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Las Vegas Flamigo Hilton/UNLV Environmental Studies Program Environmental Resource Analysis & Optimization Plan

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by

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Abstract

The UNLV Environmental Studies Program/Las Vegas Flamingo Hilton

Environmental Resource Analysis

& Optimization Plan

by

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From 1987 through 1992 the Las Vegas Flamingo Hilton instituted resource efficiency improvements in electrical, natural gas, water and materials consumption. In 1992, the Flamingo Hilton commissioned the University of Nevada Las Vegas Environmental Studies Department to analyze and quantify the improvements made by The Flamingo Hilton and investigate the potential for further improvements.

Historical billing data from the periods 1987 - 1992 were used to analyze past and present (1992) electric, natural gas and water consumption. Materials disposal data was only available for a ten month period in 1992. Pollutant emissions data were supplied by Nevada Power Company.

The efficiency improvements resulted in an annual cost savings of $412,344 and reduction in annual emissions of CO_2 by 5245 tons, SO_2 by 1.4 tons and NO_x by 14 tons.

A second objective of this project was to examine current resource consumption and identify areas where additional improvements could be realized. It was determined that the analysis would be concentrated on the hotel's lighting system because of the large potential for savings that remained in

this area. The EROAP project team formulated a resource efficiency optimization plan for the facility's lighting systems which will provide an additional annual cost savings $280,498 and annual emissions reductions of CO_2 by 4,548 tons, SO_2 by 1.4 tons and NO_x by 12.4 tons.

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Acknowledgments

The Flamingo Hilton Environmental Resource Analysis and Optimization Plan (ERAOP) Project was a collaborative effort between the University of Las Vegas Environmental Studies Program and the Flamingo Hilton, Las Vegas. The ERAOP Project Team thanks the Management and staff of the Flamingo Hilton Mr. Horst Dzuira, President and Mr. William Bigelow, Vice President and General Manager. Special thanks go to Mr. Frank Williams, Director of Property Operations and Mr Gary Cox, Chief Engineer, Property Operations and their staff for the many hours they dedicated to making this project a success.

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Introduction

Historically, the American corporate paradigm was that seeking environmental quality was rarely in the corporation's best interest. Being "green" did not seem to square with the realities of cost competition and cost reducing efforts. There was a traditional tension between seeking corporate self-interest and seeking environmental quality. However, this paradigm is now proving to be profoundly incorrect.

The increasing scarcity of natural resources and the generation of tremendous quantities of hazardous and non-hazardous wastes and both air and water pollution are inflating the costs of conducting business in America. Responsible corporations are revising policies and practices for ecological, economic and public relations reasons. Firms are discovering that by developing and applying technologies designed to increase efficiency of resource use and reducing the amount of waste and pollution they generate, they not only reduce the costs of doing business but they are indeed being "green" at the same time.

The Las Vegas Flamingo Hilton is one of the responsible corporations which desires to be recognized as a leader in corporate environmental stewardship. From 1987 through 1992 the Las Vegas Flamingo Hilton instituted resource efficiency improvements in electrical, natural gas, water and materials consumption. In 1992, the Flamingo Hilton commissioned the University of Nevada Las Vegas Environmental Studies Department to analyze and quantify the improvements made by the Flamingo Hilton and investigate the potential for further improvements.

The Environmental Studies Program of the University of Nevada Las Vegas in collaboration with the Las Vegas Flamingo Hilton developed the Environmental Resource Analysis and Optimization Plan (ERAOP) project. The Flamingo Hilton ERAOP project is designed to assess and quantify the impact of the efficiency improvements that have been implemented then to develop optimization and implementation plans so that resource use can be further minimized consistent with environmental and business goals.

The ERAOP project team investigated several areas which could be considered for development of optimization plans. It was determined that the analysis would be concentrated on the hotel's lighting systems because of the large potential for efficiency improvements and cost savings that remained in this particular end use.

This study will discuss the resource efficiency improvements implemented by the Flamingo Hilton, describe the lighting system end use optimization plan and analyze and quantify the benefits of both.

HISTORICAL RESOURCE USE ANALYSIS

The following section reviews the historical resource use at the Flamingo Hilton facility of energy (specifically electricity and natural gas), water and materials from 1987 through 1992 and establishes a baseline use for each of those resource areas. In addition there is a brief description of specific resource efficiency improvement activities which have been implemented during that period by the Flamingo Hilton that have influenced resource consumption. An analysis is conducted which establishes the level of resource use reduction achieved by the optimization activities for each resource category. The economic and environmental benefits are also quantified.

Electricity

Electrical energy use at the Flamingo Hilton facility from January, 1987, through December, 1992 was analyzed using billing data provided by Nevada Power Company from seven separate meters. This usage was reviewed both on a peak kilowatt demand basis and on a total kilowatt hour basis. Over the six year period analyzed, the Flamingo Hilton paid a total $17,634,493 for electricity. At 1992 rate levels the Flamingo Hilton's annual electric costs are approximately $3.6 million. Each annual watt of energy the Flamingo Hilton uses costs approximately $.46 (precisely $.45825). This means for every 100-watt light bulb equivalent of annual energy saved by the Flamingo Hilton in using electricity more efficiently, the Flamingo Hilton can save $46.00 per year in electrical costs.

Of this approximately $.46 per annual watt, $0.05 (or 11%) is attributable to summer peak demand charges, $.16 (35%) is attributable to summer energy charges, and $.25 (54%) is attributable to non-summer energy and demand charges. Thus even though 46% of the Flamingo Hilton's electric costs

are incurred in only four months the year, there are substantial costs in the other eight months that can be addressed.

A review of the Flamingo Hilton's electrical energy efficiency improvement activities from 1987 to 1992 reveals a number of actions which individually contribute to the aggregate savings. Each of these individual actions was analyzed for contribution to aggregate energy savings, economic cost/benefit and environmental benefits.

The Flamingo Hilton's resource efficiency improvement activities from 1987 through 1992 involved utilizing energy and resource saving technology such as:

- Plate heat exchangers in the HVAC systems for both the Flamingo and O'Sheas facilities and for kitchen refrigeration. The heat exchangers can be substituted for the electrical chiller operation to provide interior cooling during cooler periods of the year. The installation of the heat exchangers accounted for approximately 63% of the electrical energy-efficiency savings.

- Computerized air handler temperature and program controls. These computer controls, together with initiation of operational standards on chillers, pumps, cooling towers and other heating systems accounted for approximately 14% of the electrical energy-efficiency savings.

- Air side economizers on air handlers. This allows the use of outside air for cooling and ventilation when ambient temperatures are appropriate. the economizers accounted for about 6% of the electrical energy-efficiency savings.

- Two speed and variable frequency motors. Upgrading to two speed and variable frequency motors throughout the facility accounted for about 9% of the electrical energy-efficiency savings.

- Lighting system retrofits. A number of lighting retrofits were conducted throughout the casino, exterior landscaped areas and guestrooms. Low efficiency traditional incandescent and quartz lighting was replaced with high efficiency compact fluorescent or halogen lamps. The lighting retrofits accounted for about 8% of the electrical energy-efficiency savings.

In order to better compare annual electrical energy usage over the six-year period from 1987-1992, annual monthly billing data from the Flamingo Hilton's seven meters were aggregated and then converted to energy and demand consumption per square foot. This analysis then provided comparative numbers which could be related on an equal unit basis for each year of the six-year analysis. Chart 1 on Appendix A-1 depicts annual kilowatt hour per square foot usage from the 1987 - 1992.

The chart indicates kWh usage per square foot fluctuated from a high of 19.97 kWh/ft^2 in 1987 to a low of 18.51 kWh/ft^2 in 1991. The 1987 base year was choosen by Flamingo Hilton Engineering personnel. This was the year after which the majority of resource efficiency improvements were implemented. The Flamingo Hilton Engineering staff determined 1991 to be the most representative year in which improvements were effective because it was a year with relatively minor construction activity and typical weather conditions.

Chart 2 on Appendix A-2 indicates kW of demand per square foot for 1987-1992. That demand ranges from a high in 1989 of .0039 kW/ft^2 to a low in 1987 and 1991 of .00352 kW/ft^2. A similar

analysis was conducted comparing the 1987 base year with the 1991 normal year for the change in energy demand per square foot. That analysis indicates that energy demand was the same between those two periods with no significant reduction.

In order to better analyze the gross electrical energy savings from the period 1987- 1992, Nevada Power Company yearly billing billing histories were disaggregated by peak months and non-peak months and recharted. The peak months for NPC are from June through September. During these months, NPC's cost to generate electricity are higher. Accordingly the rates charged to customers, such as the Flamingo Hilton, are also higher. For example, under 1992 rates, the average charge for energy is $.04081 per kilowatt hour of use from October through May, and $.05388 per kilowatt hour from June though September, or 32% higher during the peak months. The differential in the demand charge per peak kilowatt is even greater at $1.11 in the October-May period and $10.49 per kilowatt from June through September.

The first disaggregation is depicted on Chart 3 on Appendix 3-A which shows kWh/ft^2 for the years 1987-1992 for the peak months.

Usage during those months for the years 1987-1992 varies from a high of 7.51 kWh/ft^2 in 1989 to a low of 6.95 kWh/ft^2 in 1991. A comparitive analysis between the base year 1987 and the normal year 1992 shows there was an actual decrease of 2.8% in kWh/ft^2.

A similar analysis was performed for the off-peak months, October-May. That analysis, as depicted in Chart 4 on Appendix A-4 shows a variation usage from a high of 12.82 kWh/ft^2 in 1987 to a low of 11.56 kWh/ft^2 in 1991.

A comparitive analysis between the base year 1987 and the 1991 normal year shows a reduction in kWh usage of 9.83%. This indicates that the Flamingo Hilton was able to achieve a savings of over 9% in electrical energy usage from the 1987 base year for the non-peak months, but achieved virtually no saving s during the peak months. This despite the fact that 46% of the facility's electric energy costs are incurred in the four months from June through September.

The next analysis conducted was a calculation of expected annual savings in electric energy costs as a result of the implementation of energy efficiency measures by the Flamingo Hilton Engineering staff through December 1992. This analysis was performed using billing history data only. Table 1 sets forth the calculations utilized to determine the annual cost savings achieved from the Flamingo Hiltons efforts.

Table 1: Electric Savings Calculation

Period	kWh	Factor	Rate	kW	Factor	Rate	Total
Oct.-May	38,159,664	9.83%	$0.0408	178,589	7.14%	$1.11	$159,286
June-Sept.	22,939,260	2.80%	0.0538	844,256	0.00%	10.49	34,573
							$193,858

The first task in performing these calculations was to separate the peak and non-peak periods. Then the kWh consumption for the typical year were established for each period from NPC billing data. Next, an energy-efficiency factor was calculated using the data from Appendices A-3 and A-4 comparing the base year 1987 to the typical year 1991 for the peak and non-peak periods. These factors represent the percent savings between the base year and the typical year. Then the peak and non-peak energy rates were applied to the factored kWh to determine the total energy costs avoided. The same calculations were performed for kW demand for peak and non-peak periods, calculating a savings factor for demand and multiplying by the demand rates. The calculated annual electric cost

savings attributable to the resource efficiency improvements efforts of the Flamingo Engineering staff from during the six year period total $193,858.

