamp phase-out.
- In Austria, consumers reacted to the phase-out of general purpose incandescent lamps, which also started in 2009, by purchasing more than twice as many incandescent lamps during the first year of the phase-out compared to the prior year.

A. Appendix A: Bibliography

Buhr, Tami (Opinion Dynamics Corp.), 2011. The Future of CFL Programs after EISA. Presentation prepared for ACEEE (Denver, 2011). September, 2011.

Cardwell, Diane (NY Times), 2011. Despite Delay, the 100-Watt Bulb Is on Its Way Out. December 16, 2011.

Commission of the European Communities, 2009. Commission Staff Working Document, Full Impact Assessment, Accompanying document to the Commission Regulation implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to eco-design requirements for non-directional household lamps. March, 2009.

D&R International, Ltd., 2011a. Product Snapshot: LED Replacement Lamps. Supported by U.S. Department of Energy. May, 2011.

_____, 2011b. Personal communication from Tobias Swope (D&R International) to Jennifer Canseco (DNV KEMA). April 19, 2011.

_____, 2010a. Product Snapshot: LED Replacement Lamps 2010. Supported by U.S. Department of Energy. September, 2010.

_____, 2010b. ENERGY STAR CFL Market Profile: Data Trends and Market Insights. Supported by U.S. Department of Energy. September, 2010.

DNV KEMA Energy & Sustainability, 2012a. 2011-2012 Northwest Residential Lighting Tracking and Monitoring Study. Prepared for the Northwest Energy Efficiency Alliance. May 21, 2012.

_____, 2012b. California LED Lamp Market Characterization Report. Prepared for the California Public Utilities Commission Energy Division. June 12, 2012.

_____, 2012c. 2011 California Lighting Retail Store Shelf Survey Report. Prepared for the California Public Utilities Commission Energy Division. May 30, 2012.

Ecos Consulting, 2011. Your Guide to More Efficient and Money-Saving Light Bulbs. Prepared for National Resource Defense Council (NRDC). August, 2011.

GE Lighting, 2011. Point of View: A Transforming Global Lighting Industry. March, 2011.

Hodgkiss, J., 2011. Domestic Lighting Stage 2 Compliance Project (UK). Supported by National Measurement Office and EuP. May, 2011.

- H.R. 6--110th Congress, 2007. Energy Independence and Security Act of 2007. In GovTrack.us (database of federal legislation). Retrieved May 1, 2012, from <http://www.govtrack.us/congress/bills/110/hr6>.
- Huffman, Jared, 2007. California Can Shine Across the Nation by Enacting Performance Based Lighting Efficacy Legislation. Written for CaliforniaProgressReport.com. March 13, 2007.
- International Energy Agency, 2011. Draft Benchmarking Impact of “Phase-Out” Regulations on Lighting Markets. Supported by IEA’s Mapping and Benchmarking Annex of the Efficacy End-use Electrical Equipment Implementing Agreement (4E) July, 2011.
- _____, 2010. Phase Out of Incandescent Lamps – Implications for International Supply and Demand for Regulatory Compliant Lamps. April, 2010.
- KRC Research, 2011. 4th Annual Sylvania Socket Survey. Supported by OSRAM Sylvania. November 15, 2011.
- McDermott, Matthew (Treehugger.com), 2009. India to Phase Out 400 Million Incandescent Light Bulbs by 2012, Replace with CFLs. March 4, 2009.
- National Electrical Manufacturers Association (NEMA), 2012. Shipments of Incandescent Lamps Illuminate at the Close of 2011. March 15, 2012.
- _____, 2011. NEMA Reiterates that Lightbulb Efficacy Standards Remain, Consumers Retain Diverse Option for Efficient Lightbulbs. December 16, 2011.
- Navigant Consulting Europe, Ltd., 2010. Task 3: Review of Sales and Inventory Estimates. Published by UK Department for Environment, Food and Rural Affairs, Swedish Energy Agency, and the European Council for an Energy Efficacy Economy. June, 2010.
- NMR Group, Inc., 2011. Connecticut Lighting Focus Groups: Exploration of Changes in the Lighting Market and Reactions to Various Efficient Lighting Choices. Prepared for Connecticut Energy Efficacy Board. November, 2011.
- Reuters, 2011. China to Phase Out Incandescent Light Bulbs in 5 Years: Report. November 5, 2011.
- Rubinstein, Francis (LBNL); Horowitz, Noah (NRDC); Harris, Jeff (NEEA), 2011. What to do with the “Incandescent Phase-out.” Prepared for ACEEE conference. March, 2011.
- The Cadmus Group, 2011. What will the Lighting Market Look Like Under EISA? Prepared for the National Symposium on Market Transformation. April, 2011.
- United States Environmental Protection Agency (EPA), 2011. Next Generation Lighting Programs: Opportunities to Advance Efficient Lighting for a Cleaner Environment. (EPA with assistance from ECOS and ICF). 2011.

