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The Origins of Captive Pricing: Electric Lamp Renewal Systems

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The Origins of Captive Pricing: Electric Lamp Renewal Systems

Abstract

Purpose: The paper describes the development of electric lamp renewal systems, perhaps the first, or certainly one of the first, applications of Captive Pricing.

Design/methodology/approach: Much material for the research comes from a variety of archival sources and publications of the early part of the 20th century.

Findings: The free lamp renewal system was brilliant and effective: its high level of customer service and human contact dispelled fear raised by the new energy source, increasing the acceptance and use of electric lighting and, thereby, electricity. Lighting, in the absence of electrical appliances, was one of the few users of electricity. Thus, the electric companies created perhaps the first captive pricing marketing program

Research limitations/implications: We examined the electric lighting industry at the turn of the 20th century. Other examples of technology adoption and captive pricing could generalize our findings.

Practical implications: Our research suggests that supportive programs, which are high in customer contact and customized service, can aid in the adoption of new technology and unfamiliar products. By encouraging the use of such free or cheap products, customers are induced to higher usage of related products that increase the revenue stream to the provider.

Originality/value: The lamp renewal system is unknown today, yet was a crucial factor in winning consumer acceptance of electric lighting and an early example of captive pricing. Although the concept of uniformed men in trucks coming to customer homes once a month to clean and replace light bulbs is astonishing today – it worked!

Introduction

Modern marketing has provided many examples of firms practicing Captive Pricing – selling products that must be used in conjunction with another product. Consumer firms as diverse as Gillette, Kodak, Apple, AT&T and Canon have all this technique in an effort to boost their bottom line. Generally, Captive Pricing involves the initial sale of a product at a reduced or even zero price in order to secure a stream of future purchases at a highly profitable price, based on the monopoly status of the selling firm for that specific product. But where and when did this concept begin? This paper provides a description of perhaps the first, or certainly one of the first, applications of Captive Pricing.

Kotler (2010) defines Captive Pricing, sometimes called Captive-Product Pricing, as marketers making products that must be used along with the main product (p. 314). He cites razors, video game consoles and printers as examples of main products which then necessitate a stream of future purchases in order to be utilized. Over the years, several variations on this practice can be observed:

- 1) Selling the main product at a low price with later captive products sold at a premium price. In the case of a printer manufacturer, the customer is under no legal obligation to buy printer cartridges, but must do so to make the main product operate.
- 2) A variation on this is when the main product is sold at a significant discount and then the customer is legally obligated to purchase captive product. Most cell-phone providers use this technique, where a phone is heavily discounted if the customer signs a 2-year contract.
- 3) The main product may be given away in order to stimulate sales of a captive product. Giving away a Pez dispenser may get customers to buy a future stream of Pez candies.

In fact, any number of permutations of free or discounted main products and either voluntary or mandatory captive products can be observed in modern marketing practice. All revolve around the reliance of the marketer to retain, at least for a while, monopoly control of the captive market. One could look at the recent introduction of the iPhone 5 with all the connecting hardware changed from earlier models. Perhaps the fact that chargers and cables for earlier iPhone models were now widely available from a number of suppliers played into Apple's decision to change all these, so that at least for a while they would have a monopoly on all this ancillary items.

But where did this concept have its origins?

Development of Gas and Electric Illumination in the 19th Century

The evolution of modern marketing is often divided into periods of time. Broadly the predominant marketing philosophies were the Production era, the period from the Industrial Revolution to around World War I, followed by the emergence of the Sales Era from the 1920s to around World War II and the Relationship/Marketing Era from the 1950s onward (Solomon, Marshall and Stuart, 2012; Pride and Ferrell, 1995)

The concept of Captive Pricing can be observed during the earliest of these periods of time. One of the very earliest examples, and one which, incidentally, had impact way beyond the bottom-line of the practitioners and accelerated the growth of modern society, was in the electric utility industry.

The history of modern illumination is intertwined with two industries: the gas industry and the electric industry. It may be difficult today to realize that the main source for artificial light was once something other than electricity, that once there was a battle to be the primary supplier of light, and the outcome was long in doubt.

Before the end of the 19th century, good artificial lighting for industry and for homes was only a dream. People used candles, tallow, whale oil, and primitive oil lamps to provide artificial illumination; none of these alternatives gave the consumer bright, inexpensive, steady light (Elton, 1958). Then came gas lighting.

The best, highest quality, artificial lighting that could be obtained prior to 1883 was gas lighting. The first installation of gas lighting in an industrial setting was conducted by Boulton and Watt in 1806 in the Phillips and Lee Cotton Mills in England. Although far from perfect, manufacturers found an increase in productivity accompanied the artificial illumination. Such results encouraged others to follow and gas lighting became the best source of artificial light for home and industry, but it was expensive (Chandler, 1936). In the late 19th century, when electric

lighting had developed to be competitive against gas lighting, the gas industry had such a head start that it underestimated the threat electric lighting posed to its dominance in the marketplace. Additionally, the gas industry cast itself as a supplier of gas; the electric industry was better able to cast itself as a supplier of illumination. Its definition of the market differed and the product it offered in that market was perceived by the customer as having more value.

