NEWPORT VENTURES

Gauging Consumer Perception of Residential Lighting

Prepared by Newport Ventures for the New York State Energy Research and Development Authority

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Gauging Consumer Perception of Residential Lighting

Residential lighting has become an extremely hot topic in the building and housing industry in recent years. Lighting is an important and essential component in our homes. Different characteristics such as bulb type, color temperature (kelvin), and light output (lumens) can have a significant effect on the look and feel of a home. In general, the main options available today to consumers include; incandescent bulbs, halogens, compact fluorescents lamps (CFLs), and light-emitting diodes (LEDs). Traditional incandescent bulbs will soon be phased out as a result of a 2007 Energy Independence and Security Act (EISA). As the shift to more efficient lighting takes place, it is important to understand the benefits and characteristics of the different lighting options.

Once incandescent bulbs are officially phased out, consumers will be left with three options: halogens, CFLs and LEDs as their primary lighting options. The EISA requires that bulbs operate up to 30% more energy efficient than current standards. Halogen bulbs will do the best job at emulating the traditional bulbs in regards to look, shape, size, and compatibility. Halogens are also known as eco-incandescent because technically they are incandescent bulbs. Many industry professionals have suggested that halogens will likely be the preferred replacement bulb for many consumers simply because it looks and operates that exact same way as an incandescent. However, they are also substantially less efficient than both CFLs and LEDs. A 60W replacement halogen bulb will use about 43 watts. Because of their relative inefficiency, halogen bulbs are not eligible for EnergyStar certification.

Compact fluorescent bulbs (CFLs) will also be an option for consumers once incandescent bulbs are gone. This type of bulb has been on the market for a while and has developed a bad reputation with many consumers. Often people complain about the light being too harsh or having too much of an “orange” color. The bulbs also require a warm up and cool down period when turned on and off and have had compatibility issues with fixtures and dimming controls. The newer versions of CFLs address many of these issues and the technology has certainly improved over time. They also are significantly more efficient than both incandescent and halogen bulbs. A typical 60W equivalent will pull approximately 15 watts. The bulbs are also intended to last longer than a traditional bulb, anywhere between 3-5 years. An EnergyStar rated CFL typically cost anywhere between $5-$10

The newest development in the lighting market is the light-emitting diode or LED. As this technology has developed, manufacturers have made a conscious effort to increase the compatibility and variety of options available to consumers. Early versions of these bulbs experienced many of the same problems as the CFLs. There were problems with dimming controls and compatibility, color quality issues, and many consumers didn’t like the shape and feel of the bulbs. Today, LEDs have come a long way and are widely considered the lighting option of the future. They are the most energy efficient bulb option on the market; a 60W equivalent only uses approximately 12 watts. Manufacturers have improved the shape and feel of the bulb to look much more like a traditional bulb, as well as being compatible with almost all types of fixtures. The bulbs are now available in a near-infinite palate of colors and hues,
allowing the consumer to specify different colors of light for different applications. The price of these bulbs is still rather high, $12-$15, compared to the other options, however they have an estimated life expectancy of 14-25 years depending on the amount of use.

To dive deeper into the future of residential lighting, Newport Ventures, in conjunction with the New York State Energy Research and Development Authority (NYSERDA), is currently working on a project demonstrating the effectiveness of LED lighting technology. The project intends to address some of the current market barriers being experience by LED lighting (cost, appearance, compatibility, awareness) by demonstrating the benefits of the technology. Five single-family homes throughout New York State will be outfitted with a professionally design whole-house LED lighting system. Newport has teamed with Phillips to install the LED bulbs and fixtures and Lutron will be providing their new, pocket-friendly Caseta wireless control system. Working with two leading manufacturers provides further assurance that the homes will be outfitted with high quality products that will portray the benefits of LED lighting technology. Each home will be monitored for electrical consumption (the lighting will be kept separate from the rest of the electrical use in the home) and, along with supplemental information such as homeowner/builder surveys, will be used to analyze the effectiveness of LED lighting.

To kick-off the project, it is important to gain an understanding of what the current consumer perceptions of lighting are. To do so, Newport recently participated in two consumer outreach events in New York to try and gauge consumer perception of residential lighting and to gain an understanding of consumer awareness relating to LED lighting technology. The first of these events was in Saratoga, NY at the Capital Region Parade of Homes. The second event was located in Rochester New York at the Rochester Home Builders Inc. “Homearama”. At each event, Newport conducted a lighting demonstration and administered a written survey. Each event had a large volume of foot traffic, with an audience that was clearly interested in home design and trends, providing us with great opportunities to obtain relevant feedback. This report discusses both the quantitative and qualitative findings from each event as well as an analysis of the combined data.

