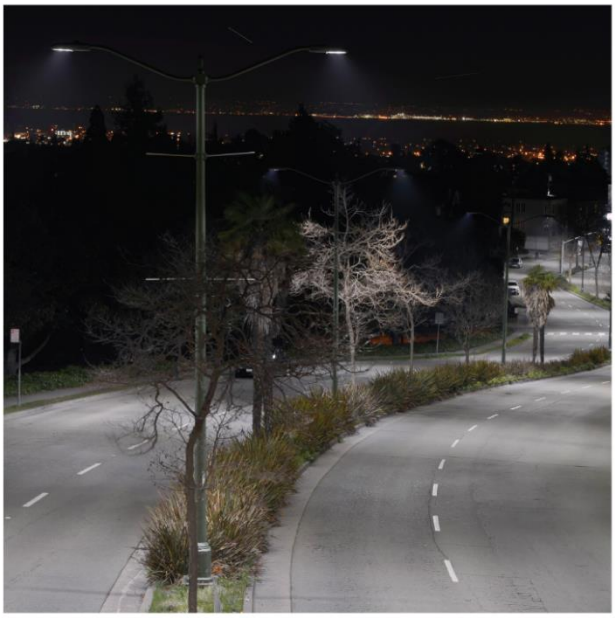

TankoLighting

STREETLIGHT TRANSITION ASSESSMENT
FOR THE
CITY OF CUPERTINO, CA

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PROJECT BACKGROUND

Tanko Lighting was engaged by the City of Cupertino to develop an assessment of a potential Light Emitting Diode (LED) conversion and operational options related to the streetlight assets located within the City.

The City's streetlight system is currently primarily comprised of Induction fixtures (IND), as well as High Pressure Sodium (HPS), Light Emitting Diode (LED), and Metal Halide (MH). Additionally, a small portion of the fixtures are owned by the utility company, Pacific Gas & Electric (PG&E).

The City requested a scope of work that assists in reviewing the existing streetlight data and standards, developing updated design guidelines for an LED streetlight system, and providing a financial analysis for converting the City-owned streetlights to LED.

METHODOLOGY

Tanko Lighting used the following methodology to complete this analysis:

- Existing Streetlight Data: Reviewed Cupertino's GIS Light Poles records for a comprehensive understanding of the City's streetlight system.
- Inventory Analysis: Reviewed the City's recent utility bills and utility inventories to determine the estimated current inventory.
- City Guidelines: Reviewed the existing Department of Public Work's *Streetlight Standard Details* and *Cupertino Municipal Code Chapter 19.102: Glass and Lighting Standards* to familiarize with the City's lighting standards and protocols.
- Rate Analysis: Analyzed the current electricity rates and the potential new rates to calculate the estimated impact of converting to LED fixtures.
- LED Conversion Analysis: Developed budgetary estimates for the LED conversion based on average material costs, installation costs, and pricing in the City's region.
- Maintenance Analysis: Estimated budget for the required maintenance services based on the nationwide industry standard of services and average pricing in the region for LED.
- Ownership Analysis: Evaluated the difference in energy and maintenance costs if the City were to purchase a subset of streetlights currently on PG&E's LS-1 rates.

DATA REVIEW

Tanko Lighting compared the City's existing PG&E streetlight inventory, as well as the City's GIS Light Pole records, with its standard list of streetlight attributes (typically collected during its streetlight field audits) to determine if any information was missing that would be critical to the subsequent stages of the project.

Based on a review of a subset of the City's data for cobra head streetlights, Tanko Lighting concluded that the data appeared to be spatially accurate. In addition, the data appeared to cover the entire City and included useful fields, such as unique identification number, latitude/longitude coordinates, pole number, lamp type, wattage, fixture type, feed type, pole material, length of arm, pole base configuration, number of heads on pole, photocell or shorting cap, ownership, maintainer, and rate schedule.

However, it was also determined that, while decent, the existing data is insufficient if the City were to proceed with a comprehensive LED replacement design of the fixtures for the following reasons:

- Confirmed Quantities: Although the data appears to cover the entire City, Tanko Lighting cannot confirm with certainty the quantity of lights in the City.

- Accuracy of Existing Conditions: The existing data does not include any information on existing conditions, such as any visible issues like pole leaning, fixture damage, tree obstructions, etc., which are critical to properly preparing for an LED conversion.

- Lack of Existing Elements Informing Design: Important fields missing in the City's data that are vital to the LED replacement design process include: pole distance to street, street width, street design/configuration (e.g., cul-de-sac, intersection, crosswalk, bridge, roundabout, etc.), arm angle, and shields.

- Verification of Pole Numbers: An LED conversion typically involves an analysis of existing pole numbers and labels to verify complete pole numbers/labels and confirm locations where numbers/labels are damaged or missing. Not only is this necessary for LED replacement design and installation implementation, but also for accurately reconciling existing data with utility records – which is a necessary part of preparing for an LED conversion.

- Decorative Fixtures: While the City's data currently classifies decorative fixtures as "ornamental", there are no photos, base size measurements, subclassifications (e.g., post top or pendant), or internal clearance measurements of these existing fixtures in the City's data. This information is necessary if decorative fixtures are included in an LED conversion because they are non-standard and typically require custom retrofits.

While the City's existing data was useful to prepare this analysis, the collection of additional information may be necessary prior to an LED conversion.