First, the electric industry offered arc lighting as an alternative to gas lighting; later they marketed incandescent electric lighting that could be installed in the home or in industrial applications. By 1893, the gas industry recognized the competitive challenge and responded with an incandescent gas light, and the edge the electric industry had in better quality light was diminished (Rathell, 1894). Thus, throughout the end of the 19th and beginning of the 20th centuries in the United States there was a battle raging between the gas industry and the electric industry to capture the illumination needs of homes and industries. It was in this period that the electric industry launched an innovative scheme and perhaps the first example of Captive Pricing.

Introduction of the lamp renewal system

The Electric Industry 1880 - 1900

Two key facts need to be remembered when viewing the lighting options offered by the gas and electric industries during this period. First, the providers were selling lighting, not energy. People did not want to buy gas or electricity; they wanted artificial light that would improve their lives and their businesses. The electric industry always spoke of providing light. Second, people were concerned about the quality of light. Artificial lights were not necessarily steady or satisfactory, nor were the lamps that provided the light. Quality was inconsistent and unreliable.

In the 1880-1900 time period, the electric industry was composed of many electric companies, privately owned, which provided electricity to specific geographic areas. These firms would operate central plants that contained generators for electric current which was sent through street mains, feeder wires, and service wires to customers. Thus, the pre-condition of a monopoly for their commodity was set. Their "original purpose was to supply electricity only for the lighting of incandescent electric lamps, later, electricity was used for the operation of motors and many other electric appliances." (Wrege, 1986, p. 17) Many companies owning central stations were members of the Association of Edison Illumination Companies (AEIC).

The Beginning of the Free Lamp Renewal Program

An important marketing strategy of the electric companies during the latter part of the 19th century was the policy of giving customers free lamp (light bulb) renewals. Customers received the initial incandescent electric lamp free, or at little cost; these were subsequently replaced free of charge. This practice began as a response to specific problems, but soon was recognized as a marketing strategy that could give the electric industry an edge over the gas companies in winning customers for electric lighting. Thus were planted the roots of captive pricing.

In 1883 Thomas Edison had developed a three-wire system of lamp distribution. He would construct small central stations in small towns capable of supplying electricity to a radius of one mile. William S. Andrews managed the central station, in Sunbury, Pennsylvania. In response to the new electric generating station, the local gas company reduced its rates; at the same time, the

quality of gas for illumination improved. Andrews was forced to respond with an increase in electrical voltage to make the electric illumination equal in light to the gas illumination; he informed Edison of the results in a letter on August 12, 1883 (Edison, 1883):

The gas people here have cut down their price 25% and also improved the quality of gas. They also claim that one of their jets gives more light than an Edison lamp...Breakage of the lamps has been enormous. I am inclined to think that we put them up too high a candlepower for the first week or two after starting, and this ruined the connections. I have cut down the light considerably, and people don't like it, but it must be done or the business won't pay.

Andrews was caught in a dilemma: if he kept the voltage of the electric current at a reasonable level, the lamps would be fine but give insufficient light to satisfy customers who would then prefer gas illumination. If he increased the voltage, there would be a high frequency of broken filaments on the lamps. There was also a strong possibility that the fault for the breakage lay in the poor quality of the lamps, because lamps seemed to break excessively even when run at pressure within the parameters of normal current. The only source of revenue for the central station was from customers using electricity for lighting; there were no electric appliances and no other uses of electricity at that time except batteries for marine buoys. Therefore, it was essential for survival of the company to get customers to use electric lighting. Andrews wrote again on August 26 with his solution: "The lamp breakage is excessive. I am giving new lamps free for broken lamps. If we don't do this people will go back to gas-lighting because of excessive breakage of lamps and lack of service." (Edison, 1883)

Edison would spend years investigating the question of why the lamps were breaking. By 1887 he found the cause was partially faulty design, construction, and careless handling, but mainly poor current regulation. By 1887 equipment was perfected that could regulate the current. By then, another reason to continue free lamp renewals had arisen.

Lamp Renewals and Platinum Recovery

From 1880 to 1911 every incandescent electric lamp contained a small bit of platinum. This material, which has the same expansion coefficient as glass, was the most efficient material for creating an air-tight joint between the two wires which carried the electric current to the filament and the glass chamber of the lamp and preserving the vacuum (Howell and Schroeder, 1927). The world's largest platinum dealer at the time, Baker & Company, supplied platinum to many lamp manufacturers, such as The Edison Lamp Company. They would purchase burned-out lamp bases from central stations, remove the leading-in wires, and recover the platinum (Edison, 1883):

The supply of platinum is so limited that a decreased supply materially increases the cost of the metal to the lamp manufacturers and in consequence the cost of the lamps to the user. A double economy is thus possible if all users of incandescent lamps will save the bases of burned-out lamps and return them to ...Baker & Company for the extraction and refining of the platinum.

