



New Hampshire Lighting Supplier Insights

FINAL

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SUBMITTED TO:
New Hampshire Program Administrators

SUBMITTED BY:
NMR Group, Inc.
DNV GL

NMR
Group, Inc.

New Hampshire Lighting Supplier Insights



This report summarizes findings from 19 in-depth interviews (IDIs) conducted in 2020 with manufacturers, retail buyers (collectively termed suppliers), and advocacy groups with knowledge of the lighting market. The study, co-sponsored with the Energy Efficiency Board in Connecticut and the PAs in Massachusetts, was designed to provide information on the current state of the market and the regulatory environment for the electric program administrators in New Hampshire.

Objectives



Collect estimates of LED market share for 2019 and predictions of market share for 2021 and 2023



Collect opinions on when LEDs would become the dominant bulb type and determine how suppliers define market dominance



Collect insights on how federal and state regulations affect suppliers' business practices

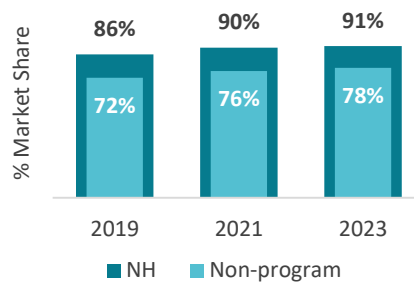
Key Findings

Market Share Predictions

Lighting suppliers provided their companies' estimated 2019 and predicted 2021 and 2023 LED market shares in non-program areas by bulb shape. The average market share estimates in New Hampshire were at **79% or higher** for all bulb shapes. For example, suppliers placed their companies' A-line market share in NH at 86% in 2019 and predicted it would rise to 91% in 2021, while they placed non-program areas at 72% with an expected rise to 78%.

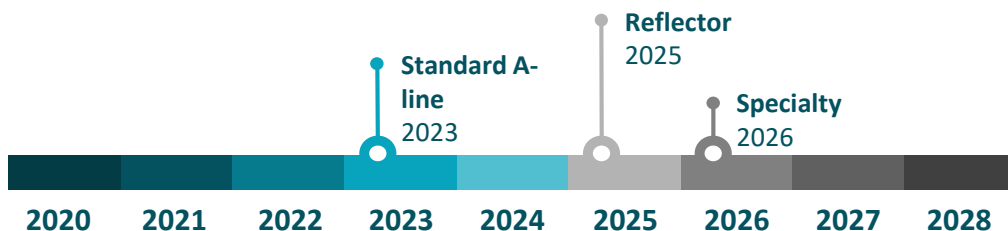
Limitations: The results likely overstate market share for two compounded reasons: 1) The questionnaire prompted suppliers to provide their companies' market share predictions, forcing LED-focused suppliers to answer 100%, 2) LED-focused suppliers were more likely to provide market-share estimates than suppliers who work with non-LED bulb types.

LED Market Share Predictions for A-lines



Year of LED Dominance

Interviewers asked suppliers to define dominant; most respondents cited a threshold of **50% to 70% LED market share** across the entire market (encompassing LED-focused and more diverse lighting suppliers). Lighting suppliers predicted that standard LEDs would become the dominant technology in 2023, but the other shapes would not reach LED dominance until the mid-2020s.



Federal Standards

Most suppliers expected little to no impact on their short- or mid-term business practices due to the recent DOE decisions to rescind the expanded definition of general service bulbs (GSLs) and to reject the 45 Lm/W backstop. However, respondents were less certain about the impact of the decisions on their long-term business practices.

State Standards

Suppliers provided a range of responses as to how their organizations interpreted the DOE's guidance on state-level GSL regulations, but they tend to prefer the consistency of federal regulations for the efficiencies in manufacturing, shipping, and other business practices.

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Executive Summary

This report summarizes findings from 19 in-depth interviews (IDIs) conducted in 2020 with manufacturers, retail buyers (collectively termed *suppliers*), and advocacy groups with knowledge of the lighting market. The study was designed to provide information on the current state of the market and the regulatory environment for the electric program administrators in New Hampshire (PAs). The Energy Efficiency Board in Connecticut and the PAs in Massachusetts also co-sponsored this study. NMR Group, Inc. conducted the study on behalf of the various study sponsors. Subcontractor DNV GL partnered with NMR on this study (the evaluation team).

The objectives of this study were to provide suppliers with the following:

- Estimates of LED market share for 2019 and predictions of market share for 2021 and 2023 (LED market share is the percentage of bulbs sold that are LEDs).
- Opinions on when LEDs would become the dominant bulb type and how suppliers define market dominance
- Insights on how federal and state regulations affect suppliers' business practices.

The study does not offer any specific recommendations, although it does offer guidance for future supplier interview research in [Appendix A](#).

METHODOLOGY

The evaluation team conducted IDIs over the phone from January to March 2020 with 14 manufacturers and three retailers. These companies manufactured, supplied, or sold lighting products that received upstream incentives from the Massachusetts program from January through October 2019. Therefore, the results represent program partners, all of whom manufacturer or sell LEDs, rather than the entire lighting market, which includes suppliers who do not deal in LEDs at all. Collectively, the lighting suppliers interviewed accounted for 67% of total program sales in Massachusetts for the first ten months of 2019. The evaluation team based the sample design on Massachusetts as it was the lead sponsor of this study. Recognizing that the New Hampshire lighting market relies more than Massachusetts on small independent retailers, the evaluation team made certain to secure interviews with suppliers working with hardware and discount stores. However, discount retailers and manufacturers primarily partnering with independent grocers declined interviews.

The sample size and respondent coverage of program sales varies across questions. Two of the 17 suppliers declined to provide market share predictions, and two others misunderstood the question, which resulted in unusable results. Six suppliers declined to provide predictions of when LEDs would become the dominant bulb type. Five of the suppliers who did provide market shares predictions almost exclusively manufacture LEDs. These five LED-focused suppliers accounted for only about 18% of total 2019 program sales. However, they account for 37% of the program sales among market share respondents. Accordingly, some of the analyses break out LED-focused suppliers from mixed lighting suppliers (those who make or carry more than LEDs).

The evaluation team also conducted IDIs with two stakeholders: one representing an energy-efficiency advocacy group and one representing a consumer advocacy group. Only one of these respondents felt comfortable providing market share predictions. To respect their confidentiality, the report does not list their market share responses.

The evaluation team conducted all interviews and developed the analysis for this report. [Appendix B](#) provides the interview guide. The sample size reported per question varies as not all suppliers provided answers to every question (they declined to answer or the question did not apply to the respondent). The evaluation team presents unweighted results due to concerns about measurement error associated with question wording exacerbated by non-response bias, as explained more in Section 1.2 and [Appendix A](#).

KEY FINDINGS

Market Share Predictions

Lighting suppliers provided their companies' estimated 2019 and predicted 2021 and 2023 LED market shares in non-program areas by bulb shape. The average market share estimates were at 66% or higher for all bulb types.

Suppliers predicted gradual increases of about four to six percentage points in their companies' LED market shares in **non-program areas** for all bulb shapes between 2019 and 2023 ([Figure 1](#)). Suppliers predicted that standard A-line and reflector LED market shares would increase from 72% in 2019 to 78% in 2023. Likewise, the suppliers believed that specialty LED market share would increase from 66% in 2019 to 70% in 2023. In comparison, Consortium for Retail Energy Efficiency Data (CREED) LightTracker^{1,2,3} estimates of the non-program state LED market in 2019 were 51% for A-lines, 82% for reflectors, 42% for globes, and 46% for candelabras.⁴ The discrepancies between the supplier IDIs and LightTracker likely reflect differences in the unit of analysis (market vs. company), differences in question wording (see [Appendix A](#)), and divergent perspectives about the state of the lighting market, as discussed in the LED dominance section.

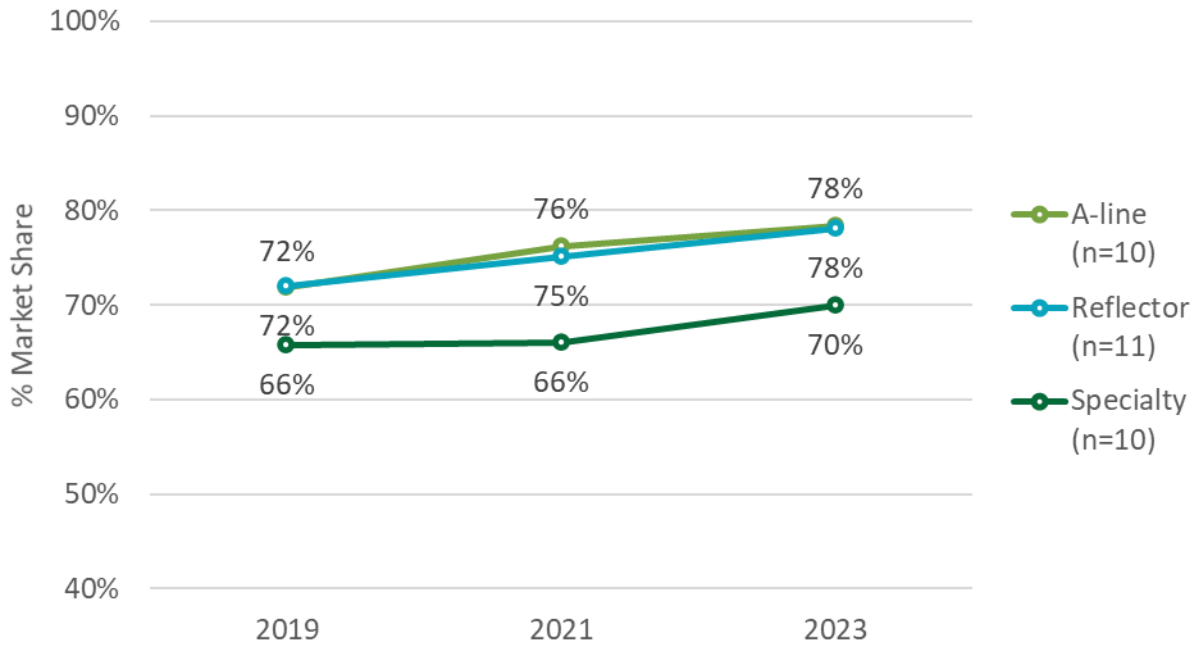
¹ CREED serves as a consortium of PAs, retailers, and manufacturers working together to collect the necessary data to better plan and evaluate energy-efficiency programs. CREED's LightTracker Initiative seeks to acquire full category lighting data for all distribution channels in the entire United States. As a consortium, CREED speaks as one voice for PAs nationwide as they request, collect, and report on the sales data needed by the energy-efficiency community (<https://www.creedlighttracker.com>).

² The information contained herein is based in part on data reported by IRI through its Advantage service, as interpreted solely by LightTracker, Inc. Any opinions expressed herein reflect the judgement of LightTracker, Inc., and are subject to change. IRI disclaims liability of any kind arising from the use of this information.

³ Data presented include LightTracker calculations based in part on data reported by Nielsen through its Strategic Planner and Homescan Services for the lighting category for the 52-week period ending approximately on December 31, 2019, for the available state level markets and Expanded All Outlets Combined (xAOC) and Total Market Channels. Copyright © 2019, Nielsen.