STANDARDS/GUIDELINES REVIEW

Tanko Lighting utilizes Illuminating Engineering Society (ANSI/IES) RP8 standards when designing for roadways and rights-of-way. Additionally, Tanko Lighting utilizes Trade Manual 12-12 for direction on light level equivalencies between high intensity discharge (HID) and LED fixtures, and maintains a working knowledge of all the latest publications and updates in the market. In Tanko Lighting's experience, guidelines should either define spill light and sky glow limitations or require specific luminaire optics.

The following are helpful terms to understand when discussing Streetlight Standards and Guidelines:

- Backlight, Uplight, and Glare (BUG) Rating – a rating based on directional lumen output used to evaluate luminaire optical performance related to the potential for light trespass, sky glow, and high-angle brightness control. A luminaire is assigned a BUG rating based on its lumen output in the various Backlight (B), Uplight (U), and Glare (G) zones. BUG ratings are assigned a value between 0 to 5. Lower BUG ratings result in less light trespass and glare.
- Color Rendering Index (CRI) – the measurement of the ability of a light source to render colors. The higher the CRI, the better the rendering of color and the more accurately colors are reflected.
- Correlated Color Temperature (CCT) – the measurement of the visual "warmth" and "coolness" of a light bulb expressed in Kelvin. The higher the CCT, the cooler the light appears.
- Foot-Candle – the unit of measure expressing the quantity of light received on a surface. One foot-candle is the illuminance produced by a candle that is one foot away from a surface that is one square foot.
- Light Trespass – the light that falls beyond the area it is intended to illuminate.
- Lumen Output – the measurement of visible light from a light source.
- Photometric Readings – the measurements of the brightness and quality of visible light emitted by a light source.

With this in mind, Tanko Lighting reviewed the City's existing streetlight standards, including the Department of Public Work's *City of Cupertino Standard Details* and the *Cupertino, CA Municipal Code Chapter 19.102: Glass and Lighting Standards*. Based on current industry standards and best practices, Tanko Lighting recommends the following revisions to the City's confirmed guideline priorities and standards:

Department of Public Work's City of Cupertino Standard and Details:
Tanko Lighting recommends revising the Cupertino Lighting Notes (page 68) to reference LEDs in lieu of IND lighting.

- The City standard should be revised from IND to LED. Typical wattages should be revised to 20W-30W (3,000 lumens) on residential roads, 40W-50W (4,000-5,000 lumens) on collector roads, and 65W-85W (8,000-9,000 lumens) on arterial roads.

- The term "cut-off" should be removed, as this is a term specific to IND or HPS lighting. Instead, the City should require all lighting to be International Dark Sky (IDA)-approved. With this edit, all new fixture installations in the City will be required to follow the industry standard for sky glow limitations.

- Whereas a typical IND fixture indiscriminately distributes light in all directions, an LED fixture directs light spread to where it is needed most – on the roadway. Thus, Tanko Lighting recommends the following LED distribution types: Type II for residential roads, Type III for arterial roads, and Type IV for cul-de-sacs/knuckles, with the assumption that the arm direction is perpendicular to the street.

- Streetlight arm length at a cul-de-sac should not differ from a streetlight on a standard street. The Type IV distribution, which is recommended for cul-de-sacs, emits light in a more circular pattern to match these specific types of roadways. While having a set standard arm length can be helpful, the streetlight head should generally be placed two feet from the face-of-curb (FOC).

Cupertino, CA Municipal Code Chapter 19.102: Glass and Lighting Standards:
Section 19.102.040 (*Outdoor Lighting Requirements*) sets submittal requirements and lighting standards that apply to private development, not to streetlighting in the public right-of-way. Tanko Lighting recommends including the following guidelines to reflect current industry standards for LED streetlighting:

- Streetlighting Standards:

1. All streetlights shall be installed in a manner such that light emitted by the luminaire is directed downward to the public right-of-way to meet the particular lighting need and away from adjacent properties to avoid light trespass.
2. All streetlighting sources shall have a maintained Correlated Color Temperature (CCT) of 3,000 Kelvin or less and have a Color Rendering Index (CRI) of 70 or better.
3. All streetlights shall be Design Lights Consortium (DLC) listed and/or Energy Star-qualified and International Dark Sky (IDA)-approved.
4. All new streetlight fixtures shall have a dimmable driver, aluminum housing, and include a seven-pin receptacle.
5. Illumination levels for a streetlight or combination of exterior lights should not cast light exceeding zero point one (0.1) foot-candle onto an adjacent or nearby property.
6. Lumen output and BUG ratings for all streetlights will adhere to the following table:

Table 1
General Streetlighting Standards

Street Classification	Average Lumen Output Range	Minimum BUG Rating
Residential	2500 - 3500	B1-U0-G1
Collector	4500 - 6000	B1-U0-G2
Arterial	8000 - 12000	B2-U0-G2

7. Generally, the suggested spacing between streetlights is 150-200 feet apart. New streetlight installations should meet these spacing recommendations, or a photometric plan may be prepared by a professional engineer, or someone qualified in outdoor lighting to determine the exact spacing.

LED STREETLIGHT DESIGN GUIDELINES

When working on an LED design, Tanko Lighting uses the existing HID wattages to help guide the selection of replacement LED wattages. The goal is to avoid unnecessary lighting or light trespass into residences and keep light levels in the right-of-way

consistent with existing light levels. This process yields a City-wide standard design that will create uniform and predictable light levels.

