



# Guidance for Using the Street and Parking Facility Lighting Retrofit Financial Analysis Tool

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## General/cross-cutting issues

### Sample data

The sample data provided in one of the spreadsheets are for example only, with the hope that they might help illustrate how the tool works and may be used. The values are not to be considered as default or suggested values. Many inputs required by the tool are likely to be very project-specific.

### File compatibility

The Street and Parking Facility Lighting Retrofit Financial Analysis Tool was developed and tested using Excel 2010 and Excel 2013 for Windows. Based on information gathered from Excel's "Check Compatibility" feature, the tool should also work without problem in Excel 2007 for Windows. As for Mac support, the tool utilizes some formatting features that preclude 100% compatibility with versions of Excel for Mac prior to the 2011 version. Although not tested within Excel for Mac 2011, we believe that the file should work properly with that edition. We anticipate it also working well with both the Windows and Mac versions of Excel 2016.

### Multiple scenarios

The tool is designed to analyze a single scenario. If analysis of multiple scenarios is desired, multiple copies of this spreadsheet may be used, with one scenario per file.

## Cutting and pasting

### Cutting and pasting from other sources

When pasting text from other documents, Excel's paste operation pastes HTML text by default. Essentially, this is formatted text, and **the formatting of the source document comes along with it, overriding the formatting and at least some of the cell properties** provided within this Excel-based tool. These properties include fill color, number formatting (currency, percentage, etc.), conditional formatting (used to change cell color in certain circumstances), and cell locking, the latter of which **may affect the ability to subsequently edit a cell**. There are two ways around this for the user:

1. After pasting text copied from another document, a little icon, known as a smart tag, will pop up. By clicking on that tag, the option "Match Destination Formatting" may be selected. This will remedy the problem, as only the text, and none of the source formatting, will remain.
2. Alternatively (and equivalently), Paste Special may be used to paste text. Paste Special is accessible by either right clicking or via the arrow at the bottom of the Paste button on

Excel's Home Ribbon. By choosing either "Text" or "Unicode Text" with Paste Special, no formatting will be imported from the source document.

### **Cutting and pasting from within tool**

When pasting text copied from elsewhere in the tool, Excel's paste operation pastes formatted text by default. This **brings the formatting of the source cell along with the text, overriding the formatting and at least some of the cell properties** provided within the tool. These properties include fill color, number formatting (currency, percentage, etc.), conditional formatting (used to change cell color in certain circumstances), and cell locking, the latter of which **may affect the ability to subsequently edit a cell**. There are two ways around this for the user:

1. After pasting text copied from elsewhere in the tool, a little icon, known as a smart tag, will pop up. By clicking on that tag, the option "Values" may be selected. This will remedy the problem, as only the text, and none of the source formatting, will remain.
2. Alternatively (and equivalently), Paste Special may be used to paste text. Paste Special is accessible by either right clicking or via the arrow at the bottom of the Paste button on Excel's Home Ribbon. By choosing "Values" with Paste Special, no formatting will be imported from the source cells.

### **"Vehicles" definition**

Note that "vehicles," referred to in many fields throughout the tool, is defined broadly, and may include other equipment, such as scissor lifts.

## **Input Page**

### **Clarifications regarding some assumptions utilized by the tool**

- Savings during implementation years: it is assumed that any fixture installed during a given year provides a full year of savings during that year.
- Timing of rebates: it is assumed that rebates are received in the year of installation, without delay.
- Poles and bracket arms to be utilized are already in place. As a retrofit tool, poles and bracket arms, their costs, and pole spacing, are not considered whatsoever.
- Related to the pole and bracket arms assumption is the fact **that the tool does not currently include the ability to analyze projects other than one-for-one replacements**.

### **Global vs. line-item (product-specific) inputs**

There has been some discussion of the value and additional flexibility that would be provided if some of the global-level inputs were instead line-item/product-specific inputs. Examples of variables with which such flexibility might be useful include vehicle rate and labor rate, to reflect different crew and vehicle requirements for different products. It's also possible that there may be multiple utilities, and therefore electricity rates, within a municipality's boundaries (an issue likely more relevant to street lighting than for parking lighting). As a workaround, users may

wish to use multiple copies of the spreadsheet if product-specific differences exist for some of these currently-global variables. For example, if multiple electricity rates are involved in a project, it may be necessary to use multiple copies of the tool, with fixtures subject to each rate included in separate files.

