

Philadelphia Story

By Joseph M. Doyle

There have been several well-known versions of “The Philadelphia Story” over the past 250 years. In 1776, the city hosted the signing of the Declaration of Independence. This was followed in 1940 by the legendary Katharine Hepburn movie about a wealthy socialite living on Philadelphia’s Main Line. The 2004 version of The Philadelphia Story involves the city’s efforts at providing a street lighting system that approaches 100 percent reliability.

The program is known as “Every Light...Every Night.” The goal, quite simply, is to operate every one of the city’s 100,000 streetlights properly every night of the year. To date, the results have been impressive. The city scored a 99.4 percent “on” rate in 2003, bringing the three-year average for the program to 99.5 percent (Table 6). Reaching this goal, however, is not so simple. It requires

the constant efforts of scores of people and the continuous allocation of resources by the city and its contractors. The full participation of the local electric utility is also essential, since it must provide dependable electrical service to the street lighting system on a daily basis.

There is much more to street lighting maintenance than the traditional view of simply replacing burned-out lamps. We must move toward developing a more comprehensive program based on customer service. By striving toward this higher level of service, lighting maintenance will improve, and the public will ultimately be better served.

The long-term ability of the street lighting system to meet these higher levels of performance is totally dependent on the successful development of a truly comprehensive maintenance program. Besides the normal day-to-day repairs, implementation of such an expanded maintenance program must include the long-term planning and investment necessary for the

continuous upgrading of the entire lighting system.

Philadelphia Partnership

While the City of Philadelphia directly owns the street lighting system, two other business partners play significant roles in its daily maintenance and operation. Both the city-paid street lighting maintenance contractor and PECO Energy share responsibility for the nightly performance of the street lighting system. Routine maintenance is performed by a combination of city personnel and private contractors. While a private contractor performs most maintenance services on a nightly basis, city employees are responsible for all major repairs including knockdown poles and luminaire replacements. Electrical service repairs are referred to the local utility.

PECO Energy supplies electrical power to the entire street lighting system through their combined aerial and underground distribution systems. Of the total 100,000 streetlights, 80,000 are attached to PECO wooden utility poles, and the remaining 20,000 city-owned streetlight poles are fed from PECO underground circuits. These business partners have formed an alliance that we call the Philadelphia Partnership (Table 1).

Each partner has a well-defined area of responsibility; shares a common service goal; and tracks their respective performance on a daily basis. By closely monitoring the operation of the lighting system and then measuring the number of lights out of service, the partners are able to determine overall system performance. This data is then used to identify areas of improvement where each partner can upgrade the quality of their maintenance services.

The Partnership “ABCs” are as follows:

Accountability is achieved through regularly scheduled monthly management meetings, clearly defined responsibilities of each of the partners, and the establishment of priorities by each of the partners. Each partner accepts their responsibilities toward the public and to each other when questions arise from the media or elected officials on ownership and delivery of maintenance services.

Brainstorming is a solutions-based approach to problem solving that encourages out-of-the box thinking by members of the operations team and field-tests the latest available lighting technologies. This approach has led to the installation of longer life non-cycling HPS (high-pres-

	2001	2002	2003
Monthly Repairs	1318	1450	1460
Daily Repairs	44	48	49
Streetlights OFF	44	48	49

Table 2-Represents the number of streetlight repairs completed by the maintenance contractor. There were an average of 1318 repairs per month (44 per day) in 2001, 1450 per month (48 per day) in 2002 and 1460 per month (49 per day) in 2003. Since each one of these repairs reflects a streetlight out of service on a daily basis, it is used in the final calculation of the number of streetlights out of service citywide each night.

sure sodium) lamps as a system-wide standard. The ability to test new ideas has always been encouraged by the city as our way of keeping pace with changing business methods and advancements in technology.

Communication is always essential to any partnership and is achieved on a daily basis with a continuous exchange of information at the field supervisory level. This kind of discussion can often lead to the solution of common maintenance problems by field personnel. The sharing of common goals by each partner also allows the communication process to reach its full potential. For example, severe weather conditions can have an immediate impact on field operations by the electric utility. High winds often require an immediate change of assignments from routine lighting repairs to emergency storm damage work. We are always cooperative when the priorities change to accommodate public safety.

The combined efforts of this partnership have challenged each one of us to continuously improve our levels of performance. Recent budget cutbacks and personnel reductions have actually strengthened our resolve to work together and achieve our shared goals.

