Halogen Torchieres: A Look at Market Transformation in Progress

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ABSTRACT

The halogen torchiere, or uplighter, has enjoyed unprecedented success over the last decade as a residential fixture in North America and parts of Europe. Its high temperature halogen light source, while bright and attractive, consumes 300 to 500 watts of power, and has caused at least 189 fires in the United States alone. The U.S. Environmental Protection Agency's recent development of a voluntary label for energy efficient residential fixtures – Energy Star – has served as the foundation for a concerted effort to transform the market for torchieres and other residential fixtures. Electric utilities are now investing millions of dollars in incentive and promotional programs to encourage their customers to switch from purchasing cheap halogen torchieres to purchasing higher cost, higher value, Energy Star alternatives. The most successful marketing efforts for such products, while acknowledging the value of their energy savings, focus primarily on their non-energy benefits, such as improved safety.

The term "market transformation" has seen widespread application to a series of initiatives to encourage the sale of more energy efficient technologies. In most cases, these initiatives are pursued by individual utilities, groups of utilities, or governments. The initiatives succeed or fail primarily on their ability to persuade consumers to buy a product on the basis of a single attribute: energy efficiency. While for some customers the energy metric can be decisive, for most it is merely a helpful piece of information – not a factor that, by itself, moves them to purchase a particular product (Jennings, et al., 1996).

Recently, a number of researchers have begun exploring another dimension of these efficient technologies: their non-energy factors. Nutek's technology procurement and market transformation programs, for example, have placed substantial emphasis on the low noise transmittance of windows, the quiet operation of refrigerators, the low-evaporation performance of clothes washers and dryers, and the lower heat output and longer life of high frequency-ballasted lamps, rather than solely addressing their energy consumption characteristics. By emphasizing non-energy factors shown to be important to target customer groups, Nutek achieved far greater interest from those parties in procuring efficient equipment. (Nutek, B1996:3, and 1994:70).

At the 1993 Right Light conference, one of the authors delivered a paper on this topic that identified the central importance of non-energy factors in consumer acceptance of compact fluorescent lamps (Wilms and Mills, 1993). It also demonstrated in some detail the poor correlation between lamp purchase price and sales for several countries. A subsequent paper explored, for a range of energy efficient technologies, the multiple dimensions of non-energy benefits, including improved indoor air quality, enhanced health and safety, improved acoustics, labor savings, improved process control, amenity/convenience, water savings, and indirect economic benefits through equipment downsizing. For energy efficient lighting, the commonly known non-energy benefits include lamp longevity, safety, the aesthetic advantages of diffuse light sources, and certain environmental advantages.

This paper addresses the particular interactions between energy efficiency and safety in one specific light fixture type: the halogen torchiere, or uplighter. It traces the simultaneous rise of interest in improving the efficiency of the products and the growing awareness of their safety

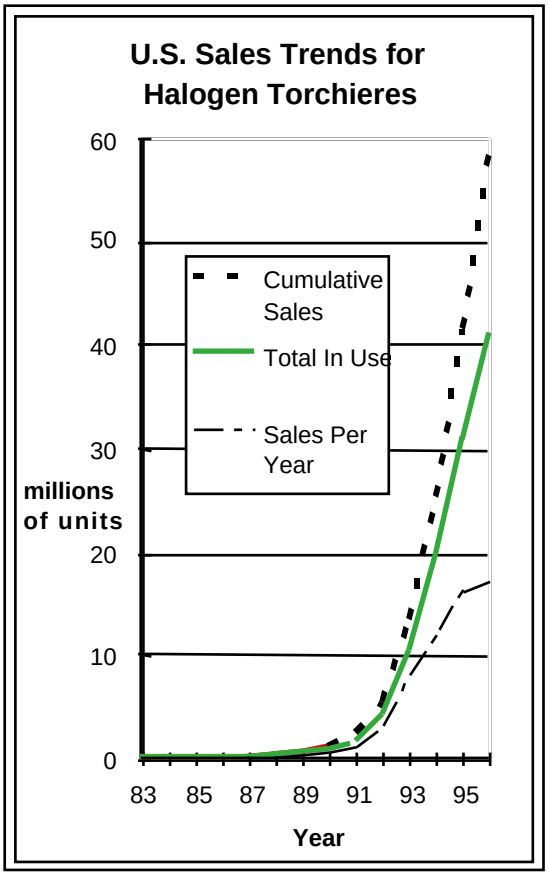

Figure 1 - Compiled from various market sources, this graph illustrates the remarkable growth in torchiere sales since 1991.

risks, showing how each factor interacted with the other to create demand for energy efficient, safer alternatives to the halogen torchiere in the U.S. market.