B. Appendix B: Additional Fall 2011 Shelf Survey Tables

Table B-1
Number of EISA-Compliant and Non-Compliant A-Lamps by Brightness and Channel, Fall 2011

MSB General Service Incandescent/Halogen A-Lamps	Channel							Overall
	Discount	Drug	Grocery	Hardware	Home Improv.	Mass Merch.	Memb. Club	
High Brightness (1490-2600 lumens)								
EISA Compliant	–	86	54	196	1,837	811	2,056	5,040
EISA Non-Compliant	52	121	736	2,114	5,900	112	–	9,035
Total High Brightness A-Lamps	52	207	790	2,310	7,737	923	2,056	14,075
Medium High Brightness (1050-1489 lumens)								
EISA Compliant	–	56	36	138	–	765	–	995
EISA Non-Compliant	18	1,021	844	2,391	2,252	1,175	–	7,701
Total Medium High Brightness A-Lamps	18	1,077	880	2,529	2,252	1,940	–	8,696
Medium Low Brightness (750-1049 lumens)								
EISA Compliant	–	52	60	212	4,690	779	2,296	8,089
EISA Non-Compliant	3,542	980	1,883	3,250	17,543	3,591	–	30,789
Total Medium Low Brightness A-Lamps	3,542	1,032	1,943	3,462	22,233	4,370	2,296	38,878
Low Brightness (310-749 lumens)								
EISA Compliant	–	–	44	160	916	511	–	1,631
EISA Non-Compliant	5,916	784	1,331	4,801	17,881	4,038	–	34,751
Total Low Brightness Compliant A-Lamps	5,916	784	1,375	4,961	18,797	4,549	–	36,382

Source: DNV KEMA, 2012c.

**Table B-2
Number of EISA-Compliant and Non-Compliant A-Lamps by Brightness and Channel, Summer 2012**

MSB General Purpose Incandescent/Halogen A-Lamps	Channel							Overall
	Discount	Drug	Grocery	Hardware	Home Improv.	Mass Merch.	Memb. Club	
High Brightness (1490-2600 lumens)								
EISA Compliant	4	118	117	328	1,699	1,353	.	3,619
EISA Non-Compliant	2	34	.	182	83	.	.	301
Total High Brightness A-Lamps	6	152	117	510	1,782	1,353	.	3,920
Medium High Brightness (1050-1489 lumens)								
EISA Compliant	.	90	79	278	75	1,138	.	1,660
EISA Non-Compliant	.	186	100	1,163	160	168	.	1,777
Total Medium High Brightness A-Lamps	.	276	179	1,441	235	1,306	.	3,437
Medium Low Brightness (750-1049 lumens)								
EISA Compliant	.	.	29	324	1,135	643	1,356	3,487
EISA Non-Compliant	2,730	1,023	843	2,455	8,507	5,542	.	21,100
Total Medium Low Brightness A-Lamps	2,730	1,023	872	2,779	9,642	6,185	1,356	24,587
Low Brightness (310-749 lumens)								
EISA Compliant	.	.	52	437	662	1,060	.	2,211
EISA Non-Compliant	3,967	775	1,247	3,438	24,167	8,028	.	41,622
Total Low Brightness Compliant A-Lamps	3,967	775	1,299	3,875	24,829	9,088	.	43,833

Source: DNV KEMA

Table B-3
Average Number of EISA-Compliant and Non-Compliant A-Lamps by Brightness and Channel, Fall 2011

MSB General Service Incandescent/Halogen A-Lamps	Channel							Overall
	Discount	Drug	Grocery	Hardware	Home Improv.	Mass Merch.	Memb. Club	
High Brightness (1490-2600 lumens)								
EISA Compliant	0	3	2	7	71	34	79	27
EISA Non-Compliant	2	4	27	78	227	5	0	49
Total High Brightness A-Lamps	2	8	29	86	298	38	79	76
Medium High Brightness (1050-1489 lumens)								
EISA Compliant	0	2	1	5	0	32	0	5
EISA Non-Compliant	1	38	31	89	87	49	0	42
Total Medium High Brightness A-Lamps	1	40	33	94	87	81	0	47
Medium Low Brightness (750-1049 lumens)								
EISA Compliant	0	2	2	8	180	32	88	44
EISA Non-Compliant	131	36	70	120	675	150	0	167
Total Medium Low Brightness A-Lamps	131	38	72	128	855	182	88	211
Low Brightness (310-749 lumens)								
EISA Compliant	0	0	2	6	35	21	0	9
EISA Non-Compliant	219	29	49	178	688	168	0	189
Total Low Brightness Compliant A-Lamps	219	29	51	184	723	190	0	198
Number of Stores	27	27	27	27	26	24	26	184

Source: DNV KEMA, 2012c.