What follows is a detailed look at the role each entity

PARTNERS	RESPONSIBILITIES	ANNUAL COST
Philadelphia Street Lighting Division	100,000 streetlight system Repair knockdown poles Replace defective luminaires Contract Management Engineering Services Modernization Program Daily system management	\$2 million
Street Lighting Maintenance Contractor	4-year Contract period Maintains lamps and photocontrols Night patrolling and repairs Work order system Computer database Customer services	\$1 million
PECO Energy	Electrical power distribution 20,000 underground tap connections 80,000 wooden utility poles Emergency Services	\$12 million
	Total Maintenance Cost	\$15 million

Table 3 - City Street Lighting Shop Summary			
	2001	2002	2003
Monthly Repairs	144	147	167
Daily Repairs	4.8	4.8	5.6
@ 10 days	48	48	56
Streetlights OFF	48	48	56

Table 3-Represents the number of streetlight repairs completed by City Street Lighting Shop personnel. There were an average of 144 repairs per month (4.8 per day) in 2001, 147 per month (4.8 per day) in 2002 and 167 per month (5.6 per day) in 2003. Since the City Shop averages 10 days to complete each repair, the duration of each streetlight out of service is calculated by multiplying the daily number of repairs by 10 days per repair. This calculated value is 48 streetlights in 2001, 48 streetlights in 2002 and 56 streetlights in 2003. Since each one of these values reflects the number of streetlights out of service on a daily basis, it is used in the final calculation of the number of streetlights out of service citywide each night.

plays in the process.

City Street Lighting Division. Daily management responsibility for the entire street lighting system falls on the City Street Lighting Division staff of engineers and managers. City personnel provide engineering design and review services of major projects, and perform daily contract management of the street lighting maintenance contract. Their work includes preparation of the annual operating budget for street lighting maintenance and operations, and the capital budget for modernization projects. In addition, City Street Lighting Shop personnel provide repair services for all knockdown streetlight poles and the repair or replacement of obsolete equipment.

System modernization is a major consideration of city capital improvements. The goals of our capital program are to improve public safety, increase lighting efficiency, and upgrade system reliability. This long-term modernization plan has three major components: the removal of all aluminum streetlight poles, the replacement of all mercury fixtures, and the eventual upgrade of the entire electrical distribution system.

A 10-year program of replacing over 2000 aluminum poles with fiberglass poles will be continued with the eventual replacement of the remaining 16,000 aluminum poles in the system. Over 75,000 obsolete mercury fixtures have been replaced with HPS and the remaining 15,000 mercury fixtures should be completed over the next five years. Major upgrades to the underground electrical distribution system by the installation of new cable and conduit have already had an impact on that system's

reliability and performance.

The continuous re-engineering of system components has improved operations and provided a complementary and cost-effective alternative to our limited capital funds. Standardizing materials can often extend the service life of equipment and reduce future maintenance requirements. This standardization has led to the development of published standards for various types of equipment and the selection of a single manufacturer for simplicity of purchase and delivery.

Maintenance Contractor. The city has employed a private contractor for many years to perform all routine maintenance services and to provide weekly inspection of the entire street lighting system. The benefits of utilizing private contractors have long been recognized as a highly effective method of providing this type of service. This contract is bid every four years with the next four-year cycle starting in July 2004. The city has adopted a proactive approach to street lighting maintenance by requiring the contractor to work five nights per week from 8 PM until 4 AM the next morning. These nighttime working hours have proven very effective for both the night inspection services and streetlight repairs and have always offered the best opportunity to accurately identify streetlight outages. This certainty of the exact location also minimizes the need for repeated and costly re-visits caused by inaccurate complaint information. In addition to nighttime repairs, the contractor also confirms the completion of all daytime repairs made by PECO and city forces when performing the nightly inspection patrols.

Table 4 - PECO Energy Summary			
	2001	2002	2003
Monthly Repairs	616	476	655
Daily Repairs	20.5	15.9	21.8
@ 20 days	410	318	436
Streetlights OFF	410	318	436

Table 4 -Represents the number of streetlight repairs completed by PECO Energy. There were an average of 616 repairs per month (20.5 per day) in 2001, 476 per month (15.9 per day) in 2002 and 655 per month (21.8 per day) in 2003. Since PECO Energy averages 20 days to complete each repair, the duration of each streetlight out of service is calculated by multiplying the daily number of repairs by 20 days per repair. This calculated value is 410 streetlights in 2001, 318 streetlights in 2002 and 436 streetlights in 2003. Since each one of these values reflects the number of streetlights out of service on a daily basis, it is used in the final calculation of the number of streetlights out of service citywide each night.