The City is comprised of numerous neighborhoods. There are a mix of residential, collector, and arterial roads – and multiple arterial roads with special lighting considerations. The City has a variety of lamp types ranging from Induction (IND), High-Pressure Sodium (HPS), Metal Halide (MH), and LED. The most common lamp type in residential areas is a 40W induction cobra head. As technology has improved, the industry standard moved away from induction lighting and towards LED technologies. Induction fixtures by design are at best 55% - 60% efficient at the delivery of the rated lumens. LEDs require less power to emit the same lumen output as induction and other high intensity discharge lighting equivalents. Other key advantages of LEDs are longer lifespans and a higher color rendering index.

Tanko Lighting utilizes Trade Manual 12-12 for direction on light level equivalencies between HID and LED and maintains a working knowledge of all the latest publications and updates in the market. As such, Tanko Lighting recommends three approximate wattage levels for the LED replacement cobra head fixtures: residential (20W-30W), collector (40W-50W), and arterial (65W-85W).

Please find a comparison of these recommendations with the existing IND fixtures, in Table 2, below.

Table 2
Comparison of Recommended LED Wattages with IND Wattages

Street Classification	IND	Estimated IND Lumens	LED	Ideal LED Lumens
Residential	40-55W	2800 - 3000	Low (20-30W)	2500 - 3500
Collector	85W-100W	4800 - 8000	Medium (35-50W)	4500 - 6000
Arterial	120-150W	8500 - 10900	High (65-85W)	8000 -12000

Correlated Color Temperature (CCT) is the measurement of the visual "warmth" and "coolness" of a luminaire expressed in Kelvin (K). The higher the CCT, the cooler and more blue the light appears. Currently, the Induction lighting in the City has an estimated CCT that ranges from 4000-5000K. Tanko Lighting would recommend the replacement LED fixtures to have a warmer CCT of around 2700K. Warmer color temperatures for LEDs have become the industry standard. CCT of 2700K is in compliance with the City's current Dark Sky ordinance.

In Tanko Lighting's experience, a critical initial step in proper design involves photometric analysis, which is an examination of the distribution or "spread" of light from the fixture onto the ground. Unlike IND or HPS fixtures, which indiscriminately throw light in all directions, LEDs intentionally direct the light to where it is needed most – on the roadway. During a granular LED design, a consultant would not only review photometric readings, but also consider multiple attributes for each location, such as road width, crosswalks, intersections, and arm angle, before selecting a distribution type. For the City, Tanko Lighting recommends three optic types:

- Type II: Type II distribution would be used for narrower streets or those where buildings have small setbacks from the road. This reduces the chances of light trespass into residences.

- Type III: Type III distribution would be used for wide roads or large areas with isolated lights. This allows light to adequately cover traffic lanes, sidewalks, and highlight other important features in the public right-of-way.

- Type IV: Type IV distribution would be used for cul-de-sac, 45-degree intersections, or areas such as parking lots. The Type IV distribution emits light in a more circular pattern to match these types of roadways.

These wattage and distribution guidelines are general indicators of good design. However, it should be noted that a proper and comprehensive design conducted at a granular level is critical for the City to prepare for a successful LED conversion. During a granular LED design:

- A consultant works with the City to select a fixture that best meets the design criteria and the City's preferences. Tanko Lighting recommends conducting a pilot project, which will allow the City to evaluate different LED wattages, manufacturers, and color temperatures in the field. Upon installation, photos and field measurements can be taken of

light levels of both the piloted fixtures and a corresponding subset of the City's existing LED and induction fixtures. Currently, the City has been installing CREE Lighting RSWS fixtures in 2700K, which complies with Tanko Lighting's design recommendations and guidelines. However, through the pilot project the City can consider additional brands and models of LED streetlights. In Tanko Lighting's experience, municipalities have seen the most success with such manufacturers as Cooper, Philips, GE, and AEL.

- A consultant develops specific recommendations for decorative lights, including retrofit options, that would be more cost effective and maintain existing aesthetics than full head replacements. This process would include a review of each location, wattage, style, purpose, and existing housing to select replacement options (both retrofit and full head replacement).

- A consultant can work with City staff to identify potential areas in need of special consideration. Soliciting this feedback will help determine areas that might be over-or-under lit and are public safety concerns All recommended fixtures will be International Dark Sky approved. For areas with any existing concerns of light trespass, additional shielding options are available. House side shields are recommended if light trespass is affecting the house side of the fixture (behind the pole). Street side shields are recommended if light trespass is affecting the street side of the fixture (across the street). Left and right-side shields are recommended if light trespass is affecting either side of the fixture.

FINANCIAL ANALYSIS OF LED CONVERSION

Tanko Lighting analyzed the financial impacts of the City shifting from the status quo of its current streetlight system and proceeding with the LED conversion of its streetlights. Please find the results of this analysis in Table 3, as well as the subsequent Graphs 1, 2 and 3, below. This analysis assumes a federal inflation rate of 4% and energy cost inflation rate 1%. The analysis included the following assumptions and data points:

- The estimated cost of the City collecting the necessary data, completing a LED design, as well as procuring and implementing activities for the LED conversion of the City's existing 2,963 City-owned IND, HPS, and MH streetlights on PG&E's LS-2 rates.