BACKGROUND

The advantages of uplighting (also known as indirect lighting) are by now well-known. By projecting the light source onto a reflective surface such as the ceiling, indirect lights provide more diffuse, shadowless illumination. They can also enhance visual performance, by minimizing the variation in luminance between the direct and peripheral fields of vision. Perhaps more importantly, in the case of fluorescent sources, they obscure the light source itself from view, unlike many direct fixture designs. The user perceives lit surfaces in the room, but not the glare from the source itself. Given the pervasive, anti-fluorescent bias in the U.S. residential market, this is an important advantage in the case of residential fixtures (Campbell, 1994).

Funeral homes were among the first businesses to make widespread use of torchieres. Fitted with standard incandescent bulbs, torchieres created a soft, warm, serene atmosphere in funeral homes, well-suited to the needs of grieving families. But the screw-based, incandescent torchiere never became an extremely popular fixture, either because of its high cost, its modest light output with typical 100 watt incandescent bulbs, or perhaps its unfortunate subconscious association with funerals.

All of that changed in the mid-1980s [1)] when a new design first appeared in America from Italy. Italian designers, eager to take advantage of new, high wattage halogen bulbs , placed them in simple, sleek, black torchieres. The design had instant appeal to America's trend-setting buyers, who were either refitting spacious, open Manhattan lofts, or building sprawling homes in which curtains of metal and glass enclosed spare, modern interiors of white and black. The early halogen torchieres sold for $150 or more, and threw a tremendous amount of crisp, white light onto the ceilings of America's trendiest residences. Ceilings became focal points of interest rather than dark, cavernous spaces. Moreover, the white halogen light looked great with white interiors, crisply illuminating them instead of tingeing them with the yellowish light of typical incandescent sources. Never before had it been so convenient for homeowners to put so much light precisely where they wanted it, all without the services of an electrician.

By the late 1980s, the interior decorating magazines began featuring the new fixtures in their pages, leading to a wave of imitation and replication by both buyers and sellers. The new buyers sought to duplicate the high style of the wealthy on more modest budgets. The sellers were increasingly Chinese and Taiwanese exporters, who found that the simple designs of halogen torchieres lent themselves nicely to mass market replication by low cost labor forces. The Asian manufacturers cut costs further by learning to build their own halogen bulbs in quantities of millions, and by designing the two meter torchiere pole in such a way that it could be disassembled into three separate sections, along with the base and an upper bowl. This allowed the entire fixture to fit into a flat, rectangular polystyrene box, making it possible to ship container loads of fixtures affordably. By contrast, other table and floor lamps employed (and continue to employ) fragile, easily damaged bases and even more easily damaged shades. Both require bulky, cushioned packaging to protect the product in shipment.

With each of these advances, the retail price of halogen torchieres dropped, first to $49, then $39, and eventually even $29. Never had so many Americans been able to buy so much light so cheaply, or so they thought. Sales passed 10 million units per year around 1993 and kept climbing (Figure 1).

Retailers discovered the advantage of having a "house brand" torchiere, cutting out the middleman and driving prices even lower. Manufacturers began shortening power cords, using two way switches instead of dimmers, and reducing the thickness of the metal pole, all to shave precious pennies from production costs. Yet each of these cost-cutting measures increased the likelihood that the fixtures would suffer quality problems shortly after purchase. Soon, as many 10 to 20% of purchased products were being returned, increasing the gap between cumulative sales and units in use (Meyer, 1994a and 1994b)

At the same time, safety problems with the fixtures began to emerge. With halogen bulbs operating at temperatures of 350 to 500 degrees C and reflector bowls open at the top, torchieres allowed combustibles to come in close proximity with a light bulb hotter than most electrical devices in the home. The United States Consumer Product

Safety Commission (CPSC) received its first report of a torchiere fire in 1991. Over the next six years, it would receive reports of at least 189 fires,11 deaths, and 29 injuries from the products, yet still not require manufacturers to switch to safer, more efficient light sources (Calwell and Todreas, 1997). Canadian statistics, likewise, reveal that at least 10 fires have been caused by halogen torchieres in that country (Alberta Labour 1997), and that far more have gone unreported (personal communication, Richard Wright, producer, Marketplace, Canadian National Broadcasting Corporation, September 3, 1997).