It was important to continue the system of lamp renewal so that the valuable platinum could be recovered from the bases. If the customers owned the lamps, they would throw them away and the platinum lost. Now, the lamp renewal system became part of an important cycle between the

supplier and buyer firms: the central stations recovered the burned-out lamps when they brought free replacements to the customer; the burned-out lamp bases were sold to a company which recovered the platinum from the base; the platinum recovery company, which was also a dealer in platinum, would sell the recovered platinum to the lamp manufacturer; the lamp manufacturer then manufactured and sold lamps to the central station for use in the free lamp renewal program (Scrapbook, 1888, p.17). The relationship engendered by platinum recovery fits one of the focal points of marketing strategy advocated by Sudharshan (1995): firms can generate and maintain competitive advantage by building relationships with their major constituencies, such as customers, partners, or, in this case, a channel member who served a dual role.

Additional strategic elements of a free lamp renewal program are noted in the words of Raymond A. Gibson, President, Hartford Electric Light Company, in meeting the quality of the competition and in increasing the revenue of the company (personal correspondence, May 29, 1959):

The early incandescent lamps were somewhat poor and of uncertain quality. The lighting business in the early 1900's was the principal source of income to utility companies. If the lamps burned out frequently and if they did not give their rated output in light, the customer became dissatisfied. He complained to the utility company, because in his mind poor results from lamps were a responsibility of the Company rather than the manufacturers. In addition to his complaints, the customer was also influenced in reducing his use of the service. It seemed to the pioneers in our industry that the growth of the industry would be inhibited if the customer received poor service from the principal use he made of electricity... The business aspect was also important.

So, the lamp renewal marketing strategy was born to overcome flaws in the product and to recover costs. In the customers' eyes, the electric companies were providing a valuable service; in reality, the electric companies were trying to equal the experience customers had when they used gas for illumination. Lamp renewals proved a successful system for competing against the gas industry, raising revenue, and increasing market share. By providing lamps for free, the companies in the AEIC solved several problems, but specifically from a marketing view, ensured a future sale of electricity to the now captive customers.

For firms, the fundamental strategic question is how can they achieve and sustain competitive advantage (Teece, Pisano, and Shuen, 1997). This can only be done by using the resources and skills available to create a value-added experience for customers (Barney, 1991). The free lamp renewal program, which arose out of necessity, became the means by which the electric industry gained competitive advantage in the illumination market.

Lamp renewal systems of 1883 - 1903

During the period 1883 to 1903 free lamp renewals systems were adopted by many electric companies in the AEIC. Various forms of the marketing program existed, with different levels of elaboration, and papers about them were presented at the annual meetings of the AEIC. This Association was a group of privately owned electric companies that collaborated to compete more effectively against the gas industry and provide support and information for each other.

In 1899, Francis W. Wilcox spoke to the AEIC at their annual meeting in Thousand Lakes, NY describing the value of free renewals, the profitability of the systems, and the various forms

it took. His speech expressed the prevailing attitudes of the industry leaders about the marketing strategies they must follow if they were to compete successfully against the gas companies.

Wilcox expressed concern that lamps deteriorated with time, providing less candle power (the traditional measure of illumination). The customer easily noticed the decrease, but the customer did not always replace the lamp. Nor, stated Wilcox, did the central station responsible for giving free lamp renewals. So, not only did the customer experience a lower quality of illumination, but also the lamps burned less electricity, lowering the amount of electricity sold to the customers. Worse yet, a burned-out lamp used no electricity; an empty socket used no electricity. Wilcox's concluded

"...there is hardly any detail of the Central Station more important than this question of lamps and lamp renewals. There is nothing, I am satisfied, which yields more gratifying returns in increased business and satisfaction of customers than liberality in lamp renewals.....The question today is how and where to make improvements in service. In station apparatus and lines there is not much opportunity for the modern station. In lamp renewal methods, however, there are few stations that cannot find a large opportunity for improvement of service. It is in this respect that most stations are unprogressive" (Wilcox, 1899, pp.56- 57).

At the time, there were three main types of lamp renewal systems being used. In the first system, the electric company was not involved in renewing lamps. Customers bought their own lamps from hardware stores, supply houses, or similar places. With the difficulty in regulating voltage, deterioration of lamps over time, and lower quality of the lamps, this was deemed to be the poorest system in terms of light actually provided and electrical usage. This system competed poorly against gas light in that it replicated the gas industry system: customers bought their own fixtures and burners, the gas company only supplied the gas. While this system was appropriate for the gas industry, the situation for electric companies was different: the quality of electric illumination was dependent on the lamp, not the flow of electricity, once the voltage was regulated; the quality of the gas light was dependent on the flow of gas, not the burner. A good system for gas lighting was not good for electric lighting.