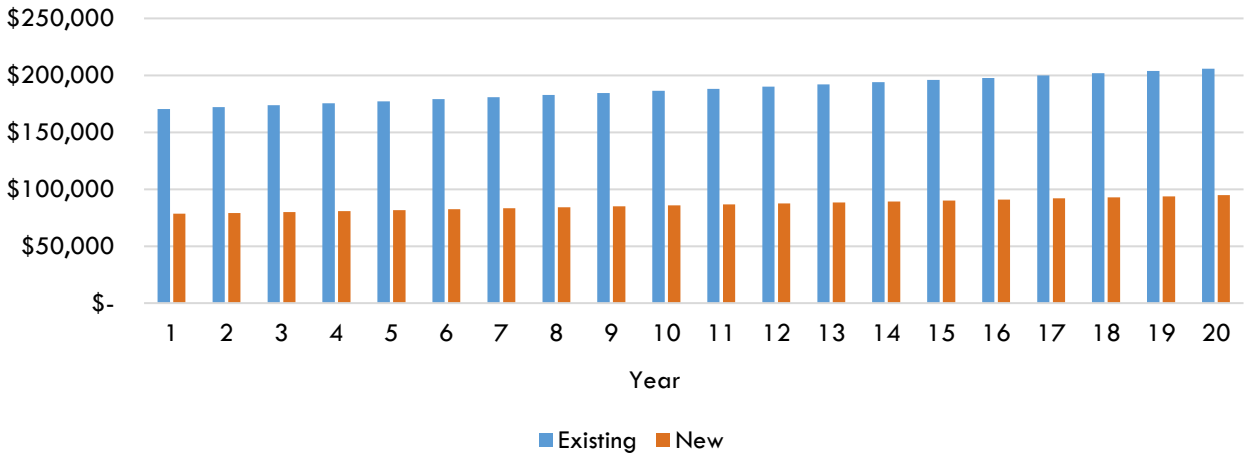
Please see Appendix A: Financial Analysis & Assumptions for detailed results.

Please note that, in addition to the LED conversion, the City has the option of purchasing the remaining 374 streetlight fixtures currently on PG&E's LS-1rate – please find more information on this option in the Ownership Transfer of Utility-Owned Fixtures section, below.

Table 3
Financial Analysis of LED Streetlight Conversion of the City-Owned Lights

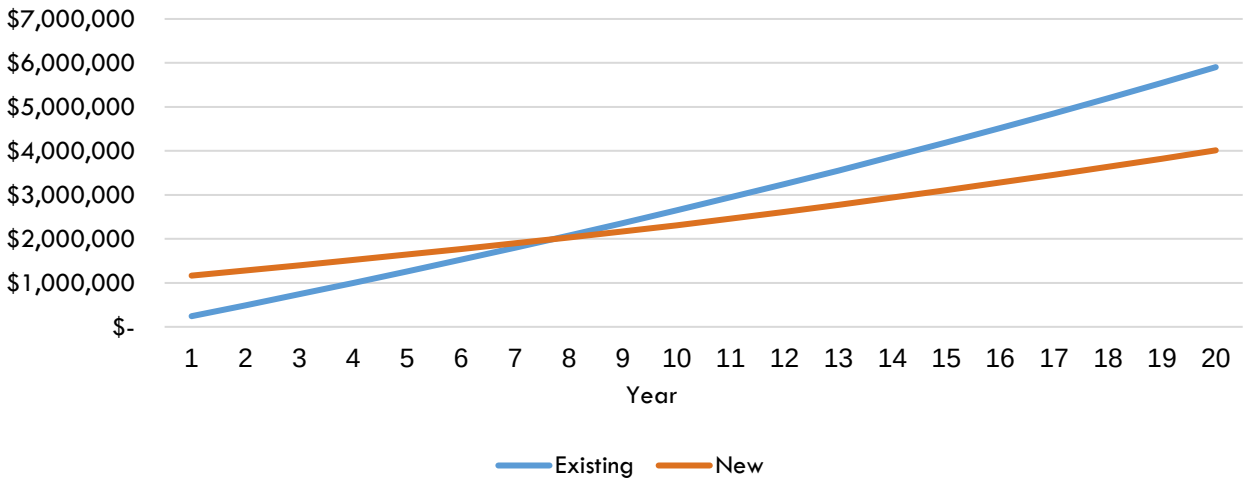
Estimated LED Conversion Cost	Net 20 Year Savings (Energy + Maintenance Savings - LED Conversion Cost)	Payback Period
$1,050,046	$1,891,098	8.02 years