By 1995-1996, torchiere retail prices of $19.99, $14.99 and even $10.99 were becoming commonplace, and sales rose to a phenomenal 17 to 20 million units – one-eighth of all the light fixtures sold in the U.S. of all types (Calwell, 1996 and HomeWorld Business, 1997). Even at that price, manufacturers were increasingly packaging the fixtures with two bulbs instead of one, reducing the return rate if one failed immediately. Americans were hooked on cheap light fixtures, and retailers felt they had to provide them to remain competitive. Halogen torchieres rose to 20 to 40% of lighting sales in many retail stores, gaining coveted positions on the end caps of home improvement centers and high volume discounters (Meyer, 1994a).

"MEANWHILE, BACK AT THE ELECTRIC UTILITY…"

While halogen torchieres were steadily gaining in popularity, America's utilities were continuing to offer demand side management (DSM) programs to encourage the sale of screw-based compact fluorescent lamps (CFLs). But these lamps faced some daunting disadvantages: costing as much as an entire halogen torchiere fixture, they provided less light, had no dimming or multi-level switching capability, and brazenly advertised their "fluorescent-ness" to a market deeply averse to that technology. And, of course, the CFLs were not usable in halogen torchiere fixtures. As a result, the energy compact fluorescents were saving was quickly displaced by the energy that halogen torchieres were consuming – without anything promoting their sale except simple consumer preference for cheap, bright lighting. By 1996, halogen torchieres were consuming roughly 16 billion kwh of electricity per year in the United States alone (Calwell, 1996).

At the same time, halogen torchieres may have reached comparable levels of saturation in both France (7 million sold) and the Netherlands (3 million sold), even at substantially higher average prices. Sales were steadily growing in Sweden, Italy, and Belgium as well, seemingly unaffected by the availability there of very expensive ($500 U.S.) energy efficient alternatives. (Calwell and Mills, 1996; email, Evan Mills, November 28,1996; and email, Willem De Groote, April 25, 1997).

As late as 1995, there was still no widespread awareness at U.S. utilities that incentives needed to be retargeted toward replacements for particularly energy consumptive fixtures. Since the early 1990s, the Lawrence Berkeley National Laboratory had operated a CFL fixture program to identify and promote ways of utilizing pin-based CFLs in fixtures optimized and dedicated for their use (Siminovitch and Mills, 1993). In December 1994, researchers at the Natural Resources Defense Council and LBNL constructed a crude prototype of an energy efficient alternative to the halogen torchiere. Utilizing a 39 watt 2D lamp with a smaller wattage 2D above it, this prototype demonstrated two things: that it was possible to use efficient sources within the form factor of a torchiere, and that better engineering would be required to make such a design attractive and practical. The prototype was exhibited at a an energy efficient fixture conference at LBNL in January 1995. The prototype and various drawings were also sent to a pair of fixture manufacturers in southern California, but neither decided to develop a product at that time (Calwell, 1995).

In early 1996, LBNL researchers began actively testing halogen torchieres in their laboratory and fashioning manufacturable energy efficient prototypes, using CFLs and improved reflector systems. By the summer of 1996, they had completed initial design work and made detailed photometric and thermal measurements of both the halogen torchieres and fluorescent alternatives.

At the same time, a Harvard student was completing her undergraduate thesis on halogen torchieres (Marr, 1996). She conducted a survey to determine the prevalence of torchieres on the Harvard campus, then measured their energy use, and finally constructed an alternative fluorescent prototype with reflector. After testing in LBNL's lab, this design was further refined by a private company in Boston, who located a manufacturing partner in China and arranged for the product to be imported and sold by a Boston-based energy efficient product distributor.