### Fixture costs

It can be valuable, although not necessary, to enter such costs for existing fixtures. The analysis treats the cost of the existing fixtures as “sunk” costs. However, the costs of the existing units are utilized, at the user’s option, on the Maintenance Page, where the calculations can incorporate periodic fixture replacement. These costs of existing fixtures may be omitted if the user is not going to utilize them via the Maintenance Page. However, in any case, costs for proposed new fixtures are required. Any ongoing costs associated with replacing existing (or new) fixtures are handled via the maintenance functionality.

### Multiple input variations for a given fixture type

If either an existing or a proposed replacement fixture requires multiple variations for one or more inputs, the fixture may be entered multiple times in section one of the Input Page. These multiple instances of a fixture should be differentiated via the use of the “Additional Description” field.

Two examples of cases where this may be useful are:

- Rebates dependent on energy savings provided, rather than being based solely on the replacement fixture utilized.
- Use of a combination of spot and group-re-lamping for a given fixture, possibly requiring different maintenance cost values for each of the two subsets.

Below is a screen capture that illustrates the use of multiple entries for a 70W LED fixture:

Section One			Power Demand & Dimming		Rebate Value (\$/unit)
Specific Technology Names	Technology Names	Additional Description (optional)	Nominal Lamp Wattage (per unit)	Fixture Wattage (per unit)	
HPS Residential: 100W	HPS Residential		100	142	0.00
HPS Residential: 150W	HPS Residential		150	202	0.00
LED: 70W, Replaces HPS 100W	LED	Replaces HPS 100W	70	70	82.75
LED: 70W, Replaces HPS 150W	LED	Replaces HPS 150W	70	68	151.71

### Price escalators

In the case of single-year installations, values for escalators of labor rates, vehicle rates, and fixture costs may be omitted. These escalators only apply to costs associated with the initial installation of equipment (and thus only have an impact in multi-year installations). Changes in costs associated with ongoing maintenance during the analysis period are handled via the Annual Change in Maint. Cost field.

## Rebates

Currently the tool provides a flat, per-fixture rebate option, with the rebate tied to the fixture being installed (the replacement fixture). However, some rebates may be provided on a per-kWh saved basis. As a work-around, users may estimate the rebate on a per-fixture basis, after first calculating the value of the rebate based on estimated energy savings per fixture.

If a fixture will replace multiple types of existing fixtures, and the rebates depend on the fixture replaced or the specific energy savings, then the replacement fixture may be entered multiple times in section one of the Input Page, in order to enter the rebates specific to each situation. See the [“Multiple input variations for a given fixture type”](#) section of this document for more information.

## Technology-Specific Inputs portion of sheet

In section one, enter data for **all** fixtures/technologies, both old/existing and new.

In section two, further below, enter data for **impacted fixtures only**.

## Utility ownership of street lights

If a utility owns the street lights and a municipality pays a flat tariff per fixture or pole instead of an explicit electricity rate, the tool may still be used to analyze possible retrofits. Based on conversations with utilities, it is our understanding that users of the tool should typically be able to obtain, by working with their utilities, the electricity rate (as well as other flat-rate components) associated with or embedded in a flat-rate tariff. Although switching to a new lighting fixture will likely change the per-fixture tariff, this would be due to changes in estimated energy use, maintenance and first costs; the underlying electricity rate should remain constant. It's important to keep in mind that there may be some cost associated with premature removal of the existing fixtures. Those costs may be handled via the tool's Disposal Cost column.

## Purchasing variations

The tool, by default, implicitly assumes that a system owner handles the purchasing and installation of the lighting products (see Scenario 1 below). However, the tool can be employed to analyze other scenarios as well, and allows for the input of data based on three typical methods of project construction. These typical scenarios are:

- **Scenario 1** – Per-unit cost for fixtures, hourly rate for installation (owner purchases fixtures and uses internal (or external) labor resources to install units at an hourly rate).
- **Scenario 2** – Per-unit cost for fixtures, per-unit cost for installation (owner purchases fixtures and uses external labor resources to install fixtures at a fixed per-unit cost).
- **Scenario 3** – Single lump sum (LS) cost for labor and materials (owner hires external resources to purchase and install fixtures at a fixed lump sum per-unit cost for labor and materials).

