SCOTTISH FUTURES TRUST

# Street Lighting Toolkit

## How to assess the impact of an energy efficiency investment in the street lighting asset

March 2013

SCOTTISH FUTURES TRUST

ARUP

# Foreword

Within the broad range of disciplines that make up the Transportation and Roads functions across the Public Sector, Street Lighting has all too often been overlooked when investment priorities are being discussed.

It has therefore been heartening to see that increasingly, over the last five years, the role that efficient and effective lighting plays in our communities has featured in debate and discussion involving politicians and chief officers. These discussions have focussed on a range of issues but one common theme has been the desire to reduce energy consumption in line with commitments on Carbon Reduction and consequentially tackle the seemingly exponential rise in the costs associated with keeping our streets and roads appropriately lit.

This Toolkit has been produced as a collaborative piece of work led by Scottish Futures Trust (SFT) with critical input from the SCOTS lead officers on Street Lighting. It builds on some workstreams that SFT and SCOTS member authorities had already been considering and will, I am sure, greatly assist all authorities in developing business cases from scratch or fine tuning existing proposals.

I see the launch of this Toolkit as the precursor to further work around how the management of our street lighting asset is developed and I would commend the Toolkit to all of you and ask that you engage with the key contacts at SFT and SCOTS as you build you business cases and deploy your projects.

**Ewan Wallace**
Chair

Society of Chief Officers of Transportation in Scotland (SCOTS)

February 2013

*Imagery is courtesy of Philips, Outdoor Lighting Solutions*




# Contents

# Introduction

This Toolkit and the two accompanying business cases have been developed to assist Local Authorities to assess the impact of investing in energy efficiency measures within their street lighting asset. It covers measures such as LED lighting, control systems and the use of dimming and trimming. It is designed as an initial feasibility assessment i.e. a pre-business case tool.

The Toolkit has been developed with technical expertise provided by Ove Arup & Partners and in consultation with the SCOTS street lighting team. It has focussed on upgrading to LED street lights however there are alternative technologies which can also be considered as part of a business case study.

## Objective of this Toolkit Guide

The Toolkit is designed to provide the required information to enable a Local Authority to assess the impact of investing in energy efficiency. It includes:

- Technical guidance on delivering a street lighting project, with an explanation of renewal technologies including LED, control systems and dimming and trimming;
- Financial and commercial guidance on delivering a street lighting project, with an outline of the potential sources of finance and the different commercial structures which could be adopted to deliver the improvements within the street lighting asset; and
- A Technical Cost Model and a Financial Model to calculate the estimated cost of investing in energy efficiency improvements within the street lighting asset and the impact on future energy and maintenance costs and carbon emissions. The financial model will also calculate the cost of finance under different financial scenarios.

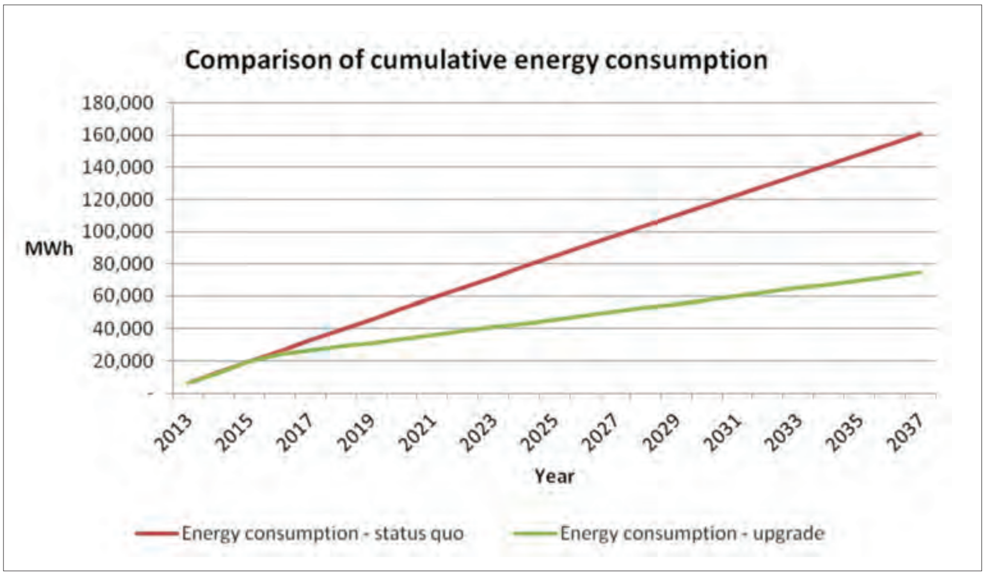
## Benefits of a LED Street Lighting Project

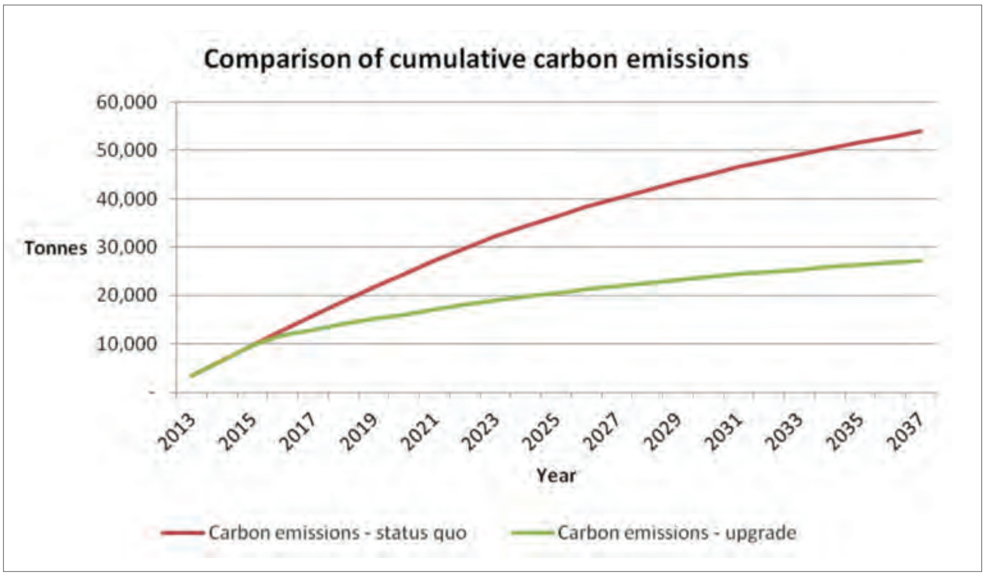
SFT has supported the development of two business cases for East Dunbartonshire Council and West Dunbartonshire Council to examine the potential impact of investing in LED street lighting, central control systems and the implementation of dimming and trimming.

Over a 25 year analysis period, with a 20 year period post LED investment the business cases indicate the following:

| | West Dunbartonshire | East Dunbartonshire |
|---|---|---|
| **Investment (in 2015-17)** | £6.6m | £6.6m |
| **Decrease in annual energy consumption** | 58% | 63.5% |
| **Saving in carbon emissions** | 45% | 50% |
| **Savings in maintenance and energy costs and carbon levies – pre-financing** | £20m | £19m |
| **Savings in maintenance and energy costs and carbon levies – post-financing** | £12m | £9m |
| **Number of lighting units** | c.18,000 | c.18,000 |

From the analysis completed for the East Dunbartonshire Business Case the following energy and carbon savings were forecast.




The findings therefore indicate that the investment:

- Provides significant protection against future energy cost rises by reducing energy consumption by c.60%;
- Provides a material contribution to the 2020 emissions targets which require Local Authorities to decrease their carbon emissions by 42%. Street lighting typically accounts for 20-25% of a Local Authority's carbon emissions – a decrease in street lighting related emissions of 50% therefore contributes to a reduction of 12.5% of a Local Authority's emissions which is approaching 30% of their 2020 target;
- Can be justified on a 'spend to save' basis with a payback of 8 years without financing costs and 16 years with financing costs.

Further details including copies of the two Outline Business Cases are available on SFT's website at:
**www.scottishfuturestrust.org.uk/publications/low-carbon-and-energy-efficiency**

## Disclaimer

The Street Lighting Toolkit consisting of the Technical Cost Model, the Financial Model and other documents (the "Toolkit") were developed by Scottish Futures Trust ("SFT"), Society of Chief Officers of Transportation in Scotland ("SCOTS") and Ove Arup & Partners Ltd ("Arup") (together the "Toolkit Authors") to support the development of an initial feasibility study by providing a high level indication of the impact of an energy efficient upgrade on a Local Authority's street lighting asset. The Toolkit is not intended, and should not be used as the basis for investment decision making. The Toolkit has been developed using data and assumptions from a variety of sources which are believed to be a reasonable representation of costs at the time of publication.

As between any user of the Toolkit and the Toolkit Authors, the Toolkit Authors accept no duty of care for the contents of the Toolkit or its use. Accordingly, regardless of the form of action, whether in contract, delict or otherwise, and to the extent permitted by applicable law, the Toolkit Authors accept no liability of any kind and disclaim all responsibility for the consequences of any such user acting or refraining to act in reliance of the Toolkit.

Local Authorities are advised to undertake the development of a detailed business case prior to investing in their street lighting asset.

## How to use the Toolkit

The Toolkit is split into five parts:

- **Part A: The Technical Aspects of Delivering a Street Lighting Project**
  This provides details on:
  - the low carbon street lighting approaches that are available;
  - a comparison between investing in LED technology and HID systems;
  - an overview of Central Management Systems ('CMS', also referred to as a Central Control System);
  - the impact of column retrofit and replacement;
  - cost assumptions; and
  - an overview of risks.

- **Part B: Financial and Commercial Aspects of Delivering a Street Lighting Project**
  This provides details on:
  - a range of commercial structures available to deliver an energy efficiency investment within a street lighting network;
  - the sources of finance available to a Local Authority or private sector partner to deliver street lighting; and
  - case studies on the various commercial options which have been identified to take forward street lighting projects. These include local authority in-house provision; design & install; outsourcing: energy performance contracts; outsourcing: joint ventures and PPP arrangements.

- **Part C: The Technical and Financial Models to assess the viability of an energy efficiency investment in a more energy efficient street lighting network**
  This provides details on:
  - instructions for the use of the Technical Cost Model. The Technical Cost Model is intended to provide a simple aid to relatively quickly evaluating the potential viability of a street lighting upgrade programme; and
  - instructions for the use of the Financial Model. The Financial Model is able to assess the cost of financing a street lighting project over a period up to 25 years under different scenarios including the cost of finance, cost of electricity and inflation scenarios.

- **Part D: Worked Example**
  This provides the technical and financial models containing sample figures to illustrate how the models can be populated.

- **Part E: Template Feasibility Report Structure**
  This provides a suggested approach for the layout and information required for a feasibility report.

- **Appendices: Street Lighting Case Studies**
  This provides details of street lighting upgrades and commercial structures in practice.

## Next Steps

The Toolkit enables an initial, feasibility assessment to be undertaken of the potential impact of an investment to upgrade the energy efficiency of the street lighting asset. The Toolkit is aimed at assessing the high level financial impact, but further analysis will need to be undertaken by each Local Authority in order to confirm the actual savings involved.

Following the development of a feasibility study, Local Authorities will need to develop more detailed business cases. A key part of these business cases will be robust information in relation to the conditions of the columns. A conditions survey will indicate the extent to which columns need to be repaired or replaced and the design of the LED investment required i.e. how powerful the LED lights require to be in different locations to take into account different column spacing.

In addition there are additional renewable opportunities which can be considered in relation to the upgrade such as solar and wind power generation. These opportunities are currently developing and could be considered within any further review of the assets.
SFT will be happy to discuss with Local Authorities the next stages of developing a street lighting Business Case.