Key Findings
Below is a list of the major highlights from both the consumer outreach events. These highlights include both quantitative and qualitative findings from the two events. While conducting the demonstrations and administering the surveys, we were able to talk with over 700 people about their lighting preferences. This allowed us to get a sense of the common perceptions consumers hold in regards to lighting their homes. With the number of people reached, and the general consistency of the messages overheard, we feel the qualitative findings are just as credible as any quantitative findings we analyzed.

Major findings include:

- The LED bulb was the clear favorite of the three bulbs. Most felt it was the brightness that drew them to the light. Overall, 59% of participants chose the LED bulb.
- There is a willingness to pay more for a high performing bulb particular is the bulb is EnergyStar certified and has a long life expectancy.
Economic considerations such as energy savings, cost, and life expectancy tend to be more important than physical characteristics of the bulbs.

Brand recognition is not important to consumers when choosing light bulbs. There seems to be no clear leader in the light bulb market from a consumer’s perspective.

Most people are aware the incandescent bulbs are being phased out and are beginning to make the switch to more energy efficient lighting.

Many people currently have CFLs in their homes however; there was a good majority that seemed unhappy with them. Participants indicated they are planning to or would switch to LEDs if the price was more comparable to CFLs.

The $12 price of the LED was a surprise to many, however most felt that it was still too high. According to the written survey the “sweet spot” for a price point should fall between $5-$15.

Many people are unaware of the new capabilities and advancements in LED lighting and seem to have a bad taste for energy efficient lighting, mostly due to bad experience with CFLs.
Saratoga, NY: Capital Region Parade of Homes

For this event, Newport worked with Belmonte Builders to conduct the lighting demonstration and survey. Upon entering the home, we asked visitors to fill out the general lighting survey. Once inside, they were able to view the lighting demonstration. The demonstration included a large box divided into three smaller boxes. Each box was wired so that it would be illuminated by a different light bulb (CFL, Incandescent, and LED). In order to best compare the boxes, we used bulbs with similar specs in regards to color temperature, lumens, and relative wattage. Under each bulb were identical items (apple, banana, playing cards, and a flower) in order to better compare the color quality and brightness of the light coming from each bulb. The top portion of each box was covered, making it so the participants could not actually see the bulbs, just the light and the items. Participants were then asked to select the light they preferred from the three boxes and then give a reason why (color quality, brightness, or just like it better).

**Lighting Demonstration Results**

We had a large number of participants who were eager to participate indicating to us that lighting is an important aspect of the home to many people. Most of the visitors seemed very enthusiastic about lighting in general and many seemed to be at least somewhat familiar with the different types of lighting available to them. Many were familiar with the phasing out of incandescent bulbs, basically leaving them with CFLs and LEDs to choose from in the future. After collecting all the responses from the participants, what we found is that overall people enjoyed the light from the LED better than the other two bulbs. The box with the LED bulb was chosen 47% of the time. Further, color quality or brightness was chosen by almost every participant as the reason for their selection.

For those who chose the LED bulb, there was a pretty even split between those who indicated brightness was the reason and those who suggested it was the color quality. Many described the LED as

<table>
<thead>
<tr>
<th>Saratoga Demonstration Bulb Specs</th>
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<tbody>
<tr>
<td><strong>Bulb Specs</strong></td>
</tr>
<tr>
<td>Watts</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>Brightness (Lumens)</td>
</tr>
<tr>
<td>Color (kelvin)</td>
</tr>
<tr>
<td>Year Life (3hrs/day)</td>
</tr>
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</table>
a whiter light and more natural than the other two options. There were a good portion of participants who were surprised to find out that the different bulbs were all within the same color temperature scale. It became apparent that there were a good number of people who were unaware of many of advancements in LED technology. Two frequent comments we heard was that they were surprised that the price of the bulb in our display was $12 as well as the improved dimming compatibility.

The incandescent bulb ranked slightly higher than the CFL among the participants. For those who preferred this bulb, 63% said the color quality of the bulb was the reason. Incandescent bulbs have been around for a very long time and emit the type of light that people are used to seeing. Most participants were well aware that they are currently being phased out and that the CFLs or LEDs will be the main two choices for residential lighting. Most indicated they were beginning to make the switch to the more energy efficient options, however there were a few people who commented that they were stocking up on the incandescent bulb while they can.