There are a number of environmental benefits associated with the implementation of energy efficient technology. Most notable is the reduction in emissions from fossil fuel burning power plants which produce the electricity used in the Las Vegas Valley. NPC has determined, based upon its fuel mix for generating electricity, that each kilowatt of electric energy generation avoided will avoid 2.1 pounds of CO_2, 0.3 grams of SO_2, and 2.6 grams of NO_x.

Based on the annual savings of 4.5 Million kWh, the Flamingo Hilton's energy efficiency improvement activities have resulted in emission avoidance of 4,676 tons of CO_2, 1.6 tons of SO_2, and 14 tons of No_x.

Natural Gas

As with electrical energy usage, natural gas consumption at the Flamingo Hilton was analyzed over a six year period from 1987 to 1992. Five separate meters provide gas to the facility. Total gas use for the facility is approximately 1.9 million therms annually, at a total annual cost of approximately $650,000. The 1992 rate for natural gas was approximately $.34/therm.

The natural gas consumption reductions achieved during the 1987-1992 period were the result of two major energy efficiency improvements to natural gas end use equipment implemented by the Flamingo Hilton Engineering staff. Both of these improvements are described and analyzed for its contribution to the reductions in natural gas consumption.

- Steam boiler conversion for domestic hot water. Steam boilers and heat exchangers replaced 11 direct fired gas boilers servicing all domestic hot water systems. This upgrade accounted for approximately 60% of the total natural gas energy savings.

- Time and temperature controls on the laundry thermal boiler. These time and temperature controls along with other miscellaneous activities related to natural gas use accounted for the remaining 40% of reduced natural gas energy consumption.

In order to assess natural gas usage during the 1987-1992 period, and determine the savings attributable to the installation of the energy efficient improvements during that period, gas usage on a per square foot basis was analyzed. That analysis, as set forth on Chart 5 on Appendix A-5 shows the annual consumption in therms per square foot for the years 1987 through 1992. As that chart indicates, the therm usage per square foot ranged from a high of .671 in 1989 to a low of .576 in 1991. In addition, a comparison was made, as with electricity, between the base year 1897 and the 1991 normal year. This comparison indicates that average natural gas usage on a therms per square foot basis was reduced by 12.6%.

This data was used to perform a calculation to determine the economic benefits, similar to the calculation for electricity in Table 1, resulting from the efficiency improvements. Table 2 uses the 1991 therm consumption level and applies the 12.6% efficiency improvement factor. The therm rate of $0.34608 per therm was then applied to the product of 1991 consumption times the improvement factor. This produced an annual savings of $82,333 in reduced natural gas costs.

Table 2: Natural Gas Savings Calculation

Period	Therms	Factor	Rate	Total
Jan-Dec	1902345	12.51%	$0.34608	$82,333

In addition to the energy cost savings achieved from implementation of gas efficiency activities, reductions in CO_2 are also realized. Based upon data from Southwest Gas Corporation, the reduction in use of one therm of natural gas avoids the emission of 1.2 pounds of CO_2. Thus, based upon the reduction of approximately 240,000 therms of natural gas use the Flamingo Hilton has avoided producing 144 tons of CO_2.

Water

Water is a precious resource and a vital element to the continuation of life and economic growth in the Las Vegas community which must be conserved. Water usage at the Flamingo Hilton was analyzed over a six year period from 1987 to 1992. Data from six separate meters was obtained from the Las Vegas Valley Water District for the purposes of analysis. The Flamingo Hilton facility uses approximately 324,000 million gallons of water annually. Two thirds of this water is for guest room use, including laundry services, with the majority of remaining consumption devoted to the facility's cooling towers and landscaping. At 1992 average water rates of $1.13 per thousand gallons, the Flamingo Hilton had an annual water bill of approximately $366,000.

Gallons per square foot annual totals for water consumption at the facility are depicted on Chart 6 on Appendix A-6. As indicated on the chart, annual gallons per square foot range from a high of 131.94 in 1989 to a low of 97.92 gallons/ft^2 in 1991. From the base year 1987 to the normal year 1991, there

has been a reduction water use at the facility of 20.8%. This reduction has resulted in a total annual cost savings of $76,153.

The water savings are the consequence of several water efficiency improvements implemented at the Flamingo Hilton during the 1987-1992 period.

- The Flamingo Hilton's engineering staff implemented a new chemical treatment process that increased the total dissolved solids allowing for recirculation of cooling tower water from 2 1/2 passes to 4 1/2 passes. This process represents approximately 25% of the total water savings.

- Low-flush toilets, low-flow shower heads, recycling cooling tower bleed water as make up water for use in an industrial garbage disposal system and irrigation of landscaped areas during night-time hours to reduce water loss from evaporation. These improvements account for the remainder of the water savings from 1987 through 1992.

The calculation for the total annual water cost savings is set forth on Table 3 below. That table utilizes the gallon consumption level in 1991 of 324 million gallons, applies the savings factor of 20.8%, and then applies the average water rate per thousand gallons of $1.13.

Table 3: Water Savings Calculation

Period	Gallons	Factor	Rate	Total
Jan-Dec	324,000	20.8%	$1.13	$76,153

In addition to the dollar savings, there have been avoided pollution emissions associated with the reduction in water consumption. For every thousand gallons of water delivered to the Flamingo Hilton, the Las Vegas Valley Water District requires 6 kWh of electrical energy in pumping and treatment energy requirements. Thus, by saving approximately 67 million gallons annually from 1987-1991, the Flamingo Hilton has also saved 40 million kWh of electricity that is not consumed for pumping and treatment. As pointed out in the electricity section these electrical savings translate into pollution emission avoidance. Utilizing the same factors used for electrical energy pollution prevention provided by NPC, this 6 kWh per thousand gallons translates into 404,352 kWh saved based upon the Flamingo Hilton's annual average water resource efficiency improvement savings of 67.4 million gallons. Based on this annual kWh savings, the Flamingo Hilton's water saving activities have also saved 425 tons of CO_2, 267 pounds of SO_2 and 1.2 tons of NO_x.

Materials And Waste

The following discussion is based on Silver State Disposal tonnage measures for 1992 that the Flamingo Hilton provided. Recycled materials data were available for 10 full months, February through November, 1992 only. The limitations of the data make extrapolations to annual quantities difficult. However, extrapolations have been made to annual figures, but, additional data should be obtained to verify such use of the data.

For the 10 month 1992 period for which data was provided, an average of over 40 tons monthly (nearly 11% of all compacted waste) was placed in the recycling compactor. This has saved the Flamingo Hilton an estimated $5,000 a month in disposal fees by reducing one compactor pull per day by Silver State Disposal from the facility. In addition, this action has diverted 480 tons of materials annually from the local land fill and back into the resource stream.

Despite the efforts to date, the ERAOP Project Team is of the opinion the Flamingo Hilton has a significant opportunity to benefit from further waste disposal minimization measures. The Flamingo Hilton recycles less than 11% of their routine discards, nearly 90% is still landfilled.

Table 4: Historical Resource Analysis

	Annual Use Total	Annual Use/ Sq. Ft.	Annual Savings %	Annual Savings $
Electricity/Energy (kWh)	61.0 MM	18.5	7.3	187,630
Electricity/Demand - Summer Peak (kW)	11.6 M	.0035	0.0	0
- Non-Summer Peak (kW)	10.8 M	.0033	7.1	6,228
Natural Gas (Therms)	1.9 MM	.576	12.6	82,333
Water (Gallons)	324 MM	97.9	20.8	76,153
Materials (lbs.)	9.2 M	2.8	10.5	60,000
		Annual Savings		**$412,344**
Pollution Prevention				
Carbon Dioxide (Tons)	5.245			
Sulfur Dioxide (Tons)	1.6			
Nitrous Oxides (Tons)	14			

Table 4 recaps the economic savings and environmental benefits the Flamingo Hilton achieved by installing resource efficient technology during the period from 1987 through 1992.

LIGHTING OPTIMIZATION PLAN

As stated in the introduction, the end use system chosen for analysis and efficiency optimization is lighting. Flamingo Hilton lighting systems range from the smallest incandescent lambs in decorative lighting to huge flood lights which illuminate the exterior of the towers at night. Lighting systems account for over 15% of the total electric consumption and cost in excess of a half a million dollars annually at the Flamingo Hilton.

The lighting systems chosen for review and optimization consisted of major interior systems which had not been upgraded at this time, and the exterior parking garages. The ERAOP Team also looked at certain systems which had already been upgraded for further upgrade and additional cost saving opportunities.

Based on comprehensive review, typical candidate systems were chosen to conduct an in-depth survey, technology feasibility study, cost-benefit analysis and environmental impact analysis. The areas chosen were:

- Back of the house second floor offices, Locker rooms, storage areas, food preparation, kitchen areas and employee dining areas
- Guest rooms.
- Guest room hallways, housekeeping storage areas and stairwells.
- Parking garages.

The efficient lighting technologies chosen for retrofit are all proven efficient technologies. Improving guest comfort and increasing employee productivity were primary concerns in lighting technology

selection. Efficient task performance, whether that task is accounting calculations in the casino audit department or putting on make-up in a guest bathroom, must be the focal point of any efficient lighting system upgrade. The following is a description of the technologies chosen for retrofit at the Flamingo Hilton which achieve effective task performance with superior energy savings.

Compact fluorescent (CF) lamps are an energy-efficient, long lasting replacement for the incandescent lamp in many task situations. With the 10,000 hour rated life of these lamps and lamp efficacies between 50-85 lumens per watt, CF lamps are now sensible alternatives in common areas. In this project these lamps have been chosen for installation in guest rooms where they will provide quality lighting at substantial savings over the halogen incandescent lamps currently in place.

T-8 lamps were selected to replace the 40 watt four foot T-12 lamps being used in most of the four foot light fixtures in the facility. T-8 lamps, while similar in size and shape to T-12 lamps, have a smaller diameter (8/12" vs. 12/12), thus making them a more efficient lamp as the light source approaches the theoretical limit of a line source. The rated lamp wattage of the T-8 lamp is 32 watts, but when used with an electronic ballast, which under drives the lamp, actual input wattage is between 26 and 29 watts. The standard T-12 40 watt lamp when driven by a standard ballast uses between 48 and 57 watts. Conversion to T-8 lamps will result in energy cost savings of 40 to 50%. These savings are accompanied with better light quality and color rendition, for improved employee and quest comfort.

Electronic ballasts will replace the standard core and coil ballasts. The higher frequency operation of electronic ballasts significantly boosts the light output per watt of energy consumed making them more efficient than the standard or the magnetic ballasts. Compared to a standard T-12 system with

a magnetic ballast, an electronic ballast with T-8 lamps can reduce system energy use by up to 50% with no noticeable reduction in light levels.

Occupancy sensors for on/off control of intermittently occupied spaces have many applications. In wall switch or ceiling-mount versions. These devices automatically respond to unpredictable occupancy of space, either through sensing of motion, or through emitted sound waves.

Stairs and Hallways

The stairwells have at each landing a one 4 foot wall-mounted wrap fixture that contains one 4 foot F40 T-12 40 watt lamp and one standard core and coil ballast. In the guest halls, there are also 4 foot fixtures containing one 40-watt F40 T-12 lamp and standard core and coil ballast. Every other fixture in the guest hallway is on an emergency circuit in case of loss of power. Both of these areas are on 24-hour operation, so substantial energy savings would be expected.