⁴ NMR Group, Inc. 2020. *2019 Regional Lighting Sales Data Analysis*. Forthcoming. Due to the length of the interview, suppliers provided combined estimates of globes and candelabras, but the LightTracker analysis separates them,

Figure 1: Average Supplier’s Market Share by Bulb Type, 2019-2023¹
(Estimate 2019, Prediction 2021, 2023)



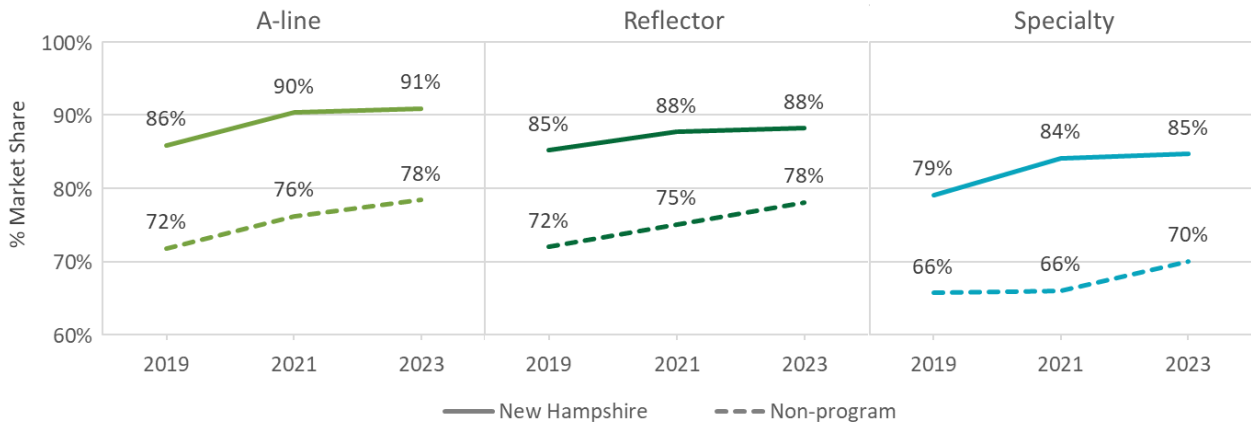
¹ Note that the scale starts at 40%, not 100%.

Lighting suppliers estimated their 2019 and predicted their 2021 and 2023 LED market shares in New Hampshire to be 79% or higher for all bulb types. This falls above non-program areas but below Connecticut and Massachusetts.

The market-level estimates and predictions of **LED sales shares in New Hampshire** were 79% or higher for all bulb types and years and predicted to increase between by three or four percentage points between 2019 and 2023 (Figure 2 and Appendix A). The evaluation team believes the estimates and predictions if market share high due to surveying only program partners coupled with question wording that forced LED-focused suppliers to place their market share at 100%. As discussed more in Section 2, the market share predictions for New Hampshire were lower than Connecticut and Massachusetts but higher than non-program states. Suppliers and an implementer⁵ explained that market share in New England states was higher than in non-program areas due to program activity, but that New Hampshire’s share was slightly behind Connecticut’s and Massachusetts’s because of the younger program age in New Hampshire. The implementer added that New Hampshire and Connecticut both have smaller budgets than Massachusetts, limiting the depth of discounts and diversity of products and channels included in the program.

⁵ The evaluation team interviewed the program implementer on behalf of Connecticut, but respondents supplied relevant information for New Hampshire.

Figure 2: 2019 New Hampshire and Non-Program States Market Share Predictions by Bulb Type, 2019-2023



Year of LED Dominance

Lighting suppliers predicted that standard LEDs would become the dominant bulb technology in 2023, reflectors in 2025, and specialty bulbs in 2026.

The evaluation team asked respondents what year they believed standard, reflector, globe, and candelabra bulbs would become dominant to help inform discussions about adjusted measure life in Massachusetts and to help determine when program sponsors in the three states should consider exiting the residential retail lighting market (Figure 3). We asked respondents to explain their predictions. Suppliers generally felt that the A-line market had progressed further than the other shapes, reflector and specialty LED prices remained higher than halogens, and competition with halogens remained stronger for non-A-line shapes. The forthcoming LightTracker data draws each of these presumptions into question, and strongly suggests that reflector LEDs have made the most progress in terms of market share, price, and competition with halogens.

Figure 3: Suppliers’ Predictions of Year of Dominance (n=11)



Interviewers asked suppliers to define *dominant*; most respondents cited a threshold of 50% to 70% LED market share across the entire market, not just their companies’ shares. Using this criteria, the LightTracker data cited above suggests that reflectors have surpassed this range in non-program areas, A-lines have reached the low-end of the range, and globes and candelabras are approaching it. Other aspects of dominance named by respondents include customer

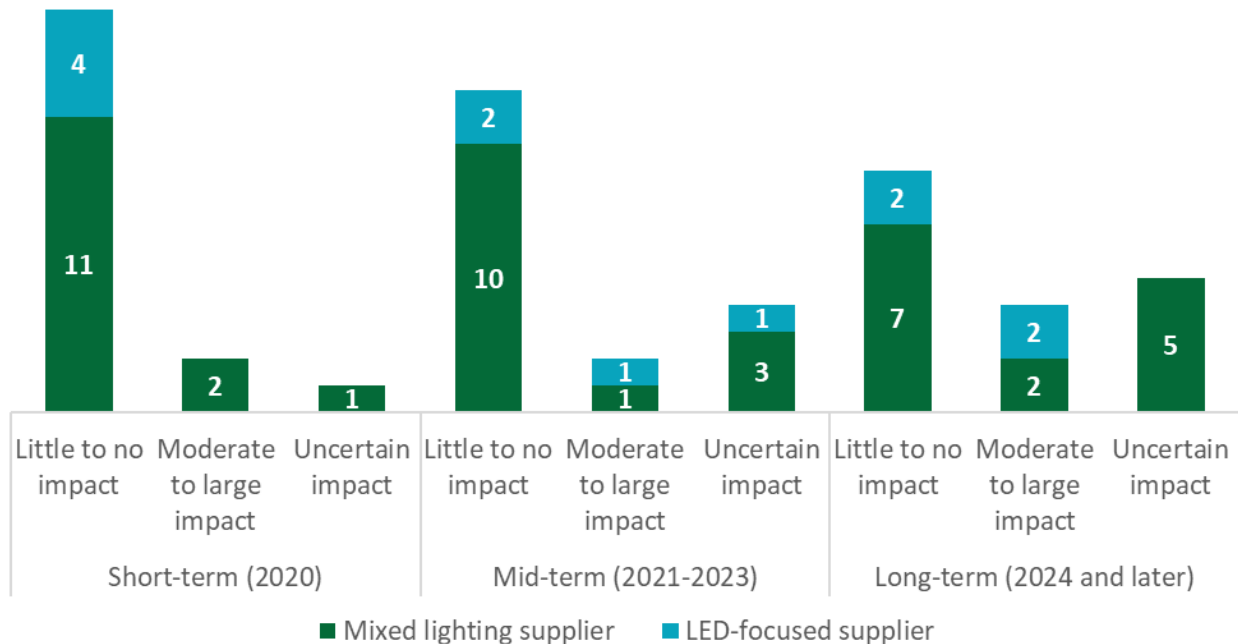
recognition of and preference for LEDs, price parity (or close to it), and greater presence and more desirable locations on store shelves.

Federal Standards

Most suppliers expected little to no impact on their short- or mid-term business practices due to the recent Department of Energy (DOE) decisions to rescind the expanded definition of general service lamps (GSLs) and to reject the 45 lumens per watt (Lm/W) backstop. However, respondents were less certain about the impact of the decisions on their long-term business practices.

Interviewers asked lighting suppliers how DOE decisions will impact their short- (2020), mid- (2021 to 2023), and long-term (2024 and later) business practices such as production, stocking, and shipping practices, packaging, and product placement (Figure 4). In the short-term, suppliers plan to continue production to meet consumer demand, but suppliers were less certain what the future impact would be.

Figure 4: Reported Impact of DOE Decisions on Business Practices (n=18)



Suppliers offered mixed responses when asked whether the uncertainty regarding federal standards affected their bulb ordering / shipment practices.

Five (including two LED-focused suppliers) out of nine suppliers (56%) reported that the uncertainty regarding federal standards had little to no impact on their bulb ordering practices (inclusive of ordering production and shipments from factories and deliveries from distribution centers or warehouses). Two suppliers said that they had increased their orders of LEDs in anticipation of the federal standard changes, whereas another two said they reduced their inventory due to the uncertainty of how well LEDs would sell if halogens and incandescents

remained on shelves. All four respondents whose companies reported a change in practices were mixed lighting suppliers.

Most suppliers reported little variation in stocking practices based on program activity, but three reported differences in LED proportions in program vs. non-program areas.

Interviewers asked suppliers how their placement of inefficient bulbs (halogen and incandescent) compare to their placement of LEDs. Interviewers asked these stocking questions for different bulb types and for states with and without lighting programs. Three out of the 15 suppliers (all mixed suppliers) reported a difference in shelf stocking. One noted that they not only carry more LEDs generally but also more ENERGY STAR LEDs specifically in program stores, primarily showcasing them in off-shelf promotions. One respondent reported that this practice increases the proportion of ENERGY STAR qualified LEDs from about 60% to 85% or even 95%.

State Standards

Suppliers provided a range of responses as to how their organizations interpreted the DOE’s guidance on state-level GSL regulations, but they prefer the consistency of federal regulations for the efficiencies in manufacturing, shipping, and other business practices.

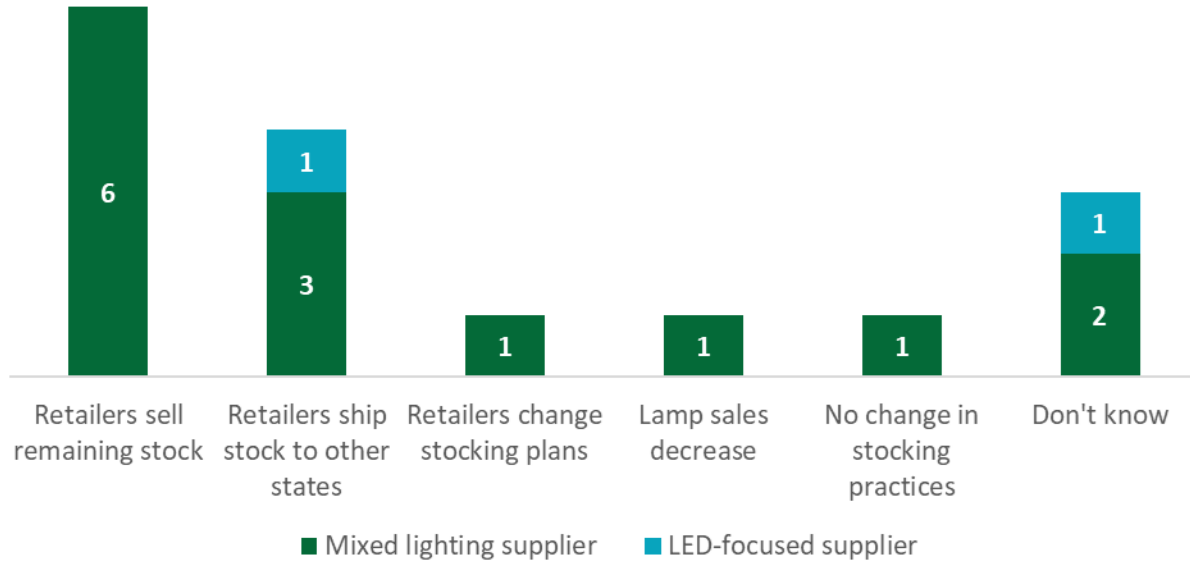
Four of the 16 suppliers (25%) who provided responses to this question said that they would follow the federal guidelines and not adjust stock to abide by state standards, and another four (25%) said the interpretation was up to the retailers. Probing more deeply revealed that suppliers prefer federal regulations as the existence of multiple state regulations complicates manufacturing and shipments, which leads to higher costs that get passed onto consumers as higher shelf prices.

“A lack of a federal standard [but institution of states ones] adds risk in the form of higher costs, more errors, potential fines.”