# Part A: The Technical Aspects of Delivering a Street Lighting Project

## Introduction

Part A of the Toolkit provides an overview of LED (Light Emitting Diodes) street lighting technologies along with associated control and monitoring systems which have been incorporated into the Technical Cost Model. Included in this guide is a high level description of the LED technology, the benefits they may realise and key technical risks with implementing a renewal programme using LED technology. It is intended that the Technical Cost Model provides an initial indication of the potential cost of investing in LED technology before a decision is taken to complete a detailed business case. It summarises the main issues which should be considered when assessing if their use is appropriate.

Appendix A includes guidance on what technical information is required to progress to a more detailed business case study, including detailed data on the existing asset specification, performance, condition and future investment requirements. Some of this technical information and basic information on the existing street lighting assets will be needed to populate the Technical Cost Model.

Part C includes the instructions and guidance notes to assist in using the Technical Cost Model and the Financial Model.

## Street Lighting Low Carbon Technologies

### What is LED Street Lighting?

Local Authorities are increasingly adopting LED technology and the associated Central Control/Management Systems across their street lighting network. Within this section we provide more details on LED technologies. Some examples of retrofitting an entire street lighting network and details on different approaches are included within the case studies in Appendix B.

LEDs are used as light sources which comprise solid-state semiconductor devices that convert electrical energy directly into light. These LED light sources are arranged in arrays of 10 to +200 individual light sources, each of which incorporate a lens attachment to control the distribution of light from the lamp. As each lantern is made up of multiple small light sources, there is the potential for housings to be designed which distribute light uniformly and efficiently over a given area and avoid lighting beyond the desired lit area.

The light emitted from each LED can be varied by varying the power levels applied. Unlike conventional HID (High Intensity Discharge) light sources, the light level emitted broadly has a lineal relationship to the power levels applied (i.e. reducing the power levels to an LED by 50% will broadly reduce light levels by 50%, whereas for HID sources the light levels will reduce significantly more). Also, dimming LEDs will tend to extend their life whereas it can reduce the life of HID lights where they are not operating at their optimum level.

In addition, the light quality and levels from LEDs do not generally degrade over time in the same way as conventional lighting and it is therefore not necessary to 'over illuminate' during initial years of installation in order to meet required lighting levels in the later part of the lamp's life as it is for HID lights.

### What are the advantages of LEDs compared to conventional HID systems?

The key advantages of LEDs are:

1. Reduced energy consumption and consequent $CO_2$ emissions
New LED units consume around half the energy that some existing traditional lanterns do. The reduced consumption is derived principally from the lumen output and the ability to readily control lighting levels without deterioration of the lamps and hence the need to 'over-rate' lamps on installation to meet performance standards later. The introduction of new trimming and dimming strategies can increase these saving further (see Central Management System below).

2. Reduced Lamp Renewal Costs
Manufacturers are claiming service life expectancy of LEDs of up to 20-25 years, with these claims, in some cases, supported by guarantees. When compared to conventional lamps, which may have service life expectancies of around 3-6 years, this represents a substantial reduction in cost of renewals as well as in the costs to manage and administer this work.

3. Better Quality of Light
LEDs have good colour rendering particularly compared to both Low and High Pressure Sodium light sources and will increase the visibility of pedestrians to road users as well as provide more uniform light levels across the lit area. It is possible to reduce a lighting class and get a better quality of lighting with fewer lumens. The increased controllability of light dispersal means that the light can be focused upon the areas intended to be lit and back and up-light pollution is reduced.

The advantages and disadvantages of LED technology are discussed further in Risks on page 11.

## Central Management Systems (CMS)

Technological advances are also being made in the control systems that are used to manage and monitor street lighting systems. CMS, (also referred to as a Central Control System) are becoming available which are a wide area control system that rely on either wireless technology (radio waves, GSM/GPRS) or mains borne cabling to communicate with individual lanterns from a central server. This allows the dimming and/or switching of the street lighting to be controlled centrally. Unlike conventional control strategies, individual luminaries can be switched or dimmed at any time and settings can be changed remotely by the Controlling Authority. They give the ability to produce the right amount of light at the right time at the right location.

One of the benefits of CMS is that the system enables two way communication of information on the lamp life of individual lanterns to be relayed back to the control centre, informing the operator whether or not any given lantern is operational. Therefore unnecessary day burning of lamps can be prevented, and costly night time inspections of installations may be avoided.

CMS can provide a wide range of remote monitoring functionality which has the following benefits for maintaining the assets:
Improved fault identification and location of fault prior to leaving depot;

- Lamp failure prediction based on out of tolerance monitoring of electrical characteristics. Under-performing lanterns can be worked into future maintenance programmes;
- Interface with asset management database for sharing and analysing data;
- Reduced need for night scouting inspections.

Like other IT based systems, the benefits of CMS will only be fully realised if operating procedures and processes are changed to maximise the benefits. For example, this could involve sharing information directly with maintenance service suppliers and reducing visual inspections once reliance on remote monitoring is trusted.

## Column Retrofit and Replacement

The core component of a viable spend to save street lighting renewal model is the replacement of lanterns, lamps and control systems with modern equipment which achieves energy savings sufficient to fund the investment. However, columns, cabling and feeder boxes are all part of street lighting systems which need maintaining and periodically replacing and these works will need to be considered in an overall investment programme. If a lantern renewal programme is undertaken then important decisions will need to be made on whether to replace aging columns and cabling or retrofit lanterns to existing assets. A clear understanding of the condition of each column and the cabling will be needed in order to make this assessment.

Where retrofitting is being considered, matching lantern design with existing column spacing will be important in order to meet required lighting performance standards in a way that realises the energy saving potential of LEDs. This is an area that is currently undergoing rapid development by manufacturers. Early LED products have generally comprised a limited number of lantern designs based on a number of standard column spacings. However, as the lanterns comprise numerous small light sources, each of which could be individually directed and focused, LEDs are potentially well suited to being designed for retrofit applications covering a wide variety of non-standard column spacings. Products are now emerging with the adaptability to address retrofit requirements with manufacturers recognising that the worldwide market for retrofit products is likely to be significantly larger than for new-build applications. It is anticipated that new cost efficient retrofit products will become increasingly available from a wide variety of manufacturers.

The Technical Cost Model assumes that new lanterns are retrofitted to existing columns and forecasts the costs of the retrofit and future running costs on this basis.

If, having completed an assessment using the Toolkit, it is decided to proceed to the next stage, then a more detailed business case should be developed based on an integrated plan of works which incorporates all lantern, controls, column and cabling works.

## Costs and Reliability

The unit costs of LED lanterns are changing rapidly as product designs are refined, more manufacturers are entering the market and as production facilities are scaling up. In addition, supply chain contractors are offering more and different turnkey products which include various combinations of design, build, finance and maintenance packages including guarantees / warranties. It is clear that over the last two to three years there has been a dramatic reduction in price of LED lanterns. This is a pattern which is similar to that seen for LED televisions, for example, where high prices dropped dramatically as the size of the market increased, with new manufacturers entering the market and creating greater competition.

At the date of publication, the LED street lighting supply market is still in a dynamic phase with prices, products and services changing regularly. However, there is now an increasing number of projects in delivery or completed and it is expected that more standardised products will become available from a wider variety of suppliers. At the same time the reliability of the technology is increasingly evidenced from around the world, and manufacturers are starting to provide long term warranties as standard.

To reflect this, within the Toolkit Technical Cost Model benchmarked unit prices have been provided based upon the level of discounting expected between 2012 and 2015.

## What are the risks?

Major upgrade projects of existing assets such as street lighting are not risk free and the introduction of developing technologies adds further issues to consider before embarking on a major refurbishment project. However, an increasing number of prototype, demonstrator and full replacement projects are being undertaken in the UK and around the world for example in Salford, Birmingham, Southampton, Glasgow and Fife. A number of these projects are referred to as case studies elsewhere in this document. As experience is gained and shared from these early projects, all parties within the industry will learn to best manage these risks.

The table overleaf highlights a number of the key technical risks specifically associated with LED renewal programmes, along with suggested mitigation measures. This list is not intended to be exhaustive or to cover the more generic risks of complex construction projects or departmental change programmes. It may be possible to transfer certain risks to the private sector through contracting models such as outsourcing (further details in Part B), although this is likely to add risk pricing to the underlying costs.

| Risk | Comment |
|---|---|
| **Energy Prices** | **Issue**<br>While the energy consumption is proven to be significantly lower for LED, meaning that a certain level of savings will always be achieved, the actual level of savings will also be a function of future energy prices. Energy price escalation may be either higher or lower than assumed in the technical cost model.<br><br>**Impact**<br>Energy savings are a key driver to a Spend to Save business case. An increase in prices above those assumed would improve the business case. Conversely, price rises below those assumed will weaken the business cases.<br><br>**Comment**<br>A range of energy price inflation rates should be considered in order to understand the impact on the programmes feasibility. The Toolkit model references DECC's forecasts for energy prices which provides a suitable reference as a starting point. However, many industry commentators consider this to be a lower bound forecast and consider that price rises will be greater.<br><br>Given that prices of electricity remain an important risk for all organisations, LED implementation can be considered to provide a key management tool for risk management by reducing energy consumption. Introducing a CMS system provides a further improved ability to manage consumption. |
| **LED Equipment Costs** | **Issue**<br>The cost of LED technology is likely to reduce over the next 2-3 years as market expansion takes place and suppler competition increases. However, the speed that this reduction is realised and its scale is uncertain.<br><br>**Impact**<br>LED costs are also a key driver to the business case. Higher than assumed supply costs would weaken the Spend to Save case for LED renewal.<br><br>**Comment**<br>The Toolkit provides a forecast of LED costs over the next few years as reference. These should be monitored over time. |

| Risk | Comment |
|---|---|
| **LED Efficiencies** | **Issue**<br>Energy efficiency of LED lanterns is predicted to improve over the next few years as lantern designs for column retrofit projects develop.<br><br>**Impact**<br>If these design developments do not continue, and by a wide range of manufacturers, then retrofit to existing column spacings might mean anticipated energy efficiencies cannot be realised or additional columns (at additional capital expenditure cost) are needed in order to achieve required lighting performance standards.<br><br>**Comment**<br>Greater in service performance data will become available over the next 12-24 months. Current LED efficiencies are felt to be such that additional columns are unlikely to be required. |
| **LED Life Cycle** | **Issue**<br>LED lanterns are predicted to have a long maintenance free operational life as reflected in the guarantees being provided by a number of manufacturers. However as they are new technologies they have not yet been fully tested in the field for this duration (15-25 years).<br><br>**Impact**<br>If contractual arrangements do not pass on the risk of the full replacement cost of failing lanterns before the end of their 25 year guarantee period, the Local Authority may be liable for additional costs.<br><br>**Comment**<br>The extent that manufacturers and contractors will cover all costs within the guarantee period is expected to become more standardised. |
| **Column Renewals** | **Issue**<br>Undertaking a major lantern replacement programme may bring forward the logical date to renew columns with deteriorating condition.<br><br>**Impact**<br>Accelerated column renewals may change the affordability of the programme.<br><br>**Comment**<br>Adequate information should be collected to understand the condition of the column (and cabling) assets and during the development of a Business Case, an integrated LED and column replacement programme should be developed. |

| Risk | Comment |
|---|---|
| **Central Office Cost Savings** | **Issue**<br>The reduced maintenance burden of LEDs and CMS could provide significant central office savings through reduced management and administration costs, lower scouting needs and fault diagnostics and predictive maintenance warnings allowing asset work to be programmed more efficiently.<br><br>**Impact**<br>These potential savings strengthen the business case for a renewal programme, but they require lighting and highways departments to change the way they manage their activities.<br><br>**Comment**<br>Extent of savings achievable will depend on the willingness to significantly change from current working practices and procedures and will need to be considered in the context of wider aspects of maintenance and resource management. |