Graph 1
LED Conversion of the City-Owned Lights
Annual Energy Costs



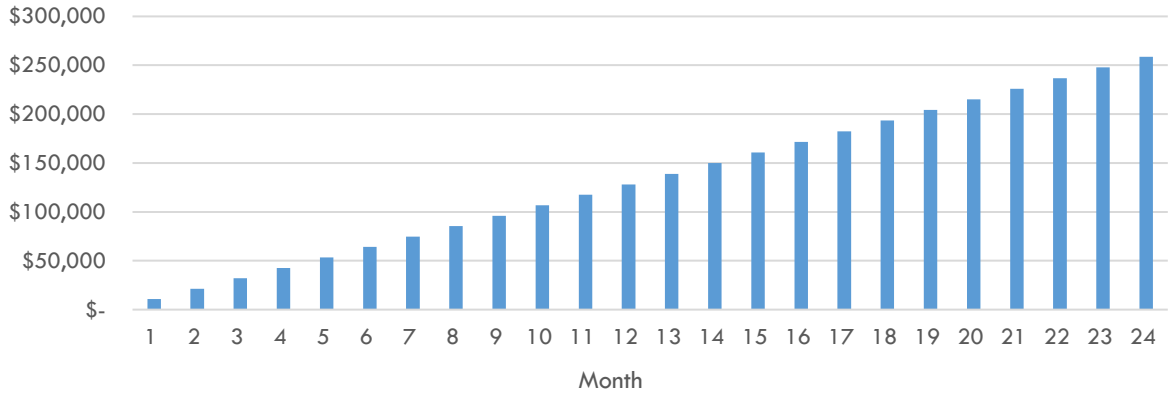
The blue bar in Graph 1 represents the existing system costs for the City-owned streetlight fixtures and the orange bar represents the energy costs for the next 20 years once all the City-owned streetlight fixtures are converted to LED. Graph 1 depicts the energy savings of the LED conversion of the City-owned streetlights.

Graph 2
LED Conversion of the City-Owned Lights
Cumulative Annual Costs



Graph 2 represents the cumulative costs (energy, system, and maintenance) for the next 20 years for both the existing City-owned streetlighting system and fully converted City-owned streetlighting system. The intersection of the two lines represents the return on investment.

Graph 3
LED Conversion of the City-Owned Lights
Cumulative Opportunity Costs



Graph 3 represents the cumulative opportunity costs the City would incur by delaying the City-owned streetlighting system conversion to LEDs.

FUNDING & INCENTIVES

Incentives were not included in the financial analysis of the LED conversion. The most common incentive for municipal streetlight projects is utility-sponsored rebates. However, based on Tanko Lighting's understanding, there are currently no rebates available through PG&E that correspond to an LED streetlight conversion. That being said, there are other potential funding opportunities available to the City.

As of January 2023, the Department of Energy has approved over $430 million in direct funding through its Energy Efficiency and Conservation Block Grant Program (EECBG). Eligible state, local and tribal governments can use the funding to assist in strategies that improve energy efficiency. The EECBG program can fund municipal LED streetlight conversion and other streetlight-related projects. The City of Cupertino is eligible for formula grant funding and has been allocated $125,790. The City can apply for funding through January 31, 2024. However, it is important to note that if the City intends to apply, it must reserve funding by submitting its Pre-Award Information Sheet by April 28, 2023. Please contact Tanko Lighting for more information.

FINANCING OPTIONS

PG&E offers on-bill financing options to municipalities to obtain low interest loans for a wide range of energy efficient projects. Loans are repaid based on projected energy savings, via installments on the City's monthly PG&E bill. After the loan is repaid, the energy savings that resulted from the conversion will translate into lower utility costs and savings for the City.

The industry standard for financing municipal streetlight conversion projects is either through public or private financing. While there are advantages and disadvantages to both, Tanko Lighting suggests private financing. Some pros and cons of each include:

Public Financing:

- Interest rates are much lower than private
- Could require voter approval
- Advertising and election costs
- Staff burden, particularly with reporting requirements
- Lengthy process
- Prepayment penalties
- Term may exceed rated equipment life
- Hidden fees
- More relevant for large and long-term projects

Private Financing:

- Interest rates subject to current market conditions
- Might not need voter approval
- Energy cost savings from the streetlight upgrade repay the financing
- Streamlined process
- No upfront costs
- Documentation is simpler, and the process is streamlined
- Staff burden is minimized
- No hidden fees or reporting requirements
- Rated equipment life matches the lease term

Municipalities can secure private financing through third party entities, which typically offer low-interest financing that includes all costs related to the project, and are repaid through the project's savings. Some private financing options that are available to a municipality include local or national banks, manufacturer-specific financing programs, and private companies. These financing options do not impact the City's ability to borrow for other projects, as the streetlight conversion will have its own positive cash flows. Tanko Lighting made a conservative estimate for the City of Cupertino that a loan considering for LED conversion costs would entail a 4% rate over varying terms.

Table 4
Private Financing Option

Financing Rate	Loan Period	Total Interest Paid	Project Payback Period with Financing
4%	10 years	$225,699	9.31 years

OWNERSHIP TRANSFER OF UTILITY-OWNED FIXTURES

In addition to an LED conversion of the City-owned fixtures, the City can also alter the status quo of its existing streetlight system by purchasing the remaining 374 PG&E-owned fixtures currently on LS-1 rates from PG&E and converting the remaining 5 HPS fixtures in this group to LED fixtures.

There are a variety of benefits if this City pursues this option, including:

1. Lower streetlight energy rates for the City.

2. Lower maintenance costs for the City.

3. Improved response time for repairs. Note that the most common complaint from municipalities with utility-owned systems is that maintenance response timelines are slow, and the infrastructure is not well maintained. While the utility will still play a role in the overall health of the system, the City will be able to dispatch its maintenance contractor at the pace that it determines is best to address repair issues.