THE POWER OF A LABEL

Although technological solutions were available, no market for them had yet been proven. Many parties were skeptical that one could be created, given the extremely low cost of halogen torchieres and their enormous popularity. But interviews with dozens of manufacturers, retailers and electric utilities in late 1995 and early 1996 revealed support in the marketplace for the creation of a visible federal benchmark for high quality, energy efficient, residential fixtures (Calwell et al., 1996). Many manufacturers felt that the residential marketplace had become a "dumping ground" for inferior products, and that most of the profitable new efficiency technologies were going into commercial, not residential fixtures. The residential lighting market needed, it seemed, a common standard around which to rally its collective efforts.

In March 1997, the US Environmental Protection Agency launched its Energy Star labeling program for residential fixtures. [2] Like the Energy Star programs for office equipment, HVAC equipment, exit signs, and homes that preceded it, this program is purely voluntary, relying on the marketing cachet of its readily recognizable symbol to motivate manufacturers to upgrade the performance and efficiency of their products. The program made it possible to unify most U.S. utilities operating residential lighting programs around a common set of technical specifications, while giving manufacturers and retailers a readily identifiable marketing signature for conveying the efficiency and safety benefits of alternative products to non-technical buyers. This was par-

Figure 2 - A side view of the Energy Star torchiere from Energy Federation Inc. – an outgrowth of student research at Harvard University.

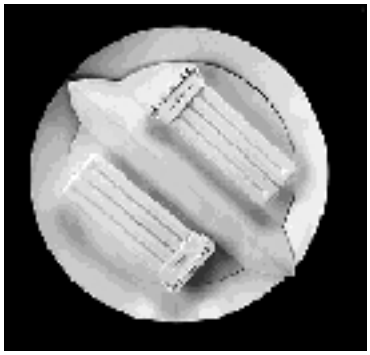

Figure 3 - A top view of the Energy Star torchiere from Emess Lighting Inc – an outgrowth of cooperative research with LBNL.

ticularly essential with torchieres, since they are frequently misperceived by buyers as energy efficient sources.

By September 1997, EPA had signed at least 21 manufacturing partners to the program, and dozens of electric utilities in California, the Pacific Northwest and New England had announced that their multimillion dollar incentive programs for residential fixtures would be directed only toward Energy Star-compliant products. Numerous articles in the trade press helped publicize the value of the label to manufacturers as well, creating a sense of momentum for the new program. EPA has begun marketing the program extensively through television and print public service announcements, and participating manufacturers now feature it at trade shows, on product packaging, and in product literature. At least five manufacturers intend to have thousands of Energy Star torchieres in consumer hands by the end of 1997, and two others are testing prototypes which may eventually qualify for Energy Star.

THE SPECIAL CASE OF COLLEGES AND UNIVERSITIES

Although the Energy Star program is oriented toward residential purchasers, Energy Star torchieres achieved their first successes in the dormitories of colleges and universities – which are considered commercial customers by electric utilities. College students have traditionally been one of the most concentrated markets for halogen torchieres (perhaps 0.3 to 0.5 torchieres per student), because residence halls provide notoriously poor lighting, students do not pay their own energy bills, and students' budgets usually permit only the lowest cost solutions. School administrators now have an opportunity to dramatically reduce energy bills and potential liability exposure by replacing the units with energy-saving alternatives. They can even utilize a publicly available curriculum module to involve students in the process of measuring on-campus energy use of halogen torchieres and potential economic and environmental savings from alternatives (Calwell and Teichert, 1997, and Calwell, 1997b).

The very first Energy Star torchieres were installed in Stanford University's dormitories in June of 1997. Stanford first learned of alternative torchiere development work in October 1996 through E SOURCE – a U.S. based publisher of reports on energy efficient technologies. Within weeks, Stanford announced an offer to buy the first 500 units produced from a collaborative design effort between LBNL and one of the Energy Star product manufacturers, Emess Lighting (Calwell, 1997c).

In the summer of 1997, Stanford conducted a torchiere exchange program, through which 500 residence hall students were able to swap their existing halogen torchieres for dedicated CFL alternatives. Average fixture efficacy rose from 15 lumens/watt to 62 lumens/watt, while light output rose by 25%, according to measurements by LBNL. The new fixtures achieved a six month payback time based on energy savings, while virtually eliminating the fire hazard from torchieres (Siminovitch and Page, 1997a).