# Part B: The Financial and Commercial Aspects of Delivering a Street Lighting Project

## Introduction

Part B of the Toolkit provides an overview of:

- Various commercial options available to upgrade a Local Authority's street lighting; and
- The various sources of funding and finance which may be available for a street lighting project;

## Commercial Options for delivering street lighting projects

### Introduction

This section of the Toolkit examines various commercial structures which can be adopted to deliver street lighting projects. The benefits of these approaches will vary by Local Authority reflecting how they address the nature of the investment required and the financial and policy drivers of the individual Local Authorities. The commercial structures which are reviewed are summarised below:

| Commercial option | Design | Installation | Finance | Operation | Risk |
|---|---|---|---|---|---|
| **Local Authority In-house Provision** | Local Authority | Local Authority | Local Authority | Local Authority | Local Authority |
| **Design & Install** | Private sector partner | Private sector partner | Local Authority | Local Authority | Design and implementation risk with private sector but not operational risk |
| **Outsourcing: Energy Performance Contract** | Private sector partner | Private sector partner | Private sector partner | Private sector partner | Private sector partner guarantees a level of savings |
| **Outsourcing: Joint venture** | Private sector partner | Joint venture | Local Authority or joint venture partner | Joint venture | Joint venture |
| **Public Private Partnership** | Private sector partner | Private sector partner | Private sector partner | Private sector partner | Private sector partner |

The above commercial structures involve various approaches around public and private sector involvement in an energy efficiency street lighting investment both in terms of the roles of both sectors and in terms of the different levels and types of risk which can be borne by either sector. The private partner is likely to include risk pricing according to the level and nature of risk transferred and their ability to effectively manage this risk. The partner may also add management costs for a transfer of key operational responsibilities.

The Technical Cost Model outlined within Part A and Part C of this Toolkit is based on a Design and Install contractual arrangement where operational and consumption risks are retained by the Authority. If other commercial structures are being considered which transfer operational functions and risk to a private partner then estimates of these costs and risk assumptions can be included within the Financial Model and further details are provided in Part C under 'Instructions for use of the financial model'.

As different commercial structures give different risk and reward profiles these can be considered further in preparation of a detailed business case.

## Local Authority In-house Provision

| Summary | |
|---|---|
| **Who does what?** | The Local Authority is responsible for designing and installing the central management system and LED lanterns. Consultancy services may be externally procured covering the "design" of the LED and CMS system i.e. to work out which lanterns need to be attached to which columns, which columns need to be replaced and other technical specifications. The Local Authority would install this technology. Warranties and guarantees for the LEDs and CMS need to be available post installation from the provider. |
| **When is it suitable?** | For schemes where:<br>• There is internal expertise (which may be supplemented with specific consultancy advice) to design and install the LED system and Central Management System<br>• There is no requirement or appetite to outsource maintenance<br>• There is no requirement or appetite for external finance |
| **Risk allocation** | The design and install provider will take design specification and installation risk as well as some early years performance, but does not take risks associated with operation of the system. |
| **What are the procurement implications?** | This can be procured through the restricted procedure or frameworks if they exist. |

**Background**
The Local Authority in-house team undertakes the energy efficiency investment appointing external expertise in limited areas – for example, design of the LED system.

**Pricing**
The contract will be for supplies at an agreed price.

**Financing**
Authorities will need to pay for supplies as invoiced. The Authority will need to meet these payments from internal resources (capital budgets or reserves) or through Authority borrowing (usually from the Public Works Loan Board).

## Design and Install

| Summary | |
|---|---|
| **Who does what?** | The Procuring Authority procures a private sector partner to "design" a system i.e. to work out which lanterns need to be attached to which columns, which columns need to be replaced and other technical specifications. The private sector designs and then installs this technology. Warranties and guarantees will be available post installation from the provider. The contract length will be for the design and installation period. |
| **When is it suitable?** | For schemes where:<br>• There is no requirement or appetite to outsource maintenance<br>• There is no requirement or appetite for external finance |
| **Risk allocation** | The design and install provider will take design specification and installation risk as well as some early years performance, but does not take risks associated with operation of the system. |
| **What are the procurement implications?** | This can be procured through the restricted procedure or frameworks if they exist. |

**Background**
A design and install contract allows the Procuring Authority to appoint a contractor who can finalise the specification of the system required within a given budget. They agree this specification with the Authority and install the lighting, control systems and column replacements within an agreed timescales.

**Pricing**
The contract will be for a fixed price subject to agreed changes following final agreement of the specification.

**Financing**
Authorities will need to make stage payments over the duration of the installation. The Authority will need to meet these payments from internal resources (capital budgets or reserves) or through Authority borrowing (usually from the Public Works Loan Board).

## Outsourcing: Energy Performance Contracting

| Summary | |
|---|---|
| **Who does what?** | The Procuring Authority enters into an Energy Performance Contract (can also be referred to as an Energy Saving Contract) with a private sector partner who takes responsibility for financing, operating and maintaining the street lighting over a defined period of time. The operator will guarantee a level of savings which he will be able to generate through investing in the street lighting asset. These savings will be shared on a pre-agreed basis. The Local Authority may agree that their share of these savings be used to implement additional energy efficiency work or to fund column replacement.<br><br>The private partner will take the long term performance and maintenance risk and the energy consumption risk, making this different from out-sourcing with private finance.<br><br>Electricity can either be procured through existing contracts or by the private sector partner. |
| **When is it suitable?** | This is suitable for schemes where:<br>• Authorities believe a private sector partner can bring added value such as project management of a large scale retrofit programme; identification and realisation of operational savings; knowledge of the technology<br>• There is an appetite or requirement to outsource operation and maintenance of street lighting<br>• There is a requirement for external finance from the private sector partner, as the Authorities do not wish to allocate capital budgets or Authority borrowing to finance the project<br>• Associated risk allocation and transfer is deemed appropriate and demonstrates value for money |
| **Risk allocation** | The Authority makes a fixed payment reflecting a guaranteed level of consumption savings and all lifelong maintenance and management of assets. Further savings are shared between Authority and private partner. |
| **What are the procurement implications?** | This may be procured through the restricted procedure or frameworks if they exist. |

**Background**

An energy performance contract can be defined as one where the savings generated from an investment are guaranteed and used to repay the capital investment. The Procuring Authority tenders for a partner who will take responsibility for financing, managing and operating their street lighting asset over a given period of time ranging from 10-15 years.

The partner will examine the asset and identify those measures which will deliver the guaranteed savings and implement these. There will either be a whole scale upfront installation or a rolling investment over a number of years and potentially over a number of out-sourcing agreements.

**Pricing**

The contract will guarantee the level of savings to be generated. There will be an agreed price (net of savings) to reflect the price of operating and maintaining the street lights. The savings will cover the cost of financing the investment and these aspects will be detailed within the contract. Any further savings will be shared between the Authority and partner.

**Financing**

The private sector will finance the capital investment required. They may have a range of sources of finance including their own resources, European funding (as outlined within the Section on financing) or other commercial finance. As this option increases the risk to the private sector (the finance is at risk if savings are not made), the cost of finance is likely to be higher and may be priced in line with equity rather than debt. It is unlikely that Project Finance will be used to finance this investment as the investment required would be too small to make project finance economical.

## Outsourcing: Joint Venture Structures

| Summary | |
|---|---|
| **Who does what?** | A Local Authority enters into a Joint Venture with the private sector to invest in, operate and maintain a street lighting asset for a period ranging from 10-15 years. |
| **When is it suitable?** | This is suitable for schemes where:<br>• Authorities believe a private sector partner can bring added value such as: management of a large scale retrofit programme; identification and realisation of operational savings; technical knowledge<br>• There is an appetite or requirement to outsource maintenance and operation<br>• There may be a requirement for external finance if the Authorities do not wish to allocate capital budgets or Authority borrowing to finance the project<br>• There is a desire to share in the returns (and risks) of the project in a more transparent manner than under an energy performance contract |
| **Risk allocation** | The risk allocation will vary according to the nature of the joint venture. It is likely that the private partner will bear design, installation and performance risk, while operating and energy consumption risks may be shared. |
| **What are the procurement implications?** | A Joint Venture is likely to be procured under competitive dialogue but there are instances where Local Authorities and their lawyers have become comfortable with procuring JV partners under the restricted procedure. |
| **Case Studies** | Appendix B1: Salford City Authority JV |

**Background**

A Joint Venture is a partnership between a Local Authority and the private sector. The structure of a JV can vary with an Authority taking a share in the ownership of the JV and an active role in its management. In entering into a JV, the Authority should have a clear understanding of the benefits that they hope the JV will deliver and ensure that these are incorporated within the contractual documentation. Possible benefits may include:

- Combining Local Authority in-house knowledge of the street lighting asset with private sector expertise in evolving technologies;
- The ability to identify savings potential based on detailed technical knowledge of a variety of approaches and technologies associated with street lighting;
- Programme management experience of a large retrofit programme; and
- Access to finance, if required.

**Pricing**
Under a JV the pricing element is likely to be broken down into a number of payment streams as follows:

- A management fee for operating and managing the JV;
- A management fee for operating and managing the street lighting asset; and
- Payment to fund the investment programme – this may be a one off payment by the Local Authority funded from its own resources. Alternatively, the private sector could provide the finance for the investment and recharge it as part of the cost of the works to the Authority over a longer period of time.

There would be the ability to guarantee savings and also to have performance and availability standards related to the payment of the JV's fees. In the latter case deductions would be made where there were failures in meeting these standards.

**Financing**
As discussed above, this could be through either the private or public sectors.

## Public Private Partnerships (PPPs)

| Summary | |
|---|---|
| **Who does what?** | The private sector designs, builds, manages and finances the street lighting asset to achieve pre-agreed performance and availability targets. |
| **When is it suitable?** | This is suitable for schemes where:<br>• The Authority wants to enter into a longer term relationship of 20+ years for the operation and maintenance of the street lighting asset<br>• The Authority wants to access private finance<br>• The Authority wants to access specific experience in programme management or technology issues<br>• The project size is big enough (possibly capital costs above £20m) |
| **Risk allocation** | The PPP operator is considered to have all risks associated with ownership of the assets i.e. design, finance, maintenance, management. It is likely that the Authority will retain consumption risk as lenders will be unlikely to accept this risk. |
| **What are the procurement implications?** | This needs to be procured through the competitive dialogue approach which will take 12-18 months.<br><br>The contract length is traditionally 20-25 years but could be as little as 10 years if the project economics allow for the full repayment of debt in this timeframe. |
| **Case Studies** | Appendix B2: Birmingham City Authority<br>Appendix B3: Hampshire County Council |

**Background**

A PPP project places responsibility on the private sector partner to design, build, finance and maintain the street lighting asset to pre-agreed standards. Failure to deliver the appropriate services results in availability and performance deductions. The duration of the contracts is for 20-25 years with finance provided by the private sector. Recently in Scotland our PPP model has been further developed as part of the wider NPD programme.

PPPs will be procured under the competitive dialogue procedure which is likely to take 12-18 months. This approach was very popular in England & Wales when PFI credits were available for such schemes.

**Pricing**

The contract price will be based on an agreed unitary charge which covers the costs of providing the maintenances and operational services and the funding of any investment required.