More suppliers (six) reported that retailers will sell through their remaining stock rather than ship stock to states with lower standards (three), citing logistics and costs.

Interviewers asked how sales and stocking practices for inefficient bulbs would be impacted if individual states were allowed to adopt their own GSL standards (Figure 5). Suppliers responses varied, but the largest group said that they would not ship stock to other states due to the challenges of logistics and costs. However, the next most common response offered the opposite reaction – suppliers would shift stock across states.

Figure 5: Reported Impact on Sales and Stocking Practices for Inefficient Bulbs (n=18)



The majority of suppliers (64%) reported that bulb promotion or sales will not vary between states with and without stricter standards.

Assuming individual states can adopt GSL standards, interviewers asked suppliers whether bulb promotions or sales will vary between states with and without stricter standards. Seven out of 11 respondents said bulb promotion and sales would not vary between states. The remaining four said bulb promotions and sales would vary between states by price (one suggesting prices would go up in states with specific standards), the nature of the state regulation, market demand, product assortment, and technology adoption rates.

“Do I see a retailer promoting an LED product more in a state with a state regulation? I don’t see that.”

Section 1 Introduction

This report summarizes findings from 19 in-depth interviews (IDIs) conducted in 2020 with manufacturers, retail buyers (collectively termed suppliers), and advocacy groups with knowledge of the lighting market. The study was designed to provide information on the current state of the market and the regulatory environment for the electric program administrators in New Hampshire (PAs). The Energy Efficiency Board in Connecticut and the program administrators in Massachusetts also co-sponsored this study.

NMR Group, Inc. conducted the study on behalf of the various study sponsors. Subcontractor DNV GL partnered with NMR on this study (the evaluation team).

1.1 STUDY BACKGROUND AND OBJECTIVES

The PAs decided to conduct interviews with suppliers and stakeholders to gather information on how suppliers are reacting to the following market changes and federal and state regulations:

1. The rapid adoption of LED A-line and reflector bulbs, even in areas of the nation that lack upstream residential lighting programs⁶
2. DOE decisions that rescinded the expanded general service bulb (GSL) definition from early 2017⁷ and rejected the 45 Lm/W backstop of the Energy Independence and Security Act of 2007 (EISA) has been triggered^{8,9}
3. State-level lighting efficiency standards designed to promote efficient lighting,¹⁰ although a final determination by the DOE ruled that states were not permitted to adopt such standards¹¹

⁶ NMR Group, Inc. 2019. *MA19R06-E Massachusetts Lighting Sales Data Analysis*. http://ma-eeac.org/wordpress/wp-content/uploads/MA19R06-E-LtgSalesDataAnalysisReport_FINAL_2019.10.29.pdf.

⁷ Department of Energy, Final determination, "Energy Conservation Program: Definition for General Service Lamps." Federal Register 84, No. 172 (September 5, 2019) 46661.

<https://www.federalregister.gov/documents/2019/09/05/2019-18940/energy-conservation-program-definition-for-general-service-lamps>.

⁸ Department of Energy, Final determination, "Energy Conservation Program: Energy Conservation Standards for General Service Incandescent Lamps." Federal Register 84, No. 248 (December 27, 2019) 71626.

<https://www.federalregister.gov/documents/2019/12/27/2019-27515/energy-conservation-program-energy-conservation-standards-for-general-service-incandescent-lamps>.

⁹ These two decisions reset lighting efficiency standards implemented between 2012 and 2014 that phased out general service incandescent light bulbs in the 40W to 100W range from manufacture inside or shipment into the United States.

¹⁰ DiMascio, Marianne. 2019. "States Step Up on Appliance Standards as the Federal Government Goes Backwards." *Appliance Standards Awareness Project*. Posted July 18. <https://appliance-standards.org/blog/states-step-up-appliance-standards-fed-government-goes-backward>.

¹¹ Department of Energy, Federal Register 84, No. 248, *ibid*.

Therefore, the objectives of this study were to provide suppliers with:

- Estimates of LED market share for 2019 and predictions of market share for 2021 and 2023
- Opinions on when LEDs would become the dominant bulb type
- Insights on how federal and state regulations affect their business practices.

1.2 METHODOLOGY

The evaluation team conducted IDIs over the phone from January to March 2020 with 14 manufacturers and three retailers. These companies manufactured, supplied, or sold lighting products that received upstream incentives from the program from January through October 2019. Collectively, the lighting suppliers interviewed accounted for 67% of total program sales in Massachusetts, the primary study sponsor, for the first ten months of 2019. Most of the suppliers represented manufacturers, and collectively, these manufacturers sold bulbs in every retail channel. However, only one of the manufacturers who primarily supply independent stores and grocery stores provided market share estimates. Therefore, while included in the study, the results have limited representation of smaller retailers and hard-to-reach channels.

The evaluation team also conducted IDIs with two stakeholders: one representing an energy-efficiency advocacy group and one representing a consumer advocacy group. The original work plan called for interviewing five advocates, but one advocate contacted by the evaluation team preferred to respond on behalf of his employer (a manufacturer). Other potential interviewees representing environmental or lighting advocacy groups declined participation or did not respond to repeated interview requests.

The interviews addressed four main topics ([Appendix B](#) provides the interview guide):

1. LED market share estimates for 2019 and predictions for 2021 and 2023 for A-line, reflector, and specialty (mainly globe and candelabra) bulbs in non-program areas¹²
2. Predictions of when LEDs would become the dominant light bulb and supplier definitions of dominance for A-line, reflector, globe, and candelabra bulbs
3. Impact of federal regulatory decisions on business practices such as ordering bulb shipments and stocking practices
4. Anticipated reactions to state lighting efficiency standards on the same business practices

The study faced challenges securing information on market share and when LEDs would become the dominant bulb technology. Two of the 17 suppliers declined to provide market share predictions, and two others misunderstood the question, which led to unusable results. Suppliers also do not always manufacture or sell all bulb types. Therefore, the usable sample for market share questions was 10 for standard A-line and specialty bulbs and 11 for reflectors. Likewise,

¹² For the Connecticut and New Hampshire partners, the evaluation team also gathered market share for those two states in all three years and Massachusetts in 2019,

six suppliers declined to provide predictions of when LEDs would become the dominant bulb type. Five of the suppliers who did provide market shares predictions almost exclusively manufacture or sell LEDs. These five LED-focused suppliers accounted for only about 18% of total program sales. However, they account for 37% of the program sales among market share respondents. Accordingly, some of the analyses break out LED-focused suppliers from mixed lighting suppliers (those who make or carry more than LEDs). Sample size also varies for other questions, either because respondents declined to answer or questions did not apply to them.

Prior to the interviews, evaluation team members sent the market share questions and an accompanying response sheet to each supplier and stakeholder so that they could gather the necessary information prior to the interview to reduce its length. Suppliers generally did not return the sheets ahead of the interviewer, but most respondents had the information ready to discuss or provided estimates relatively easily and quickly. Interview length ranged from about 20 to 45 minutes, with 30 minutes being average.

The evaluation team initially planned to weight the results by program sales in the three partnering states. However, the PAs, EEAC consultants, and evaluation team decided against reporting weighted results due to concerns about question wording and sample representativeness. The two concerns may have led to market share and dominance estimates that, while reflecting the market share of responding companies, likely fell short of accurately reflecting true market share (see [Appendix A](#) for additional discussion). For consistency, the evaluation team also decided against weighting dominance questions.

Finally, the evaluation team completed the interviews prior to the widespread market interruptions and stay-at-home orders stemming from the Coronavirus-19 pandemic. The report does not speculate on potential long-term impacts of the pandemic on the lighting market.

Section 2 LED Market Share

The section presents market share predictions for three bulb types: (1) A-line/standard spiral (standard bulbs), (2) Reflector, and (3) Specialty. Respondents provided estimates shares for LED bulb technologies in 2019 and predicted shares for 2021 and 2023. [Table 4](#) in [Appendix A](#) summarizes supplier responses for all three bulb shapes for New Hampshire, Connecticut, Massachusetts, and non-program states and the subsections below provide more detail for each bulb shape. Program sales market shares are presented for non-program states and state-level comparisons.

The interviewer asked respondents the following questions about A-line market share:

*Thinking only about the areas of the US that **do not have retail lighting programs** [e.g., states like Kansas or Alabama, among others], what proportion of all of the A-Line lamps that your company sold in 2019 in these non-program areas were LEDs?*

*What proportion of the A-line lamp your company sells in places **without retail lighting programs** do you expect to be LEDs in 2021? and 2023?*

The interviewer repeated the questions for reflector and specialty bulbs.¹³

2.1 LED MARKET SHARE IN NON-PROGRAM STATES

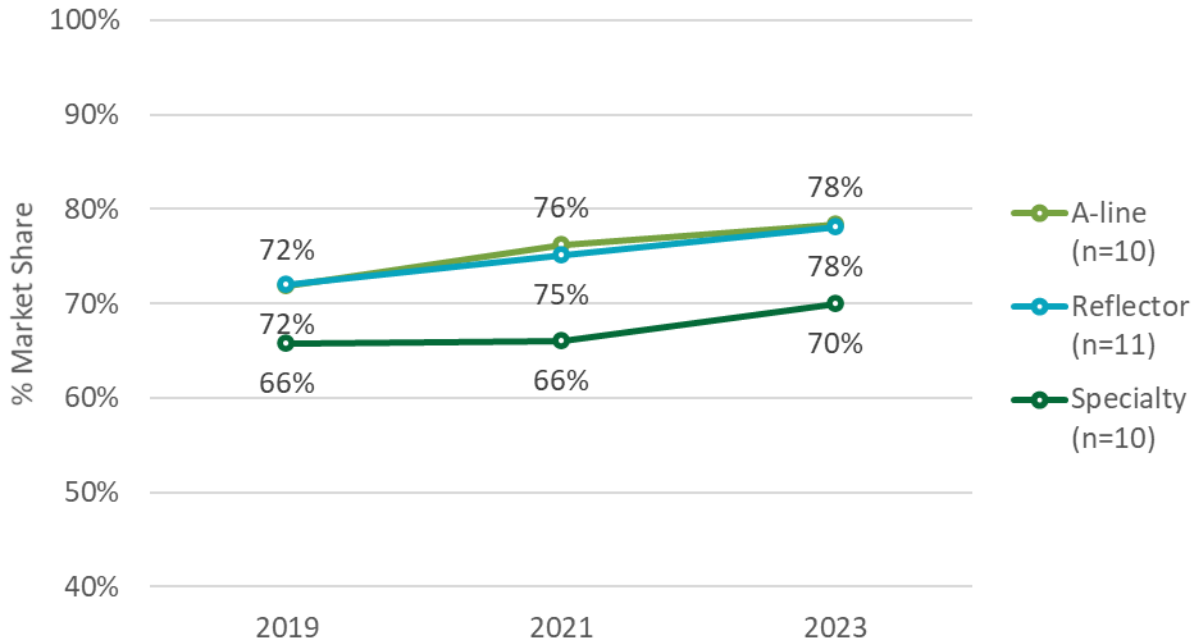
2.1.1 Suppliers' Predictions of Their Companies' LED Market Shares

[Figure 6](#) presents suppliers' and stakeholder LED market share predictions for all bulb shapes in non-program areas. Specific observations include the following:

- The lighting suppliers predict relatively small and gradual increases to their companies' market shares, rather than jumps in shares.
- Suppliers predicted that the standard A-line and reflector market shares for their companies will increase by 6% from 2019 to 2023 – from 72% to 78%.
- Suppliers thought that their specialty market shares would increase by about 4% between 2019 to 2023 – from 66% to 70%.