Each fixture was counted in the guest hallways and tower stairwells. There are a total 2,938 fixtures. The technology selected for retrofit in these areas was the T-8 32-watt lamp and low wattage electronic ballast. The low wattage electronic ballast will drive the T-8 lamp at approximately 26.5 watts. This will result in a 53.5% demand reduction from the current standard system which uses approximately 57 watts. This configuration will retain 87% of the original lumens. However the reduction in lumens will be unnoticeable because the T-8 has a better color rendering and a higher scotopic light component. Foot-candle levels which result will still be well within the Illuminating Engineering Society (IES) standards for halls and stairwells. The installation system data sheet and kW and kWh savings calculation are contained on Appendix B-1 for this area.

This retrofit will result in first year savings of $47,373, as shown on Table 6 on page 23 with a simple payback of 1.1 years , and an internal rate of return of 96.5%.

Garages

The next retrofit considered for efficient lighting system upgrade was the Flamingo Hilton garages. This included the south garage, the garage attached to O'Sheas, and the casino/executive garage in the lower front basement of the facility. Each of these garages uses standard 75-watt F96 T-12 8 foot lamps and standard core and coil magnetic ballasts. The south garage is unique in that there are two ballasts per two-lamp fixture. This configuration results in excessive energy use requiring approximately 100 watts of power to drive each lamp.

The executive garage and O'Shea's garage both have two lamp 8 foot fixtures with one ballast per fixture. This normal configuration uses only 86.5 watts per lamp. The reason for the anomaly in the south garage is the fact that every other lamp is turned off on a timer because of the availability of light during the day into the garage.

The technology chosen for retrofit in these areas was an energy saving 60-watt F96 T-12 lamp and an electronic ballast. These efficient retrofit components will save approximately 42% of total system demand as shown on Appendix B-2. In order to save component costs in the south garage but to maintain the feature of using daylight to illuminate the facility during the day a photocell switch system was recommended that would switch off all the perimeter fixtures in each floor of the garage during daylight hours while maintaining fully lit fixtures in the interior of the garage. In retrofitting this type of a daylight photocell switched system, it will be possible to go to a two lamp electronic ballast. The result is substantial energy savings that still take advantage of available daylight and can

still be run on an emergency system basis. The new electronic ballast/energy saving lamp combination will use only 54.5 watts per lamp. Total yearly energy savings for this retrofit are $24,820 as shown on Table 6 with a simple payback in 6 months and an internal rate of return of 188.4%.

The O'Shea's and executive casino garages will use the same technology as the south garage without the daylight photocell system. Neither of these garages have adequate daylight to use the photocells. Despite that fact, total first year savings are expected to be $21,000 with paybacks in less than eight months and an internal rate of return in excess of 150%.

Guest Rooms

Flamingo Hilton Engineering staff in 1989 and 1990 retrofitted all of the guest rooms with 72 watt MB halogen incandescent lamps in all fixtures. These lamps provided substantial energy savings from the existing 100 watt incandescent lamps. Despite this retrofit, it was decided to review the feasibility of retrofitting the guest rooms with compact fluorescent lamps. In addition, in talking with Housekeeping personnel and other Flamingo Hilton employees, it was evident that there was some guest dissatisfaction with the current guest room lighting. Specifically, complaints about the level of lighting in the guest bathrooms. Further, footcandle readings taken in guest rooms at desk lamps and other lamp areas that would be normally used by guests for reading indicate levels below IES standards.

It was discovered during the survey of the guest rooms that illumination levels in table and desk lamps to be under IES recommended levels. In addition, the 72-watt MB Capsulites installed in the bathroom sconces do not provide adequate light for putting on make-up and other bathroom tasks.

To alleviate this problem it is suggested that the bathroom wall sconces be retrofitted with 27-watt compact fluorescent lamps. A 27-watt compact fluorescent can provide approximately 1,800 lumens compared to the 1,300 lumens produced by the existing 72-watt halogen bulbs. In addition, electronically ballasted compact fluorescent lamps can be obtained with color phosphors of warm Kelvin temperatures which will provide attractive lighting for bathroom illumination.

This recommendation to install 27-watt compact fluorescent lamps in the guest bathrooms is limited to 2,098 of the 3,096 rooms. This is because the remainder of the guest bathrooms have fixtures which will not take the 27-watt compact fluorescent lamp. Given the number of guest complaints regarding lighting levels in the bathroom, there are a number of possibilities which could be explored by Flamingo Hilton management.

The option recommended by the ERAOP Team would be to replace the non-conforming fixtures to sconces that will take a 27-watt compact fluorescent lamp. This would achieve an approximate additional $40,000 in annual energy savings which would pay for the cost of the lamps and new fixtures in approximately three years, assuming a new fixture cost of $50 each.

The guest room bed lamps and dresser lamps, which are used primarily for general illumination, can be 18-watt compact fluorescent without concern of inadequate light. At least one lamp in the guest should be of adequate illumination for reading or other work related tasks. Accordingly, it is recommended that the guest room table and floor lamps be retrofitted with 27-watt compact fluorescent lamps.

For the guest room entry, it is recommended the Flamingo Hilton stay with the MB halogen incandescent lamp but reduce wattage from 72 to a 42-watt lamp. It is recommended that this lamp remain a halogen incandescent for the purpose of controlling the lamp with a manual dimmer at the existing wall switch. The manual dimmer switch will allow the guests a means to create a night light of a desired level.

The technologies recommended for guest room retrofit and the resultant kW and kWh savings are set forth on Appendix B page 3. The table shows total kW consumption in guest rooms can be reduced by 65%. Kilowatt hour consumption can be reduced by approximately 61%. The hours of operation used to calculate kWh savings and cost savings for the guest rooms of the Flamingo Hilton were those hours estimated by NPC in its study of guest room occupant use. (Schlacks, 1992) Based upon that study and the Flamingo Hilton guest rooms, total first year guest room savings from the efficient lighting system retrofit recommendations is $138,125, as set forth on the energy cost savings analysis on Table 6. All retrofits have a simple payback of less than 2 ½ years with the quickest payback in the guest bathrooms of approximately 11 months.

Second Floor Back Area

The final representative area for lighting system analysis was the second floor back-of-the-house areas which consist of all management offices (with the exception of engineering), employee cafeteria and locker rooms, housekeeping, room reservations, PBX and telephone switching and a number of kitchen facilities, including room service and the pastry kitchen. There are also a number of warehouses and storage rooms including the liquor and soda gun rooms.

In order to accurately assess the appropriate efficient lighting technology recommendations for these areas and determine the cost benefit of such a retrofit, each and every specific area on the second floor was meticulously surveyed. The details of that survey are listed on pages 4 through 10 of Appendix B.

The predominant lamp and ballast used throughout the second floor area is the 40-watt F40 T-12 lamp with a standard core and coil ballast. The recommended retrofit for all fixtures containing this lamp/ballast combination was the F32 T-8 lamp with electronic ballast. In a number of offices foot candle readings were taken. Those readings determined foot-candle levels far exceed those recommended by the EIS. Specifically, many office areas had foot-candle levels at or above 75 foot-candles. The recommended level for an office environment, especially where there is extensive computer use, is 35-50 foot-candles. Based upon this analysis, a number of offices were delamped where the primary fixture was a four lamp 2' x 4' fluorescent troffer. The recommended system for these delamped fixtures is two T-8 lamps with an electronic ballast.

The recommended regime for all fixtures that are to be delamped is that two lamps be removed from the fixtures permanently, the remaining two lamps be replaced with T-8 lamps, and the lamp holders be centered to optimize the fixture photometry. One electronic ballast would be installed per fixture, unless the installation sheet indicates tandem wiring. Then one four lamp ballast would be tandem wired between two fixtures.

Other specific recommendations to note are the use of occupancy sensors in a number of office areas. The second floor back-of-the-house areas were surveyed three separate times. During those surveys it was noted that there are a number of areas where lights are on and the area is unoccupied. This was

especially true in offices and warehouse areas. The installation of infrared or ultrasonic occupancy sensors as appropriate will substantially reduce the energy used in these areas when unoccupied.

The final technology recommended for the back-of-the-house areas were half-hour twist timers in those areas which were either small storage areas or electrical panel rooms where occupancy is for a very short period of time only to obtain materials or check equipment. A half hour twist timer is a good inexpensive alternative to an occupancy sensor in appropriate areas.

The component technologies recommended for retrofit in each area are described on Appendix B pages B-4 through B-10. The ERAOP Project Team recommended efficient lighting retrofits for the second floor back-of-the-house areas would result in an annual energy cost savings of $48,975, as set forth on Table 6.

Table 5: Lighting End-Use Optimization Analysis

	Annual Use Total	Annual Use/ Sq. Ft.	Annual Savings %	Annual Savings $
Electricity/Energy (kWh)	9.0 MM	2.7	55	230,734
Electricity/Demand - Summer Peak (kW)	1.6 M	N/A	62	38,184
- Non-Summer Peak (kW)	2.1 M	N/A	43	11,580
		Annual Savings		**$280,498**
Pollution Prevention				
Carbon Dioxide (Tons)	4548			
Sulfur Dioxide (Tons)	1.4			
Nitrous Oxides (Tons)	12.4			

Table 5 indicates the economic savings and environmental benefits that could be achieved by the Flamingo Hilton with the implementation of efficient lighting system upgrades. As shown, it was determined efficient lighting retrofits would produce yearly savings of $280,498. These annual savings represent a 68% increase in resource efficiency savings over those achieved historically.

Table 6: Energy and Energy Cost Savings Economic Results by Area

		Without Labor Costs			With Labor Costs		
Stairwells and Halls	$47,373	1.1	96.5%	$299,277	1.4	74.1%	$280,914
South Parking Garage	$24,820	0.5	188.4%	$179,167	0.7	147.3%	$174,486
Oshea's Parking Garage	$18,271	0.7	143.8%	$117,771	0.9	114.6%	$113,928
Executive Parking Garage	$2,934	0.6	179.10%	$19,464	0.7	140.3%	$18,932
Guest Room Bed Lamps	$35,892	1.7	57.90%	$180,623	1.8	57.9%	$180,623
Guest Room Bath	$40,851	0.9	103.50%	$248,275	1	103.5%	$248,275
Guest Room Dresser Lamps	$23,742	1.2	78.10%	$133,139	1.3	78.1%	$133,139
Guest Room Entry	$20,094	1.2	39.30%	$58,507	2.5	39.3%	$58,507
Guest Room Table Floor Lamps	$17,546	2.4	12.00%	$16,977	5.1	12.0%	$16,977
2nd Floor Back Area	$48,975	0.4	251.00%	$330,274	0.8	136.7%	$311,461
Totals	**$280,498**	**1.07**			**1.54**		**$1,537,242**

CONCLUSION

The Flamingo Hilton's efforts and accomplishments over the last two decades are helping to develop a new corporate paradigm which will transform Corporate America in the future. By incorporating environmentally sound principles and utilizing efficient technologies businesses can improve their economic and competitive standing. Savings of over $400,000 in annual overhead expenses, and the opportunity to save an additional $280,000 annually, which will be reflected in the Flamingo Hilton's bottom line. Nearly 3/4 of a million dollars which can be reinvested into the hotel or distributed to the shareholders resulting in a more attractive product for investors.