**Financing**

The Authority will pay monthly unitary charges with deductions for failure to meet performance and availability standards.

## Sources of Finance for a Street Lighting Project

### Introduction

This section of the Toolkit examines the different sources of finance which may be available to Local Authorities to deliver an energy efficiency street lighting project.

The source of finance will determine both the cost of finance and the approach to repaying the finance (the repayment profile). This will influence the period of time required to pay back the investment and the impact on Authority budgets.

Within this section we review the financing options outlined within the Table below providing a summary table for each source of finance explaining the key features of the finance, when they are available and where further information can be obtained.

| Source of Finance | Type of Finance |
|---|---|
| **European Finance** | |
| Scottish Partnership for Regeneration in Urban Centres (SPRUCE) (JESSICA) Fund | Loan Finance and guarantees |
| European Local Energy Assistance (ELENA) Fund | Grant funding for implementation of projects |
| European Energy Efficiency Fund (EEEF) | Loan Finance and guarantees |
| **Private Finance** | |
| Private Sector Finance | Loan Finance |
| Project Finance | Loan Finance |
| **Public Sector Finance** | |
| Green Investment Bank | Loan Finance and guarantees |
| Central Energy Efficiency Fund (CEEF) | Loan Finance |
| Public Works Loan Board | Loan Finance |

## European Funds
## SPRUCE

| SPRUCE Funding: Summary Table | |
|---|---|
| **Who is it?** | The Scottish JESSICA fund is a £50m fund targeted at projects with a regeneration focus (£35m) or an energy efficiency focus (£15m). |
| **When can it be used?** | Regeneration and energy efficiency projects within 13 specified Local Authority areas. Eligible projects include: office and commercial space, key transport projects, energy production and energy efficiency. They must meet the EU's 20-20-20 targets[1]. |
| **When is it available?** | £50m fund to be fully allocated between 2012-2015. |
| **How does it work?** | The fund can provide loan financing to public and private sectors. It is flexible around the type of finance which is provided e.g. senior debt, junior debt and/or guarantees. It is also flexible around the duration of the financing although the funds must be invested by 2015. |
| **Further details available from:** | **http://www.ambergreenspruce.co.uk/** |

**Background**
The Joint European Support for Sustainable Investment in City Areas ("JESSICA") is aimed specifically at urban sustainability, using structural funds to co-invest in urban development funds with other public or private players. This initiative has been developed by the European Commission and the European Investment Bank (EIB), in collaboration with the Authority of Europe Development Bank (CEB). The initiative is designed to increase the use of Structural investment funds, in order to make repayable investments in projects forming part of an integrated plan for sustainable urban development. Key areas of focus for the development funds include:
- Climate change mitigation
- Promotion of waste management and sustainable use of natural resources
- Improvement of urban transport and the urban environment
- Reduction of pollution
- Protection of biodiversity
- Energy efficiency and renewable energy

An urban street lighting efficiency scheme would qualify as an appropriate project for JESSICA funding under this latter category.

[1] *EU 20-20-20 targets – reduce green house gases by 20%: increase renewable energy usage by 20%: improve energy efficiency by 20%*

**SPRUCE Fund**

Within Scotland, the SPRUCE fund, which has a £50m value, has been established with funding from the Scottish Government and the European Regional Development Fund. It is available in the following 13 Local Authority areas:

- Clackmannanshire
- Dundee
- East Ayrshire
- Edinburgh
- Fife
- Glasgow
- Inverclyde
- North Ayrshire
- North Lanarkshire
- Renfrewshire
- South Lanarkshire
- West Dunbartonshire
- West Lothian

It is managed by Amber Fund Management Limited and details on the application process can be found by contacting:
**enquiries@ambergreenspruce.co.uk**

**Lending Options**

The finance can be provided as debt, equity or guarantees to either the public or private sectors. Its repayment terms can be tailored to an individual project so on energy efficiency projects the repayment profile can be matched to the forecast savings profile.

The interest rates applicable to JESSICA loans are priced off LIBOR (the London Inter Bank Offer Rate). Repayment terms are flexible, but pricing varies dependent upon the borrower's credit rating, the structure of the deal and the nature of the cash flows.

**Availability**

A key evaluation criterion for the Fund is how an individual project supports the Fund's key performance indicators. Those performance indicators include a tonne of CO2 being saved for every £1,500 lent, and a 20% energy saving for the project. Investments between £1m and £10m are being targeted.

The expiry date of the Structural Fund programming period for JESSICA funds is the end of 2015. This mean the funds have to be drawn down or committed by that date.

**Summary of SPRUCE Fund Advantages and Disadvantages**

| Advantages | Disadvantages |
|---|---|
| • Funding can be provided to either the public or private sectors.<br>• The term of the loan and pay-back period are flexible and can be adapted to the specific project requirements or affordability.<br>• The finance can be provided as equity, debt and/or guarantee investment.<br>• SPRUCE Fund can fund up to 100% of the project cost<br>• No early repayment charges | • The funding interest rate is based upon LIBOR, so other cheaper sources of finance could be available to Authorities, for example Public Works Loan Board which is priced off Gilts.<br>• As the loan is based on standard commercial terms and conditions, the underlying project has to be revenue generating and robust enough to ensure repayments can be made.<br>• The maximum loan period is 10 years |

## European Local ENergy Assistance (ELENA)

| ELENA Funding: Summary Table | (European Local ENergy Assistance) |
|---|---|
| **What is it?** | EU grant funding for technical due diligence on projects which meet the EU 20-20-20 targets[2]. |
| **When can it be used?** | ELENA provides grant funding for technical assistance to cover eligible technical costs that support the necessary preparation, implementation and financing of an investment programme. It covers 90% of the agreed costs. |
| | There are claw back provisions in the event that the investment is not completed within 3 years of the assistance being provided. |
| **When is it available?** | Now |
| **How does it work?** | An outline paper is submitted to EIB for confirmation that the project or projects are eligible for ELENA funding. A detailed submission is then subject to due diligence and credit committee approval by EIB. |
| **Further details available from:** | **http://www.eib.org/products/elena/index.htm** |

**Background**
In order to facilitate the mobilisation of funds for investment in sustainable energy at a local level, the European Commission and the European Investment Bank have established the ELENA technical assistance facility, financed through the Intelligent Energy-Europe programme.

ELENA provides grant funding for technical assistance for eligible technical costs that support the necessary preparation, implementation and financing of an investment programme. The eligible costs relate to helping projects get off the ground, and could typically include costs for pre-feasibility work, legal work, financial work, business plans, newly recruited staff costs, market studies, energy audits and tendering procedures. Hardware costs, however, such as computer equipment, office costs and technical apparatus are excluded.

Up to 90% of eligible costs for a specific and clearly identified investment programme can be provided and beneficiaries must be local authorities. There is no specific requirement for cross-border partnerships.

Investment programmes that can be supported by the ELENA fund include:
- Energy efficiency in public and private buildings
- Renewable energy technologies being built into urban environments
- Urban transport
- Local infrastructure

[2] *EU 20-20-20 targets – reduce green house gases by 20%: increase renewable energy usage by 20%: improve energy efficiency by 20%*

There are various eligibility criteria attached to ELENA funding, which include but are not limited to:

- The ELENA fund invests in programmes that are above €50m in value;
- The total investment costs of the programme supported must be at least 25 times the total cost of the ELENA grant assistance;
- The public entity's investment programme must be contributing to the objectives of the 20-20-20 initiative of the EU and help meet the EU's 2020 targets[3];
- Any project supported by ELENA has to be in procurement within three years of application; the investment programme has to be "bankable";
- The applicant must have financial and technical capacity to implement and complete the investment programme; there is an absence of other EU support.

**Application Process**

The ELENA fund is an open call with no specific deadlines for applications. It is available on a first come, first served basis until the limits of the given budget are reached. To start the process for obtaining the funding, minimum information has to be submitted to EIB, which will include a description of the investment programme, the expected investment cost and the amount, scope and needs to be addressed by the technical assistance. If the preliminary application has a positive assessment, a full ELENA application form then has to be completed. This stage will require submitting detailed information on the technical scope, costs involved, payback periods and how it addresses the EU policies. In essence, the project will need to be well advanced and have a large amount of information on its feasibility in order to progress further in the application process.

Also critical for ELENA funding is demonstrating that there is a need for the support. If a company applying for the funding has a large balance sheet, or significant recurring income streams, then it is less likely the application will be successful.

**Summary of ELENA Advantages and Disadvantages**

| Advantages | Disadvantages |
|---|---|
| • Provides financial assistance in the early, risky stages of an investment programme, where commercial funding is unlikely to be available.<br><br>• Can be applied to a number of investment programmes.<br><br>• Can improve the affordability of a project significantly, as nearly all of the technical feasibility costs are covered by the funding.<br><br>• Grant funds so no requirement to repay if the project is delivered. | • Only large investment programmes normally qualify for ELENA funding. The fund normally lends c.€1-€2m for each large investment programme (normally above €50m).<br><br>• Only addresses technical aspects of the investment programme.<br><br>• If the project is deemed viable, but is not progressed within three years of ELENA funding being awarded, then that finance has to be repaid. |

[3] *EU 2020 targets include reaching a 20% share of energy from renewable sources by 2020 and a 10% share of renewable energy specifically in the transport sector*

## European Energy Efficiency Fund (EEEF)

| **EEEF Funding: Summary Table** | **(European Energy Efficiency Fund)** |
|---|---|
| **What is it?** | Loan financing for sustainable energy projects in the range €5m-€25m |
| **When can it be used?** | Provides senior debt instruments, mezzanine, equity co-investments and leasing structures.<br><br>Eligible projects need to meet the EU 20-20-20 targets[4]. |
| **When is it available?** | Ongoing |
| **How does it work?** | Fund is managed by Deutsche Bank |
| **Further details available from:** | **http://www.eeef.eu/**<br>**http://www.eib.org/projects/pipeline/2010/20100508.htm** |

**Background**
The European Energy Efficiency Fund ("EEEF") is a fund that was launched by the EIB, the Cassa Depositi e Prestiti and Deutsche Bank in July 2011, and is a financial facility dedicated to sustainable energy.

The fund will provide finance for projects as well as technical assistance for projects.

It aims to focus on smaller scale investments by local authorities or energy service companies, thereby complimenting the European investment funds available that target bigger value programmes. The fund has an initial budget of €265m, but hopes to raise more money for programmes by leveraging in other public and private investors.

It is expected that the Fund will provide funding for investments in energy efficiency and renewable energy projects in the range of €5m to €25m, and investment instruments will include senior debt, mezzanine instruments, equity co-investments and leasing structures. Debt investments, however, can only have a maturity of up to 15 years.

The fund aims to support EU member states in meeting the 20-20-20[5] objective. The fund will therefore target energy saving, energy efficient and renewable energy projects within the urban environment that will achieve these objectives.

The fund will pursue a two track investment approach, by either investing directly into projects or by investing into financial institutions who will invest in energy saving, energy efficiency or renewable energy projects. The fund will offer a wide range of financial products to the selected projects, including senior and junior loans, guarantees and equity injection into projects. There is also c.€20m of grant funding that will be available for projects requiring technical assistance in the early stages of a project.

The fund will be managed by Deutsche Bank, and to apply for the funding, a business case will have to be presented to the bank that complies with the scope and the objective of the fund.