The CFL bulb was the least popular option for this demonstration. Of those who did prefer it, color quality was noted slightly more than brightness as to why they opted for the bulb. Many participants who chose the CFL claimed they were surprised by their choice. Participants frequently commented that the bulb was too “orange” and didn’t like the shape of the bulb. They also indicated they did not like the warm up and cool down time they had experienced with other CFL bulbs. However, a good majority of the participants said they had them in their home.
General Lighting Survey Results
We also gathered the data from the general lighting survey we conducted at the event. This survey was delivered before visitors entered the home so the demonstration had no effect on the findings. The purpose behind this survey was to get a general idea of how the majority of consumers make decisions regarding lighting in their home and gauge how well LED lighting technology is penetrating into the residential lighting market.

*Each of the following charts is based on the results of the 204 surveys collected*

*When purchasing light bulbs for your home, what factors do you consider?*

![Factors considered when purchasing light bulbs](image-url)
Which factors would most likely convince you to pay more for a light bulb?

What factors would convince you to pay more for a bulb?

What price would you be willing to pay for a high performance (energy efficient, long lasting, high quality of light) bulb?

What price would you pay for a "high performance"* bulb?

- $0-$10: 12%
- $10-$15: 13%
- $15-$20: 45%
- $20-$30: 31%
How familiar are you with LED lighting? Have you purchased LED bulbs for your home?

<table>
<thead>
<tr>
<th>Familiarity with LEDs</th>
<th>Participants who have purchased LEDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somewhat</td>
<td>Yes</td>
</tr>
<tr>
<td>Very</td>
<td>No</td>
</tr>
<tr>
<td>Not at all</td>
<td></td>
</tr>
</tbody>
</table>

67.6% 26.0% 6.4%

61.8% 38.2%


Newport conducted its second consumer outreach effort at the Rochester Home Builders Inc. “Homearama” in Rochester, NY. The event showcased seven homes from leading local builders as well as products and technologies from leading vendors. Newport participated in the opening weekend of the event by conducting a lighting demonstration to gauge consumer perception on the different types of bulbs on the market. Like in Saratoga, the Rochester Homearama is a highly attended event providing Newport with a great opportunity to engage with consumers who are particularly interested in housing and all the components that make up a home.
Lighting Demonstration Results

Similar to the Saratoga event, the attendees in Rochester were very interested in residential lighting. Our demonstration was stationed inside an exhibit tent which allowed us to have access to a high percentage of those who attended the show. For the second event in a row, the vast majority of participants chose the LED bulb over both the CFL and Incandescent. In fact, over 60% of respondents chose the LED. People seem drawn to the brightness and “natural color” of the light. There was a pretty even split between brightness and color quality for those who preferred the LED over the other options. Many were impressed with how the LED looked similar to the traditional incandescent they have grown accustomed to. While the majority said they liked the light of the LED, many hinted at the price being a major obstacle. When told the bulb we purchased was about $12, some were surprised that it had dropped that low, however even at this price most thought the bulbs were still too expensive. Some even indicated that they would rather pay the extra in energy cost for the traditional Incandescent bulbs than pay the high price of the LED. When told the bulbs were supposed to last about 20-25 years, again most were surprised and felt that if the bulb really would last that long, the $12 price tag would be worth it. While it was clear that many people are starting to make the switch to energy efficient lighting (CFL or LED), and there was a clear preference for LEDs, the high price of the bulbs is still a major obstacle to overcome.

The incandescent bulb was the second most popular choice among participants in the demonstration. For the majority of those who selected this bulb, they tended to indicate the color quality was the main reason for their choice. Many people indicated they liked the traditional bulb because it is what they are used to and what they have used for the majority of their life. The majority of participants were aware that these types of bulbs were being phased out and many were starting to make the switch to the options that will be available to them in the future. However, a handful of people indicated they were stocking up on these incandescent bulbs while they could still find them in stores.
Once again, the CFL light was selected by the least amount of participants. Most felt it was too yellow and gave off too much of a fluorescent glow. However, a good number of participants indicated those were the bulbs they had in their home, although most said they hated them. People claimed they had problems with dimming and getting the lights to be suitable for mood lighting and ambience, a well-documented issue for both CFLs and LEDs. The inability for CFLs to turn on and off instantaneously was another issue that was raised by many of the participants. People don’t want to wait for their bulbs to come on, particularly in areas such as the bathroom or kitchen.