4. Standardization and control of the lighting levels and coverage throughout the City's roadways.

With this option, the City would:

- Transfer all streetlights to the LS-2 City-owned electricity rate for the streetlight system.

- Upon completion of the LED conversion of the 5 HPS streetlights, transfer to an LS-2 LED fixture electricity rate for the streetlight system. The LS-2 rate for a converted LED will be lower than that of the previous HPS streetlight.

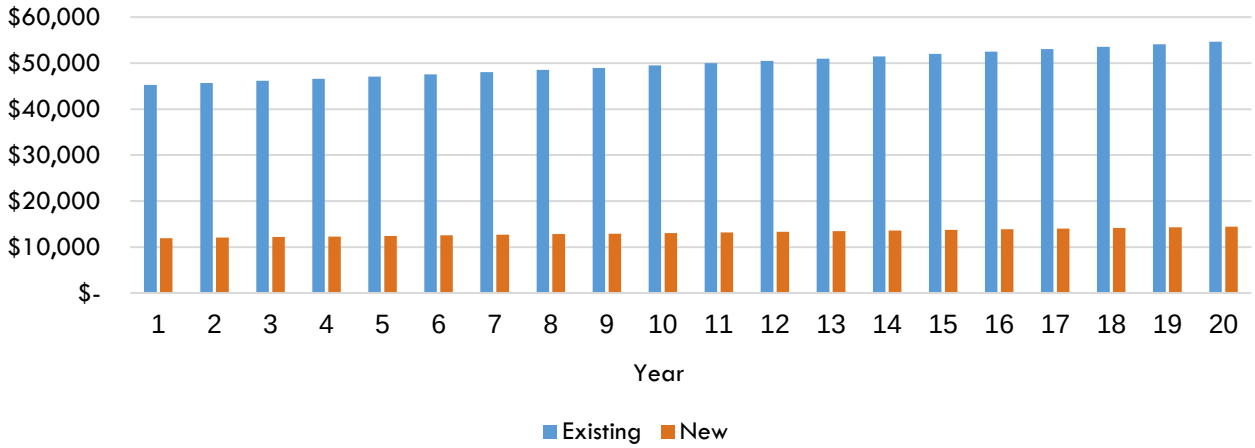
- Maintain the entire system via City staff or a qualified contractor.
- Explore and employ smart systems management and explore third party attachments (with possible revenue generation opportunities for the City) on the entire streetlight system.

Table 5 and Graph 4 (below) outline the estimated energy costs of the existing PG&E-owned fixtures, compared with the energy costs if these fixtures were purchased by the City and converted to an LS-2 rate. This analysis assumes a federal inflation rate of 4% and energy cost inflation rate 1%. Please see Appendix A: Financial Analysis & Assumptions for detailed results.

Table 5
Ownership Energy and Maintenance Costs/Benefits

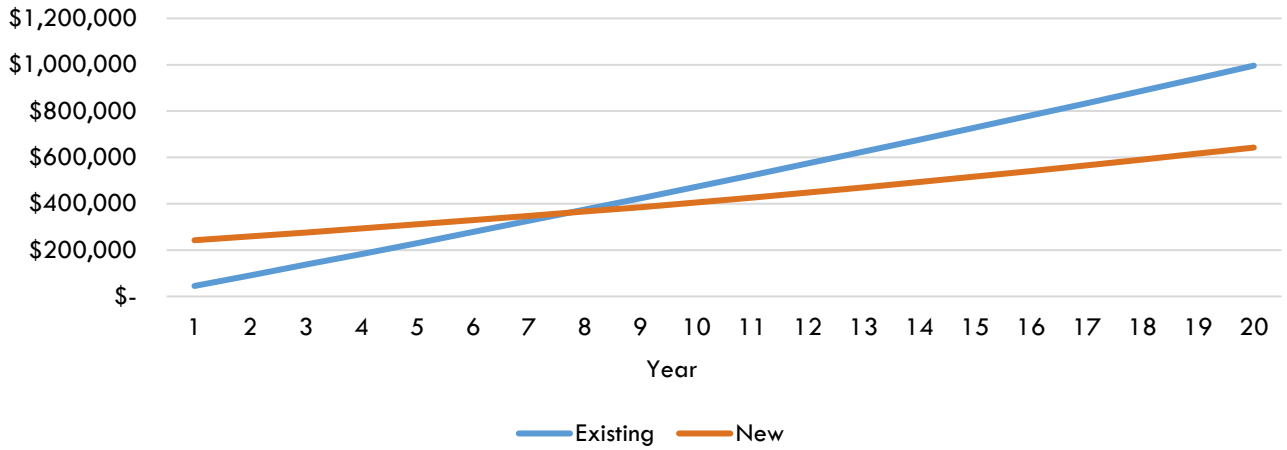
Existing Annual Energy and Maintenance Cost	New Annual Energy and Maintenance Cost	Annual Savings	20 Year Savings	% Annual Savings
$45,233	$16,423	$28,810	$579,606	64%

Graph 4
Ownership Transfer of Utility-Owned Lights
Annual Energy Costs



The blue bar in Graph 4 represents the existing system on the LS-1 rate, and the orange bar represents the estimated energy for the next twenty years for the 374 existing LS-1 PG&E-owned streetlights, if there were acquired by the City (transferred to the LS-2 City-owned rate), and converted to LED.