¹³ The industry uses *lamp* instead of the term *bulb*. When interviewing lighting industry experts, we use the term *lamp*. In public reports, NMR generally uses the common term *bulb* as opposed to the technical term *lamp* so that readers will not confuse a light bulb with table, desk, or floor *lamp* (aka a portable fixture).

Figure 6: Average Supplier’s Market Share by Bulb Type, 2019-2023¹
 (Estimate 2019, Prediction 2021, 2023)

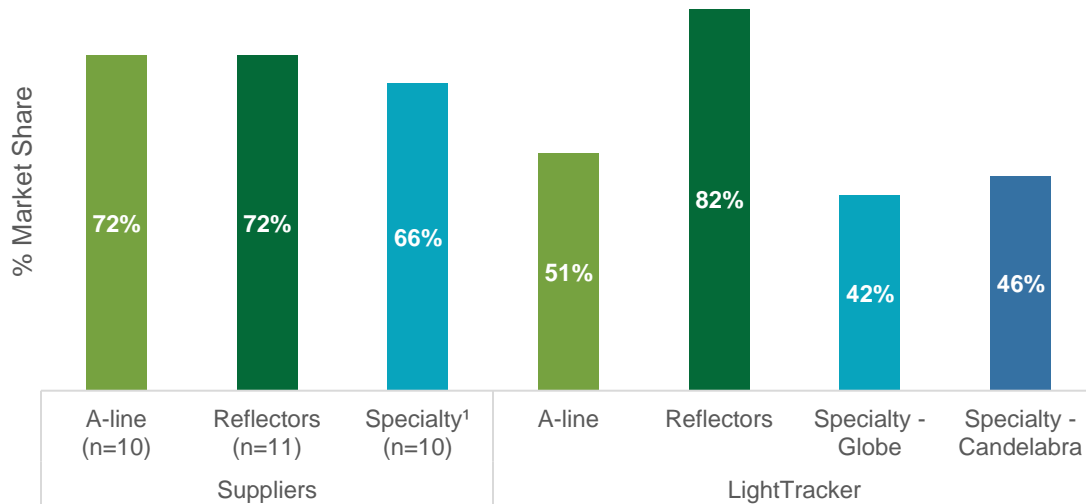


¹ Note that the scale starts at 40%, not 100%.

2.1.2 Comparison to LightTracker Non-program State Results

NMR is currently preparing a report summarizing 2019 market-level sales as reported in the CREED LightTracker dataset for New Hampshire, three other New England states, and non-program states. Figure 7 presents a preview of the 2019 non-program state LED market share by bulb shape, and compares it to the supplier results estimates of 2019 market share for their companies. For A-lines and specialties, the suppliers’ estimates of their companies’ LED market shares were 20% higher than LightTracker estimates for the entire market. This discrepancy likely reflects that all of the suppliers make or sell LEDs – four of them primarily – while the LightTracker market estimates also include non-LED suppliers as well. However, reflectors stand in contrast to the other shapes. LightTracker market share estimates exceed suppliers’ estimates by 10%, despite all five LED-focused suppliers saying that their companies’ shares were 100%. Therefore, the results suggest that the suppliers do not believe that the reflector market has progressed towards LEDs to the extent captured in the LightTracker data, a topic we return to in Section 3.

Figure 7: Comparison of 2019 LED Market Share Estimates: Suppliers and LightTracker



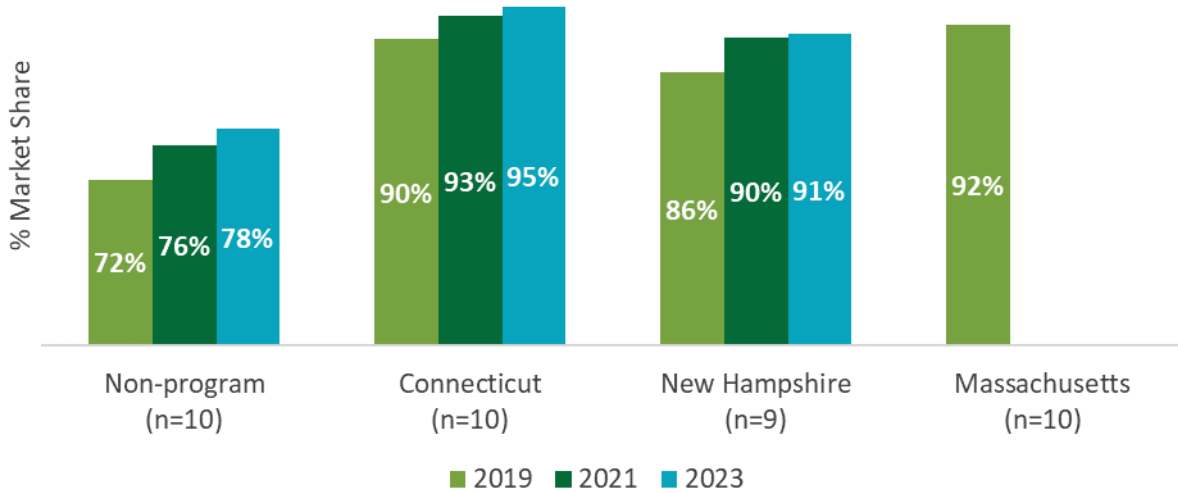
¹ Suppliers provided a single response for globes and candelabras in the interest of time.

2.2 STATE-LEVEL MARKET SHARE ESTIMATES AND PREDICTIONS

Figure 8 presents suppliers’ LED market share estimates and predictions for standard bulbs in New Hampshire, Connecticut, Massachusetts (2019 only), and non-program states.

- Lighting suppliers suggested that market share for standard bulbs would increase from 86% to 91% in New Hampshire from 2019 to 2023.
- Lighting suppliers placed New Hampshire’s market shares higher than non-program states (72% to 78%) but lower than Connecticut’s (90% to 95%) and Massachusetts’s (92%). Although most suppliers placed market share similarly for the three states, interviewers asked the two suppliers with divergent estimates why they predicted different market shares by state. The respondents cited the relatively young age of New Hampshire’s lighting program as the reason for predicting lower market share compared to the other two New England states.
- An implementer interviewed on behalf of Connecticut added that both New Hampshire and Connecticut have smaller budgets. This limits the depth of discounts suppliers can offer. This in turn limits the number of suppliers and channels that partner with the program because suppliers will decline if they cannot offer ENERGY STAR LED products at a price point that is competitive with non-LED technology.

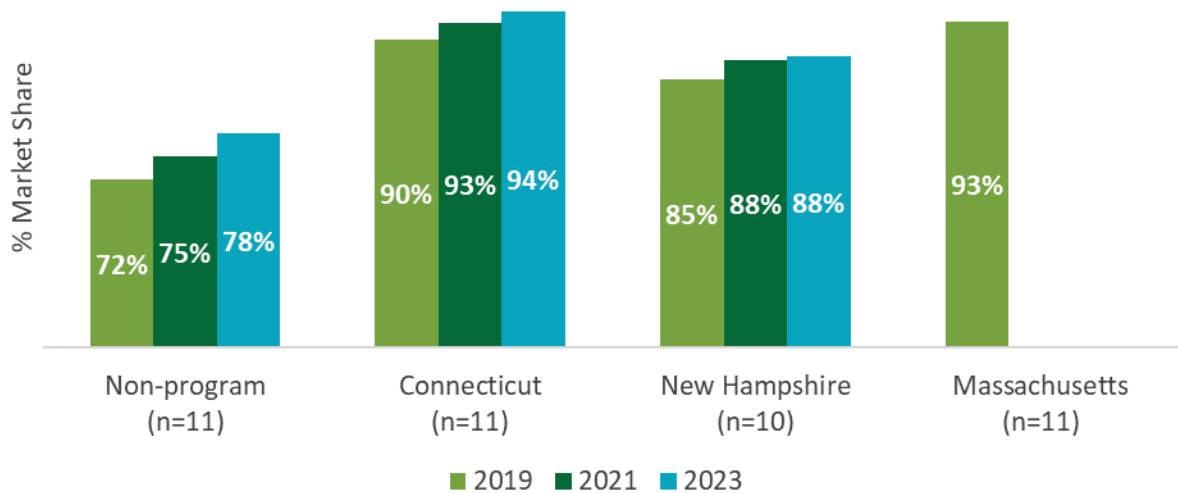
Figure 8: 2019 LED Market Share Predictions by State: Standard Bulbs, 2019-2023¹



¹ One respondent did not provide New Hampshire market share predictions for 2021 and 2023. However, excluding the respondent from the New Hampshire market share analysis would inflate results to 95% and 96%, respectively. Thus, the team applied the respondent’s 2019 estimate to 2021 and 2023.

Figure 9 presents suppliers’ LED market share predictions for reflector bulbs. Although individual shares differ, the patterns of estimated and predicted market share – and reasons for New Hampshire’s predicted lower shares – mirror those for standard LEDs.

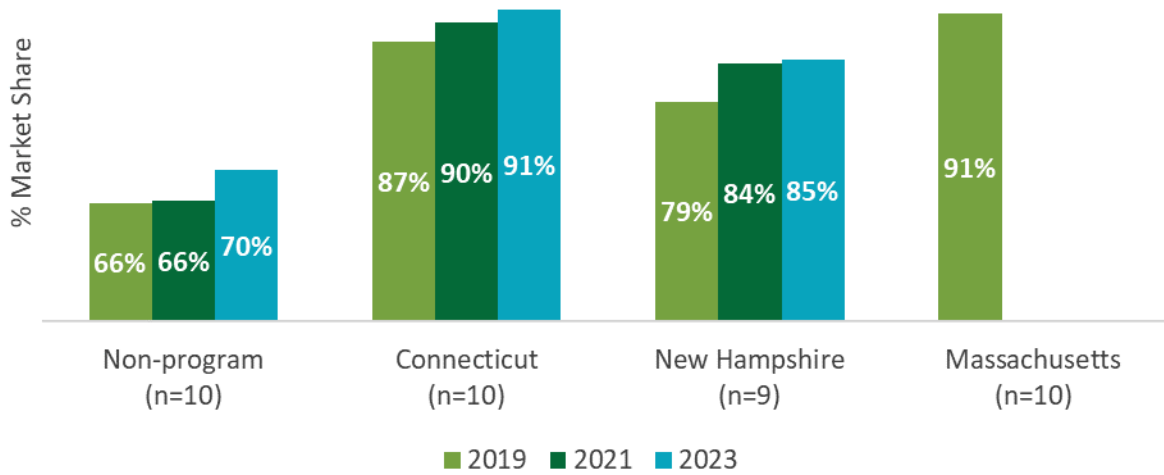
Figure 9: 2019 Market Share Predictions by State: Reflector Bulbs, 2019-2023¹



¹ One respondent did not provide New Hampshire market share predictions for 2021 and 2023. However, excluding the respondent from the New Hampshire market share analysis would inflate results to 94% and 95%, respectively. Thus, the team applied the respondent’s 2019 estimate to 2021 and 2023.

Figure 10 presents suppliers' LED market share predictions for specialty bulbs. For the most part, the patterns mirror those for standards and reflector bulbs. However, suppliers placed specialty shares lower than those for standards and reflectors.

Figure 10: 2019 Market Share Predictions by State: Specialty Bulbs, 2019-2023 ¹



¹ One respondent did not provide New Hampshire market share predictions for 2021 and 2023. However, excluding the respondent from the New Hampshire market share analysis would inflate results to 93% for both years. Thus, the team applied the respondent's 2019 estimate to 2021 and 2023.

Section 3 Year of LED Dominance

This section presents lighting suppliers’ predictions of when LEDs will become the dominant technology for standard, reflector, globe, and candelabra bulbs. Interviewers also asked suppliers to define *dominant*. The wording of these questions was as follows (with the prediction preceding the definition):

More generally in what year do you think LEDs will become the dominant technology in the national retail lighting market for each lamp shape?