Remember, these economic gains were achieved while reducing resource use and pollution production. Although the Flamingo Hilton will not benefit directly from the reductions of pollution the benefits of living and operating a business in a clean environment are well known. However, it is suspected that by acting as an environmentally responsible corporate citizen the Flamingo Hilton may indeed reap additional economic benefits by attracting more customers who wish to do business with responsible corporations.

Efficient use of resources and reductions in the generation of wastes and pollution are and will continue to be a large part of the realities of cost competition and cost reductions for corporations. The Flamingo Hilton is one of the responsible corporations which realizes that the traditional tensions between the environment and business will diminish when the economics of conservation are fully recognized.

References

Schlacks, Eric (1992). Occupancy Sensor Controls. Las Vegas, NV. : Nevada Power Company.

APPENDIX A

Historical Resource Use

&

Efficiency Improvement Analyses

1987-1992

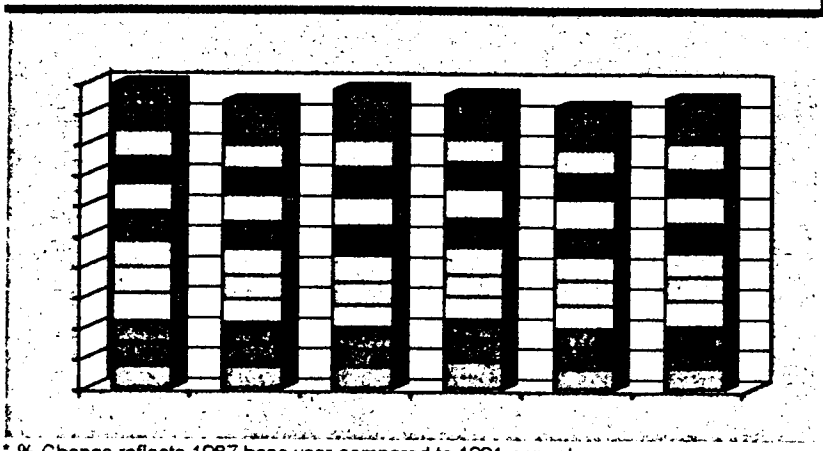
Chart 1

KWH per Square Foot

26-Apr-93

Annual Totals

1987	1988	1989	1990	1991	1992	% Change*
19.97	18.84	19.62	19.28	18.51	19.06	-7.3%



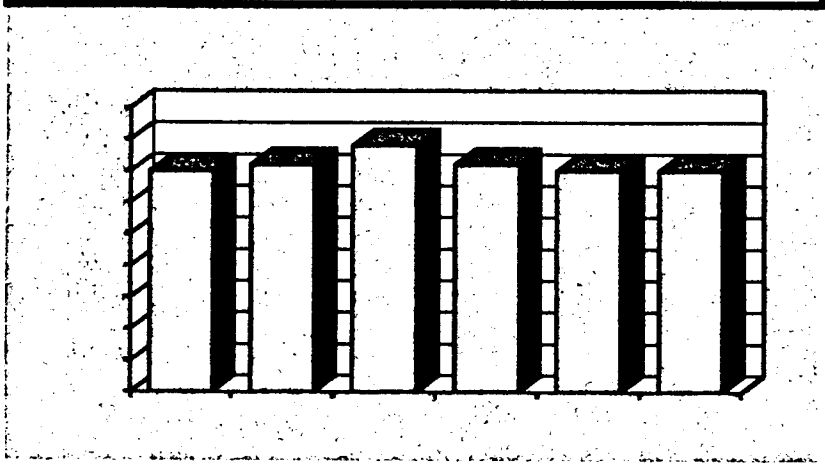
* % Change reflects 1987 base year compared to 1991 normal year

Chart 2

KW per Square Foot
Annual Totals

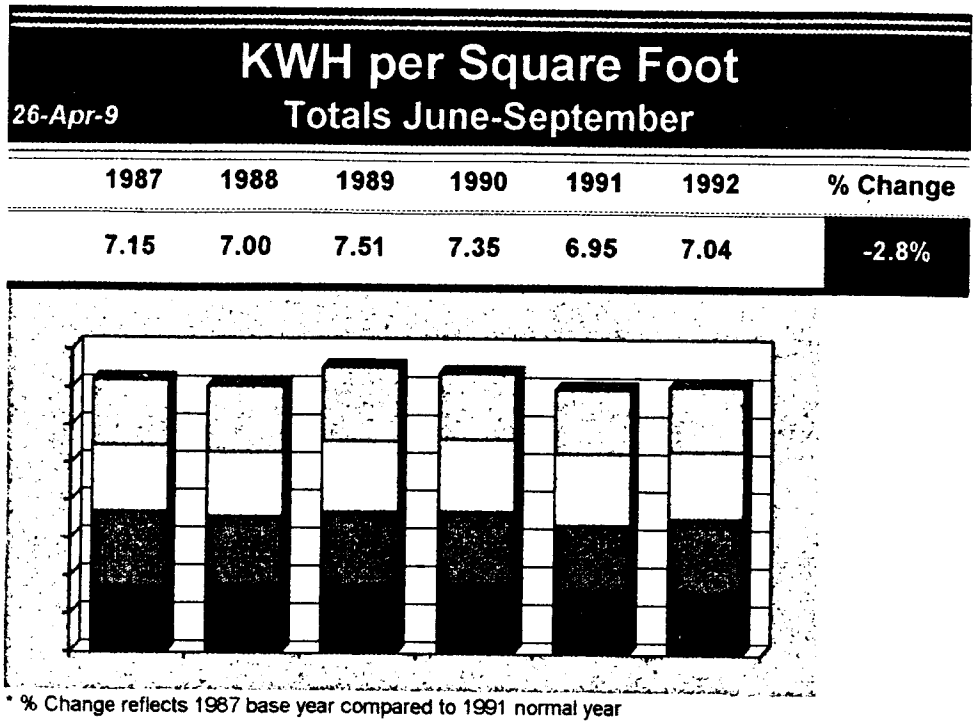
26-Apr-93

1987	1988	1989	1990	1991	1992	% Change*
0.0035	0.0036	0.0039	0.0036	0.0035	0.0035	0.00%



* % Change reflects 1987 base year compared to 1991 normal year

Chart 3



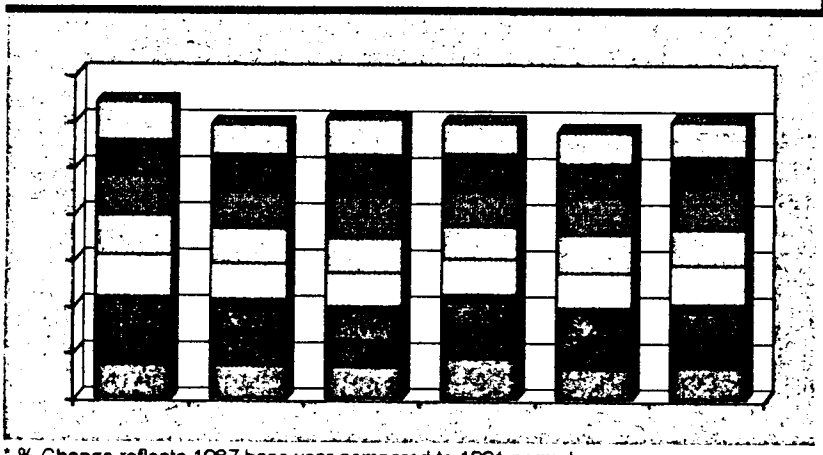
* % Change reflects 1987 base year compared to 1991 normal year

Chart 4

26-Apr-93

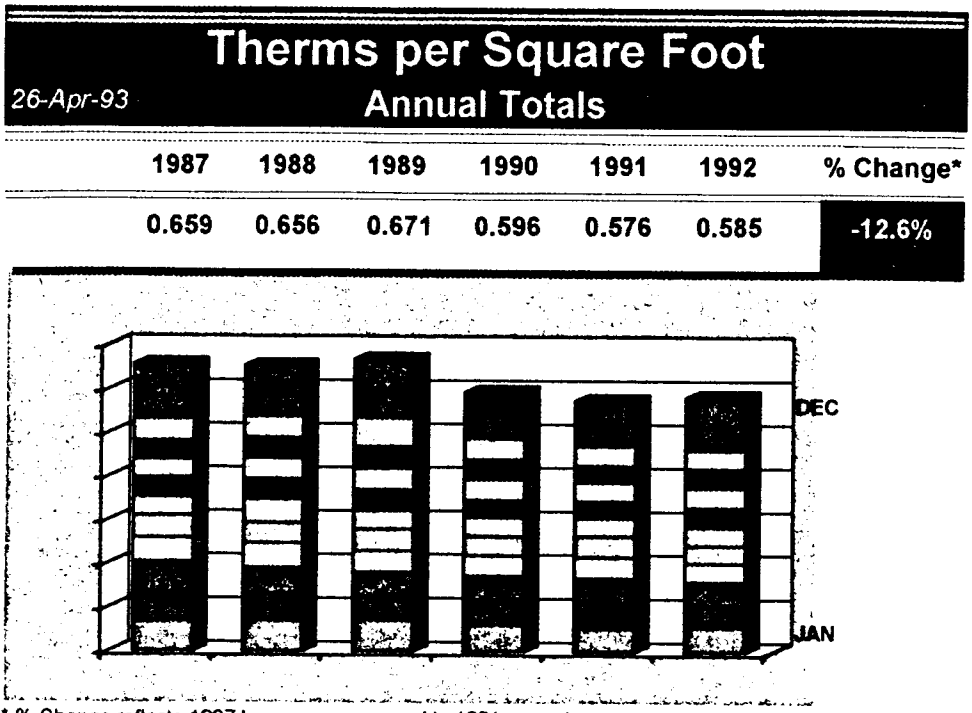
KWH per Square Foot
Totals Jan- May and Oct-Dec

1987	1988	1989	1990	1991	1992	% Change *
12.82	11.85	12.11	11.93	11.56	12.02	-9.83%



* % Change reflects 1987 base year compared to 1991 normal year

Chart 5



* % Change reflects 1987 base year compared to 1991 normal year

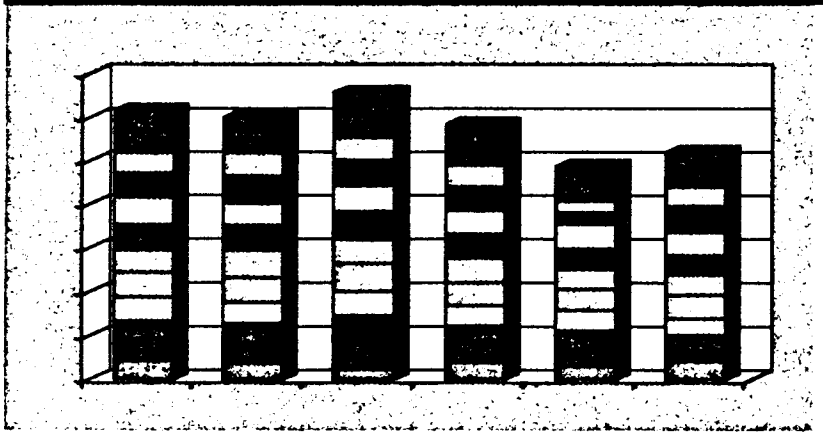
Chart 6

Gallons per Square Foot

26-Apr-93

Annual Totals

1987	1988	1989	1990	1991	1992	% Change*
123.72	120.39	131.94	117.30	97.92	104.40	-20.8%



* % Change reflects 1987 base year compared to 1991 normal year

APPENDIX B

Lighting Efficiency Analysis

&

Optimization Plan

Las Vegas Flamingo Hilton / Stairs & Hallways

Facility: Flamingo Hilton Contact: Account No.: Telephone:

Existing System Components					Recommended Lighting System Components			
Area	Hrs.	Fixture, Lamp & Ballast Type	Kw/Fx	Kw	Fixture, Lamp & Ballast Type	Controls	Kw/Fx	Kw
					.			
Stairs & Halls	24	2938 1L 1x4. 1 40w F40T12. Std.	0.057	167.466	2938 F32T8. 2938 1L F32T8 Low Wattage EB.		0.027	77.857
					.			
					.			
					.			
					.			