In the second lamp renewal system, central stations sold lamps to their customers at a fixed price. The situation was similar to the first system except the supplier of the lamps was the supplier of the electricity. This system was also undesirable because the responsibility for the quality of the light, dependent on the lamp, resided in the customer. All the expense and efforts taken by good, efficient central stations for providing excellent electrical service would be negated by the customer. Wilcox stated (1899):

To the average customer electric lighting is a mystery . . . particularly is this so as regards lamps. To him a lamp is a device like a lamp chimney or a bottle to be used until it breaks, and the only criterion by which to judge it are first its cost and the length of time it will last. The result is almost invariable that the customer buys the cheapest lamp obtainable, the poorest grade, and continues to use it until it breaks. It is evident that these two conditions absolutely prevent a high class service of light. (p. 58).

The third type of lamp renewal system was the free lamp renewal system followed by the AEIC. However it was done, the system had to have two parts: control of the lamps being used by the customers would rest with the central station supplying electricity and the supply of the lamps

had to be free to the customer. The customer typically would be visited on a periodic basis by a service technician who would replace all the electric lamps in the house, clean the fixtures, and give advice about the best types of lamp shades and other similar matters; the removed lamps were returned to the central station. The customer was also given a supply of replacement lamps to use if necessary, and was asked to store blackened or dim lamps in wooden boxes supplied by the central station. The large wooden boxes were replaced with boxes of new lamps on the next scheduled visit.

The electric light customer believed that the lamp was free, but the actual cost of the initial lamp and lamp renewals was built into the price of supplying electricity. The customer was buying an augmented product that would not be unbundled. In many respects, the situation resembled that faced by early customers of Xerox photocopiers when buying Xerox paper, to ensure quality, was a requirement of using the Xerox technology. Of course, the customer was relieved of the inconvenience and responsibility of replacing lamps and so received exceptional benefit.

The key aspect of Wilcox's speech was recognition that the customer was buying light, not electricity. Wilcox did not fall victim to a form of business short-sightedness which was formally identified a somewhat common problem some 60 years later - marketing myopia (Levitt, 1960). "Central stations are in the business of making and selling light. They may sell it by the ampere-hour, lamp-hour, or kilowatt-hour, but what the customer is buying and using is light." (1899, p. 58) Once that fact is recognized, the importance of good quality lamps can be appreciated. Lamps were too important an aspect of the product to be left in the hands of the customer whose behavior could negatively affect the quality and use of the product. In fact, "the highest class of electric lighting service should provide for a condition in which the customer has nothing to do but turn his switch and pay his bills." (Wilcox, 1899, p. 59)

The model of good central station free lamp renewals was the New Haven and Bridgeport Lighting Company (Wilcox, 1899):

This system provides for the "pulling in" of all lamps at stated periods, and the replacement by new lamps. The lamps pulled in are returned to the station and photometered. All lamps saved for reissue at the next replacement (p. 60).

The extra cost to the central station was said to be the slight cost of labor. There was also value in removing all the lamps periodically because those lamps that were still good would be cleaned and then reissued, once again improving the quality of the final product, light. For small central stations that could not afford to have all customers' lamps removed periodically, an alternative system was suggested: remove the lamps of customers based on meter records, using either the amount of electricity used or the amount of dollars spent as the criteria to replace the lamps.

Central stations might still be concerned about the cost of the system, including the added personnel. The offset to the cost was two-fold. First, the increase in the gross meter income due to renewing burned-out lamps. During the period 1883-1905 most lamps were Edison carbon filament lamps. Despite product testing before its use by the better companies, the quality of the lamp was poor and it burned out frequently. Without free renewals, there could be many burned out lamps in sockets and a significant loss of gross meter electric usage. Second, better lighting service would increase business. "The best advertisement and solicitor a station can secure is a clear and bright lighting constantly before the public's eye. This means increased satisfaction on

the part of old customers and new business wherever the light is shown." (Wilcox, 1899, p. 61)

Most of all, the members of the AEIC recognized that they were selling light and that most of their income was generated through illumination. In 1903, the first year the Association collected statistics for its members, income information for 43 of the 72 member companies shows that lighting was the chief source of income, both on a per capita basis and on an annual basis. On average, 40 companies had over 80% of their per capita income from light versus power; for some the figure was as high as 95% of income from illumination (AEIC, 1903).

The companies in the AEIC were still mindful of the threat from the gas industry. The introduction of the Welsbach upright incandescent gas mantle in 1883 and new mixtures of high pressure gas enabled gas lighting to equal good incandescent electric lighting at a lower cost. From 1895 to 1899 the superiority of the incandescent electric lamp remained in doubt.

Therefore, the support and recommendation of the AEIC, the problem of unreliable quality of lamps, the promise of increased revenue, the threat from the gas industry, and the model of the lamp being an integral part of the suppliers' process as final means of delivering the product, all led to the free lamp renewals becoming the service standard in the electric illumination industry. For a minimum cost, the system created maximum value for the customer in terms of quality illumination. The added benefit of human contact with the service technician also helped the customer overcome any fear of the new product.