How do you define dominant?

3.1 YEAR OF DOMINANCE

Figure 11 shows the timeline for supplier estimates for the year LEDs will become the dominant technology by bulb type. Standard bulbs are expected to become dominant in 2023, reflectors in 2025, and specialty bulbs in 2026. Table 1 provides summary statistics for supplier predictions by bulb type.

Figure 11: Suppliers’ Predictions of Year of Dominance (n=11)



Table 1: Suppliers’ 2019 Year of Dominance Predictions Summary Statistics(n=11)

Year of Dominance	Standard	Reflector	Specialty
Mean	2023	2025	2026
Min	2019	2020	2022
Max	2027	2030	2030
Median	2023	2025	2026

It seems contradictory that suppliers place their companies’ reflector market share estimates equal to those of A-lines but the year of dominance later than A-lines. The evaluation team thinks the discrepancy has two likely sources. The first, and most significant, source is that respondents answered for their own companies, all of which make or sell LEDs. Their opinions about the state of the broader retail lighting market differ from their opinions about their company. Likewise, the market share estimates focused on reflectors generally, while some respondents described differences within the category. Some direct quotes focused on reflectors include the following:

- *“I think [reflectors are] going to be quite a long time.... Retrofit kits and BR30 are doing fairly well, all in all. You know, putting a new trinket in an existing can, I think that those are dominating the [home improvement] market.... But when you get outside of [home improvement] then you're looking more at hardware stores or hard-to-reach type retailers, that's where we're still seeing halogen, halogen products. It's still pretty good though.... BR30 is sort of used as the poster boy for that whole category. And it does represent a large percentage of reflectors that are sold. But when you look at the applications for BR30 versus the applications of PAR20, PAR30, PAR38, BR40, those applications are, you know, drastically lower than what BR30 is selling in terms of percentage of sales versus sockets.”*
- *“[Reflectors] are going to be longer [than A-lines] because of the cost difference between, you know, an incandescent reflector and an LED reflector. So, I'd say eight to ten years.”*
- *“[Reflectors are] a little tricky because halogen and whatnot are still widely available, and those weren't really going to be impacted as much. I know that people like [LED reflectors], and they're on their way to being a more major player, but I'm not sure if it will be as quickly as A-Lines. I think it's going to take a few more years with help from programs and ENERGY STAR marketing to show why you shouldn't go buy the halogen version.”*

The second source of the discrepancy is that the suppliers who provided market share predictions did not entirely overlap with the suppliers who predicted when LEDs would become dominant. The evaluation team believes this to be a minor reason for the discrepancy.

3.2 DEFINITION OF DOMINANCE

Interviewers asked respondents to provide their definition of market dominance for a given lighting technology. All of the suppliers (17) and one stakeholder provided answers to this question. As shown in [Figure 12](#), 11 of the respondents defined dominant as having met a minimum market share threshold. The threshold of market share to signify dominance ranged from above 50% to 90%, with an average response of 62% (59% if you remove the outlying highest value) ([Figure 13](#)). The interviewees provided the following definitions for market dominance:

- A minimum market share threshold is met (62%)
- Consumer recognition and preference of LEDs (17%)
- Holds majority shelf space and product variety (11%)
- A minimum socket penetration threshold is met (6%)
- Price parity (or close to it) (6%)

Figure 12: Reported Supplier Definition of Dominance (n=18)

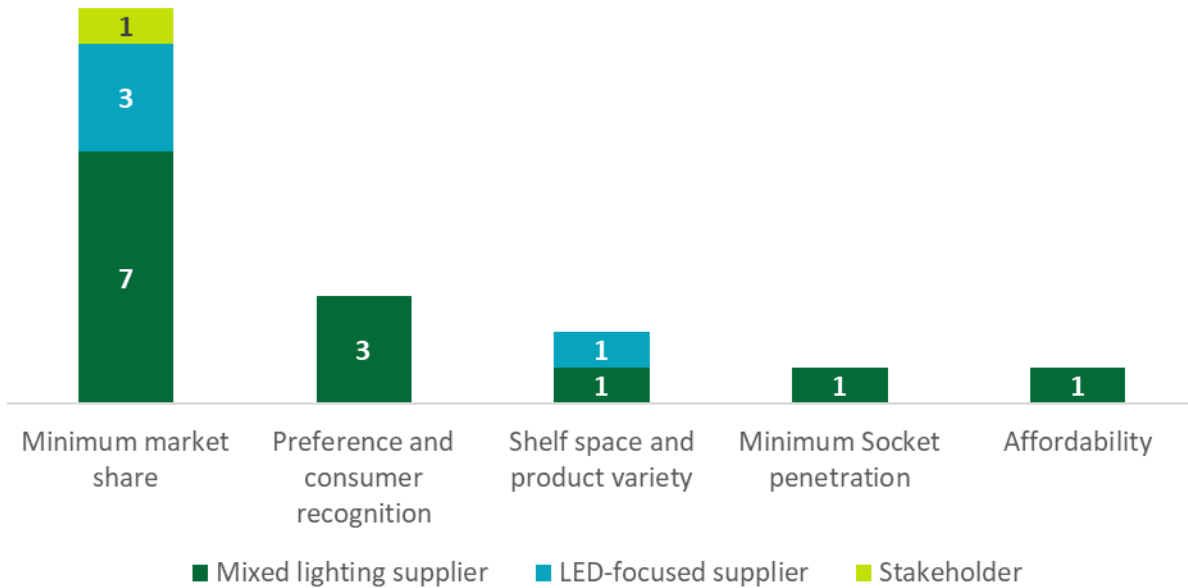
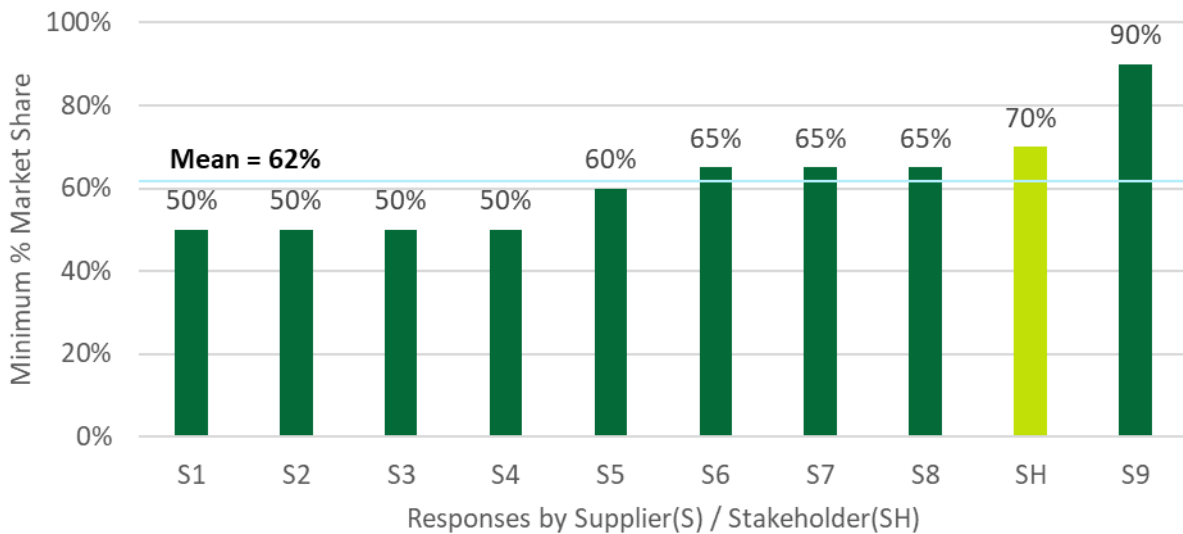


Figure 13: Definition of Dominance: Minimum Market Share (n=10)



Based on a market share definition of dominance, the LightTracker data presented in [Figure 7](#) suggest that the reflector market has met and surpassed the most common definition of dominance. Preliminary data from LightTracker suggest that LED reflector prices in non-program areas fall *below* those of halogens in a subset of retail channels (discount, dollar, drug, grocery, mass merchandise, and some membership clubs). Together, these two pieces of information strongly suggest that LEDs have become dominant in the reflector market, drawing into question how well the respondents understood the market. Based on the same LightTracker data, the other bulb shapes have met or are approaching the minimum market share thresholds.

Section 4 Federal Lighting Standards

In September 2019, the DOE issued a final rule that rescinded the 2017 GSL definition expansion,¹⁴ and in December 2019, the DOE issued a second final rule that argued that the 45 Lm/W backstop had not been triggered and that federal efficiency regulations took precedence over state regulations in all but a few situations.¹⁵ The upshot is that halogen bulbs can continue to be manufactured, imported, and sold for almost all residential lighting applications, and incandescent bulbs can continue to do the same for many applications.

This section presents suppliers' and stakeholders' general market assessment of the impact DOE decisions will have on their business practices in the short- (2020), mid- (2021 to 2023), and long-term (2024 and later). Interviewers also asked suppliers how bulb ordering / shipment practices have been impacted by the uncertainty regarding federal standards and how their placement of LED and inefficient bulbs compare.

4.1 IMPACT ON BUSINESS PRACTICES

Figure 14 provides supplier responses to a question about their expectations of short-, mid-, and long-term impacts of the DOE decisions on business practices such as production, stocking, shipping, packaging, and product placement. The main takeaway from the discussion is that suppliers are confident that the decisions will not greatly impact their short-term practices, but they are less certain of the mid- to long-term impacts.

Short-term (2020) – Over four-fifths of respondents (83%; 15 of 18 suppliers) reported little to no impact in the short term, and they expected to continue production to meet demand for LEDs and non-LEDs in the short-term. All four LED-focused suppliers were amongst the 15 respondents who mentioned the rulings have not impacted their business practices. Two suppliers (10%) reported a moderate to large impact. Of the two, one supplier said the DOE rulings impacted the amount of sales in utility programs across the nation by causing suppliers to cut back on inventory and by causing PAs to prematurely drop A-lines from state programs in anticipation of the standard change. The other mentioned that their product sales and operations are impacted in California (where state-level standards have already been enacted and upheld by courts, despite the DOE's decision). One respondent was uncertain of the impact.