General Lighting Survey Results
To supplement our demonstration, we also administered the same general lighting survey used in the Saratoga event. Again, the purpose of this survey was to gain a better understanding of specific characteristics people look for when making lighting decisions for their home. The questions were designed to try and understand how consumer make decisions on lighting and gauge the level of market penetration being realized by LED lighting. Because of the nature of the event, the number of responses to the written survey was down from Saratoga. However, overall we were able to reach more than double the number of consumers through the demonstration summarized above and through informative conversation.
Each of the following charts is based on the results of the 85 surveys collected.

When purchasing light bulbs for your home, what factors do you consider?

Factors considered when purchasing light bulbs

<table>
<thead>
<tr>
<th>Factor</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Savings</td>
<td>60%</td>
</tr>
<tr>
<td>Cost</td>
<td>50%</td>
</tr>
<tr>
<td>Color of Light</td>
<td>40%</td>
</tr>
<tr>
<td>Life Expectancy</td>
<td>30%</td>
</tr>
<tr>
<td>Lumen/Light Output</td>
<td>20%</td>
</tr>
<tr>
<td>Controllability</td>
<td>10%</td>
</tr>
<tr>
<td>Shape/Style</td>
<td>5%</td>
</tr>
<tr>
<td>Matching Current Lighting</td>
<td>5%</td>
</tr>
<tr>
<td>Brand</td>
<td>2%</td>
</tr>
</tbody>
</table>

Which of the following factors would most likely convince you to pay more for a light bulb?

What factors would convince you to pay more for a bulb?

<table>
<thead>
<tr>
<th>Factor</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Life Expectancy</td>
<td>75%</td>
</tr>
<tr>
<td>Energy Star Certified</td>
<td>60%</td>
</tr>
<tr>
<td>Brightened Color Output</td>
<td>45%</td>
</tr>
<tr>
<td>High Lumen Output</td>
<td>30%</td>
</tr>
<tr>
<td>Controllability</td>
<td>15%</td>
</tr>
<tr>
<td>Brand Recognition</td>
<td>5%</td>
</tr>
<tr>
<td>Other</td>
<td>5%</td>
</tr>
<tr>
<td>The Cheapest Bulb</td>
<td>2%</td>
</tr>
</tbody>
</table>
What price would you be willing to pay for a “high performance” light bulb?

What price would you pay for a "high performance"* bulb?

*“High performance” was loosely defined as energy efficient, long lasting, and high quality of light. Not surprisingly consumers want to get these bulbs at the lowest price possible.

How familiar are you with LED lighting? Have you purchased any LEDs for your home?

Familiarity with LEDs

78% Somewhat
13% Not at all
9% Very

Participants who have purchased LEDs

52% Yes
48% No
Saratoga/ Rochester Comparison and Combined Data

When comparing the results from the two consumer outreach events Newport has conducted thus far, we can see that the results are very similar. The consistency in the responses from participants helps us to further validate any findings we extract from the data collected. Although responses from the two events were very similar, it is impossible to draw conclusive findings from the demonstration because of several variables that may have an effect on the way participants responded to the questions. For example we did not use the same bulbs for each demonstration however; we carefully selected bulbs that were consistent in color temperature, wattage, and lumens. Further, in Saratoga our demonstration was set up inside a home as opposed to in Rochester where we were stationed under a tent. While these variable certainly can have an impact on the way light is perceived by consumers, the results are consistent enough to provide a general idea of what bulb is most preferred and why.

Lighting Demonstration Results

In regards to the lighting demonstration poll, the results from the two events are very similar. In Saratoga, 47% of participants indicated they preferred the LED bulb over the other two options. In Rochester, that number actually increased to 63% of participants. In both cases, the LED bulb was the overwhelming favorite, the incandescent ranked second, and the CFL was the least preferred bulb. During the Saratoga event, incandescent only slightly beat out CFLs however, in Rochester there was a substantial difference.

It was also interesting to compare the reasons participants gave for making their selections. Brightness slightly edged out color quality for the LED bulbs in both polls, although the split was very close. The numbers were also very similar for those who preferred the incandescent bulb; both groups suggested color quality was the primary reason rather than brightness.
The only difference among the reasoning behind their bulb choices was for those who said they preferred the CFL, the lowest total in both groups. Those in Saratoga indicated it was the brightness that attracted them to the CFL while those in Rochester suggested that the color quality of the bulb was the main reason they chose the CFL. Below is a chart depicting the difference in reasoning between the two events broken out by bulb choice.