Existing System Kilowatt Consumption =	167.466
Recommended System Kilowatt Consumption =	77.857
Saved System Kilowatt Consumption =	-89.6
% Change in System Kilowatt Consumption =	-53.5%
Existing System Kilowatt-Hour Consumption =	1,467,002
Recommended System Kilowatt-Hour Consumption =	682,027
Saved System Kilowatt-Hour Consumption =	-784974.8
% Change in System Kilowatt-Hour Consumption =	-53.5%

Recommended System Kilowatt Consumption = 77.857

Las Vegas Flamingo Hilton / Garages

Facility: Flamingo Hilton **Contact:** **Account No.:** **Telephone:**

Existing System Components					Recommended Lighting System Components			
Area	**Hrs.**	**Fixture, Lamp & Ballast Type**	**Kw/Fx**	**Kw**	**Fixture, Lamp & Ballast Type**	**Controls**	**Kw/Fx**	**Kw**
					.			
South Garage	18	749 2L 1x8. 2 75w F96T12. Std.	0.200	149.800	1498 60w F96T12. 749 2L 60w F96T12 EB.	DL	0.109	81.641
Oshea's Garage	24	615 2L 1x8. 2 75w F96T12. Std.	0.173	106.395	1230 60w F96T12. 615 2L 60w F96T12 EB.		0.109	67.035
Executive Garage	24	85 2L 1x8. 2 75w F96T12. Std.	0.183	15.555	170 60w F96T12. 85 2L 60w F96T12 EB.		0.109	9.265
					.			
					.			

Existing System Kilowatt Consumption =	271.750
Recommended System Kilowatt Consumption =	157.941
Saved System Kilowatt Consumption =	-113.809
% Change in System Kilowatt Consumption =	-41.88%
Existing System Kilowatt-Hour Consumption =	2,052,468.000
Recommended System Kilowatt-Hour Consumption =	1,204,769.370
Saved System Kilowatt Consumption =	-847,698.630
% Change in System Kilowatt Consumption =	-41.30%

Recommended System Kilowatt Consumption = 157.941

DL - Daylight Photocell Control

Las Vegas Flamingo Hilton / Guest Rooms

Facility: Flamingo Hilton **Contact:** **Account No.:** **Telephone:**

Existing System Components					Recommended Lighting System Components			
Area	**Hrs.**	**Fixture, Lamp & Ballast Type**	**Kw/Fx**	**Kw**	**Fixture, Lamp & Ballast Type**	**Controls**	**Kw/Fx**	**Kw**
Guest Room Bed Lamps	3.2	6164 1L Lamp. 1 72w MB.	0.072	443.808	6164 18w Quad CF.		0.018	110.952
Guest Room Bath	9.54	4196 1L Sconce. 1 72w MB.	0.072	302.112	4196 27w Quad CF.		0.027	113.292
Guest Room Dresser Lamps	5.76	3082 1L Lamp. 1 72w MB.	0.072	221.904	3082 18w Quad CF.		0.018	55.476
Guest Room Entry	9.54	3096 1L Recessed Round. 1 72w MB.	0.072	222.912	3096 42w MB.	Dimmer	0.042	130.032
Table/Floor Lamps	3.2	3616 1L Lamp. 1 72w MB.	0.072	260.352	3616 27w Quad CF. 3616 1L 27w Quad CF Remote.		0.027	97.632

Existing System Kilowatt Consumption =	1451.088
Recommended System Kilowatt Consumption =	507.384
Saved System Kilowatt Consumption =	-943.704
% Change in System Kilowatt Consumption =	-65.03%
Existing System Kilowatt-Hour Consumption =	3,117,145.709
Recommended System Kilowatt-Hour Consumption =	1,207,526.026
Saved System Kilowatt-Hour Consumption =	-1,909,619.683
% Change in System Kilowatt-Hour Consumption =	-61.26%

Recommended System Kilowatt Consumption = 507.384

Dimmer - Wall Switch, Manual Dimmer

Las Vegas Flamingo Hilton / 2nd Floor Back of House

Efficient Lighting System Installation and Energy Savings Worksheet

Existing System Components					Recommended System Components			
Area	Hrs.	Fixture, Lamp & Ballast Type	Kw/Fx	Kw	(Fixture), Lamp & Ballast Type	Contro	Kw/Fx	Kw
					.			
Service Corridor	24	5 2L 1x4 Recessed. 2 40w F40T12. Std.	0.096	0.480	10 F32T8. 5 2L F32T8 EB.		0.058	0.290
Engineering Parts Rm	2	1 4L 8'. 4 40w F40T12. Std.	0.192	0.192	4 F32T8. 1 4L F32T8 EB.	TT/.5H	0.106	0.106
Storage Area	2	9 2L 4'. 2 40w F40T12. Std.	0.096	0.864	18 F32T8. 9 2L F32T8 EB.		0.058	0.522
Time, Hire Area, Elevator	24	4 2L 1x4. 2 40w F40T12. Std.	0.096	0.384	8 F32T8. 2 4L F32T8 EB. Tandem Wire.		0.053	0.212
Time, Hire Area, Elevator	24	1 2L 1x4. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.		0.058	0.058
Time, Hire Area, Hallway	24	19 2L 1x4. 2 40w F40T12. Std.	0.096	1.824	38 F32T8. 19 2L F32T8 EB.		0.058	1.102
Time Office	24	10 4L 2x4. 4 40w F40T12. Std.	0.192	1.920	20 F32T8. 10 2L F32T8 EB. DL & Rctr.		0.058	0.580
Paymaster's Off	8	2 4L 2x4. 4 40w F40T12. Std.	0.192	0.384	8 F32T8. 2 4L F32T8 EB.	OS	0.106	0.212
Liquor Warehouse	24	13 2L 8'. 2 40w F40T12. Std.	0.096	1.248	26 F32T8. 13 2L F32T8 EB.	OS	0.058	0.754
Liquor Warehouse	24	5 1L 4'. 1 40w F40T12. Std.	0.057	0.285	5 F32T8. 5 1L F32T8 EB.	OS	0.029	0.145
Human Res, Hallway	24	5 2L 1x4. 2 40w F40T12. Std.	0.096	0.480	5 F32T8. 5 1L F32T8 EB. DL & Rctr.		0.029	0.145
Purchasing Warehouse	24	12 4L 8' Strip. 4 40w F40T12. Std.	0.192	2.304	48 F32T8. 12 4L F32T8 EB.		0.106	1.272
Purchasing Warehouse	24	2 2L 4' Strip. 2 40w F40T12. Std.	0.096	0.192	4 F32T8. 2 2L F32T8 EB.		0.058	0.116
Human Res Off	12	21 4L 2x4. 4 40w F40T12. Std.	0.192	4.032	42 F32T8. 21 2L F32T8 EB. DL & Rctr.		0.058	1.218
Human Res Off	12	2 4L 2x4. 4 40w F40T12. Std. Nitelite.	0.192	0.384	4 F32T8. 2 2L F32T8 EB. DL & Rctr.		0.058	0.116
Human Res Office, VP	12	2 4L 2x4. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 2 2L F32T8 EB. DL & Rctr.	OS	0.058	0.116
Emp Benefits Off	12	3 4L 2x4. 4 40w F40T12. Std.	0.192	0.576	6 F32T8. 3 2L F32T8 EB. DL & Rctr.		0.058	0.174
Emp Benefits, Storage Area	2	2 4L 2x4. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 2 2L F32T8 EB. DL & Rctr.	OS	0.058	0.116
Emp Benefits, Hallway	24	1 4L 2x4. 4 40w F40T12. Std.	0.192	0.192	4 F32T8. 1 4L F32T8 EB.		0.106	0.106
Emp Benefits, H. Hesterson's Off	12	3 4L 2x4. 4 40w F40T12. Std. Para Louvers.	0.192	0.576	6 F32T8. 3 2L F32T8 EB. DL & Rctr.	OS	0.058	0.174
Payroll Office	12	18 4L 2x4. 4 40w F40T12. Std.	0.192	3.456	36 F32T8. 18 2L F32T8 EB. DL & Rctr.		0.058	1.044
Payroll Office	12	2 2L 2x2. 2 40w FB40T12. Std.	0.096	0.192	4 FBO31T8. 2 2L FBO31T8 EB. DL & Rctr.		0.058	0.116
Payroll Computer Rm	24	1 4L 2x4. 4 40w F40T12. Std. Nitelite.	0.192	0.192	2 F32T8. 1 2L F32T8 EB. Delamp & Recenter.		0.058	0.058
Labor Rel, VP, Secretary	12	3 4L 2x4. 4 40w F40T12. Std.	0.192	0.576	6 F32T8. 3 2L F32T8 EB. Delamp & Recenter.	OS	0.058	0.174
Labor Rel, VP	12	3 4L 2x4. 4 40w F40T12. Std.	0.192	0.576	6 F32T8. 3 2L F32T8 EB. Delamp & Recenter.	OS	0.058	0.174
Training Rm, Hallway	24	9 2L 1x4. 2 40w F40T12. Std.	0.096	0.864	18 F32T8. 9 2L F32T8 EB.		0.058	0.522
Training Rm	24	3 4L 2x4. 4 40w F40T12. Std.	0.192	0.576	6 F32T8. 3 2L F32T8 EB. Delamp & Recenter.	OS	0.058	0.174
General Merchandising	15	6 2L 1x4 Pendant. 2 40w F40T12. Std.	0.096	0.576	12 F32T8. 6 2L F32T8 EB. Rehang PL w/Aisles.		0.058	0.348
Inventory Cont, Food & Bev Cont Off	24	7 2L 2x4. 2 40w F40T12. Std. Dual Control Switch.	0.096	0.672	21 F32T8. 7 3L F32T8 EB.		0.087	0.609
Inventory Cont, Food & Bev Cont Off	24	7 1L 2x4. 1 40w F40T12. Std. Dual Control Switch.	0.057	0.399	.			
Refrigeration Rm	24	8 2L 8'. 2 40w F40T12. Std.	0.096	0.768	16 F32T8. 4 4L F32T8 EB. Tandem Wire.		0.053	0.424