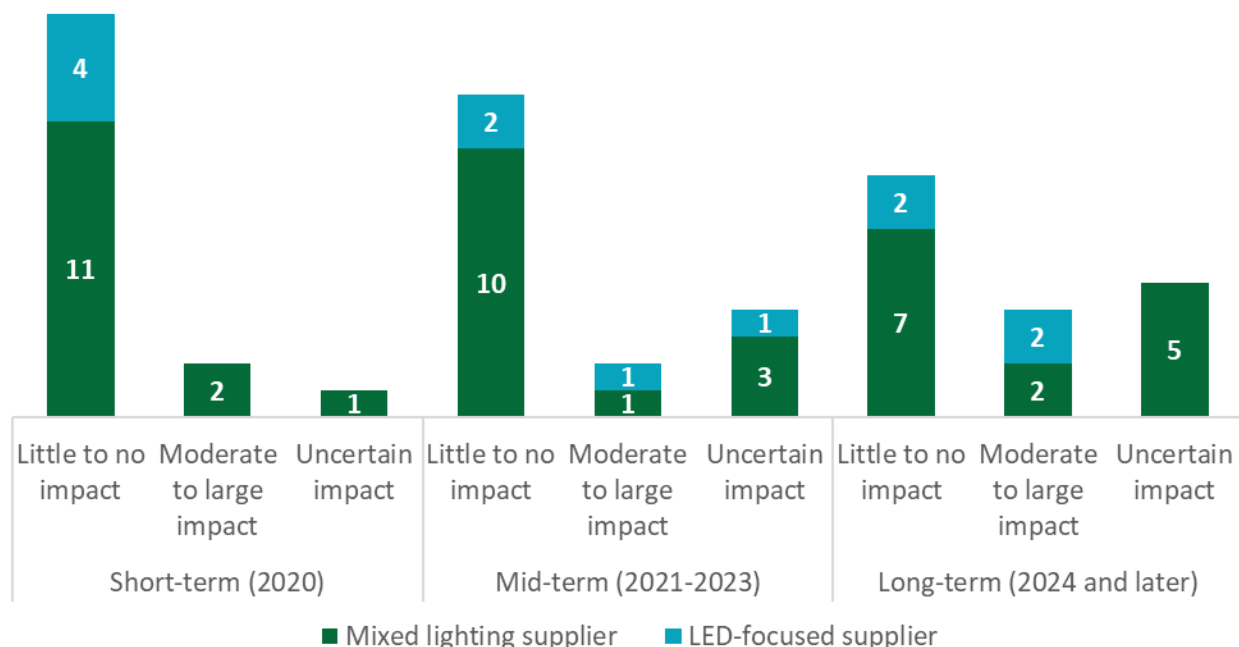
¹⁴Department of Energy, Final determination, "Energy Conservation Program: Definition for General Service Lamps." Federal Register 84, No. 172 (September 5, 2019) 46661. <https://www.federalregister.gov/documents/2019/09/05/2019-18940/energy-conservation-program-definition-for-general-service-lamps>.

¹⁵ Department of Energy, Final determination, "Energy Conservation Program: Energy Conservation Standards for General Service Incandescent Lamps." Federal Register 84, No. 248 (December 27, 2019) 71626. <https://www.federalregister.gov/documents/2019/12/27/2019-27515/energy-conservation-program-energy-conservation-standards-for-general-service-incandescent-lamps>.

Mid-term (2021 to 2023) – Two-thirds of respondents (67%; 12 of 18 suppliers) expected little to no impact from the DOE decisions on their mid-term business practices. Two suppliers (10%) reported that the DOE decisions will have a moderate to large impact on product development. One of the two suppliers is an LED-focused supplier and said their mid-term strategy is to adapt as new regulations come through (One respondent said, “California has specific products”). Four respondents (22%) said they were uncertain of the impact.

Long-term (2024 and later) – One-half of respondents (50%; nine of 18 suppliers) mentioned little to no impact on their business practices in the long-term. Over one-fourth (28%) of suppliers said they were uncertain of the impact DOE decisions will have on their long-term business practices. Four of 18 (22%) suppliers expect a moderate to large impact on product development and production, but they generally expected the shift to be towards almost complete dominance of LEDs. One representative stated, “I think at some point in the next four to six years, we won't see anything other than LED on retail shelves.”

Figure 14: Reported Impact of DOE Decisions on Business Practices (n=18)



All levels – Across all levels of term planning, eight suppliers (excluding LED-focused suppliers) mentioned that the federal rulings (and potential future court rulings) brought uncertainty and noise which made it difficult to plan and prepare their businesses for the future. Two suppliers said their mid- and long-term business practices will depend on whether there will be a presidential administration change. Some verbatim responses below summarize the similarities across respondents:

- “We've had to have a lot of conversations with our retail partners because they're horribly confused. I would say that still even [the majority of our retailers] in California ... still don't understand what's happened and what they're allowed to do and not allowed to do.”

- *“We talk about all of the government standards and, you know, the federal level and the state level. And as far as we're concerned, that's a roller coaster ride because they tell us something is allowed, and then it's not allowed, and it creates tremendous uncertainty in marketplace.”*
- *“There's lots of uncertainty, lots of uncertainty. We're cautious, so we don't bring in a tremendous amount of inventory because we don't know.”*

Four suppliers expressed their support for the DOE decisions. These suppliers mentioned that if the EISA 45 Lm/W standard had gone into effect, utility program funding would have disappeared. This funding has made ENERGY STAR LEDs competitive in the marketplace and bolstered innovation of LED technology. Their verbatim responses are as follows:

- *“Manufacturers kind of caution that if the legislation would have went through, then it would have flooded the market with a lot of cheaper manufactured products that are non-ENERGY STAR just to get them out there.”*
- *“[Retailers] wouldn't stock those stores in the way they stock them if it wasn't for these programs. They're a huge influence.”*
- *“We only sell ENERGY STAR-certified product in stores where money is available. Otherwise retailers will sell LEDS that are not certified.”*
- *“If EISA goes in full-fledged and utilities go away, innovation in the LED market will cease. If programs go away due to government intervention, then innovation is pointless.”*

Stakeholders – Interviewers also asked stakeholders how they expected the DOE decisions to impact business practices in the short-, mid-, and long-term. One stakeholder said incandescent and halogen products will continue to be sold in states outside of California in the short-term. Echoing a similar response to some suppliers, one stakeholder cited that mid- and long-term business practices will be determined by whether there will be a change in presidential administration, saying, *“Depends on if there is a new administration to implement the standards.”* The other stakeholder showed concern for weakened standards, explaining that *“the market has really, I want to say, weakened, but I just don't see the push for more efficient lighting on the shelf.”*

4.2 IMPACT ON BULB ORDERING / SHIPMENT PRACTICES

Interviewers asked suppliers whether the uncertainty regarding federal standards affected supplier bulb ordering / shipment practices. Among the nine suppliers who answered this question, five (56%) reported that the uncertainty regarding federal standards had little to no impact on their bulb ordering and shipping practices, as shown in

“In some cases, we cut back too much [on LED shipments] and were out because we didn't order enough for the demand that was still out there but we had to protect ourselves because a large portion of our residential business at [supplier] is our utility programs.”

Table 2. Two mixed lighting suppliers said they increased their inventory on LEDs in anticipation of the federal standard change. In contrast, another two reduced their inventory, one said it was due to the uncertainty (with no further explanation), and the other said they had expected LED demand to fall without the standard in place.

Table 2: Reported Impact on Bulb Ordering/Shipment Practices (n=9)

Reported Impact	Mixed lighting suppliers	LED-focused suppliers
Increased inventory on LEDs	2	0
Reduced inventory	2	0
Little to no impact	3	2

4.3 INEFFICIENT VS. LED PLACEMENT

Interviewers asked suppliers how their placement of inefficient bulbs compare to their placement of LEDs by bulb type and between states with and without lighting programs. Fifteen suppliers provided responses to this question.

Six out of 15 (four mixed lighting, two LED-focused) suppliers said that retailers mostly place LEDs in areas aligned with the consumer’s line of vision such as bays, off-shelf space (e.g. free-standing displays, end caps, wing caps, bulb displays), or centered on-shelf space. In comparison, inefficient bulbs tend to be on-shelf and in more obscure locations such as the bottom of the shelf. Three of the six suppliers specified that this is the placement in areas with lighting programs. One mixed lighting supplier reported that program areas devote more off-shelf space to LEDs compared to non-program areas; off-shelf space in non-program areas will display a wider variety of bulb technologies. The respondent said, *“Cheap [LED] types, or they’ll be halogen products on end-caps... so the makeup is much more different and built around there not being a program that’s helping advertise the benefits of the products.”*

Three suppliers (two mixed lighting, one LED focused) commented on the general placement of bulb types. Standard bulbs take up what one supplier called *“the premium presentation spots,”* reflectors are given the second largest share of presentation space, and specialty bulbs are given the least shelf space. Another supplier said there is a mix of both LED and inefficient standard bulbs, but there is a higher share of LED reflective bulbs in program areas: *“We do see a higher percentage of reflective bulbs in program areas be LED than we do in non-program areas.”*

Three mixed lighting suppliers replied that product placement is dependent on the retailer's customer base. For example, a general merchandise store might have an even mix of incandescent and LEDs products for price-sensitive customers, whereas home improvement stores will focus more on LED products. One respondent noted, *"Typically don't have too many incandescent products or halogen products on end caps."*

Two mixed lighting suppliers commented on the differences in non-ENERGY STAR and ENERGY STAR-qualifying LEDs. One supplier estimated ENERGY STAR LEDs make up 85 to 95% of the bulbs in program stores whereas ENERGY STAR LEDs make up 60% of the bulbs in non-program stores, with the difference driven by off-shelf promotions. Off-shelf LED promotions in non-program stores are typically non-ENERGY STAR models. Another supplier explained that without the program incentive to lower shelf prices, non-program stores will stock non-ENERGY STAR LEDs with lower rated lives and poorer dimming capability to make LED prices competitive with inefficient bulbs. *"Maybe it's 10 or 15,000 hours instead of 25. Maybe it's 20% dimming level instead of down to five [compared to] some of our more advanced products, because there are cost considerations there."*

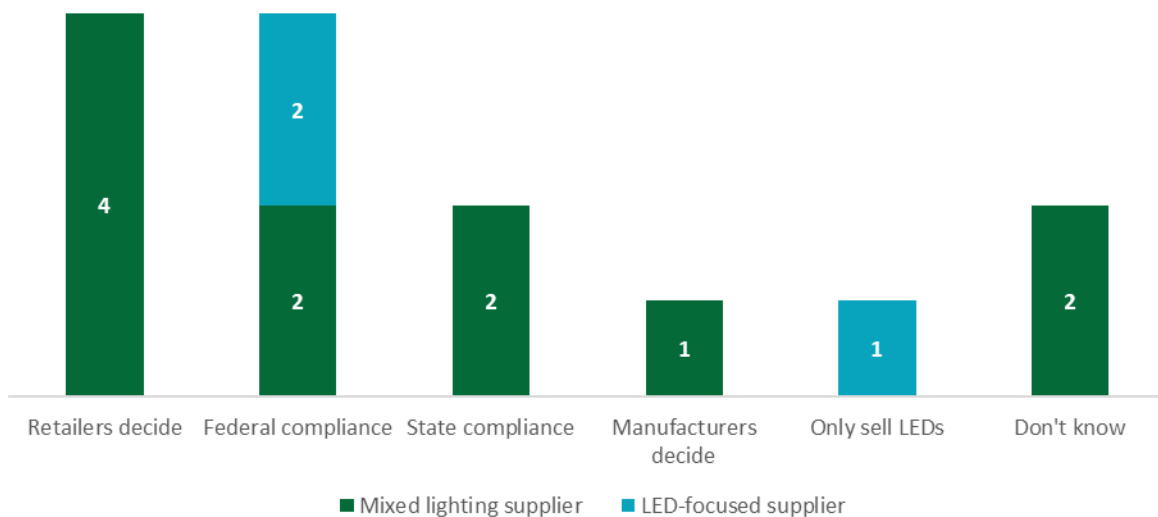
Section 5 STATE LIGHTING STANDARDS

The DOE's recent proposed determination clarified that states were prohibited from adopting energy conservation standards for GSLs that differed from those of the federal government, except in limited circumstances. The DOE further clarified that California and Nevada, which had permission to adopt standards earlier than the rest of the nation under the original EISA legislation, did not meet the criteria set forth in the decision. This section presents suppliers' interpretation of DOE guidance on state standards and their assessment of the potential impact of state lighting standards on their stocking practices, sales, and promotions.

5.1 SUPPLIER RESPONSE TO DOE GUIDANCE

Interviewers asked suppliers how their organization interpreted the DOE's guidance on state standards for GSLs. As shown in [Figure 15](#), the 14 respondents to this question were split in their reactions, which may reflect the recognition that the DOE guidance puts suppliers in a difficult position. Four (29%) of the suppliers reported that they would comply with the federal standards, and another four (29%) said it was up to the retailers. Other respondents stated that they would comply with state regulations (2 of 14), that they would let the manufacturers decide (1 of 14), or that it did not apply to them since they primarily make LEDs (1 of 14). The last two respondents did not know their organization's interpretation of the guidance.