Free lamp renewal system 1903 - 1919

The Free Lamp Renewal Process

Even a simple idea, like replacing customers' lamps for free can be complex in execution. If a central station were to provide free lamp renewals there would have to be a system in place to remove, replace, test the removed lamps, clean the good removed lamps, and begin the cycle again. Although the electric companies were convinced that the free lamp renewal system was the best product/service strategy to pursue to increase their market share of the illumination market and to increase their own revenue, the renewal system was more complex and costly than its advocates had led members of the AEIC to believe.

Data describing in detail a typical renewal system and its cost in 1911 comes from the Commonwealth Edison Company of Chicago. The total cost of the program was calculated to be \$500,000. The program required special vehicles, designated as free lamp renewal vehicles that would advertise their function with placards as they conveyed service technicians and the lamps to the customers. The wagon would attract attention for electric lighting and could be considered a promotional factor in the campaign for illumination customers. Similar wagons were used to encourage the use of other electric products, such as the flatiron wagon that delivered electric irons and electric iron salesmen. Charles Esterly, who was involved with the electric iron campaign, believed that the promotional value of the wagon was nil and that the true purpose of the wagons was to generate a little enthusiasm in the wagon occupants and, for the most part, "to cover the ground in short order." (Esterly, 1910)

The electric illumination technicians would call on each customer, take out all the customers' lamps and replace them with new lamps. The service technician would also leave wooden boxes with replacement lamps in the customer's home. The customer could use the replacement lamps and put burned out lamps back into the box for removal when the maintenance man returned on

the next visit. The company also provided the service on request. If a customer had a burned-out lamp, the customer could telephone or contact the central station; the station would dispatch a vehicle and technician to the customer to replace the lamp. All lamps were returned to the central station, tested, and either disposed of or cleaned and reissued.

The Commonwealth Edison Company listed as expense items for the free lamp renewal program: 12 telephone operators to handle the service, 7 horse drawn wagons, and 5 electric wagons. There was also the cost of the lamps. In 1910, half of the lamps tested were burned-out; 15 - 30% had broken filaments that could be repaired; and 15 - 30% were good lamps that could be used as renewals. (Electric World, 1911) The company had special facilities to test the lamps and photometers to measure the intensity of light. The company also incurred the cost of buying the lamps for distribution. In 1910 the cost per lamp ranged from \$.70 for a 25-watt lamp to \$1.45 for a 100-watt lamp. The cost of lamps for each company ran into the hundreds of thousands of dollars.

The Tungsten Lamp

In 1903 the AEIC members faced more changes in the light industry. First, there was the threat of the more efficient Nernst lamp, but it was found to be too expensive and complicated to challenge the carbon filament lamp. By 1911 advances in the making of tungsten filament lamps caused the Nernst lamp to be phased out.

Instead, the electric companies had a far more efficient lamp about which to be concerned. Dr. Charles P. Steinmetz, the renowned scientist, said "a tungsten filament lamp of 1-watt per candle could be used to replace carbon filament lamps on a one to one basis and 'would cut down the lighting revenue... of the central stations to one third or one quarter.'" (Wrege, 1986, p. 187) The question was then, what do the central stations do to generate electrical use and income?

The General Electric Company (GE) bought the American rights to the tungsten lamp in 1906 and sold half a million in 1907. The threat was real. The lamp was more expensive to purchase, making a free renewal system more expensive; the lamp was more fragile than a carbon filament lamp; and it used less power. The lamps were readily available from other sources; customers could buy the tungsten lamps from electrical wholesalers and dealers rather than the electric companies, thereby changing the channels of distribution.

In 1909, John Leib of the New York Edison Company, one of the largest purchasers of lamps from GE, expressed the shock felt by the central stations from the introduction of tungsten lamps and GE's strong advertising campaign to introduce the lamp (Leib, 1909):

These lamps were put out at . . . an efficiency of 1 1/4 watts per candle power...cutting down the current consumption from 3.1 to 1 1/4 watts per candle. There was too large a reduction made for the first introduction of the tungsten lamp, giving the customer not only all the benefit of increased efficiency, but too much benefit. (p. 166)

Worse yet for the central station companies, GE was becoming less interested in selling lamps to them for the free lamp renewal programs and more interested in merchandising lamps themselves.

Other experts in the electric industry were not as pessimistic about tungsten lamps as was Leib. Samuel Insull promoted a four-part marketing strategy to overcome the problems posed by the more efficient lamp: 1) add tungsten lamps to the free lamp renewal system, (2) increase the

level of street illumination, (3) eliminate competition from isolated plants, and (4) convince managers in industry that they need higher levels of industrial lighting.