Graph 5
Ownership Transfer of Utility-Owned Lights
Cumulative Annual Costs



Graph 5 represents the cumulative costs (energy, system, and maintenance) for the next 20 years for both the existing LS-1 PG&E-owned streetlights and the existing LS-1 PG&E-owned streetlights, if there were acquired by the City (transferred to the LS-2 City-owned rate), and converted to LED. The intersection of the two lines represents the return on investment.

RECOMMENDATIONS

Based on the assessment, Tanko Lighting offers the following recommendations:

1. Update the City's standards and guidelines per the recommendations provided in the Standards/Guidelines Review section of this report.

2. Pursue design and implementation of an LED conversion for the City-owned streetlight fixtures. LED conversion is a cost-effective option for the City, with the potential to save the City over the next twenty years an estimated 50% on its energy bills, or approximately $1,891,098.

3. Consider pursuing an ownership strategy to purchase the remaining streetlight fixtures currently on PG&E's LS-1 rates, which would result in an additional $579,606 in savings over the next twenty years.

APPENDICES

Appendix A – Financial Analyses & Assumptions

APPENDIX A – FINANCIAL ANALYSES & ASSUMPTONS

Assumptions

The following list of assumptions were made to determine the results for this report:

- LED conversion scope of work consists of the following tasks:
  - Audit
  - Data reconciliation
  - LED replacement design
  - Financing options
  - Materials procurement
  - Community outreach and notification
  - Logistics management
  - Installation
  - Pole Labeling
  - Commissioning
  - Tariff change coordination
  - Final reporting
- Ownership support scope of work consists of the following tasks:
  - Certified appraisal
  - Ownership negotiations
  - Final ownership transfer support
- Materials
  - Reputable fixture manufacturers and recent fixture pricing
  - Photocells
  - Pole Tags Labels (assumes 5% of the system will require a new pole label)
- Labor
  - Per fixture installation rates from qualified electrical workers in the region (budgetary)
  - Included labor to install fixture, photocell, and any required ancillary materials
- Utility
  - Existing rate:
    - PG&E LS-1 and LS-2
  - Municipal owned rate:
    - PG&E LS-2
- Quantities
  - Derived from PG&E's inventory
- Preliminary watt-for-watt design replacement of existing fixtures
  - 20% ballast factor applied to high intensity discharge (HID) wattages
- Federal Inflation Rate: 4%
- Energy Cost Inflation Rate: 1%
  - Note that this is a conservative estimate and can reach about 3%
- Sales Tax Rate: 9.13%
- Estimated Acquisition Cost: $200 per fixture
- 10-year fixture manufacturer warranty on streetlight fixtures
- Maintenance program costs
  - $2/pole/month administrative fee for the existing LS2 system comprised of a majority of IND fixtures
  - $1.25/pole/month administrative fee for a converted LS2 system comprised of LED fixtures
  - T&M repair work (based on qualified electrical workers in the region (budgetary))
  - Emergency costs assumed recuperated through insurance
  - Average call-out frequency, hourly pricing, and batched responses

Financial Analysis

Please see subsequent pages.

Financial Analysis of the LED Conversion of City-Owned Streetlight System

May 2022

Project Overview	
Total Cost *(City Owned LED Conversion)*	$1,050,046
20 Year Savings	$2,941,145
Net 20 Year Savings *(20 Year Savings - Total Cost)*	**$1,891,098**
Payback Period *(Energy Savings Only)*	10.86 years
Payback Period *(Energy + Maintenance Savings)*	8.02 years

Project Costs	
LED Conversion Cost *(estimated costs for turnkey services, including labor/material)*	$1,050,046

Year 1 Analysis	Existing	New	Savings
Energy Usage Cost	$170,371	$78,400	$91,972
Maintenance Cost	$72,312	$36,156	$36,156
Total	$242,683	$114,556	**$128,128**

20 Year Analysis	Existing	New	Savings
Energy Cost	$3,751,409	$1,726,279	$2,025,129
Maintenance Cost	$2,153,312	$1,237,297	$916,015
Total	$5,904,721	$2,963,576	**$2,941,145**

Assumptions	
Quantity of Lights Included in Analysis	3,013
Quantity of Lights to be Converted	2,963
Quantity of Lights to be Audited	3,387
Tariff Rate of Old System	LS2
Tariff Rate of New System	LS2 - Converted to LED

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20 Year Savings Analysis of the LED Conversion of City-Owned Streetlight System