[4] *EU 20-20-20 targets – reduce green house gases by 20%: increase renewable energy usage by 20%: improve energy efficiency by 20%*
[5] *EU 20-20-20 targets – reduce green house gases by 20%: increase renewable energy usage by 20%: improve energy efficiency by 20%*

**Summary of EEEF Advantages and Disadvantages**

| Advantages | Disadvantages |
|---|---|
| • The fund targets smaller scale projects (below €50m) and most street lighting efficiency projects would be within this limit.<br>• Provides technical assistance to projects, not just finance.<br>• Additional funds may be sourced from other private or public sector sources.<br>• The Fund can (co-)invest as part of a consortium and participate through risk sharing with a local bank.<br>• Finance can be provided as senior debt, mezzanine finance or leasing structures. | • Requires initial screening and portfolio assessment, along with due diligence (as with project finance).<br>• Debt loans will not have maturities of more than 15 years.<br>• There are on-going monitoring and reporting requirements in regard to financial and environmental performance. |

## Private Finance

Private Sector Finance

| Private Sector Finance: Summary Table | |
|---|---|
| **What is it?** | Finance which is provided by the private sector partners to a contract. |
| **When can it be used?** | Companies may be willing to fund a project if it involves out-sourcing of service provision, joint venture arrangements and PPP type arrangements. |
| **When is it available?** | Availability will reflect an individual company's preferences to finance projects through their own resources or organising finance from external third parties such as the corporate loans, external equity finance or the European sources of finance. |
| **How does it work?** | The private sector company will organise finance for a project. The source of this finance and the terms associated with it are specified during the bid process. |
| **Further details available from:** | This source of finance will be associated with the out-sourcing, JV and PPP commercial structures outlined earlier. |

**Background**

If a contract is issued by a Local Authority which requires the private sector to finance the investment in the street lighting asset, the companies bidding for the contract will have a number of sources from which to provide this financing. These sources may include:

- Finance provided from their own resources;
- European finance as outlined above; and /or
- Traditional bank finance including project finance.

Companies have the ability to provide the debt in whichever manner that they feel is most appropriate for the project for example, senior or junior debt. The interest rate and repayment profile will be determined by the individual company.

**Summary of Corporate Funding Advantages and Disadvantages**

| Advantages | Disadvantages |
|---|---|
| • Flexible in terms of type of debt, cost of debt and repayment profile.<br>• Due diligence process may be quicker and more aligned to the project timescales than that of an external finance provider. | • Lending will be on commercial terms so may not be competitive in comparison with PWLB. |

## Project Finance

| Project Finance: Summary Table | |
|---|---|
| **What is it?** | A type of private finance which is secured on the cash flows of a specific project which is ring-fenced in a separate company. It tends to be associated with Public Private Partnership projects. |
| **When can it be used?** | When a separate company is established to finance infrastructure investment and provide ongoing services. |
| **When is it available?** | Ongoing basis although a number of banks have withdrawn from the market in recent years. |
| **How does it work?** | The finance will be organised by the private sector partners. |

**Background**

Project finance relies on the revenues generated by a single project, both as the source of repayment and as security for the lender's loan. The debt finance borrowed will have no recourse, or limited recourse, to the private sector (i.e. the borrowers) or to the Procuring Authority.

It is associated with PPP transactions and was the basis for financing the Street Lighting PFI programme in England & Wales. Under the PPP structure the Local Authority pays for the services as they are provided with such payments being subject to certain performance and availability standards being met.

**Summary of Project Finance Advantages and Disadvantages**

| Advantages | Disadvantages |
|---|---|
| • Robustness of underlying cash flows of project - with financial, technical and legal due diligence carried out on any project as part of the project finance route, there is increased confidence that debt will be paid off through the life of the project. | • Potential increased cost of borrowing.<br>• Project finance tends to be suitable for projects above £15m which is likely to be higher than an individual street lighting project. This is because the levels of project and due diligence costs are generally similar irrespective of the underlying capital value of the project being financed. Therefore smaller capital projects are not normally considered economically viable for project finance.<br>• Project finance loan lengths are dependent on market conditions and range from 10-25 years. |

## Public Sector Finance

Green Investment Bank

| Green Investment Bank: Summary Table | |
|---|---|
| **What is it?** | A bank established by the UK government to provide finance to renewables and energy efficiency projects. |
| **When can it be used?** | GIB has the following five priority sectors offshore wind, Green Deal, non-domestic energy efficiency, waste processing and recycling and energy from waste generation. |
| **When is it available?** | The GIB is now fully operational. It has £3billion to invest over the three Spending Review periods 2012/13 to 2014/15. |
| **How does it work?** | GIB should be approached direct for specific opportunities. |
| **Further details available from:** | **http://www.greeninvestmentbank.com/** |

**Background**

The UK Government has established the UK Green Investment Bank ("GIB") with funding of £3 billion in the 3 years 2012/3 to 2014/5. GIB's mission is:

- to accelerate investment in the UK's transition to a green economy; and
- to create an enduring institution, operating at arm's length from government.

GIB's five priority sectors are:

- offshore wind;
- waste processing and recycling;
- energy from waste generation;
- non-domestic energy efficiency; and
- support for the Green Deal programme.

GIB is able to invest up to 20% of its capital in other non-priority sectors which include biomass energy generation.

A street lighting energy efficiency project would be classified as non-domestic energy efficiency which is a priority sector.

GIB can only invest in UK based projects and has three further key investment requirements:

- sound banking;
- additionality; and
- green impact.

GIB is required to fund on commercial terms and to generate a return appropriate to the underlying risks involved in the investments that it makes. This is the basis for GIB's "sound banking" investment requirement.

GIB is required to demonstrate that its funding is additional to that which is available in the market. Its role is to crowd capital into its target sectors, and not to crowd capital out. GIB will normally only provide funding if there is funding at least equal to the GIB's contribution provided on pari passu terms by sources of funding which are genuinely independent of the contracting parties involved in a project i.e. co-investment of at least 50% will be required from another third party source.

In addition to its capacity to invest directly in projects, GIB has committed funding to a number of specialist fund managers to invest in smaller projects. In July 2012, GIB made available £100 million of funding for non-domestic energy efficiency projects through two specialist fund managers, Equitix and SDCL. The fund managers are required to match GIB's funding with at least the same amount of third party capital, thereby generating at least £200 million of new funding capacity for the NDEE market. Funding is available where the investment will be committed by March 2015. Projects meeting the investment criteria will be accepted on a 'first come first served' basis for achieving investment readiness.

**Summary of GIB Funding Advantages and Disadvantages**

| Advantages | Disadvantages |
|---|---|
| • A specialist provider of finance to the five key sectors.<br>• Is designed to promote investment in green energy and attract capital into the market. Therefore, likely to be flexible regarding how it lends i.e. equity, debt, guarantees etc. | • The bank will need to lend on commercial terms preferably as one of a number of funders; it does not regard itself as a lender of first resort. |

## Scottish Government Central Energy Efficiency Fund

| **Scottish Government: Central Energy Efficiency Fund: Summary Table** | |
|---|---|
| **What is it?** | A £20m revolving loan fund provided by the Scottish Government. |
| **When can it be used?** | For projects which promote the improved energy efficiency throughout the public sector through the installation of energy efficiency and renewable energy measures. |
| **When is it available?** | Ongoing. |
| **How does it work?** | Applications should be made to the Scottish Government. |
| **Further details available from:** | **http://www.energy-efficiency.org/ceef/CCC_FirstPage.jsp** |

**Background**

The Scottish Government's Central Energy Efficiency Fund (CEEF) is a key vehicle for delivering energy efficiency and small-scale renewable energy measures across the public sector in Scotland. The scheme applies to all Scottish local authorities and health boards as well as Scottish Water.

CEEF is a £20m revolving loan fund to assist the public sector make the initial capital investment to achieve energy savings. £15 million of the fund was allocated to the 32 local authorities in Scotland, £4 million to the NHS trusts and £1 million to Scottish Water. It was established in 2004.

Local authorities are responsible for managing their own CEEF allocation and identifying potential capital projects. Funding can only be spent on capital projects, but up to 10% of the fund can be used each year to cover running costs. To be eligible for CEEF funding, projects must use specific energy saving technologies and must meet a 5 year payback period for energy efficiency projects or 7.5 year payback period for renewable projects.

**Summary of CEEF Funding Advantages and Disadvantages**

| Advantages | Disadvantages |
|---|---|
| • Easy application process.<br>• Authority has control of what projects to identify and put forward. | • Very short payback period requirements.<br>• Ongoing monitoring requirements from Scottish Government.<br>• Savings are paid back into the CEEF Fund. |

## Local Authority Prudential Borrowing

| Prudential Borrowing: Summary Table | |
|---|---|
| **What is it?** | Prudential Borrowing specifies Local Authority borrowing limits. Local Authorities normally borrow from the UK Debt Management Office commonly referred to as the Public Works Loan Board ("PWLB"). Other banks may provide borrowing but the PWLB is the most cost effective as it is priced off UK Government Gilt rates. |
| **When can it be used?** | At a Local Authority's discretion. A Local Authority must have complied with its procedures and Standing Orders to authorise the borrowing. |
| **When is it available?** | Ongoing availability. |
| **How does it work?** | Local Authorities approach the PWLB for a loan specifying the term and the repayment approach (either annuity over the length of the loan or a bullet repayment at the end of the period). PWLB specify the interest rate. |
| **Further details available from:** | **http://www.dmo.gov.uk/index.aspx?page=PWLB/Introduction** |

A loan made under prudential borrowing is normally provided by the Public Works Loan Board ("PWLB"). The PWLB is managed by the UK Government through the United Kingdom Debt Management Office. The Government intends the Board to be able to meet all of a local authority's legitimate need for long term borrowing. Accordingly the Board is prepared to lend an authority an amount up to its legal borrowing limit. The lending is secured against the Authority's revenues.

Prudential borrowing allows Authorities to take greater control of their investment strategy in sustaining delivery of services and infrastructure within their Authority boundaries. Prudential borrowing requires Authorities to take a strategic approach to capital investment and management of their assets, in order to ensure that proposed prudential borrowings are prudent, affordable and sustainable.

The Authority can stipulate a number of the terms and conditions of the loan, including:
- The level of PWLB borrowing (so long as the Authority deems it affordable)
- The type of interest rate (fixed or variable)
- The type of repayment profile (semi-annual or bullet)
- The length of the loan (as part of the Treasury Management protocol)

Interest rates for Prudential Borrowing are based upon the price of government gilts, and this will often mean more favourable rates and fees when compared to private sector capital, which is driven by LIBOR. A margin of 1% is applied to fixed rate borrowing. This is 0.8% if a Local Authority is eligible for the Certainty Rate. Further details can be found at
**http://www.dmo.gov.uk/index.aspx?page=PWLB/PWLB_Interest_Rates**

In addition, the UK Debt Management Office, which disburses the PWLB loans, carries out no (project specific) due diligence on the uses to which its loans will be put (because it takes no risk on the performance of the underlying project assets), and this will contribute to lower terms. This is contrasted with the significant diligence the private sector funder undertakes which includes legal, technical, financial and insurance due diligence in readiness for an application to credit committee for funds.

**Summary of PWLB Funding Advantages and Disadvantages**

| Advantages | Disadvantages |
|---|---|
| • Potential reduced cost of borrowing which are based on a margin of c.0.8% above gilts.<br><br>• Loan length - the maximum period to borrow under prudential borrowing is 50 years whereas private sector capital is restricted to anywhere between 10 and 25 years, dependent on market conditions.<br><br>• Immediate availability - money can be accessed relatively quickly, and there is no prolonged application process to go through. | • External third party discipline - PWLB funding does not require external due diligence which often provides additional third party reassurance regarding the viability of the project.<br><br>• Grace Period - no grace period is allowed in the repayment of a loan made under prudential borrowing, the first repayment date of a fixed rate loan must be not more than six months from the date of the advance.<br><br>• Early repayment fees. |

# Part C: The Technical Cost Model and the Financial Model

## Introduction

Part C of the Toolkit includes instructions for using the Technical Cost Model and the Financial Model.