Insull's first strategy was adopted immediately by most AEIC members. Companies like the Commonwealth Edison Company in the spring of 1914 used a lamp renewal system to educate the customers about the value of higher levels of illumination; they made it advantageous for customers to use higher-wattage lamps. Customers would be given replacement tungsten lamps at a reduced fee, the fee decreasing with increased wattage. The customer would get a carbon filament lamp for free, a 25-watt tungsten filament lamp for \$.24, or a 60-watt tungsten filament lamp for \$.10. This, coupled with information about the benefits of higher levels of lighting, led many customers to acquire higher wattage lamps that burned brighter and used more electricity. Their electricity bills would be higher, but always it was stressed that they were buying light, not electricity.

Coupon Purchase Plan for Lamp Renewals

On April 29, 1916 the AEIC created another product/service strategy to deal with the tungsten lamp problem. It was a stopgap measure: the coupon purchase plan. To keep tungsten lamp renewal costs within bounds and encourage renewals, the AEIC members etched lamps with their initials or other identifying marks. Central stations would renew only lamps so marked. When the customer purchased a tungsten lamp at the company office and at the same time turned in a burned-out lamp of approximately the same wattage, the customer received a "Lamp Coupon" applicable to his monthly electric bill. The Coupon varied according to the wattage of the lamp, ranging from \$.04 for a 25 watt lamp to \$.50 for a 100 watt lamp." (Borden, 1916, p. 990-991)

Gas maintenance service systems

The gas industry recognized the threat posed by the electric companies' efforts to promote electric lighting and by the more efficient and high quality tungsten lamps. In reaction, the gas industry established illuminating committees and even adopted and advocated gas maintenance service systems that mimicked the lamp renewal systems of the electric industry.

The best example of a gas maintenance system, the Toronto House Maintenance Plan, was piloted in 1911 then extended throughout the city. The plan was a direct reaction to the decreased rates offered by electric companies in the area which were inducing customers to switch to electric light even though, "the average person knows that gas lighting is easier on the eyes and better for home lighting." (Hewitt, 1914, p. 405)

Under the plan, the city of Toronto was divided into districts, each of which was the particular territory of one house maintenance man. Three inspectors were responsible for all the house maintenance men in the city; they would patrol the city on bicycles superintending the work. Approximately 30 men were employed under the program with the average weekly wage of \$30. The house maintenance men were trained by observing experienced men on the jobs for a period of two weeks. Working in the house maintenance force was a stepping stone to better jobs in the gas industry; they could prove themselves good enough for sales and inspection jobs.

The house maintenance men had five responsibilities: answer complaints from customers; go door to door asking for permission to clean and regulate burners, clean the glass, sell mantles and

other items at retail prices; repair leaking fixtures, burners, etc. and report any cases which need further repairs; install fixtures and items ordered at gas salesroom, including rush service on special orders; and fill orders for mantles, glassware, burners, and clean and regulate lights and glassware. A considerable number of forms were created for tracking work and performance of the house maintenance men.

The cost of the house maintenance plan was pronounced low: the average cost per call was \$.085. Each man was expected to cover his entire territory once every three months. The entire cost of the house maintenance program, that is cost less revenue from the sale of maintenance materials, was estimated to be \$13,000 per year for a city the size of Toronto. (Hewitt, 1914)

In the face of competition from the electric industry, the gas industry had responded with the house maintenance system and a strong program to operate more efficiently. By 1915, gas lighting reduced their rates by 33 1/3%, but electric lighting had reduced their rates by 87 1/2%. The only effective weapon left was the house maintenance system (Pierce, 1915). Too late the gas industry had realized that customers were not buying gas for illumination as much as they were buying light. What the gas industry viewed as the energy market was actually the illumination market, a classic example of Levitt's marketing myopia (1960).

However, with North American involvement in World War I, men in nonessential jobs were drafted; unlike their electric counterparts, the War Industries Board, at the suggestion of the AEIC, deemed gas maintenance men nonessential. Without their services, conditions in the gas industry declined. In 1918, too late to stop the onslaught of electric lighting, the American Gas Association, similar to the AEIC, was formed, but its efforts were directed to promoting gas usage through the use of gas appliances rather than usage from illumination. Committees on Illumination were again formed but the end was inevitable. Without concentrated industry-wide efforts, even the strength of gas illumination for industrial use would be lost. From a peak of 48% of all industrial lighting in 1918, gas illumination declined. The Midwest was its last bastion; as late as 1936 gas lighting was promoted for use in Kalamazoo, Battle Creek, and Grand Rapids, Michigan (Wrege, 1986).

Lamp Renewal Programs 1920 - Depression

After World War I Insull's strategies were again advocated, but none included the lamp renewal programs. Instead, electric companies directed efforts to increasing electric lighting for street illumination. They also began a series of practices, some of dubious legality, to eliminate isolated (in-house) plants and inherit their customers (Wrege and Greenwood, 1986).