May 2022

Year	**Annual Energy Costs**			**Annual Maintenance Costs**		
	Existing	*New*	*Savings*	*Existing*	*New*	*Costs/Savings*
1	$ 170,371	$ 78,400	$ 91,972	$ 72,312	$ 36,156	$ 36,156
2	$ 172,075	$ 79,184	$ 92,892	$ 75,204	$ 37,602	$ 37,602
3	$ 173,796	$ 79,975	$ 93,821	$ 78,213	$ 39,106	$ 39,106
4	$ 175,534	$ 80,775	$ 94,759	$ 81,341	$ 40,671	$ 40,671
5	$ 177,289	$ 81,583	$ 95,706	$ 84,595	$ 42,297	$ 42,297
6	$ 179,062	$ 82,399	$ 96,663	$ 87,979	$ 43,989	$ 43,989
7	$ 180,853	$ 83,223	$ 97,630	$ 91,498	$ 45,749	$ 45,749
8	$ 182,661	$ 84,055	$ 98,606	$ 95,158	$ 47,579	$ 47,579
9	$ 184,488	$ 84,895	$ 99,592	$ 98,964	$ 49,482	$ 49,482
10	$ 186,333	$ 85,744	$ 100,588	$ 102,923	$ 51,461	$ 51,461
11	$ 188,196	$ 86,602	$ 101,594	$ 107,039	$ 66,900	$ 40,140
12	$ 190,078	$ 87,468	$ 102,610	$ 111,321	$ 69,576	$ 41,745
13	$ 191,979	$ 88,343	$ 103,636	$ 115,774	$ 72,359	$ 43,415
14	$ 193,899	$ 89,226	$ 104,673	$ 120,405	$ 75,253	$ 45,152
15	$ 195,838	$ 90,118	$ 105,719	$ 125,221	$ 78,263	$ 46,958
16	$ 197,796	$ 91,019	$ 106,777	$ 130,230	$ 81,394	$ 48,836
17	$ 199,774	$ 91,930	$ 107,844	$ 135,439	$ 84,649	$ 50,790
18	$ 201,772	$ 92,849	$ 108,923	$ 140,857	$ 88,035	$ 52,821
19	$ 203,789	$ 93,777	$ 110,012	$ 146,491	$ 91,557	$ 54,934
20	$ 205,827	$ 94,715	$ 111,112	$ 152,350	$ 95,219	$ 57,131
Total	$ 3,751,409	$ 1,726,279	$ 2,025,129	$ 2,153,312	$ 1,237,297	$ 916,015

Financial Analysis of the Ownership Transfer of Utility-Owned Streetlight System

May 2022

Project Overview	
Total Cost *(City Owned LED Conversion)*	$226,178
20 Year Savings	**$579,606**
Payback Period *(Energy Savings Only)*	6.6 years
Payback Period *(Energy + Maintenance Savings)*	7.6 years

Project Costs	
Ownership Cost *(estimated cost to purchase the streetlights from the utility)*	$74,800
LED Conversion Cost *(estimated costs for turnkey services, including labor/material)*	$151,378

Year 1 Analysis	Existing	New	Savings
Energy Usage Cost	$45,233	$11,935	$33,298
Maintenance Cost	*Included in current energy costs*	$4,488	($4,488)
Total	$45,233	$16,423	**$28,810**

20 Year Analysis	Existing	New	Savings
Energy Cost	$995,979	$262,790	$733,190
Maintenance Cost	*Included in current energy costs*	$153,584	($153,584)
Total	$995,979	$416,374	**$579,606**

Assumptions	
Quantity of Lights Included in Analysis	374
Quantity of Lights to be Converted	5
Buyout Cost per Pole	$200
Tariff Rate of Old System	LS1
Tariff Rate of New System	LS2

TankoLighting

20 Year Savings Analysis of the Ownership Transfer of Utility-Owned Streetlight System

May 2022

Year	**Annual Energy Costs**			**Annual Maintenance Costs**		
	Existing	*New*	*Savings*	*Existing*	*New*	*Costs/Savings*
1	$ 45,233	$ 11,935	$ 33,298	$ -	$ 4,488	$ (4,488)
2	$ 45,685	$ 12,054	$ 33,631	$ -	$ 4,668	$ (4,668)
3	$ 46,142	$ 12,175	$ 33,967	$ -	$ 4,854	$ (4,854)
4	$ 46,603	$ 12,296	$ 34,307	$ -	$ 5,048	$ (5,048)
5	$ 47,069	$ 12,419	$ 34,650	$ -	$ 5,250	$ (5,250)
6	$ 47,540	$ 12,543	$ 34,997	$ -	$ 5,460	$ (5,460)
7	$ 48,015	$ 12,669	$ 35,347	$ -	$ 5,679	$ (5,679)
8	$ 48,496	$ 12,796	$ 35,700	$ -	$ 5,906	$ (5,906)
9	$ 48,981	$ 12,924	$ 36,057	$ -	$ 6,142	$ (6,142)
10	$ 49,470	$ 13,053	$ 36,418	$ -	$ 6,388	$ (6,388)
11	$ 49,965	$ 13,183	$ 36,782	$ -	$ 8,304	$ (8,304)
12	$ 50,465	$ 13,315	$ 37,150	$ -	$ 8,636	$ (8,636)
13	$ 50,969	$ 13,448	$ 37,521	$ -	$ 8,982	$ (8,982)
14	$ 51,479	$ 13,583	$ 37,896	$ -	$ 9,341	$ (9,341)
15	$ 51,994	$ 13,719	$ 38,275	$ -	$ 9,715	$ (9,715)
16	$ 52,514	$ 13,856	$ 38,658	$ -	$ 10,103	$ (10,103)
17	$ 53,039	$ 13,994	$ 39,045	$ -	$ 10,507	$ (10,507)
18	$ 53,569	$ 14,134	$ 39,435	$ -	$ 10,928	$ (10,928)
19	$ 54,105	$ 14,276	$ 39,829	$ -	$ 11,365	$ (11,365)
20	$ 54,646	$ 14,418	$ 40,228	$ -	$ 11,819	$ (11,819)
Total	$ 995,979	$ 262,790	$ 733,190	$ -	$ 153,584	$ (153,584)