Figure 15: Organization Response to DOE Guidance on State Regulations (n=14)



Regardless of their reported interpretation of DOE guidance, over two-fifths (42%, six of the 14 of suppliers) expressed their preference for federal regulations because it is easier and less costly than to comply with individual state guidelines. Suppliers provided the following reasons (and illustrative quotes) for their preferences:

- States passing individual standards need to have enough demand to drive innovation *“There will always be a manufacturer or two that will work towards complying if that state has a population large enough to drive the innovation.”*
- Difficulty tracking state regulation and shipment *“Managing state-by-state legislation becomes very difficult.”*
- Lack of enforcement *“Rules aren’t currently being enforced, as far as we can tell from our retail partners who are in the states that have done it.”*
- Higher costs *“A lack of a federal standard adds risk in the form of higher costs, more errors, potential fines,” “It’s usually cost prohibitive to try to match a state’s guidelines.”*

Stakeholders – When asked how their organizations interpreted DOE’s guidance, both stakeholders took the stance that California’s and Nevada’s lighting efficiency standards were clear and should be followed. One stakeholder voiced interest in seeing whether retailers will have a positive experience following California’s regulations and expand their California lighting set nationally through voluntary compliance. Another stakeholder voiced interest in seeing how California will impact manufacturers.

Note that these stakeholders were assuming that suppliers would continue to abide by California’s regulations despite the DOE guidance. Based on responses to the supplier interviews, and on discussions the evaluation team heard at the ENERGY STAR Partners meeting in September 2019, it appears that suppliers have already changed production, shipping, and stocking practices to meet California’s regulations and would not change back. California’s large population limits the production, shipping, and stocking inefficiencies that meeting state standards in smaller states could create.¹⁶

¹⁶ The National Electrical Manufacturers Association and the American Lighting Association tried one last time to block California’s standards, but ultimately withdrew the lawsuit after a federal judge denied their request for a restraining order. See <https://www.jurist.org/news/2020/01/federal-judge-allows-california-updated-light-bulb-efficiency-standards-to-take-effect/> and <https://www.nrdc.org/media/2020/200115>.

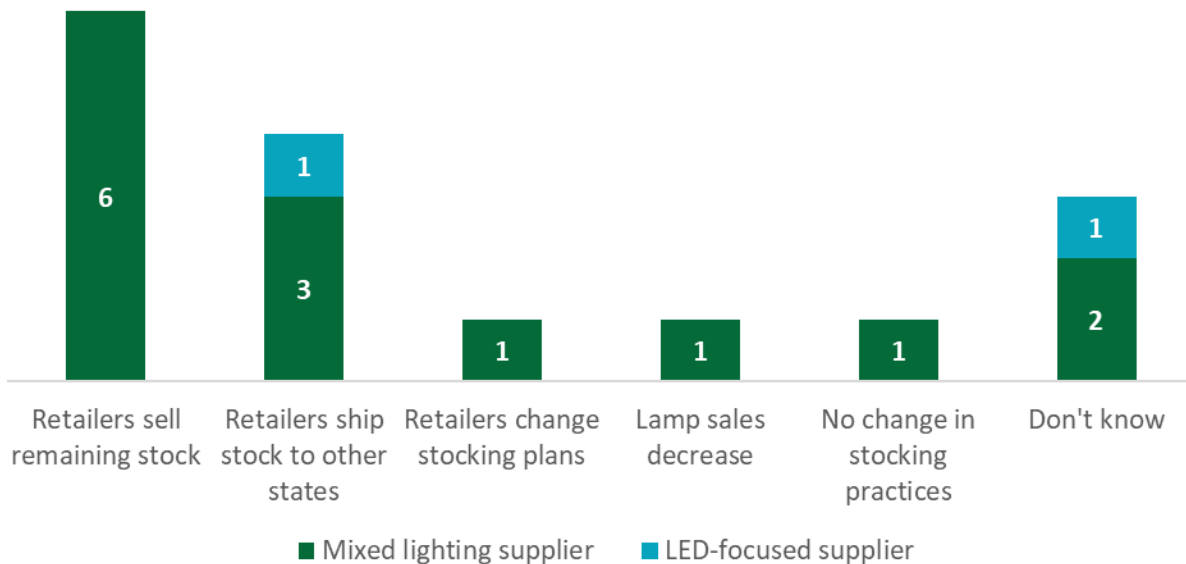
5.2 IMPACT ON SALES AND STOCKING PRACTICES FOR INEFFICIENT BULBS

The interviewers asked how sales and stocking practices for inefficient bulbs would be impacted, assuming individual states can adopt GSL standards. Figure 16 shows that over one-third of suppliers who provided responses (38%, six of 16) reported that retailers will sell through the remaining stock of inefficient bulbs by marking down prices. When asked why they would not ship among states, three suppliers cited logistical reasons, the expense of moving stock, and market forces driven by demand. They offered such explanations as:

- *“It just isn't in line with the logistics practices of most of the major retailers.”*
- *“We're not necessarily going to look to take that heavy expense to drive that from one area of the country to the other.”*
- *“That's not how market forces work. We carry these products because there's a demand for them.”*

Over one-fifth of suppliers (22%) said retailers will ship inefficient bulbs to states with lower standards. One supplier each said retailers will change their stocking plans, inefficient bulb sales will decrease regardless, and that their organization would not make any changes to stocking practices.

Figure 16: Reported Impact on Sales and Stocking Practices for Inefficient Bulbs (n=16)



Stakeholders – When interviewers asked stakeholders whether manufacturers and retailers would shift stock of inefficient bulbs to states with lower standards, the two stakeholders offered conflicting responses. One stakeholder said retailers will ship stock to other states. The supplier explained, *“I've had colleagues who've been to retail outlets in California some of the major outlets have stopped stocking incandescent lightbulbs. They've been shipped to other states.”* The other stakeholder said retailers will sell remaining stock at different rates: big box retailers will be able

to phase out the inefficient stock faster, whereas drug stores will take longer to sell through their stock.

5.3 VARIATION IN BULB PROMOTION BETWEEN STATES

Given a scenario in which individual states could adopt GSL standards, interviewers asked suppliers whether bulb promotion or sales will vary between states with and without stricter lighting efficiency standards. Over three-fifths of respondents (64%, seven out of 11 respondents) said bulb promotion and sales will not vary between states. Verbatim responses from three of the seven suppliers are provided below.

- *“We will not run promotions in Wisconsin to make up for the declining sales in Washington State. We're not running promotions on any incandescent lamps because the demand is declining. Where we run a promotion, it's on LED product.”*
- *“Do I see a retailer promoting an LED product more in a state with a state regulation? I don't see that.”*
- *“I think you'd likely continue to see consistency in promotion [regardless of standards], although you might see a reduction in number of promotions [in states with standards].”*

Four out of 11 respondents said bulb promotion and sales will vary between states by price, state regulation and market demand, and product assortment and technology adoption rates. Comments included the following:

- *“It would actually cause prices to go up [in states with standards.]”*
- *“Our promotions will be geared [to] what is allowed and what the market demand is.”*
- *“Product assortment will vary depending on legislation.”*
- *“States that have standards will be more efficient and progressive in adopting energy saving technologies.”*

Appendix A Market Share Responses: Additional Detail

This appendix addresses two topics: (1) potential threats to the validity of market share responses and (2) descriptive statistics for the market share responses.

A.1 POTENTIAL THREATS TO VALIDITY AND RELATED GUIDANCE

The analysis of supplier predictions of LED market share yielded market shares in the 70% range for non-program areas for all bulb shapes (Section 2). The evaluation team believes that question wording has likely biased the market share estimates upwards.

Table 3 compares the question wording and the market share predictions from the prior 2017 effort and the current 2020 effort described in this report for A-line LEDs. *The 2017 study asked respondents to imagine what market share would be in Massachusetts if the program stopped incentives in 2017. The 2020 effort asked for market share for non-program areas for the respondent's company.* The table only includes responses from the subset of suppliers who took part in both efforts and provided market share predictions in at least one them. All but one of the respondents are manufacturers.

Importantly, every supplier makes or sells LEDs, and some of them almost exclusively make or sell LEDs. Therefore, when asked to speak to *your company's* sales, three suppliers (in red, bolded font) had to say 100% because their companies almost exclusively supply LEDs. In contrast, in 2017, these same three suppliers had provided estimates well below 100%, even though they also primarily supplied LEDs in 2017. Notably, each of the suppliers in the table provided higher estimates of LED market share in 2020 than they did in 2017. This almost certainly stems from the fact that the LED market took off more rapidly than predicted in 2017, but it also likely reflects that every respondent makes or sells LEDs.

Guidance for Future Research

Based on the challenges described above and also within the report, the evaluation team offers the following general **guidance for future supplier interview efforts**:

Guidance 1: Consider asking suppliers about the *lift* associated with program efforts. *Lift* refers to the numeric or percentage increases in sales stemming from program activities.

Rationale: Residential lighting supplier interview efforts described here and that the evaluation team has conducted elsewhere make clear that some suppliers will not answer questions about their company's market share or even market share more generally. Reasons vary, but common ones include company policy against sharing the information and lack of access to such information (i.e., "I don't know"). Additionally, past reviewers have raised concerns about the ability of LED-focused suppliers and suppliers with smaller sales volumes to provide informed market share predictions, as they often operate in a very limited corner of the market. However, they would be in a position to describe the lift

to their companies' sales. Weighting by program sales is appropriate in a *lift* scenario, as the effort focuses on understanding the program, not the entire market.

Guidance 2: If an effort must ask about market share, consider doing so at the national level. Also considering asking if and how New Hampshire differs from the national trends.

Rationale: A few suppliers in this and other efforts have told us that they do not keep overall sales records at a state (or combination of states) or regional level. Only some suppliers are willing to hazard an educated guess on market share at the state or regional level. Therefore, asking about national sales may yield the greatest number of well-informed estimates of shares, but asking about a state may yield strong guesses. Weighting by program sales would be appropriate in this approach if the researchers successfully obtained market share estimates from a wide variety of suppliers.

Guidance 3: Only ask about a specific company's share if the research effort is fairly certain it will obtain a representative sample of suppliers.

Rationale: Asking suppliers about their companies' shares forced some suppliers to answer 100% as they primarily make or sell LEDs. Yet, such suppliers only represent a portion of the overall lighting market. The company share approach will lead to biased results unless the sample includes a representative mix of suppliers who deal with numerous bulb types and those who focus on halogens or incandescents. Weighting by program sales would not be appropriate in this approach, because, ideally, it would include non-program suppliers for an accurate representation of the market.

Table 3: Comparison of Supplier Market Share Predictions Across Studies

Supplier	2017 Study Predictions MA A-line LED Market Share, No Program Scenario I'd like you to predict the future market shares for A-Line Medium Screw Base Lamps for 2018, 2020, and 2022 under the assumption that the Massachusetts lighting program would end LED incentives in 2017.			2020 Study Predictions LED Market Share, Non-program Areas Thinking only about the areas of the US that do not have retail lighting programs [e.g., states like Kansas or Alabama, among others], what proportion of all of the A-Line lamps that your company sold in 2019 in these non-program areas were LEDs?		
	2018	2020	2022	2019	2021	2023
A	40%	45%	48%	100%	100%	100%
B	27%	27%	27%	80%	80%	80%
C	25%		35%		39%	Declined
D	40%	50%	Declined	100%	100%	100%
E	60%	72%	78%	60%	70%	80%
F	35%	45%	59%	90%	85%	70%
G	25%	30%	35%	100%	95%	85%
H	36%	32%	31%	45%	60%	65%
I	25%	35%	50%	50%	50%	50%
J	24%	48%	95%	53%	57%	74%

A.2 MARKET SHARE DESCRIPTIVE STATISTICS

Table 4 presents the market shares for the three New England states and non-program states by way of comparison.