The third strategy was to expand the use of electric lighting in industrial settings. In 1919, led by GE, the electric industry decided to tackle the industrial lighting market. At that time the market was served by either gas lighting or electric lighting from isolated plants. The focus on industrial rather than residential use of electricity for lighting decreased interest in the lamp renewal programs. Interest in the industrial market led to the illumination tests by William Durgin and at Western Electric's Hawthorne plant (Wrege, 1986).

In the 1920's the establishment of independent electric manufacturing companies using lamp-making machinery purchased from Charles Eisler threatened the AEIC, and thus free lamp renewal systems. Charles Eisler was a Hungarian toolmaker who had immigrated from Hungary to Newark, New Jersey; Newark was the center for tool makers immigrating from Hungary to

America. In the garage behind his home on Eighteenth Avenue in Newark, Eisler had developed a lamp-making machine and, by 1918, he became Chief Engineer for Lamp-Making Machinery at Westinghouse's plant in Bloomfield, New Jersey. But the streetcar trip to Bloomfield on the Clifton streetcar line was slow and difficult and in 1920, Eisler became a tool-maker for the Newark Engineering and Tool Company located close to his home in Newark. With the hiring of Eisler, the company created a department to manufacture lamp-making machinery not covered by General Electric patents. In 1924, this department became the Eisler Engineering Company.

Eisler Engineering Company manufactured and sold lamp-making machines that were not as automatic or as fast as the General Electric lamp-making machines, but they enabled the independent lamp manufactures to purchase machines more cheaply than if they purchased or leased them from General Electric. The Eisler lamp-making machines made it possible for the independent lamp manufacturers to manufacture and sell their lamps at prices below the cost of the so-called "free" lamps under the Lamp Renewal contracts of the AEIC. The Lamp Committee of the AEIC conducted investigations into this threat to their control over the lamps. In addition, General Electric sued the Eisler Engineering Company four times during the 1920's for infringement of General Electric lamp-making machine patents. In each case, General Electric patents failed in their suit and Eisler continued to manufacture lamp-making machinery until the 1930's (Bright, 1949).

More threats to the lamp renewal programs came from two government actions. First, the federal government began antitrust action against GE for monopolistic control of the channels of production and distribution. "Extensive hearings produced a number of complaints against the methods used by General Electric in the lamp business. Independent lamp manufacturers charged legal harassment, exorbitant profits, and unfair tactics. General Electric defended its actions as fair and legal in view of its admitted patent monopoly." (Bright, 1949, p. 253) A decision in GE's favor encouraged the company to expand its vertical integration throughout the electric industry. "Moreover, the court found that the method of distribution whereby thousands of merchants became selling agents for the large producers of electric lamps was a true agency relationship and did not violate the antitrust laws." (Bright, 1949, p. 255) GE rapidly promoted the sale of its lamps through retail establishments; other producers followed, thus capturing more of the profits to be made in the industry. The desirability of lamp renewal programs decreased.

In 1925 the Public Service Commission of Massachusetts held hearings to investigate the free lamp renewal system. The commission was concerned that the electric light customer, through a variety of inducements, was being led to use higher wattage lamps that consumed more electricity. As noted before, the customer was particularly encouraged through price concessions to use higher watt lamps. Lamp renewal systems were attacked on three grounds (Edgar, 1925):

1. It forces the customer to use lamps of larger size than are necessary for satisfactory service, and this increases his use of electricity and subsequently his bills.
2. The company's excess charges of lamps under 50 watts are unfair and result in charging a customer more for lamps of small size than he would pay at retail.
3. On the whole, it costs the customer more for lamp services under the renewal system than it cost if the system were discontinued and the lamps were sold by the company at cost. (p. 698)

The Commission, however, did not find against the practice, but the damage was done. The

public began to understand that free lamp renewals were not free. Lamp renewal systems decreased for a number of reasons, all of which transformed the light and the electric energy industry.

Thus, it was a number of factors that contributed to the decline of the free lamp renewal systems as part of effective marketing strategies for electric illumination. First, there was the decline of carbon filament lamps that had given less light per watt and had deteriorated and blackened quickly. Light from carbon filament lamps was poor advertisements for electric light and required constant renewal. While they did bring in revenue to electric companies, they were not able to provide high enough quality light to have sustainable competitive advantage over gas lighting.

Second, the rapid development and distribution of the tungsten filament lamp was another problem for lamp renewal programs. The tungsten lamp gave more light per watt, deteriorated slowly, therefore required less testing and renewal, and was a better vehicle for electric light.

Third, the increased availability of tungsten filament lamps on the open market at reasonable prices further undermined the free lamp renewal system. Also, the favorable findings of the antitrust action increased retail sales of lamps.

Fourth, the rapid decline in the use of gas lighting in both industrial and residential applications removed a strong argument for the free renewal system. The central station no longer had to be concerned with gas lighting as a less expensive competitor to electric lighting.