Efficient Lighting System Installation and Energy Savings Worksheet									
Existing System Components					Recommended System Components				
Area	Hrs.	Fixture, Lamp & Ballast Type	Kw/Fx	Kw	(Fixture), Lamp & Ballast Type	Contro	Kw/Fx	Kw
Refrigeration Rm	24	1 2L 8'. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.		0.058	0.058
Refrigeration Rm	24	3 1L 4'. 1 40w F40T12. Std.	0.057	0.171	3 F32T8. 3 1L F32T8 EB.		0.029	0.087
Refrigeration Rm, Outside	24	2 2L 1x4. 2 40w F40T12. Std.	0.096	0.192	4 F32T8. 2 2L F32T8 EB.		0.058	0.116
Locker Rm, Men's, Inside	24	3 4L 8'. 4 40w F40T12. Std.	0.192	0.576	12 F32T8. 3 4L F32T8 EB.		0.106	0.318
Locker Rm, Men's, Inside	24	46 2L 4' Tandem Wrap. 2 40w F40T12. Std.	0.096	4.416	92 F32T8. 23 4L F32T8 EB. Tandem Wire.		0.053	2.438
	24	2 2L Wrap Pendant Mount. 2 40w F40T12. Std.	0.096	0.192	4 F32T8. 2 2L F32T8 EB.		0.058	0.116
Locker Rm, Men's, Inside	24	2 1L 4' Wrap. 1 40w F40T12. Std.	0.057	0.114	2 F32T8. 2 1L F32T8 EB.		0.029	0.058
Locker Rm, Men's, Inside	24	22 2L 4' Wrap. 2 40w F40T12. Std.	0.096	2.112	44 F32T8. 11 4L F32T8 EB. Tandem Wire.		0.053	1.166
Locker Rm, Men's, Inside, Bathroom	24	13 2L 4' Wrap. 2 40w F40T12. Std.	0.096	1.248	26 F32T8. 13 2L F32T8 EB.		0.058	0.754
Air Handler 19A Rm	2	5 2L 4' Strip. 2 40w F40T12. Std.	0.096	0.480	10 F32T8. 5 2L F32T8 EB.		0.058	0.290
Liquor Gun Rm, Hallway	24	1 4L 8'. 4 40w F40T12. Std.	0.192	0.192	4 F32T8. 1 4L F32T8 EB.		0.106	0.106
Cafeteria, Employee	24	50 1L 8' Strip. 1 75w F96T12. Std.	0.100	5.000	50 2L 8' Strip Retrofit Kits. 100 F32T8. Tandem Wir		0.058	2.900
Cafeteria, Employee	24	5 1L 3' Strip. 1 30w F30T12. Std.	0.046	0.230	5 F25T8. 5 1L F25T8 EB.		0.025	0.125
Cafeteria, Employee	24	1 1L 2' Strip. 1 20w F20T12. Std.	0.025	0.025	1 F17T8. 1 1L F17T8 EB.		0.017	0.017
Cafeteria, Employee	24	190 1L 4' Tube. 1 34w F40T12. Std.	0.050	9.500	190 F32T8. 95 2L F32T8 EB. Tandem Wire.		0.029	5.510
Cafeteria, Emps', Hallway	24	6 2L 4' Tandem Wrap. 2 40w F40T12. Std.	0.096	0.576	12 F32T8. 3 4L F32T8 EB. Tandem Wire.		0.053	0.318
Cafeteria, Emps', Hallway	24	9 2L 4' Tandem Wrap. 2 40w F40T12. Std.	0.096	0.864	18 F32T8. 9 2L F32T8 EB.		0.058	0.522
Soda Rm	24	5 2L 8' Strip. 2 40w F40T12. Std.	0.096	0.480	10 F32T8. 5 2L F32T8 EB.	OS	0.058	0.290
Soda Rm	24	1 1L 4' Strip. 1 40w F40T12. Std.	0.057	0.057	1 F32T8. 1 1L F32T8 EB.	OS	0.029	0.029
Soda Rm	24	1 4L 8'. 4 40w F40T12. Std.	0.192	0.192	4 F32T8. 1 4L F32T8 EB.	OS	0.106	0.106
Liquor Gun Rm #1	24	8 2L 8'. 2 40w F40T12. Std.	0.096	0.768	16 F32T8. 8 2L F32T8 EB.	OS	0.058	0.464
Liquor Gun Rm #1	24	4 2L 1x4. 2 40w F40T12. Std.	0.096	0.384	8 F32T8. 4 2L F32T8 EB.	OS	0.058	0.232
Room Svc Bakery/Gen Off	24	6 2L 1x4 Recessed Troffer. 2 40w F40T12. Std.	0.096	0.576	12 F32T8. 6 2L F32T8 EB.		0.058	0.348
Steward's Dept Chem Rm	24	5 2L 8' Strip. 2 40w F40T12. Std.	0.096	0.480	10 F32T8. 5 2L F32T8 EB.	TT/.5H	0.058	0.290
Steward's Dept Silver Rm	24	6 2L 1x4 Recessed. 2 40w F40T12. Std.	0.096	0.576	12 F32T8. 6 2L F32T8 EB.	TT/.5H	0.058	0.348
Room Svc Mgr's Off	24	4 2L 1x4. 2 40w F40T12. Std.	0.096	0.384	8 F32T8. 4 2L F32T8 EB.		0.058	0.232
Room Svc Mgr's Off	8				1 1L Task Light. 1 27w Quad CF Screw In. Add.		0.027	0.027
Room Service, Back Area	24	140 2L 1x4. 2 40w F40T12. Std.	0.096	13.440	280 F32T8. 140 2L F32T8 EB. Disc: CB Patt.		0.058	8.120
Room Service	24	108 2L 1x4. 2 40w F40T12. Std.	0.096	10.368	216 F32T8. 54 4L F32T8 EB. Disc: CB Patt.		0.053	5.724
Room Service	24	2 2L 1x4. 2 40w F40T12. Std.	0.096	0.192	4 F32T8. 2 2L F32T8 EB. Disc: CB Patt.		0.058	0.116
Room Service	24	1 2L 1x4. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB. Disc: CB Patt.		0.058	0.058
Locker Rm, Women's	24	56 1L 4' Strip. 1 40w F40T12. Std.	0.057	3.192	56 F32T8. 28 2L F32T8 EB. Tandem Wire.		0.029	1.624
Locker Rm, Women's	24	1 1L 4' Strip. 1 40w F40T12. Std.	0.057	0.057	1 F32T8. 1 1L F32T8 EB.		0.029	0.029
Locker Rm, Women's	24	46 2L 4' Wrap. 2 40w F40T12. Std.	0.096	4.416	92 F32T8. 23 4L F32T8 EB. Tandem Wire.		0.053	2.438
Locker Rm, Women's	24	1 2L 4' Wrap. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.		0.058	0.058

Efficient Lighting System Installation and Energy Savings Worksheet								
Existing System Components					Recommended System Components			
Area	Hrs.	Fixture, Lamp & Ballast Type	Kw/Fx	Kw	(Fixture), Lamp & Ballast Type	Contro	Kw/Fx	Kw
Locker Rm, Women's	24	2 1L 8' Wrap. 1 75w F96T12. Std.	0.100	0.200	2 2L 8' Strip Retrofit Kits. 4 F32T8.		0.058	0.116
Locker Rm, Women's, Hallway	24	8 4L 8'. 4 40w F40T12. Std. Opal.	0.192	1.536	32 F32T8. 8 4L F32T8 EB.		0.106	0.848
Air Handler Rm #18	2	3 2L 4' Strip. 2 40w F40T12. Std.	0.096	0.288	6 F32T8. 3 2L F32T8 EB.		0.058	0.174
Air Handler Rm #8	2	2 4L 8' Strip. 4 40w F40T12. Std.	0.192	0.384	8 F32T8. 2 4L F32T8 EB.		0.106	0.212
Air Handler Rm #8	2	1 2L 8' Strip. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.		0.058	0.058
Air Handler, Hallway	24	4 2L 1x4 Recessed. 2 40w F40T12. Std.	0.096	0.384	8 F32T8. 4 2L F32T8 EB.		0.058	0.232
Telephone Switching Rm	2	1 1L 4' Strip. 1 40w F40T12. Std.	0.057	0.057	1 F32T8. 1 1L F32T8 EB.	TT/.5H	0.029	0.029
Dealers' Lounge, Hallway	24	10 4L 1x8 Recessed. 4 40w F40T12. Std.	0.192	1.920	40 F32T8. 10 4L F32T8 EB.		0.106	1.060
Bally's Computer Rm	24	9 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	1.728	18 F32T8. 9 2L F32T8 EB. Delamp & Recenter.		0.058	0.522
Uniform Rm	18	19 4L 8' Strip. 4 40w F40T12. Std.	0.192	3.648	76 F32T8. 19 4L F32T8 EB.		0.106	2.014
Uniform Rm	18	1 2L 1x4 Strip. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.		0.058	0.058
Casino Attic, Catwalk	2	1 1L Keyless. 1 150w A.	0.150	0.150	1 27w Quad CF Screw In.		0.027	0.027
Casino Attic, Catwalk	2	37 1L Keyless. 1 75w R30.	0.075	2.775	37 18w Quad CF ER30 Screw In.		0.018	0.666
Surveillance, Hallway	24	11 4L 1x8 Recessed. 4 40w F40T12. Std.	0.192	2.112	44 F32T8. 11 4L F32T8 EB.		0.106	1.166
Surveillance, Hallway	24	9 1L Recessed Round. 1 72w A.	0.072	0.648	9 13w Quad CF ER30 Screw In.		0.013	0.117
Surveillance, Hallway	24	4 4L 2x4. 4 40w F40T12. Std.	0.192	0.768	8 F32T8. 4 2L F32T8 EB. Delamp & Recenter.		0.058	0.232
Breakroom, Keno Department	24	6 2L 1x4. 2 40w F40T12. Std.	0.096	0.576	12 F32T8. 6 2L F32T8 EB.		0.058	0.348
TV Room, Hallway	24	1 2L 1x4 Recessed. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.		0.058	0.058
Slot Mechanic	24	19 4L 8' Tandem Strip. 4 40w F40T12. Std.	0.192	3.648	76 F32T8. 19 4L F32T8 EB.		0.106	2.014
Slot Mechanic	24	2 2L 1x4 Strip. 2 40w F40T12. Std.	0.096	0.192	4 F32T8. 1 4L F32T8 EB. Tandem Wire.		0.053	0.106
Head Cashier	24	2 4L 2x4. 4 40w F40T12. Std.	0.192	0.384	8 F32T8. 2 4L F32T8 EB.		0.106	0.212
Beverage Manager	24	2 4L 2x4. 4 40w F40T12. Std.	0.192	0.384	8 F32T8. 2 4L F32T8 EB.	OS	0.106	0.212
Hallway	24	4 2L 1x4 Recessed Troffer. 2 40w F40T12. Std.	0.096	0.384	8 F32T8. 4 2L F32T8 EB.		0.058	0.232
Restaurant Manager	24	3 4L 2x4. 4 40w F40T12. Std.	0.192	0.576	12 F32T8. 3 4L F32T8 EB.	OS	0.106	0.318
Keno Manager's Office	12	4 2L 1x4 Recessed Troffer. 2 40w F40T12. Std.	0.096	0.384	8 F32T8. 2 4L F32T8 EB. Tandem Wire.	OS	0.053	0.212
Sports Book/Poker Rm Manager	12	2 2L 2x4 Troffer. 2 40w F40T12. Std. Already DL.	0.096	0.192	4 F32T8. 2 2L F32T8 EB.	OS	0.058	0.116
Slot Storage Rm	2	8 1L 4' Strip. 1 40w F40T12. Std.	0.057	0.456	8 F32T8. 2 4L F32T8 EB. Tandem Wire.	TT/.5H	0.027	0.212
Slot Storage Rm	2	4 1L 4' Strip. 1 40w F40T12. Std.	0.057	0.228	4 F32T8. 1 4L F32T8 EB. Tandem Wire.	TT/.5H	0.027	0.106
TV Shop	24	6 2L 1x8 Strip. 2 40w F40T12. Std.	0.096	0.576	12 F32T8. 3 4L F32T8 EB. Tandem Wire.	OS	0.053	0.318
TV Shop	24	1 2L 1x8 Strip. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.	OS	0.058	0.058
TV Shop	24	3 4L 1x8 Strip. 4 40w F40T12. Std.	0.192	0.576	12 F32T8. 3 4L F32T8 EB.	OS	0.106	0.318
TV Shop	24	1 2L 1x4 Strip. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.	OS	0.058	0.058
Slot Shop Office, Hallway	24	3 4L 2x4. 4 40w F40T12. Std.	0.192	0.576	12 F32T8. 3 4L F32T8 EB.		0.106	0.318
Lead Mechanic's Office	12	2 4L 2x4. 4 40w F40T12. Std.	0.192	0.384	8 F32T8. 2 4L F32T8 EB.	OS	0.106	0.212
Hilton Systems' Office	12	5 4L 2x4 Recessed Troffer. 4 40w F40T12. Std.	0.192	0.960	20 F32T8. 5 4L F32T8 EB.		0.106	0.530