Table 4: Suppliers' 2019 New Hampshire, Connecticut, Massachusetts, and Non-program States Market Share Predictions Summary by Bulb Type, 2019-2022

Market Share	New Hampshire ¹			Connecticut			Massachusetts	Non-program		
	2019	2021	2023	2019	2021	2023	2019	2019	2021	2023
Standard A-lines	n=9			n=10			n=10	n=10		
Mean	86%	90%	91%	90%	93%	95%	92%	72%	76%	78%
Median	100%	100%	95%	98%	99%	98%	98%	100%	100%	100%
Min	53%	53%	53%	57%	80%	80%	71%	70%	70%	77%
Max	100%	100%	100%	100%	100%	100%	100%	30%	50%	50%
Reflectors	n=10			n=11			n=11	n=11		
Mean	85%	88%	88%	90%	93%	94%	93%	72%	75%	78%
Median	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%
Min	27%	27%	27%	49%	67%	76%	60%	80%	70%	80%
Max	100%	100%	100%	100%	100%	100%	100%	27%	45%	50%
Specialty	n=9			n=10			n=10	n=10		
Mean	79%	84%	85%	87%	90%	91%	91%	66%	66%	70%
Median	100%	100%	95%	95%	98%	97%	98%	100%	100%	100%
Min	17%	17%	17%	40%	55%	65%	52%	70%	60%	68%
Max	100%	100%	100%	100%	100%	100%	100%	17%	25%	35%

¹ One respondent did not provide New Hampshire market share predictions for 2021 and 2023. However, excluding the respondent from the New Hampshire market share analysis would inflate results. Thus, the team applied the 2019 estimate to 2021 and 2023.

Appendix B Interview Guide

Draft Interview Guide

Interviewer:
Date of Interview:
Time Begun
Time Ended
Respondent Name
Respondent Title
Phone Number (s)
Email Address

[NOTE: THE QUESTIONS IN THIS INTERVIEW GUIDE WILL NOT NECESSARILY BE READ VERBATIM BUT MAY BE MODIFIED TO SUIT THE INTERVIEW.]

Introduction

Hello, this is ____ from [NMR or DNV GL] calling on behalf of the retail lighting program administrators in Connecticut, Massachusetts, and New Hampshire. May I please speak with [Respondent]?

Thank you for taking the time to speak with me today about the residential lighting market. I am part of a team that is exploring the residential lighting markets in New England. Our conversation today, along with other information that we will collect for the evaluation, will help us to understand the current and future state of the residential lighting market. The interview should last about **30** or so minutes.

Alright, let's jump right into it!

Confirmation of Program Sales [As Applicable]

1. **[For suppliers]** I emailed you information on your sales of energy-efficient lamps through the [INSERT STATE] ENERGY STAR Lighting Program for [most or all of 2019. Does that information appear generally correct? **[Be sure to confirm zeros for any categories]**

	Omnidirectional /A-Lamp / Standard	Directional / Reflectors / floods	Specialty, mainly globes and candelabras
Program Records	To be filled in	To be filled in	To be filled in
Corrections (if any)	To be filled in	To be filled in	To be filled in

Current and Projected Product Mix

[PRIOR TO THE CALL and with the 2019 MA Program Sales above, email respondent this section through Q4, including the table. Invite the respondent to fill the table in and return it prior to the call. Make clear that doing so will reduce the amount of interview time.]

Now we'd like to talk about the current state of the market, where the market may be heading, and how the federal standards discussed above may impact the market.

[IF RESPONDENT EMAILED RESPONSES AHEAD OF TIME go to Q5 or Q6, depending on how they responded in table.]

[IF RESPONDENT DID NOT RETURN THE FILLED IN TABLE] Prior to this call, I emailed you a preview of the questions in this section. I hope the preview of this first set of questions will reduce the time it takes to fill these estimates in.

[IF NEEDED: Specialty comprises shapes other than A-line and Reflector / flood types, with the most common being globes and candelabras]

[ANSWERS FOR Q2 TO Q3 TO BE ADDED TO TABLE BELOW QUESTION 3]

2. **[For suppliers]** Thinking **only** about the areas of the United States that **do not** have retail lighting programs [e.g., states like Kansas or Alabama, among others], what proportion of all of the A-Line lamps that your company sold in 2019 in these non-program areas were LEDs? Here I am interested in the proportion of individual lamps you sold, not in the dollar value of those sold. [REPEAT SUBSTITUTING REFLECTORS FOR A-LINES, THEN SPECIALITIES.]

[For advocacy stakeholders] Thinking **only** about the areas of the United States that **do not** have retail lighting programs, what proportion of all of the A-Line lamps that were sold in 2019 in these non-program areas do you estimate were LEDs? Here I am interested in the proportion of individual lamps sold, not in the dollar value of those sold. [REPEAT SUBSTITUTING REFLECTORS FOR A-LINES, THEN SPECIALITIES.]

3. **[For suppliers]** What proportion of the A-line lamps your company sells in places **without retail lighting programs** do you expect to be LEDs in 2021? and 2023? Again, please think about the proportion of unit sales, not dollar value. [REPEAT SUBSTITUTING REFLECTORS FOR A-LINES, THEN SPECIALITIES.]

[For advocacy stakeholders] What proportion of A-line lamp sales do you expect to be LEDs in places **without retail lighting programs** in 2021? and 2023? Again, please think about the proportion of unit sales, not dollar value. [REPEAT SUBSTITUTING REFLECTORS FOR A-LINES, THEN SPECIALITIES.]

	Year	A-Line	Reflector	Specialty
Non-Program	2019	To be filled in%	To be filled in%	To be filled in%
	2021	To be filled in%	To be filled in%	To be filled in%
	2023	To be filled in%	To be filled in%	To be filled in%

4. **[For suppliers only]** Now I'd like you think about three New England states with retail lighting programs – Connecticut, Massachusetts, and New Hampshire. What proportion of all of the A-Line lamps that your company sold in each state in 2019 were LEDs?

Let's start off with Connecticut. What proportion of all of the A-Line lamps that your company sold in Connecticut in 2019 were LEDs? Again, please think about the proportion of unit sales, not dollar value. [REPEAT SUBSTITUTING REFLECTORS FOR A-LINES, THEN SPECIALITIES. REPEAT ENTIRE PROCESS FOR MA AND NH.]

Now, please think ONLY about Connecticut and New Hampshire. I'd like you to assume that the current retail lighting programs in those two states continues as it was in 2019. , what proportion of your company's A-line lamp sales in 2021 will be LEDs in Connecticut and New Hampshire in 2021? 2023? Again, please think about the proportion of unit sales, not dollar value.

Again, let's start off with Connecticut. What proportion of your company's A-line lamp sales in Connecticut will be LEDs in 2021? 2023? Again, please think about the proportion of unit sales, not dollar value. [REPEAT SUBSTITUTING REFLECTORS FOR A-LINES, THEN SPECIALITIES. REPEAT ENTIRE PROCESS FOR NH.]

	Year	A-Line	Reflector	Specialty
Connecticut	2019	To be filled in%	To be filled in%	To be filled in%
	2021	To be filled in%	To be filled in%	To be filled in%
	2023	To be filled in%	To be filled in%	To be filled in%
Massachusetts	2019 ONLY	To be filled in%	To be filled in%	To be filled in%
New Hampshire	2019	To be filled in%	To be filled in%	To be filled in%
	2021	To be filled in%	To be filled in%	To be filled in%
	2023	To be filled in%	To be filled in%	To be filled in%

[START HERE IF RESPONDENT SENT RESPONSES BEFORE INTERVIEW]

5. **[For suppliers only]** [If any market shares differ across states] Why do you think market share does / or will differ [for at least some lamp shapes] across the states? [PROBE: Program and population differences]
6. **[For suppliers only]** [If market share estimates all the same] Why do you think the market share will be the same across all three areas for all three products? [REMIND supplier of PROBE: Program and population differences]
7. More generally in what year do you think LEDs will become the dominant technology in the national retail lighting market for each lamp shape? [Probe for a specific year or a range.]
 - a. A-Line
 - b. Reflector
 - c. Globe-shaped specialty lamps
 - d. Candelabra- or other flame-shaped specialty lamps
8. How do you define **dominant**? [ACCEPT QUALITATIVE AND QUANTITATIVE RESPONSES. IF RESPONDENT SAYS “MARKET SHARE” probe for a specific % level of share, by bulb shape as in Q7 if necessary. FOR ALL RESPONDENTS, try to have them be as specific as possible].]

Federal Standards

Now let's talk a bit about federal lighting standards.

As you know, in September, the Department of Energy (DOE) issued a final rule that rescinded the 2017 General Service Light definition expansion, restoring exemptions for seven categories of lamps including: reflectors, rough service, and vibration resistant lamps. In December, they ruled that the backstop had not been triggered, so sales of halogens and incandescents could continue past January 1, 2020.

Although various lawsuits have been brought to challenge these decisions, today we're trying to understand how the market is reacting to recent DOE action and what impact it will have on the lighting market in the near term.

9.
 - a. **[For suppliers]** What impact have these decisions had on your organization's short-term business practices (2019 to 2020)? What impact will they have in the mid- and long-term? We are specifically interested in such business practices as production, stocking, shipping practices, packaging, and product placement. [PROBE FOR VARIATIONS BY CATEGORY (A-LINE, REFLECTOR, & SPECIALTY)]

- i. Short-term (2019 - 2020):
 - ii. Mid-term (2021 - 2023):
 - iii. Long-term (2024+)
 - b. **[For advocacy stakeholders]:** What impact will these decisions have on the availability of lighting products in the marketplace?
 - i. Short-term (2019 - 2020):
 - ii. Mid-term (2021 - 2023):
 - iii. Long-term (2024+)
- 10. **[For suppliers]** How, if at all, has the uncertainty regarding federal standards affected your lamp ordering / shipment practices?
- 11. **[For suppliers]** How does your placement of inefficient lamps compare to your placement of LEDs? [PROBE: on-shelf and off-shelf placement; special displays, etc.] How does that vary between lamp types? In places with and without retail lighting programs? [IF NEEDED by retail lighting program I mean programs that provide incentives to manufacturers and retailers to reduce the shelf-price a customer pays for a lamp.]
 - a. A-Lines
 - b. Reflectors
 - c. Specialty
- 12. [For manufacturers working in different retail channels]: To what degree do your lamp sales strategies vary by retail channel? For example, does the proportion of LEDs vs. inefficient lamps vary? The placement of products on shelves, etc.? [By retail channel, I mean mass merchandise, home improvement, hardware, grocery, drug, bargain / discount, etc.]

State Standards

Finally, I would like to ask a few questions about state-level standards and federal preemption.

- 13. The DOE's recent decisions clarified that all states, including California and Nevada, are prohibited from adopting energy conservation standards for GSLs. How has your organization interpreted DOE's guidance on this topic? What actions do you plan to take in response? Why?
- 14. If the courts decide that some or all individual states can adopt GSL standards, what impact, if any, do you think this will have on sales and stocking practices for inefficient lamps? For example, will manufacturers and retailers shift stock of inefficient lamps to states that do not have standards? Why? [LOOK FOR EVIDENCE OF ANY DUMPING OR PUSHING SALES TO NON-STANDARD STATES]
- 15. Will lamp promotion or sales vary between states with and without stricter standards? [PROBE: ON- AND OFF-SHELF PROMOTION, LIGHTING DISPLAYS, PALLET DROPS]

We really appreciate you taking the time to share your insights on the lighting marketplace. Have a nice day.