Table B-4
Average Number of EISA-Compliant and Non-Compliant A-Lamps by Brightness and Channel, Summer 2012

MSB General Purpose Incandescent/Halogen A-Lamps	Channel							Overall
	Discount	Drug	Grocery	Hardware	Home Improv.	Mass Merch.	Memb. Club	
High Brightness (1490-2600 lumens)								
EISA Compliant	0	4	4	12	59	47	0	18
EISA Non-Compliant	0	1	0	7	3	0	0	2
Total High Brightness A-Lamps	0	6	4	18	61	47	0	20
Medium High Brightness (1050-1489 lumens)								
EISA Compliant	0	3	3	10	3	39	0	8
EISA Non-Compliant	0	7	3	42	6	6	0	9
Total Medium High Brightness A-Lamps	0	10	6	51	8	45	0	17
Medium Low Brightness (750-1049 lumens)								
EISA Compliant	0	0	1	12	39	22	47	17
EISA Non-Compliant	98	38	28	88	293	191	0	106
Total Medium Low Brightness A-Lamps	98	38	29	99	332	213	47	123
Low Brightness (310-749 lumens)								
EISA Compliant	0	0	2	16	23	37	0	11
EISA Non-Compliant	142	29	42	123	833	277	0	208
Total Low Brightness Compliant A-Lamps	142	29	43	138	856	313	0	219
Number of Stores	28	27	30	28	29	29	29	200

Source: DNV KEMA

Table B-5
Number of EISA-Compliant and Non-Compliant A-Lamps by Brightness and Channel, 2009, 2011, 2012

MSB General Purpose Incandescent/Halogen A-Lamps	Channel											
	Home Improvement			Mass Merchandise			Membership Club			Overall		
	2009	2011	2012	2009	2011	2012	2009	2011	2012	2009	2011	2012
High Brightness (1490-2600 lumens)												
EISA Compliant	390	1,757	1,555	.	811	1,353	.	2,056	.	390	4,624	2,908
EISA Non-Compliant	4,435	5,767	83	1,528	96	.	.	.	.	5,963	5,863	83
Total High Brightness A-Lamps	4,825	7,524	1,638	1,528	907	1,353	.	2,056	.	6,353	10,487	2,991
Medium High Brightness (1050-1489 lumens)												
EISA Compliant	.	.	75	.	765	1,138	.	.	.	.	765	1,213
EISA Non-Compliant	4,034	2,197	160	600	1,175	168	.	.	.	4,634	3,372	328
Total Medium High Brightness A-Lamps	4,034	2,197	235	600	1,940	1,306	.	.	.	4,634	4,137	1,541
Medium Low Brightness (750-1049 lumens)												
EISA Compliant	474	4,592	1,021	.	779	643	.	2,296	.	474	7,667	1,664
EISA Non-Compliant	10,594	15,267	5,391	2,140	3,523	5,446	.	.	.	12,734	18,790	10,837
Total Medium Low Brightness A-Lamps	11,068	19,859	6,412	2,140	4,302	6,089	.	2,296	.	13,208	26,457	12,501
Low Brightness (310-749 lumens)												
EISA Compliant	.	786	578	.	511	1,060	.	.	.	.	1,297	1,638
EISA Non-Compliant	9,746	16,399	22,865	1,871	4,000	8,028	.	.	.	11,617	20,399	30,893
Total Low Brightness Compliant A-Lamps	9,746	17,185	23,443	1,871	4,511	9,088	.	.	.	11,617	21,696	32,531

Source: DNV KEMA

Table B-6
Average Number of EISA-Compliant and Non-Compliant A-Lamps by Brightness and Channel, 2009, 2011, and 2012