At the same time, dozens of universities throughout the U.S. moved to ban the use of halogen torchieres in residence halls. The Northeast College and University Fire Safety Officers Association issued a statement opposing their use on all member campuses. But, schools that have instituted torchiere bans without taking an active role in providing suitable alternatives have come under tremendous pressure by students. As a result, Brown, Rice, Harvard, Texas A&M, and numerous other schools are moving during late 1997 to purchase Energy Star torchieres for their dormitories or encourage their purchase by interested students. Some schools may stock them in on-campus bookstores, while others are considering lease options for their students or even direct sales over the internet. [3)]

The more widespread diffusion of the product into traditional residential markets is also underway, with Energy Star manufacturers moving aggressively to secure retail and mail order distribution channels for their products. The fluorescent and metal halide designs from U.S. manufacturers appear to be significantly less expensive than those currently available in Europe, which points to promising export opportunities for the Energy Star partners once domestic markets are firmly established (email, Willem De Groote, April 25, 1997).

The Energy Star program and subsequent utility promotional efforts have catalyzed a great deal of innovation by lighting manufacturers, particularly in the area of torchieres (Nirk, 1997). Though the transformation of the torchiere market is by no means complete, it is far enough along to provide a number of useful lessons, not only for future efficient lighting programs, but also for market

transformation efforts in general. Four lessons are particularly significant:

1. *When researching and promoting the energy benefits of efficient technologies, look carefully at the non-energy benefits that may be of greater interest to potential buyers.*

The early popular press coverage focused solely on individual fires from halogen torchieres, rather than on any systematic safety deficiencies with the products' design. Almost none of them mentioned that halogen torchieres also wasted energy, and were therefore expensive to own and operate, even if inexpensive to purchase. At the same time, energy-oriented audiences were initially thinking primarily about the energy savings associated with substituting fluorescent sources for halogens, but not about the marketing opportunities presented by the safety issue. Key articles published by ESource (Calwell, 1996 and Calwell, 1997c), the International Association for Energy Efficient Lighting (Calwell and Mills, 1996), the Contra Costa Times (Maclay, 1996), Home Energy (Calwell, 1997a), the Wall Street Journal (Ramstad, 1997) and the Christian Science Monitor (Belsie, 1997) helped to bridge this gap, by making a wider audience aware of the causal link between energy inefficiency and safety risks throughout the halogen torchiere product line, as well as the early efforts to develop energy efficient alternatives. By contrast, television stories focused solely on the safety angle, ignoring the energy story (and the concomitant opportunities for electric utility involvement) entirely.

2. *Consider not just who buys a particular product, but who and what influences that decision.*

In the case of halogen torchieres, knowing that most purchasers were residential customers of low and moderate incomes did not begin to tell the whole story. Interviews conducted during the development of the USEPA Energy Star fixtures program revealed why such people often buy torchieres: they live in the kinds of housing where builders typically fail to provide adequate lighting to begin with (Calwell, et al., 1996). For example, it is common for low cost suburban housing, apartments, public housing and dormitories in the U.S. to provide very inexpensive and dim lighting, if any, in common rooms and bedrooms. The opposite is true in New Zealand, where higher quality installed lighting has left a much smaller market for torchieres, or "freestanding uplighters" as they are known there. Similarly in Sweden, builders uniformly include wiring in the ceiling for hard-wired fixtures, reducing the need for torchieres.

In rooms where switched outlets may be the norm, it is hardly surprising that occupants would purchase very bright, inexpensive, portable lighting, particularly if they do not pay their own energy bills. At that point, incentives are more usefully directed toward the bill-payer (the property owner), who may in turn be able to encourage occupants to switch to efficient alternatives or choose a house that already provides them. Energy efficient installed lighting can be a strong selling point in new homes, provided that good design practice accompanies the improved technology (Koltai and Leslie, 1995).