## Objective

The Business Case Toolkit is intended to provide a simple aid to quickly evaluate the potential viability of a street lighting upgrade programme. The Toolkit includes two spreadsheet models:

- **Technical Cost Model** – this estimates the maintenance costs, energy costs and $CO_2$ emissions of a 'status quo' case based on the existing lighting inventory compared to an 'upgrade' case inventory. The outputs from this model include an estimate of the capital expenditure investment needed for the upgrade along with projections of energy costs, maintenance costs and $CO_2$ emissions.
- **Financial Model** – this uses the outputs from the Technical Cost Model to compare the nominal costs, carbon costs, funding costs and payback across the analysis period.

**Financial years within the model assume a 31 March year end. As costs in the technical model are based on calendar year references these are allocated to the closest financial year e.g. calendar year 2012 equates to the financial year 2012/13 ending 31 March 2013.**

The models have been set to automatically update when changes are made. If individual user's settings have been made so that the Model recalculates manually, then pressing F9 will process any changes or updates.

Throughout the spreadsheets a consistent colour coding approach has been adopted

| | |
|---|---|
| (orange) | User input cell |
| (light blue) | User input from pull-down menu or user defined cost |
| (grey) | Cell data repeated for information from elsewhere in the model and is locked to user modification |
| (white) | Output, information or calculation cell which is locked to user modification |
| (green) | Output/input cell for transfer from the Technical Model into the Financial Model |

This section provides detailed instructions for use of the Technical Cost Model and the Financial Model.

## Instructions for Use of the Technical Cost Model

### Technical Cost Model Assumptions

In order to facilitate use of the Technical Cost Model a number of assumptions have been made. These are detailed below:

- The Technical Cost Model analyses two conditions:
  - a 'Status Quo' case which requires details of the existing street lighting assets to be input for a starting 'base year' and then calculates costs assuming this inventory is maintained as is over the appraisal period; and
  - an 'Upgrade' case which considers the introduction of a single upgrade project on a user-defined date which replaces some or all of the street lights and controls. Costs and emissions are based on maintaining the upgraded lighting inventory, assuming no further changes after the upgrade date.
- The Technical Cost Model only assesses a single upgrade 'event', not phased upgrades over a number of years.
- The Technical Model upgrade is for LED lanterns. It has focussed on upgrading to LED street lights however there are alternative technologies which can also be considered as part of a business case study.
- The upgrade includes only lantern and control systems. The cost of column and cabling replacement is not included in the Technical Cost Model. If the extent of this is known, then it can be included as an additional cost within the Financial Model.
- There are many hundreds of types of lanterns and lamp systems on the market. For simplicity the model includes a manageable selection of generic types with fixed assumed properties. If the exact system desired is not included then a 'best fit' approach is needed.
- The cost outputs of the Technical Model are in real prices and excluding any VAT. Indexation assumptions are entered in the Financial Model.

## Detailed Instructions for Use of Technical Cost Model

The Technical Cost Model includes 10 sheets as follows:

| Sensitivity | Type of Worksheet | Overview of Worksheet |
|---|---|---|
| **0 - Title Page** | Input | Selection of base year (the starting date for analysis) and details on the model |
| **1 - Existing Inventory** | Input | Input sheet for the 'status quo' case i.e. the existing assets |
| **2 - Summary of Assets** | Output | Summary of the existing assets entered on sheet 1 |
| **3 – Upgrade Information** | Input | Input assumptions for 'upgrade' case i.e. what lanterns are to be removed and what replacements are required |
| **4 – Assumptions - Maint Cost** | Input | Input assumptions for maintenance costs |
| **5 – Assumptions – Capex** | Input | Input assumptions for capital expenditure costs |
| **6 – Assumptions – Energy** | Input | Input assumptions for energy prices and emissions factors |
| **Outputs – status quo** | Output | Lamp profiles, energy and maintenance costs for the 'status quo' case |
| **Outputs – upgrade** | Output | Lamp profiles, capital, energy and maintenance costs for the 'upgrade' case |
| **Output for financial** | Output | Cost profiles for both cases to be copied to the financial model |

The Technical Cost Model has been set up to allow flexibility for user-defined inputs to test a variety of operational and cost parameters. However, where this functionality has been included reference parameters are provided in adjacent cells for information which may be input as default values. For example, indicative costs are provided but there is the ability for the User to input a different cost.

**0 - Title sheet**
This title sheet allows the user to record model run details and define the base year of the analysis. The base year is the start year for the Status Quo analysis and is generally the current year.

Instructions
1 **Cell E5** – enter base year. The base year may be any year from 2012/13 to 2019/20 and sets the start year of the modelling period. Costs in the technical model are based on calendar year and, for example, for 2012 this equates to financial year 2012/13. It should be noted that the financial model assumes costs are provided at 2012 prices and if the base year is not 2012 cost information inputs will still need to be in 2012 prices.
2 **Cell B-N8** – enter text to record details of the model.

**1 - Existing Inventory**

This is the input sheet for details of the inventory that will be evaluated as the 'Status Quo' case.

Instructions

1 **Cell D-E14** – enter the annual average hours of operation. For information, in the cells above are approximate annual average hours of operation for locations in the Central Belt of Scotland based on different PECU operating levels

2 **Cells E29-E133** – enter the number of lanterns of each different type on the inventory list. If the exact type is not included, use a best fit approach based on the circuit wattage and operational life.

3 **Cells H29-H133 and I29 – I133** – using the pull down menu, input the approximate age profile of the lanterns. If this is unknown, input 35% for each cell to give an approximate one-third split.

4 **Cells L29-L133** – for each lantern type estimate the proportion that operate at dimmed levels during non-peak hours.

5 **Cells M29-M133** – referring to the table at the top of the sheet, select the dimming profile category that best fits for the majority of lanterns that are dimmed. The % refers to the reduction in light levels (rather than power consumed).

An initial starting point for detailing the existing inventory would be the street lighting asset maintenance register.

**2 - Summary of Assets**

This sheet provides a summary of the inputs from Sheet 1. Review to 'sense check' details of the Status Quo Case inventory.

**3 - Upgrade Information**

This is the input sheet for details of the upgrade case to be tested.

Instructions

1 **Cell D-E15** – enter the average hours of operation in the year for all lanterns after the upgrade. This can only be a single average figure which is applied to all lanterns including those that were not upgraded. For information, in the cell above is the Sheet 1 value as entered for the Status Quo Case.

2 **Cells L13-L14** – enter from the pull down menu the date when the upgrade is complete and operational. The upgrade will be assumed to be operational from the start of the selected year.

3 **Cell L15** – state if a CMS is to be included in the upgrade. Refer to Part A of the Toolkit for an overview of a CMS. Note that the model will not allow a CMS to be retrofitted to existing lanterns and if included must incorporate all of the upgraded lanterns.

4 **Cells I40-I45** – input the number of each LED lantern types on the list to be included in the upgrade. Reference can be made to the table at the top of the sheet which gives guidance on the approximate equivalent conventional lantern type for each LED type.

5 **Cells K40-K45 and L40-L45** – input the proportions of lanterns that are dimmed in non-peak hours and the best fit dimming category from the pull down menus.

6 **Cells H53-H159** – input the number of each type of lantern from the Status Quo Case inventory which are to be removed in the upgrade.

7 **Cells I53-I159** – input the number of new lanterns in each 'non-LED' category type which will be included in the upgrade.

8 **Cells K53-K159** – re-estimate the proportion of each lantern type (based on the totals in cells J53-J159) which are dimmed. Note, the default is that this is the same proportion as inputted on Sheet 1 for the Status Quo case.

9 **Cells L53-L159** – change the dimming profile category if different from the Status Quo Case (i.e. same as pre-upgrade) for each lantern type, again referring to the table at the top of the sheet (cells A27-E32).

The table 'Summary of Upgrade' at the top of the sheet (cells I17-L19) compares the number of lanterns included in the Status Quo Case with the number after the upgrade. The model will allow the totals to be greater or smaller after the upgrade but a warning note will appear stating if this is the case. It should be noted that no cost is included in the Technical Cost Model for new columns and cabling or for removing redundant columns and cabling. If this is required a user input capital expenditure should be included in the Financial Model – see 'Instructions for Use of the Financial Model ' on page 45.

**4 – Assumptions - Maintenance Cost Inputs**
This is the input sheet for details of maintenance cost assumptions. The model only assesses the maintenance cost associated with the replacement of failed lamps, lanterns and control gear. Costs for maintenance activities such as inspections, maintenance of columns, feeder posts and cabling and in-house overheads should not be included. This is because they are comparable between the Status Quo and Upgrade scenarios.

**All costs should be in 2012 prices and should include material and labour.**

For each of the maintenance activities listed, a reference unit cost has been provided in cells E11-E20. These are industry average benchmarked costs in 2012 prices which have also been set as the default values in the adjacent user-defined column. However, these default values can be superseded and it is the values entered in column F11-F20 that are used in the evaluation calculations.

For details of LED Lantern replacement reference costs see the instructions provided for Sheet 5 (Assumptions – Capex) which are detailed below.

CMS running costs are assumed to cover service agreement contracts to maintain and update software, on-line charges and replace failed units.

The introduction of a CMS to control and monitor street lighting remotely can potentially provide reductions in cost of central offices management and administration, night scouting, surveys, inspections, fault diagnostics and maintenance planning. The scale of these savings depends on the existing management systems and processes in place as well as a willingness to change these to take advantage of potential savings. The model allows a user-defined annual saving to be included. It is recommended that a number of scenarios are tested with a range of savings to understand the impact this will have on the viability of the Spend to Save proposition.

Instructions
1 **Cells F11-F20** – enter item unit costs to be used in the analysis, over-writing the default reference values as required.
2 **Cells I24-L25** – if on Sheet '3 – Upgrade Information' cell L15 you have entered 'yes', enter any annual 'central office' savings to be included in the analysis as a result of adoption of CMS remote monitoring and management. Note, this can be left blank if no savings are to be incorporated in the analysis. Enter any saving as a positive number.

**5 - Assumptions - Capex Cost Inputs**
This is the input sheet for details of capital expenditure assumptions. The model only assesses the capex cost associated with upgrading lanterns, control gear and CMS systems. Capex for column, feeder post and cabling replacements are not included in the Technical Cost Model but there is allowance for them to be included within the Financial Model.

**All costs should be in 2012 prices and should include material and labour.**

Part A of the Toolkit discusses the forecast reduction in LED prices over the next few years. In cells E11-E19 reference prices have been provided. These reference prices will vary depending on the year of installation selected (as entered on sheet '3 – Upgrade Information' cell L13-14). The reference prices are based on good quality lanterns with claimed 20-25 year life expectancy. Reference prices have been discounted in future years based on analysis of the market and expected future price reductions. These reference costs will be shown automatically for the relevant upgrade year. For example if the year of upgrade is specified as 2013-14 the reference cost shown for one 5,000 lumen LED lantern is £352 but if the year of upgrade is specified as 2015-16 then the reference cost is £264.

Note that on sheet '4 – Assumptions – Maint Cost' , the LED replacement reference costs are based on the 2015+ year reference prices on the basis that the majority of the maintenance work will be carried out post-2015.

Instructions

1 **Cells F11-F19** – if any figures are to be changed enter item unit costs to be used in the analysis, over-writing the reference default values as required.