MSB General Purpose Incandescent/Halogen A-Lamps	Channel											
	Home Improvement			Mass Merchandise			Membership Club			Overall		
	2009	2011	2012	2009	2011	2012	2009	2011	2012	2009	2011	2012
High Brightness (1490-2600 lumens)												
EISA Compliant	28	84	74	0	41	52	0	79	0	11	69	40
EISA Non-Compliant	317	275	4	139	5	0	0	0	0	175	88	1
Total High Brightness A-Lamps	345	358	78	139	45	52	0	79	0	187	157	41
Medium High Brightness (1050-1489 lumens)												
EISA Compliant	0	0	4	0	38	44	0	0	0	0	11	17
EISA Non-Compliant	288	105	8	55	59	6	0	0	0	136	50	4
Total Medium High Brightness A-Lamps	288	105	11	55	97	50	0	0	0	136	62	21
Medium Low Brightness (750-1049 lumens)												
EISA Compliant	34	219	49	0	39	25	0	88	0	14	114	23
EISA Non-Compliant	757	727	257	195	176	209	0	0	0	375	280	148
Total Medium Low Brightness A-Lamps	791	946	305	195	215	234	0	88	0	388	395	171
Low Brightness (310-749 lumens)												
EISA Compliant	0	37	28	0	26	41	0	0	0	0	19	22
EISA Non-Compliant	696	781	1,089	170	200	309	0	0	0	342	304	423
Total Low Brightness Compliant A-Lamps	696	818	1,116	170	226	350	0	0	0	342	324	446
Number of Stores	14	21	21	11	20	26	9	26	26	34	67	73

Source: DNV KEMA, 2012c.

C. Appendix C: Consumer Survey Questions

Appendix C contains verbatim survey questions related to the various survey results referenced in the main body of the report.

4th Annual Sylvania Socket Survey Questions (KRC Research, November, 2011)

- 1) In 2007 Congress passed legislation that will eliminate most traditional incandescent light bulbs by 2014. Before today were you aware of this legislation?
- 2) As part of FUTURE legislation, additional traditional watt light bulbs will begin to be PHASED OUT over the next few years and NO LONGER BE MADE. Before today, were you aware of this PHASE OUT PROGRAM of traditional watt light bulbs
- 3) As part of the legislation, traditional 100 watt light bulbs will NO LONGER BE MADE after January 1, 2012. Before today, were you aware that 100 watt light bulbs will be eliminated by 2012?
- 4) When traditional 100 watt light bulbs are eliminated, which ONE of the following are you most likely to do?
 - a. Switch to new technology light bulbs, such as CFLs, LEDs or halogen light bulbs?
 - b. Keep using traditional light bulbs but switch to lower wattage bulbs, like 75 watt?
 - c. Buy a lot of 100 watt light bulbs while they are still produced and continue using them?

2011-2012 Northwest Residential Lighting Tracking and Monitoring Study (DNV KEMA on behalf of NEEA, May, 2011)

- 1) Are you aware of any legislation in the United States that may affect the availability of certain types of light bulbs?
- 2) In 2007 Congress passed legislation that will phase out most traditional incandescent light bulbs by 2014. Before today, were you aware of this legislation?
- 3) As part of the legislation, retailers began phasing traditional 100-Watt light bulbs out of stores at the beginning of 2012. Before today, were you aware that traditional 100-Watt light bulbs are being phased out?

- 4) When traditional 100-watt light bulbs are no longer available, which one of the following things are you most likely to do: switch to a new type of light bulb, keep using traditional light bulbs but switch to a lower wattage, or something else?

California Consumer Survey (DNV KEMA, July, 2011)

- 1) Are you aware of any legislation in the United States that may affect the availability of certain types of light bulbs?
- 2) In 2007, the U.S. Congress passed legislation that will ban most traditional incandescent light bulbs by 2014. Before today, were you aware of this legislation?
- 3) In 2007, California adopted legislation that will ban most traditional incandescent light bulbs a year earlier than the rest of the country. Before today, were you aware of this legislation?
- 4) As part of this legislation, California began phasing traditional 100-Watt incandescent light bulbs out of retail stores at the beginning of 2011. Before today, were you aware that traditional 100-Watt incandescent bulbs are being phased out in California?
- 5) Did you shop for any traditional 100-Watt incandescent light bulbs in California during 2011?
- 6) Did you end up purchasing any 100-Watt incandescent light bulbs [IF NECESSARY: "...in 2011 when you went shopping for them in California"]?
- 7) If not, why not?
- 8) What type of light bulb did you end up purchasing instead?
- 9) When traditional 100-Watt light bulbs are no longer available, which one of the following things are you most likely to do? Will you switch to a new type of light bulb, keep using traditional bulbs but switch to a lower wattage, or something else?
- 10) Which type of light bulb are you most likely to switch to?

Interviews with LED Market Actors (DNV KEMA, 2012)

- 1) Have you heard about the Energy Independence and Security Act, or EISA? [IF NO] Are you aware of any new federal regulations that require higher efficiency for certain types of lighting?

- 2) Have you heard about California's Lighting Efficiency and Toxics Reduction Act, or AB 1109? [IF NO] Are you aware of any new regulations in California that require higher efficiency for certain types of lighting?