Efficient Lighting System Installation and Energy Savings Worksheet								
Existing System Components					Recommended System Components			
Area	Hrs.	Fixture, Lamp & Ballast Type	Kw/Fx	Kw	(Fixture), Lamp & Ballast Type	Contro	Kw/Fx	Kw
Storage, Housekeeping	2	1 2L 1x4 Strip. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.		0.058	0.058
Power Vault	2	1 4L 1x8 Strip. 4 40w F40T12. Std.	0.192	0.192	4 F32T8. 1 4L F32T8 EB.		0.106	0.106
Power Vault	2	1 2L 1x4 Strip. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.		0.058	0.058
Power Vault, Hallway	24	4 1L 1x4 Strip. 1 40w F40T12. Std.	0.057	0.228	4 F32T8. 4 1L F32T8 EB.		0.029	0.116
Telephone Rm	2	17 4L 2x4 Recessed Troffer. 4 40w F40T12. Std.	0.192	3.264	68 F32T8. 17 4L F32T8 EB.		0.106	1.802
PBX Control Center	2	14 2L 1x8 Strip. 2 40w F40T12. Std.	0.096	1.344	28 F32T8. 7 4L F32T8 EB. Tandem Wire.		0.053	0.742
PBX Control Center	2	1 2L 1x8 Strip. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.		0.058	0.058
PBX Control Center	2	3 1L 1x4 Strip. 1 40w F40T12. Std.	0.057	0.171	3 F32T8. 1 3L F32T8 EB. Tandem Wire.		0.029	0.087
PBX Control Center, Hallway	24	1 2L 1x4 Wrap Wall Mount. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.		0.058	0.058
Housekeeping, Hallway	24	3 1L 1x4 Wrap Pendant Mount. 1 40w F40T12. Std.	0.057	0.171	3 F32T8. 3 1L F32T8 EB.		0.029	0.087
Housekeeping, Hallway	24	1 2L 1x8 Wrap Pendant Mount. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.		0.058	0.058
Housekeeping Offices	12	8 4L 2x4 Troffer. 4 40w F40T12. Std.	0.192	1.536	16 F32T8. 8 2L F32T8 EB. Delamp & Recenter.	OS	0.058	0.464
Housekeeping Reception	24	12 4L 2x4 Troffer. 4 40w F40T12. Std.	0.192	2.304	24 F32T8. 12 2L F32T8 EB. Delamp & Recenter.		0.058	0.696
Housekeeping, Break Rm/Restroom	24	3 1L Recessed Can. 1 75w R30.	0.075	0.225	3 13w Quad CF ER30 Screw In.		0.013	0.039
Photographer's Office	24	4 4L 2x4 Recessed Troffer. 4 40w F40T12. Std.	0.192	0.768	8 F32T8. 4 2L F32T8 EB. Delamp & Recenter.		0.058	0.232
Housekeeping, Hallway	24	6 1L 1x4 Wrap Wall Mount. 1 40w F40T12. Std.	0.057	0.342	6 F32T8. 6 1L F32T8 EB.		0.029	0.174
Housekeeping Storage	2	4 2L 1x8 Tandem Strip. 2 40w F40T12. Std.	0.096	0.384	8 F32T8. 2 4L F32T8 EB. Tandem Wire.		0.053	0.212
Housekeeping Storage	2	1 1L 1x4 Tandem Strip PM. 1 40w F40T12. Std.	0.057	0.057	1 F32T8. 1 1L F32T8 EB.		0.029	0.029
Air Handler Rm for Ran Lobby	2	6 2L 1x4 Strip Pendant Mount. 2 40w F40T12. Std.	0.096	0.576	12 F32T8. 6 2L F32T8 EB.		0.058	0.348
Air Handler Rm, Hallway	24	9 1L 1x4 Wrap Wall mount. 1 40w F40T12. Std.	0.057	0.513	9 F32T8. 9 1L F32T8 EB.		0.029	0.261
Vacuum Cleaner Repair Rm	24	2 4L 1x8 Strip. 4 40w F40T12. Std. (aka Ref Rep Rm).	0.192	0.384	8 F32T8. 2 4L F32T8 EB.		0.106	0.212
Vacuum Cleaner Repair Rm	24	2 2L 1x8 Strip. 2 40w F40T12. Std.	0.096	0.192	4 F32T8. 1 4L F32T8 EB. Tandem Wire.		0.053	0.106
Vacuum Cleaner Repair Rm	24	1 2L 1x4 Strip Pendant Mount. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.		0.058	0.058
Pump Rm	2	2 4L 1x8 Strip Pendant Mount. 4 40w F40T12. Std.	0.192	0.384	8 F32T8. 2 4L F32T8 EB.		0.106	0.212
Housekeeping Blanket Storage Area	2	3 4L 1x8 Tandem Strip. 4 40w F40T12. Std.	0.192	0.576	12 F32T8. 3 4L F32T8 EB.	TT/.5H	0.106	0.318
Housekeeping Blanket Storage Area	2	3 2L 1x8 Strip. 2 40w F40T12. Std.	0.096	0.288	6 F32T8. 3 2L F32T8 EB.	TT/.5H	0.058	0.174
Housekeeping Blanket Storage Area	2	18 1L 1x4 Wrap Wall Mount. 1 40w F40T12. Std.	0.057	1.026	18 F32T8. 18 1L F32T8 EB.	TT/.5H	0.029	0.522
Sales	12	74 4L 2x4. 4 40w F40T12. Std.	0.192	14.208	148 F32T8. 37 4L F32T8 EB. DL & Rctr & TW.		0.053	3.922
Sales	12	1 4L 2x4. 4 40w F40T12. Std.	0.192	0.192	2 F32T8. 1 2L F32T8 EB. Delamp & Recenter.		0.058	0.058
Sales	12	4 4L 2x4. 4 40w F40T12. Std. Nitelite.	0.192	0.768	8 F32T8. 2 4L F32T8 EB. DL & Rctr & TW.		0.053	0.212
Sales	12	1 4L 2x4. 4 40w F40T12. Std. Nitelite.	0.192	0.192	2 F32T8. 1 2L F32T8 EB. Delamp & Recenter.		0.058	0.058
Sales Conf Rm	12	8 4L 2x4. 4 40w F40T12. Std.	0.192	1.536	16 F32T8. 4 4L F32T8 EB. DL & Rctr & TW.		0.053	0.424
Pub & Catering	12	30 4L 2x4. 4 40w F40T12. Std.	0.192	5.760	60 F32T8. 15 4L F32T8 EB. DL & Rctr & TW.		0.053	1.590
Pub & Catering	24	2 4L 2x4. 4 40w F40T12. Std. Nitelite.	0.192	0.384	4 F32T8. 1 4L F32T8 EB. DL & Rctr & TW.		0.053	0.106
Pub & Catering	24	1 4L 2x4. 4 40w F40T12. Std. Nitelite.	0.192	0.192	2 F32T8. 1 2L F32T8 EB. Delamp & Recenter.		0.058	0.058