For each of these scenarios, pre-construction, construction engineering (including inspection), and project management costs may be entered in the Project Overhead and Implementation section, to capture all project labor costs.

## Addressing the data entry for these scenarios on the Input Page

### ***Installation Labor Rate (cell D20)***

Identify the purchasing and installation scenario to be used and follow the steps provided below to determine the Installation Labor Rate to be entered in cell D20.

- **Scenario 1** – Hourly in-house (or external) rate for complete crew needed to install one unit.
- **Scenario 2** – Take the per-unit bid item cost from the labor vendor; multiply by the estimated total number of units to be installed per hour per crew. This is the hourly rate. For instance, if the contractor can install 5.5 units per hour (11 minutes each, 41 units per day) and the bid item cost is \$130 per unit, then the hourly rate is \$715.00/hr. (In this scenario, the more efficient the crew is, the higher the hourly rate. But the project will be completed in fewer hours.)
- **Scenario 3** – Add no value to the Installation Labor Rate (cell D20) with this scenario. Instead, place the total bid item costs for labor and materials, on a per-fixture basis, in the Fixture Cost field (Input Page, beginning in cell M59), found in the Installation subsection of Section One.

It may be helpful to document any additional calculations undertaken by entering them in the User Notes and Scratchpad section of the Input Page.

### ***Project Overhead and Implementation (cells D34-D36)***

In this section, users can estimate a project's pre-construction (PS&E – Plans (engineering and drafting), Specifications, and Estimates), construction engineering, and project management costs. Enter the appropriate factors as described below.

- **D34 – Project Overhead Labor** is the total number of staff typically needed to plan and manage a lighting retrofit project, including engineers, project managers, inspectors, etc.
- **D35 – Project Overhead Labor Rate** is the average fully-burdened hourly rate of all overhead staff members included in cell D34.
- **D36 – Project Overhead Work Year** is the estimated average number of hours worked per year for each staff member included in cell D34.

**Note:** Alternatively, overhead labor can be factored into the Installation Labor Rate (cell D20) when completed overhead costs are known or can be estimated closely. This number may then combined with the construction labor costs and entered in cell D20, as described below:

Combine the total estimated expenses for overhead labor, divide by the number of units to be installed, and then multiply this number by the number of units per hour. This is an extrapolation of the pre-construction, construction engineering, and project management overhead labor rate.

## Maintenance Page

### Group re-lamping or sensors/controls replacement

For "Lamp Rated Life" and "Control Rated Life" in the Maintenance Page's Scheduled Maintenance section, if replacements will occur prior to rated life (i.e. due to group re-lamping), enter the hours of operation until scheduled replacement.

### Scheduled Maintenance

This is where the cost for system planned maintenance (i.e. group re-lamping, cleaning, etc.) is captured. If an agency or owner relies solely on spot re-lamping on a per-call basis, this can be handled in the *Unplanned Maintenance* section. If cleaning is part of the maintenance routine, it may not be necessary to include additional time in this area for incumbent systems. However, many will find that the only likely scheduled maintenance for an LED system will be cleaning. If so, a value should be placed in Annual Cleaning Rate (%), found in column BA. For example, if a fixture life of 65,700 hours is assumed (15 years at 4,380 hours/year) and cleaning is scheduled at ½ life, then cleaning would occur only once over the life of the fixture, or 1/15. This could then be expressed as a 6.6% (or 7%) cleaning rate, thus capturing the cost for all fixtures to be cleaned over the life of the system.

### Unplanned Maintenance

This is where most of the maintenance expenses for LED products will be captured. An estimated 1% annual failure rate in these categories would mean a total failure rate of 15% over a 15-year period.

## Results Summary

### Show results for individual lighting products, in addition to the aggregated results shown on the Results Summary sheet

This can be achieved relatively easily by altering the numbers of fixtures entered in column E of Section Two of the Input Page. This will quickly update the Results Summary sheet to show only results associated with a desired subset of the products.

### Information on the NPV and IRR metrics

Some valuable discussion of the NPV and IRR metrics can be found at the following links:

<http://www.investopedia.com/ask/answers/05/npv-irr.asp>

<http://www.investopedia.com/ask/answers/05/irrvsnpvcapitalbudgeting.asp>