Fifth, the elimination of competition from isolated electric plants lowered the degree of competition felt by the central electric stations; they no longer had to provide more service to compete against rival electricity suppliers.

Sixth, the rise of imports of tungsten lamps, especially from Japanese manufacturers, caused large price reductions tungsten lamps. The price of some Japanese tungsten lamps, though of inferior quality, was as low as \$.10 or \$.05, compared to earlier prices in the US of \$1.00 for a 100-watt lamp in 1915.

The seventh problem faced by the free lamp renewal system was GE's creation of a cheap lamp to compete against the Japanese lamp. In order to match the price of the Japanese lamps, GE produced low quality lamps that burned out too quickly. The AEIC soon noticed that the lamps' short lives were unsuitable for the lamp renewal system since they would necessitate such frequent replacement as to make the renewal program too costly. AEIC set up the Electrical Testing Laboratories (ETL) to test all lamps and began to pressure GE for more reliable lamps, creating reluctance on GE's part to supply lamps for the renewal program.

The final blow to the lamp renewal systems occurred when the electric industry focused on applications other than residential lighting for electricity. With more and more electric appliances being introduced, lighting was no longer the main source of electric use. Also, industrial lighting was recognized as the big market and the lamp renewal systems were not applicable there as a marketing strategy. Instead, citing the work of William Durgin, electric lighting was marketed to industry for its ability to improve productivity.

Lamp Renewal Systems Fade Away

Despite these problems, lamp renewal programs survived for many years in certain pockets of the country. In Michigan, two power companies continued the system of free lamp renewals

until the end of the century. Detroit Edison's free lamp renewal program had customers bring their burned out lamps to the company to receive replacement lamps. In 1973 a local pharmacy sued Detroit Edison in U.S. District Court claiming the practice damaged the pharmacy's business. In 1978, in response, Detroit Edison ended the practice that had been active since 1903.

The Lansing Board of Water and Light, in Lansing, MI, had a longer-lived program. Their free bulb renewal program began October 1, 1907, was discontinued in 1915, began again in 1936, and continued until 1994. Through 1986 it operated as an exchange of burned-out lamps for new ones; after 1986 customers received new lamps, without exchange, based on their annual electric consumption. About one-fourth of the customers took advantage of the program. In the last full year of operation 431,444 bulbs were given out for a total program cost \$185,448. The company would also replace, for free, detachable household appliance cords until 1991.

The Lansing Board of Water and Light believed that, as a municipally owned utility, they were acting under the spirit of their charter by providing service to their customers. The cost, complexity, and difficulty in also acquiring quality bulbs strained the system and led to using a system of coupons for buying new bulbs in area stores. Eventually, the Board decided the program was too complex, expensive, and underutilized. In 1994 it was ended, but in the following years, the board reviewed the policy of free lamp renewals. Many in the community remember the program as an oddity, but also as a valued tradition (personal communication, J. Strickler, September 12, 1997).

Conclusion

Through analysis of the strategies of the electric industry in the late 1800s and early 1900s we can see the development of the Captive Pricing strategy which is used by so many companies today. It is difficult for us today to imagine the electric industry in its early days as it fought for acceptance and market share from the gas providers. The industry was new, even frightening to many people. As late as 1889, Thomas Edison and George Westinghouse engaged in a "Current War" in the public press as they debated the merits of alternating versus direct current. Edison's position invoked the deaths and danger associated with electric wiring and current and his wish to avoid all alternating current because of the great loss of life that would result (Edison 1889; Westinghouse 1889). With such ignorance and fear on the part of the public, the electric industry needed some unusual strategies to gain acceptance of its product. Once electricity gained acceptance, it needed strategies to increase its market share, increase revenue, and take customers from other illumination providers. Free lamp renewal systems provided the human contact and technical assistance required so it could gain acceptance. Next, the free lamp renewal systems created significant competitive advantage by minimizing the problems electric use posed at the time and delivering a valued service component with the product.

The free lamp renewal system enabled the electric companies to overcome the defects in the products by offering customers a replacement lamp and a service technician to replace the lamp. The service had value to the customer. At the same time, the electric companies were generating demand for their true product, electricity, by augmenting the service component. Much like offering free pretzels with beer, the companies, by offering the personal renewal service and free lamps, were encouraging the use of electric light that would increase the consumption of

electricity. Without other electric products available at the time, the illumination market was the main source of income for electric companies.

The free lamp renewal system today appears extraordinary for its level of service. Today, a wagon coming to your house to change and clean light bulbs is quaint. But, placed in the context of its time, and the demands of the marketplace, the free lamp renewal system was brilliant and effective. It provided a high level of customer service and human contact that dispelled the fears raised by the new energy source. The problems inherent in the product led to the serendipitous creation of free lamp renewal programs, and the programs greatly affected the success of the electric industry during its introduction and rise. Thus it was necessity that caused the electric companies to create perhaps the first captive product marketing program and, in its implementation, changed the course of modern society.

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