![Reasons for bulb choice chart](image)

While these results can give us some indication as to why participants made their selections, it is not possible to draw conclusive findings from them due to a variety of circumstances. During the Saratoga event we conducted our lighting demonstration inside the laundry room of a home. As a result, we had control over the additional light in the room which can have a significant effect on how light is viewed. In Rochester we were outside in an exhibit tent which, although it was completely covered, did allow light in through the front entrance. Further, the amount of sunlight coming in to the tent changed during the course of the day which may also have affected the way participants viewed the light. The way people define brightness and color quality may also differ from person to person. A participant who indicated they chose a particular light because of color quality could very well have a different definition of color quality than the next person.

While the results of these demonstrations are subject to these variables, they also demonstrate a more “real life” scenario. To conduct a demonstration that would remove these variables and provide conclusive results we would have to use identical homes, rooms, and/or exhibit areas. The time of day would have to be the same as well as the impact of other light sources. We would also have had to clearly define “brightness” and “color quality”. However, these variables are also important to include because they portray a “real life” environment. Other light sources will always come into play, as will natural sunlight, the changing objects in a room, and even our own perceptions. We don’t live in laboratories where everything can be controlled. Our environments are constantly changing and as a result, the variables in our demonstration actually do a better job of reflecting a true consumer opinion.
Below are two charts that portray the combined data from the two outreach events:

**Which light do you prefer?**

- **LED**
- **Incandescent**
- **CFL**

**Reason for choosing bulb**

Combines Data

- **Brightness**
- **Color Quality**
- **Spread (Range) of Light**
- **I don't know I just like it better!**
General Lighting Survey Results
Because no variables were present that could have influenced the answers to the survey questions, we are simply reporting on combined data for the two events rather than compare the two.

*When purchasing light bulbs for your home, what factors do you consider?*

![Important Purchasing Decision Factors](chart)

*Lumens/Light Output was added to the survey for the Rochester event and was circled by 26% of those who took the survey.*

The combined data shows that in general, economic considerations are more important to consumers when purchasing light bulbs than the physical characteristics of the bulb. Energy savings (operating cost), life expectancy (maintenance cost), and the price of the bulb were three of the top four responses from participants. The color of the light was the most important physical characteristics that consumers looked for. This is consistent with the messaging we heard through the lighting demo, as many people indicated that the color of light preferred was dependent on the room or application. Interestingly, brand was only selected by 3% of all participants who took the survey indicated that there is no dominant brand of light bulb in the market today.
Which of the following factors would most likely convince you to pay more for a light bulb?

The results from this question show that for the most part, consumers are willing to pay a higher cost for a light bulb as long as it comes with certain desired attributes. Overall, only two participants suggested that they only buy the cheapest bulbs available. The top two selections, having a long life expectancy and being EnergyStar certified were far and away the most important attributes for consumers if they are going to pay a premium for a light bulb. Many indicated life expectancy was particular important for recessed fixtures in high ceilings that are not easy to change. The responses from this question suggest that consumers want some sort of guarantee or a sense of comfort in knowing that the bulb they purchase is of a high quality and will not break down on them. Again, brand recognition did not receive a high percentage of responses.
What price would you be willing to pay for a “high performance” light bulb?

*For the purpose of this survey we loosely defined “high performance” as energy efficient, long life expectancy, and high quality of light. Obviously, high performance can be defined in many different ways.

The cost of light bulbs was identified as being extremely important to consumers in a variety of ways throughout this survey. This question gets to the point directly by asking them what they would be willing to pay for a “high performance” bulb. From the results, it seems as though the “sweet spot” for a price point would be somewhere between $5-$15, although there is a substantial percentage that indicated $15-$20 would also be an acceptable price point. Through discussion with many participants during the lighting demo, we found that many were surprised at the fact the LED we used was only $12. However, many indicated that was still a bit too high and they would like to see the price drop down to the average price of a CFL in today’s market.
How familiar are you with LED lighting? Have you purchased any LEDs for your home?

The last two questions of the survey were intended to gauge the current state of the LED market in regards to consumer awareness. The vast majority clearly had some idea of LED light bulbs and were vaguely familiar with some of their characteristics. The majority of participants indicated they had previously purchased LEDs for their home. It did however become clear through conversation with participants, that many were not familiar with the advancements in LED technology and the improvements that have been made. For example, many were surprised to hear about the improved compatibility with dimmer controls, applicable fixtures, and increased options for color temperature.