A major component of the night repair service is the responsibility to identify the location and nature of the streetlight complaint. Each fixture is tested to determine the exact cause of the outage and a work order is issued to the appropriate owner for repair, e.g. power failure to PECO.

Repairs completed by the contractor are documented in a maintenance database and submitted to the city for review on a monthly basis. Major repairs are referred to either the city or to PECO on a daily basis for assignment to field crews for quick action. Upon completion, the contractor re-checks the field location for proper operation and confirms that the repair order has been completed and the streetlight is working properly.

The contractor has also been designated by the city to provide customer service to the public by processing all telephone requests for service. This service is provided 24 hours per day for seven days per week as a public convenience when reporting streetlight outages. A city telephone line is linked to the contractor's call center to facilitate the receipt of telephone requests from the public. After normal working hours a professional answering service provides this service to the public without the need for answering machines or other impersonal devices. A computer database of all maintenance activities is updated on a daily basis for storage of all completed work. This detailed information is the basis for all reporting of performance measures established to track the daily progress of all types of maintenance activities.

PECO Energy. PECO Energy presently provides and maintains electrical power to the entire street lighting system of aerially fed wooden utility poles and city-owned streetlight poles that are connected to the underground distribution system. Maintenance of this extensive electrical distribution system by PECO requires the continuous assignment of manpower and resources sufficient to perform this task without delay. Several specific field crews are permanently assigned to troubleshooting defective streetlight circuits and making all aerial and underground repairs.

Because PECO management shares the same cus-

Table 5 - Daily Streetlights OFF			
	2001	2002	2003
Contractor	44	48	49
City Shop	48	48	56
PECO	410	318	436
Total OFF	502	414	541

Table 5 represents the total number of streetlights out of service on an average day. By combining the average number of outages for the City, Maintenance Contractor, and PECO Energy, there are an average of 502 streetlights out of service each night in 2001, 414 streetlights in 2002 and 541 streetlights in 2003.

Table 6 - Percentage Streetlights ON			
	2001	2002	2003
System	100,000	100,000	100,000
Streetlights OFF	502	414	541
Streetlights ON	99,498	99,586	99,459
Percent ON	99.5%	99.6%	99.4%

Table 6-Represents the actual percentage of streetlights operating on an average night. The number of streetlights ON is calculated by subtracting the number of streetlights OFF from the total 100,000 streetlights in the system. The number of streetlights ON is then converted to the percentage ON of the total system of 100,000 streetlights.

tomor service goals as the city, each partner establishes their own monthly work priorities and discusses their implementation with the other partner at our scheduled coordination meetings. This allows each partner to adjust their own resources in response to and support of the others.

A Bright Future

The partnership has yielded impressive results. The information presented for the period 2001-2003 documents that an average of 99.5 percent of streetlights were working each night in 2001, 99.6 percent in 2002, and 99.4 percent in 2003, for a three-year average of 99.5 percent. This extremely high number of streetlights working properly each night of the year certainly supports the claim that the City of Philadelphia street lighting system has been meeting our stated goal of "Every Light...Every Night."



The Author: Joseph M. Doyle P.E., Member IESNA (2000), has been an engineer in the Streets Department of the City of Philadelphia for over 32 years, first serving in the Traffic Engineering Division and later in the Street Lighting Division. For the past 15 years, he has been the city's chief street lighting engineer. He is a registered professional engineer in the Commonwealth of Pennsylvania and a graduate of Villanova University. He received his Bachelor's Degree in Civil Engineering in 1971, followed by a Master's Degree in Transportation from Villanova in 1977. Mr. Doyle has been a member of the IESNA Roadway Lighting Committee since 2000 and is currently Section President of the Philadelphia Section and Chair of the Section's Education Committee. He has been active in many local and regional lighting activities and educational seminars over the past 15 years including serving as the Chief Lamplighter of the Lamplighters of Delaware Valley. They are a regional group dedicated to outdoor and roadway lighting who presented their joint IES/Lamplighters Ralph Engthouse Award for "Distinguished Service To The Lighting Industry" to Mr. Doyle in 2002.