**6 - Assumptions - Energy**

This is the input sheet for energy price projections and it provides details of the emissions conversion factors used to calculate $CO_2$ emissions. Energy price projections are user-defined inputs, but again reference guidance is provided in adjacent cells. These are based on year-on-year growth factors extracted from DECC's long term central, high and low energy price forecast. In the reference table provided on this sheet these growth factors have been applied to a 2012 base year price of 9.712pkWh to derive reference prices (in 2012 prices) for years 2012-2041. The energy costs are all expressed in real terms for the purposes of the Technical Cost Model. The Financial Model allows the inflation factor to be applied to the energy costs to be tested across a range of sensitivities.

Energy price assumptions are a critical driver of the 'Spend to Save' case and it is therefore recommended that a number of sensitivity tests are carried out with different price levels. Many industry experts also believe that even the DECC high growth forecasts could be a low prediction of the rate of increase of energy prices, so consideration should be given to including a sensitivity model with forecast prices higher than these reference price levels to show the impact on the investment.

Further details of the DECC forecast can be found on their website at:
**http://www.decc.gov.uk/en/content/cms/about/ec_social_res/iag_guidance/iag_guidance.aspx**

This sheet '6 – Assumptions – Energy' also provides details of the factors used to estimate $CO_2$ emissions associated with the calculated energy consumption. These factors are also based on DECC's forecasts and can be found on their website at:
**http://efficient-products.defra.gov.uk/spm/download/document/id/759.**

Instructions

1 **Cells C15-M15, C21-M21, C27-M27, C33** – enter energy unit prices to be used in the analysis, over-writing the reference default values as required.

**Outputs - Status Quo**

This is the output sheet for the Status Quo Case analysis. For each year from the base year through to 25 years after the upgrade the following is summarised:

- Total number of lanterns, by type.
- The number of lamp, lanterns and control gear replacements per annum within the maintenance activities.
- Annual energy consumptions and corresponding energy cost and carbon emissions.
- The annual maintenance costs for replacement of lamps, lantern and control gear.

The number of lamps and control gear replacements are calculated simply by considering the replacement life of each component and assuming replacements are uniformly distributed in each year. Annual lantern replacement numbers depend on the age profile details entered in sheet '1 – Existing Inventory'. Replacements are distributed so if in the base year the lanterns on average are towards the end of their lives then more are replaced in the early years of the evaluation period. Conversely, if the lanterns are on average newer then replacements are distributed towards the back end of the evaluation period.

**8 - Outputs - Upgrade**

This is the output sheet for the 'upgrade' case analysis. For each year from the base year through to the end of the evaluation period the following is summarised:

- Total number of lamps or lanterns, by type.
- The number of new lanterns, control gear units and CMS units included in the upgrade.
- The capital expenditure associated with the upgrade.
- The number of lamp, lanterns and control gear replacements per annum within the maintenance activities.
- Annual energy consumptions and corresponding energy cost and carbon emissions.
- The annual maintenance costs for replacement of lamps, lantern and control gear.
- CMS running cost and any user-defined CMS related annual central office savings.

The number of conventional lamp, lantern and control gear replacements is calculated in the same way as in the Status Quo Case analysis and are identical in the years before the upgrade. LED lanterns are assumed to have a manufacturer guarantee which covers the replacement cost if they fail within 25 years of installation. Only a nominal maintenance cost is therefore included to cover a small proportion of damaged units which are not covered by a guarantee. Replacement CMS units are assumed to be covered in a service contract and covered in the annual CMS running costs.

**9 - Outputs for Financial Model**

This sheet takes the relevant outputs from sheets 'Output – Status quo' and 'Output – Upgrade' so they can be simply cut and pasted into the Financial Model.

Instructions

1 **Cells J10:AQ10, J23:AQ24, J30:AQ31 and J37:AQ43** – copy these cells to paste into the financial model.

## Instructions for Use of the Financial Model

### Model Structure

The Financial Model starts from the outputs from the Technical Model and compares the cashflows to show the economic impact. It has been designed to be transparent and user friendly. To facilitate this process, the Model is structured into three main areas:

- Inputs ('Input Constants' and 'Input Profile' sheets)- where the user is required to input key project assumptions and costs;
- Calculations ('Flags', 'Workings' and 'Financing' sheets) - which perform the necessary workings in order to convert the inputs into meaningful outputs; and
- Outputs ('Comparison of Cashflows' and 'Results Summary' sheets) - these present the results of the Financial Model.

The Financial Model has the functionality to perform scenario analysis, whereby the model has the capability to simultaneously hold data relating to seven different financial scenarios and allow the user to quickly switch between these. The active scenario can be selected in cell F7 of the 'Inputs Constants' sheet. For details on this see the notes below.

### General Assumptions

**Timing**

The model operates on an annual basis during both the delivery and operations period. The financial year runs from 1st April to 31st March.

**Carbon Reduction Commitment**

It is assumed that all of the Authority's street lighting electricity consumption will be measured as part of its CRC scheme obligations, and will accordingly be a cost to the Authority.

### Model Operations

**Link to Technical Model**

The Toolkit includes a technical model. This technical model should be used in conjunction with the Financial Model. As described previously, certain inputs within the Financial Model are of a technical nature, and these should be sourced from the Technical Model. The specific profiles to come from the Technical Model are the operational costs, energy consumption and carbon emissions for both the status quo and upgrade cases as well as the capital expenditure for the upgrade. These profiles are to be input on the 'Input Profile' sheet as detailed overleaf.

## Model Worksheets

**The Model contains the following worksheets:**

| Worksheet | Type of Worksheet | Overview of Worksheet |
|---|---|---|
| **Title Page** | Input | Shows scenario selected and any details on the model. |
| **Input Constants** | Input | Details the constant (i.e. non-time based) inputs for the project, including dates, inflation rates and financing assumptions. |
| **Input Profile** | Input | Details the time based inputs for the project, including construction costs, status quo and option cost data and carbon cost assumptions across the analysis period. These are from the Technical Model. |
| **Flags** | Calculation | Details the operational flags that help the project costs start and end at the appropriate dates. Also details how costs inflate over time. |
| **Workings** | Calculation | Details the main workings and calculations that determine the outputs. |
| **Financing** | Calculation | Details the annual financing requirement for the different tranches of finance, including the finance requirement and the drawdown and repayment profiles. |
| **Comparison of Cashflows** | Output | Details the comparative cashflows over the analysis period of both the status quo and the upgrade scenarios. Also details the financing costs associated with the upgrade. |
| **Results Summary** | Output | Highlights the key results from the model, including, but not limited to total savings, payback periods and graphs. The worksheet also details graphical representation of the results. |

**Title Page**

This sheet shows the scenario selected and allows the user to enter details on the model.

Instructions

1 **Cell B-N9** – enter text to record details of the model.

**Input Constants**

This sheet contains the constant inputs to be used in the model. There is the functionality to input more than one set of assumptions (across columns J to P) to allow various scenarios to be run. The scenario selected in cell F7 picks up the relevant inputs shown in column F. Only the data in column F flows through to the model. At least one scenario must have all the inputs completed but it is not necessary to use more than one scenario if not required. For example if only one scenario is needed then inputs may be entered in column J only and the "base" scenario selected in cell F7. To create a new scenario the user should copy all inputs relating to an existing scenario into the column to the right and then work through the inputs making amendments as required. Sensitivities on the base case scenario can then be performed with relative simplicity.

Instructions

1 **Cell F7** –select scenario from the drop down list. This defines which inputs (columns J to P) are used in the model
2 **Cells J11:P11** – enter base year (i.e. the starting year for the analysis). Ensure this matches the base year selected in the Technical Model
3 **Cells J15:P15** – enter the number of years of the analysis period. This should take into account the length of the manufacturers guarantee period. Based on this ensure that the end date of the analysis is no more than 25 years from the year of upgrade.
4 **Cells J24:P26** – enter the inflation assumptions for the 'status quo' costs. The standard assumption is set at 2.5%
5 **Cells J29:P31 and J33:P33** – enter the inflation assumptions for the 'upgrade' costs. The standard assumption is set at 2.5% for operation costs and 1% for capital expenditure
6 **Cells J36:P36** – enter the repayment profile for the financing assumptions (annuity repayment, where the interest plus capital repayments total the same amount every year, or flat repayment where the capital repayment amount is the same every year). Flat repayments will have a higher total cost in the early years following the upgrade
7 **Cells J38:P48** – enter the term of the loan, the all-in annual interest rate and the percentage of financing to come from each tranche of debt
8 The total percentage of financing in cells F40, F44 and F48 should be 100%

**Input Profile**

When copying data from the Technical to the Financial Model, the drop down functions 'Paste-Special' and 'Values' should be used to paste hardcoded data (rather than simply 'Paste'). Instructions are provided if you click on cells J10, J23, J24, J30 and J31. Ensure that the start and end dates of the costs match those from the Technical Model and are aligned with the base year and upgrade year selected on the 'Inputs Constant' sheet.

Instructions

1 **Cells J10:AQ10** –input the profile of lantern replacement capital costs from the Technical Model (from 'Output for financials' sheet)

2 **Cells J11:AQ11** –input any other infrastructure costs to be included. These would be additional cost estimates from outwith the Technical Model for example, an estimate of any column replacement costs

3 **Cells J12:AQ12** –input any other capital costs to be included. These would be additional cost estimates from outwith the Technical Model

4 **Cells J16:AQ17** –input any contributions from capital budget or capital reserves to be used to offset against the capital costs for calculation of the net financing requirement i.e. the capital cost less this contribution will be used to calculate the value of any loans the Local Authority may be required to take out to finance the project

5 **Cells J23:AQ24** – input the profile of status quo maintenance and energy costs from the Technical Model. As these forecasts reflect aging of assets and increased real terms energy prices, they may be different from existing budgets

6 **Cells J25:AQ25** –input any other status quo operational costs to be included. These would be additional cost estimates from outwith the Technical Model

7 **Cells J30:AQ31** – input the profile of upgrade maintenance and energy costs from the Technical Model

8 **Cells J32:AQ32** –input any other upgrade operational costs to be included. These would be additional costs estimates from outwith the Technical Model

9 **Cells J37:AQ37** –input the status quo energy consumption profile from the Technical Model

10 **Cells J39:AQ39** –input the upgrade energy consumption profile from the Technical Model

11 **Cells J41:AQ41** –input the status quo carbon emissions profile from the Technical Model

12 **Cells J43:AQ43** –input the upgrade carbon emissions profile from the Technical Model

13 **Cells J45:AQ45** – enter the profile of carbon allowance cost. This refers to the Carbon Reduction Commitment (CRC) scheme, and that the Authority will be charged for each tonne of carbon dioxide it produces. During the initial phase of the CRC, the price of carbon allowances will be fixed at £12/tonne $CO_2$, with no cap on the amount of carbon allowances that can be purchased. The second phase of the scheme, starting in 2013, will cap the number of allowances available and their price will be set by the market. The user of the financial model should input their view on how the cost of carbon will increase over time. A reference profile is provided but may be over-written.

**Flags**

This sheet calculates:

• The years in the operational period based on the length of period input at 'Input Constants' row 15
• The years for the debt repayment for each tranche of debt based on the term length input at 'Input Constants' rows 38, 42 and 46
• The annual inflation increases for each cost category based on the rates input at 'Input Constants' rows 24 to 33

**Workings**

This sheet calculates:

• The nominal capital expenditure
• The nominal operational costs for the status quo case and the upgrade case
• The carbon costs for the status quo case and the upgrade case

**Financing**

This sheet calculates the net financing requirement (total nominal capital expenditure less contributions from capital budgets) and allocates it across the selected tranches of debt.