3. *Making the affirmative case for buying the efficient alternative is only half of the challenge; consumers also need a reason not to purchase the "base case" product.*

In the case of halogen torchieres, a steady stream of negative publicity has accompanied the various fires, deaths and injuries that have occurred since 1991 (Calwell, 1997c). Though regulators did not prevent people from purchasing halogen lamps or recall the units already purchased, the steady pressure from television newsmagazines and newspapers did cause them to push for more stringent testing methods, issue more forceful consumer warnings about the products, and institute a retrofit campaign to make protective cages available for halogen units already in consumer hands. As a result, halogen torchiere sales fell by as much as 70 percent in some regions of the United States in early 1997, setting the stage for consumer and retailer receptivity to an alternative (Meyer, 1997). In addition, a number of private lawsuits are currently underway against halogen torchiere manufacturers, encouraging them to utilize safer light sources in future products, and to price remaining halogen products higher to cover redesign and legal costs.

4. *The insurance industry represents a potentially powerful and, as yet, underutilized ally in the effort to increase usage of energy efficient lighting.*

Insurance companies have a pivotal role to play in the torchiere market, since their rates are supposed to reflect the relative risks posed by their customers. Insurance companies who raise their rates for universities that continue to allow halogen torchieres in residence halls or lower their rates for universities who take proactive measures to encourage the use of alternatives would provide a valuable additional financial signal to the marketplace.

The insurance industry is beginning to view energy efficiency (including efficient torchieres) as an untapped strategic opportunity. It helps to prevent conventional insurance losses from fires, injuries and loss of life, and to reduce the emissions of greenhouse gases that some insurers believe are linked with increased rates of costly natural disasters such as hurricanes (Mills and Rosenfeld, 1994; Mills 1996; and Mills 1997).

Individual insurers are now beginning to evaluate the merits of energy-efficient torchieres and to prepare consumer-education materials about safe and efficient alternatives. One company, Arkwright Mutual, has already distributed an informational brochure about halogen torchieres and Energy Star alternatives to universities throughout the country (Arkwright, 1997). The industry is also evaluating the potential for more concerted involvement in market transformation. Insurers may even join with utilities and universities in offering discounts on the purchase of energy efficient torchiere alternatives.

REMAINING CHALLENGES

Manufacturers of imported halogen torchieres and replacement lamps continue to market their products as energy efficient, even though LBNL testing reveals efficacies of 10 to 14 lumens/watt – about a third less efficient than a standard 100 watt incandescent bulb (Siminovitch

and Page, 1997b). Though the U.S. Federal Trade Commission possesses the authority to prevent such misleading claims, the agency has not, as of September 1997, yet exercised it.

Similarly, though the Consumer Product Safety Commission and Underwriters Laboratories have actively discouraged the sale of torchieres operating at more than 300 watts, very little has been done to discourage the manufacture, sale or purchase of 500 watt replacement bulbs. Indeed, virtually all retailers that sell 300 watt replacement bulbs for torchieres sell the 500 watt replacements right next to them on the shelf – available in the same physical size and usually at the same price. Because many consumers still judge lamp desirability by watts rather than lumens or operating costs, the 500 watt bulbs continue to be popular, finding use in torchieres, outdoor fixtures, and work lights. Given the additional fire risk of utilizing 500 watt bulbs in fixtures designed for a maximum of 300 watts, the need for action remains urgent.

International solutions remain hampered by a lack of detailed information regarding torchiere sales and usage in Asia, Canada, Australia, parts of Europe, and other regions where one might expect torchieres to be popular. It appears that safety regulations are even less stringent in many of those regions than in the U.S., suggesting that torchiere manufacturers may actively seek to sell halogen designs there if they face declining sales in the U.S. More stringent and systematic safety rules are needed throughout the world to discourage lighting manufacturers from marketing products that can cause household fires.

Finally, it appears that no energy efficient retrofit kits have yet been introduced for the tens of millions of halogen torchieres still in use. Though manufacturers have recently made metal guards available for free to U.S. purchasers of halogen torchieres (Meyer, 1997), the inherently safer solution of replacing the light source itself with a more energy efficient and cooler alternative remains untried. ●

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ENDNOTES

1) There is some evidence that an American product, the Pylon torchiere from Casella Lighting, preceded the Italian designs, but had a boxy, mirrored housing and utilized a 500 watt incandescent source. See the profile of Georgine Aasen Casella in "Up Close and Personal," Home Lighting and Accessories, December 1996, p. 98.

2) See Nirk, 1997 for more information, or contact the EPA program manager, Lena Nirk, at nirk.lena@epa-mail.epa.gov.

3) A sample ordering form and description for such products can be seen at www.ecosconsulting.com.