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Existing System Components					Recommended System Components			
Area	Hrs.	Fixture, Lamp & Ballast Type	Kw/Fx	Kw	(Fixture), Lamp & Ballast Type	Contro	Kw/Fx	Kw
Pub & Catering	12	1 2L 2x2. 2 40w FB40T12. Std.	0.096	0.096	2 FBO31T8. 1 2L FBO31T8 EB.		0.058	0.058
Room Reservations	15	2 2L 2x4 Recessed Troffer. 2 40w F40T12. Std.	0.096	0.192	4 F32T8. 2 2L F32T8 EB.	OS	0.058	0.116
Room Reservation, Office	15	2 2L 2x4 RT Paracube. 2 34w F40T12. Std.	0.082	0.164	6 F32T8. 2 3L F32T8 EB.	OS	0.087	0.174
Room Reservation, Office	15	2 1L 2x4 RT Paracube. 1 34w F40T12. Std.	0.050	0.100	.			
Room Reservation Main Area	15	17 2L 2x4 Recessed Troffer. 2 34w F40T12. Std.	0.082	1.394	51 F32T8. 17 3L F32T8 EB.		0.087	1.479
Room Reservation Main Area	15	17 1L 2x4 Recessed Troffer. 1 34w F40T12. Std.	0.050	0.850	.			
Room Reservation Main Area	15	2 1L Track Can. 1 75w R30.	0.075	0.150	2 13w Quad CF ER30 Screw In.		0.013	0.026
Room Reservation Main Area	24	4 2L 2x4 RT. 2 34w F40T12. Std. NiteLite.	0.082	0.328	12 F32T8. 4 3L F32T8 EB.		0.087	0.348
Room Reservation Main Area	24	4 1L 2x4 RT. 1 34w F40T12. Std. NiteLite.	0.050	0.200	.			
Air Handler Rm (Equipment Rm)	2	19 1L 1x4 Strip. 1 40w F40T12. Std.	0.057	1.083	19 F32T8. 19 1L F32T8 EB.		0.029	0.551
Motor Control Rm	2	1 2L 1x8 Strip. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.	TT/.5H	0.058	0.058
Equipment Rm, Hallway	24	1 2L 2x4 Surface Mount. 2 40w F40T12. Std. Most DL.	0.096	0.096	1 F32T8. 1 1L F32T8 EB. DL Remaining & Rctr.		0.029	0.029
Equipment Rm, Hallway	24	7 1L 1x4 Wrap Wall Mount. 1 40w F40T12. Std.	0.057	0.399	7 F32T8. 7 1L F32T8 EB.		0.029	0.203
Sound Rm Storage	2	3 4L 1x8. 4 40w F40T12. Std.	0.192	0.576	12 F32T8. 3 4L F32T8 EB.	OS	0.106	0.318
Banquet Storage Rm	2	14 2L 1x8. 2 40w F40T12. Std.	0.096	1.344	28 F32T8. 7 4L F32T8 EB. Tandem Wire.	OS	0.053	0.742
Banquet Storage Rm	2	1 2L 1x8. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.	OS	0.058	0.058
Accounting, Elevator	24	3 1L 1x4 Wrap Ceiling Mount. 1 40w F40T12. Std.	0.057	0.171	3 F32T8. 3 1L F32T8 EB.		0.029	0.087
Accounting, Storage Rm	2	1 2L 1x8 Strip. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.		0.058	0.058
Accounting, Hallway	24	1 2L 2x2 Surface Mount. 2 40w FB40T12. Std.	0.096	0.096	2 FBO31T8. 1 2L FBO31T8 EB.		0.058	0.058
Accounting, Hallway	24	1 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.192	4 F32T8. 1 4L F32T8 EB.		0.106	0.106
Accounting, Hall, Keno Audit Off	24	12 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	2.304	48 F32T8. 12 4L F32T8 EB.	OS	0.106	1.272
Casino Audit Supervisor's Office	12	2 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 2 2L F32T8 EB. Delamp & Recenter.	OS	0.058	0.116
Casino Audit, Storage	2	1 1L 1x4 Strip. 1 40w F40T12. Std.	0.057	0.057	1 F32T8. 1 1L F32T8 EB.	TT/.5H	0.029	0.029
Casino Audit, Office	15	3 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.576	6 F32T8. 3 2L F32T8 EB. Delamp & Recenter.	OS	0.058	0.174
Casino Audit, Gen Audit Off Area	15	27 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	5.184	54 F32T8. 27 2L F32T8 EB. Delamp & Recenter.		0.058	1.566
Casino Audit, Gen Audit Off Area, Off	15	2 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.384	8 F32T8. 2 4L F32T8 EB.	OS	0.106	0.212
Casino Audit, Gen Aud Off Area, Stor	2	1 1L 1x4 Strip. 1 40w F40T12. Std.	0.057	0.057	1 F32T8. 1 1L F32T8 EB.	TT/.5H	0.029	0.029
Casino Audit, Computer	15	11 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	2.112	44 F32T8. 11 4L F32T8 EB.		0.106	1.166
Casino Audit, Computer, Office	15	2 4L 2x4. 4 40w F40T12. Std.	0.192	0.384	8 F32T8. 2 4L F32T8 EB.	OS	0.106	0.212
Casino Audit, Computer, File Rm	15	2 1L 1x4 Strip. 1 40w F40T12. Std.	0.057	0.114	2 F32T8. 2 1L F32T8 EB.	TT/.5H	0.029	0.058
Comptroller's Office	15	28 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	5.376	56 F32T8. 28 2L F32T8 EB. Delamp & Recenter.		0.058	1.624
Comptroller's Office, Office	15	2 4L 2x4. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 2 2L F32T8 EB. Delamp & Recenter.	OS	0.058	0.116
Comptroller's Office, Office	15	2 4L 2x4. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 2 2L F32T8 EB. Delamp & Recenter.	OS	0.058	0.116
Comptroller's Office, Office	15	2 4L 2x4. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 2 2L F32T8 EB. Delamp & Recenter.	OS	0.058	0.116
Comptroller's Office, Storage	2	1 2L 1x4 Surface Mount. 2 40w F40T12. Std.	0.096	0.096	1 F32T8. 1 1L F32T8 EB. Delamp & Recenter.	TT/.5H	0.029	0.029

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Area	Hrs.	Fixture, Lamp & Ballast Type	Kw/Fx	Kw	(Fixture), Lamp & Ballast Type	Contro	Kw/Fx	Kw
Treasurer's Office	24	1 8L 4x4. 8 40w F40T12. Std.	0.384	0.384	8 F32T8. 2 4L F32T8 EB.		0.212	0.212
Treasurer's Office	24	6 1L Track Can. 1 75w R30.	0.075	0.450	6 13w Quad CF ER30 Screw In.		0.013	0.078
Treasurer's Office, Bathroom	24	2 1L Recessed Can. 1 75w R30.	0.075	0.150	2 13w Quad CF ER30 Screw In.		0.013	0.026
Comptroller's Office, Storage	2	1 2L 1x4 Surface Mount. 2 40w F40T12. Std.	0.096	0.096	2 F32T8. 1 2L F32T8 EB.	TT/.5H	0.058	0.058
Comptroller's Off, Cust Closet	2	1 1L Recessed Can. 1 75w R30.	0.075	0.075	1 18w Quad CF ER30 Screw In.		0.018	0.018
Executive Offices, Restroom, Women's	24	15 1L Recessed Can. 1 75w R30.	0.075	1.125	15 18w Quad CF ER30 Screw In.		0.018	0.270
Hallway	24	32 2L 2x2 Recessed Troffer. 2 40w FB40T12. Std.	0.114	3.648	64 FBO31T8. 32 2L FBO31T8 EB.		0.058	1.856
Executive Breakroom	24	2 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 1 4L F32T8 EB. DL & Rctr & TW.	OS	0.053	0.106
Mail Room	24	10 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	1.920	20 F32T8. 5 4L F32T8 EB. DL & Rctr & TW.	OS	0.053	0.530
Mail Room	24	1 2L 2x2 Surface Mount. 2 40w FB40T12. Std.	0.114	0.114	2 FBO31T8. 1 2L FBO31T8 EB.	OS	0.058	0.058
Mail Room Storage	2	4 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.768	8 F32T8. 2 4L F32T8 EB. DL & Rctr & TW.	OS	0.053	0.212
Audit Storage	2	1 4L 2x4 Recessed Troffer. 4 40w F40T12. Std.	0.192	0.192	2 F32T8. 1 2L F32T8 EB. Delamp & Recenter.	OS	0.058	0.058
Main Accounting Offices	24	14 4L 2x4 Surface Mt. 4 40w F40T12. Std. Some DL.	0.192	2.688	28 F32T8. 7 4L F32T8 EB. DL & Rctr & TW.		0.053	0.742
Main Accounting Offices	24	1 4L 2x4 Surface Mount. 4 40w F40T12. Std. Some DL.	0.192	0.192	2 F32T8. 1 2L F32T8 EB. Delamp & Recenter.		0.058	0.058
Main Accounting Offices	24	2 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 1 4L F32T8 EB. DL & Rctr & TW.	OS	0.053	0.106
Main Accounting Offices, Office	24	2 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 1 4L F32T8 EB. DL & Rctr & TW.		0.053	0.106
Main Accounting Offices, Office	24	4 4L 2x4 Recessed Troffer. 4 40w F40T12. Std.	0.192	0.768	8 F32T8. 2 4L F32T8 EB. DL & Rctr & TW.		0.053	0.212
File Rm	15	2 4L 2x4 Troffer. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 1 4L F32T8 EB. DL & Rctr & TW.	OS	0.053	0.106
File Rm	15	1 4L 2x4 Troffer. 4 40w F40T12. Std.	0.192	0.192	2 F32T8. 1 2L F32T8 EB. DL & Rctr & TW.	OS	0.058	0.058
Mr Bigelow's Secretary's Office	12	2 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 1 4L F32T8 EB. DL & Rctr & TW.		0.053	0.106
Mr Bigelow's Office	12	1 8L 4x4 Ceiling Mount. 8 40w F40T12. Std.	0.384	0.384	8 F32T8. 2 4L F32T8 EB.	OS	0.212	0.212
Mr Bigelow's Office	12	4 1L Recessed Can. 1 75w R30.	0.075	0.300	4 13w Quad CF ER30 Screw In.	OS	0.013	0.052
Mr Dejura's Office, Secretary	12	2 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 1 4L F32T8 EB. DL & Rctr & TW.		0.053	0.106
Mr Dejura's Office, Secretary	12	1 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.192	2 F32T8. 1 2L F32T8 EB. Delamp & Recenter.		0.058	0.058
Mr Dejura's Office	12	2 8L 4x4 Recessed Troffer. 8 40w F40T12. Std.	0.384	0.768	16 F32T8. 4 4L F32T8 EB.		0.212	0.424
Mr Dejura's Office	12	10 1L Recessed Can. 1 75w R30.	0.075	0.750	10 13w Quad CF ER30 Screw In.		0.013	0.130
Mr Dejura's Office, Restroom Area	2	3 1L Recessed Can. 1 75w R30.	0.075	0.225	3 13w Quad CF ER30 Screw In.		0.013	0.039
Mr Dejura's Office	12	1 1L Table Lamp. 1 75w A.	0.075	0.075	1 13w CF Screw In.		0.013	0.013
Board Rm	2	4 8L 4x4. 8 40w F40T12. Std.	0.384	1.536	16 F32T8. 8 2L F32T8 EB. DL & Rctr & TW.		0.116	0.464
Board Rm	12	2 1L Table Lamp. 1 75w A.	0.075	0.150	2 13w CF Screw In.	OS	0.013	0.026
Board Rm	12	19 1L Track Can. 1 75w R30. Dimmer.	0.075	1.425	19 45w PAR 38.	OS	0.045	0.855
Hotel Manager's Offce, Secretary	12	2 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 2 2L F32T8 EB. Delamp & Recenter.		0.058	0.116
Hotel Manager's Offce	12	4 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.768	8 F32T8. 4 2L F32T8 EB. Delamp & Recenter.		0.058	0.232
Food and Beverage Office, Secretary	12	2 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 2 2L F32T8 EB. Delamp & Recenter.		0.058	0.116
F&B Mgr Office	12	3 4L 2x4 Recessed Troffer. 4 40w F40T12. Std.	0.192	0.576	6 F32T8. 3 2L F32T8 EB. Delamp & Recenter.		0.058	0.174

Efficient Lighting System Installation and Energy Savings Worksheet								
Existing System Components					Recommended System Components			
Area	Hrs.	Fixture, Lamp & Ballast Type	Kw/Fx	Kw	(Fixture), Lamp & Ballast Type	Contro	Kw/Fx	Kw
F&B Mgr Office	12	7 1L Recessed Can. 1 75w R30.	0.075	0.525	7 13w Quad CF ER30 Screw In.		0.013	0.091
Food and Beverage, Back Office	12	2 4L 2x4 Surface Mount. 4 40w F40T12. Std.	0.192	0.384	4 F32T8. 2 2L F32T8 EB. Delamp & Recenter.	OS	0.058	0.116
					.			

Existing System Kilowatt Consumption =	203.844	Recommended System Kilowatt Consumption = 93.317
Recommended System Kilowatt Consumption =	93.317	
Saved System Kilowatt Consumption =	-110.527	
% Change in System Kilowatt Consumption =	-54.2%	
Existing System Kilowatt-Hour Consumption =	1,245,220	
Recommended System Kilowatt-Hour Consumption =	455,920	
Saved System Kilowatt-Hour Consumption =	-789,300	
% Change in System Kilowatt-Hour Consumption =	-63.4%	

CB Patt - Checkerboard Pattern
Disc - Disconnect
DL - Delamp
EB - Electronic Ballast
MT - Mount
PL - Parallel
PM - Pendant Mount
Rctr - Recenter
RT - Recessed Troffer
Std - Standard Ballast
TW - Tandem Wire