The drawdowns then flow into the individual tranches to calculate repayments and interest payable. The model inputs allow the debt to be repaid as either a flat repayment or an annuity repayment. As the focus has been on a spend to save basis a bullet repayment has not been included within the model as it would likely give a negative cashflow in the year of repayment. A bullet repayment could be considered during a business case evaluation when a Local Authority's treasury function could determine the most appropriate repayment profile.

**Comparison of Cashflows**
This sheet compares the cashflows of the status quo case and the upgrade case to show the savings for operational costs, pre-financing costs and post financing costs. It also calculates the payback period to indicate how quickly the ongoing savings exceed the cost of the investment, both in pre and post financing terms. The net present value of the cashflows is also calculated with the cashflows discounted at 6.0875% as set out in the HM Treasury Green Book.

**Results Summary**
This sheet summarises various outputs from the model including total net savings, payback period, net present value of cashflows as well as energy reduction and carbon saving.

Various graphs are also included to illustrate the savings and cashflows.

## Finance Structure
The model is structured so that it can incorporate three separate tranches of debt. These tranches of debt can have different term lengths and interest rates. The model does not allow for draw down of any sub-debt or equity financing although one of the tranches of debt could be used to approximate to sub-debt.

The model will draw down debt in the required amounts to target the net financing requirement of the project, being the total capital expenditure less any contributions. The three tranches of debt are calculated from the same net financing requirement, and therefore the proportion of each debt to finance the construction costs must add up to 100%.

For each tranche of debt financing, debt is drawn down at the time of upgrade in line with the profile of the construction costs, in the proportions specified in the inputs sheet. Repayments on the loans will start at the end of the financial year. It is assumed the upgrade is done at the start of a financial year so a full year's interest is payable.

The tranches of debt financing can be set to either an annuity basis where the total interest and capital payment for each year will be the same for every year of the debt term or equal instalments of principal (flat repayments) where the capital payments are the same for each year. Under the flat repayment profile more debt is repaid in early years compared to the annuity profile. This results in a higher debt service amount (interest plus repayment) in earlier periods.

# Part D: Worked Example

## Introduction

This section provides a walkthrough of an indicative project, demonstrating how the inputs and assumptions have been applied in the two models. It is intended to help Toolkit users to understand how the models work and how data should be entered into the models. Reference should be made to models including the worked example provided with the Toolkit.

## Technical Model

**Worked Example - Existing Inventory Inputs**

Sheet '1 – Existing Inventory' has average annual hours of operation of 4,138.

In total it shows a current asset position of 10,000 lanterns, comprising 8,000 low pressure sodium and 2,000 high pressure sodium. None of the existing lanterns allow dimming.

The existing assets are:

- 6,000 low pressure sodium with low loss control gear split across different lamp wattages, 25% less than 8 years old, 25% between 8 and 16 years old and 50% older than 16 years
- 2,000 low pressure sodium with magnetic control gear split across different lamp wattages, 20% between 8 and 16 years old and 80% older than 16 years
- 2,000 high pressure sodium lanterns with magnetic control gear split across different lamp wattages, 20% less than 8 years old and 80% between 8 and 16 years old.

The low pressure sodium lamps are assumed to need replacing every 3.5 years, while high pressure lamps are assumed to last 5 years.

It is assumed that none of the existing lanterns allow dimming (column L all at 0% and so the dimming profile in column M is not relevant).

The summary on sheet '2 – Summary of Assets' shows the high-level split of age and dimming of the 10,000 lanterns.

**Worked Example - Upgrade Inputs and Timing**

Sheet '3 – Upgrade information' shows the details for the upgrade. The year of upgrade is set at 2015/16; for simplicity the Technical Model only allows one input year for upgrade and energy savings are assumed for the whole of that year i.e. that the upgrade occurs at the start of the year. The average annual hours of operation are expected to be 4,138 (before any dimming and trimming), the same as entered on sheet '1 – Existing Inventory'. The upgrade is as follows:

- 6,000 low pressure sodium with low loss control gear to
    - 3,500 LED
    - 2,500 not upgraded
- 2,000 low pressure sodium with magnetic control gear to
    - 1,500 LED
    - 500 not upgraded
- 2,000 high pressure sodium with magnetic control gear to
    - 1,000 LED
    - 1,000 not upgraded

In the Summary of Upgrade box, the number of assets after the upgrade is still 10,000.

The equivalent types of LED lamp are in line with the guidance table at the top of sheet '3 – Upgrade Information'. All LED lanterns are assumed to have dimming: the 7,000 lumen lamps are assumed to be dimmed by 40%; the 11,000 and 18,000 lumen lamps are assumed to be dimmed by 20%.

Sheet '3 – Upgrade information' also shows a CMS is included as part of the upgrade. In addition to this sheet '4 – Assumptions – Maint Cost', has £10,000 pa savings in terms of operational budget which are forecast to be derived from using the CMS.

**Worked Example - Costs**

Sheet '4 – Assumptions – Maint Cost' applies the real unit maintenance costs to both upgrade and existing assets as they are replaced in accordance with the operational lives. For existing lanterns this is in line with the asset lives identified on sheet '1 – Existing Inventory'. For LED lanterns the maintenance cost is based on replacing 0.1% of the lanterns per annum (being a prudent estimate to cover any additional damage not included in warranty cover). Also included is any CMS saving (as noted above).

Sheet '5 – Assumptions – Capex' defines the unit costs for the upgrade lanterns and CMS cost.

Sheet '6 – Assumptions – Energy' uses the forecast real electricity prices taken from the 2012/13 cost and increased in line with DECC forecasts. The default price is set to the DECC central forecast but can be adjusted; in this example the price for 2013/14 has been reduced to 10p/kWh (cell D15).

Sheet '6 – Assumptions – Energy' also shows the conversion factors for MWh to tonnes of $CO_2$.

**Worked Example - Output Status Quo**

The Output Status Quo sheet uses the asset lives from the input sheets to identify a total maintenance cost of £250k pa initially, rising to £251k pa and then to £207k. This is broken down into three types of maintenance cost:

- Lamp replacement of £134k pa based on 2,686 lamps being replaced per annum (based on total number of lamps in column E and operation life in column F in sheet '1 – Existing Inventory') at a cost of £50 per lamp (per cell F11 on sheet '4 – Assumptions – Maint Cost').
- Lantern replacement varying between £99k pa to £100k to £56k pa based on lamp and lantern replacements required per age profile entered at columns H:J on sheet '1 – Existing Inventory' at £210 per unit (per cell F12 on sheet '4 – Assumptions – Maint Cost').
- Control gear replacement of £17k pa based on 10,000 units over the 15 year operational life per sheet 1 column K at £25 (per cell F13 on sheet '4 – Assumptions – Maint Cost').

The 'Output Status Quo' sheet calculates an energy cost of £424k rising to £579k in real terms based on the user defined inputs on sheet '6 – Assumptions – Energy'. As there are no dimming included the energy consumption is based on the average burn hours and the circuit wattage of each lantern.

The 'Output Status Quo' sheet calculates carbon emission of 2,052 tonnes per annum falling to 829 tonnes per annum, using the DECC guidance.

**Worked Example - Output Upgrade**

In 2015 the capex investment is:

- £2.5m for the LEDs based on 6,000 units at the respective costs on sheet '5 – Assumptions – Capex'.
- £0.4m for CMS based on 6,000 units installed at £65 per sheet '5 – Assumptions – Capex'.

The Output Upgrade sheet uses the same maintenance cost as the Status Quo option until the upgrade year 2015. From 2015 the maintenance cost is £87k pa and comprises:

- Existing lamp replacement of £53k pa based on lantern replacements required per age profile entered at columns H:J on sheet '1 – Existing Inventory' at a cost of £50 per lamp (per cell F11 on sheet '4 – Assumptions – Maint Cost)
- Lantern replacement of
  - LED lanterns of £2k pa based on 0.1% failure of 6,000 units at an average price of £413 per unit (based on cells F12:F17 on sheet '5 – Assumptions – Capex').
  - Non-LED lanterns of £17k to £47k to £37k pa based on lamp and lantern replacements required per age profile entered at columns H:J on sheet '1 – Existing Inventory' at £210 per unit (per F12 on sheet '4 – Assumptions – Maint Cost').
- Control gear replacement of £7k pa based on 4,000 lanterns not replaced over the 15 year operational life (per sheet '1 – Existing Inventory' column K) at £25 (per cell F13 on sheet '4 – Assumptions – Maint Cost'). If CMS is included in the upgrade then the control gear replacements are covered within this running cost (see below).
- CMS running cost of £18k pa based on 6,000 units at £3 pa (per cell F20 on sheet '4 – Assumptions – Maint Cost).
- CMS savings of £10k pa per sheet '4 – Assumptions – Maint Cost'.

The 'Output Upgrade' sheet calculates an energy cost of £240k in 2015 rising to £304k in real terms based on the DECC central electricity price forecast.

The 'Output Upgrade' sheet calculates carbon emission of 2,052 tonnes per annum falling to 436 tonnes per annum, using the DECC guidance.

## Worked Example - Financial Model

**Worked Example - Input Constants**

The scenario is set to 'Base' so the data entered in column J is used for the calculations.

The Inputs Constants sheet includes the following key dates:

- Base year is 2012, as per the Technical Model. This is the start of analysis (including the interim period prior to upgrade)
- Length of analysis is 25 years from 2012, which means 22 years from year of upgrade in 2015, which is within an expected manufacturer's guarantee period.

**Inflation**

Inputs Constants rows 24 to 31 have an inflation assumption of 2.5% pa for operating and energy costs and 1% for capital costs at row 33.

**Financing**

The debt is repayable on an annuity basis per row 36 (i.e. the total debt service, interest plus the capital repayment, is the same each year). Cells J38 to J40 shows 80% of financing from tranche A with a 15 year term and 4% interest rate. Cells J 42 to J44 shows 20% of financing from tranche B with a 10 year term and 6% interest rate. No borrowing is assumed to come from tranche C.

**Costs**

The Input Profile sheet contains the real cost outputs from the Technical Model for capex, maintenance and energy and also energy consumption and $CO_2$ tonnage. Also assumed is a further £500k capex costs to cover other infrastructure. No further capex or operational costs are included and it is assumed there are no contributions from capital budgets towards the capital costs of the upgrade.

Also included at row 45 is an assumed cost of carbon per tonne which starts at £12 and increases to £30 in real terms.

**Worked Example - Comparison of Cashflows**

The Financial Model indexes all the costs and adds the financing costs. The resulting cashflows are displayed in the 'Comparison of Cashflows' sheet.

The 'Comparison of Cashflows' worksheet shows the costs under the Status Quo scenario (including carbon) less the costs for Upgrade, giving a net saving. This saving is £424k in 2015/16, rising to £691k in 2036/37 ('Comparison of Cashflows' row 22).

The debt service costs are shown from row 24, resulting in a post financing saving over the analysis period totalling £7.6m (cell H32).

The 'Comparison of Cashflows' calculates the payback period from end of construction comparing the cumulative savings with the capex. Savings before deducting financing give a payback of 8 years (row 53). Savings after financing costs give a payback of 16 years (row 67).

**Worked Example - Results Summary**

The Results Dashboard shows the full output of key financial information:

- Initial investment and financing required
- Net savings pre and post finance
- Breakdown of savings
- Payback period
- Net present value of savings
- Decrease in energy and carbon saved

It also includes various charts comparing costs and profiling financial and carbon savings.

# Part E: Template Feasibility Report Structure

## Strategic Context

Authority Strategy
Project Objectives

## Existing Arrangements

Street Lighting Inventory
Current Maintenance programme and budget
Current Energy Use

## Status Quo Option

Technical Approach
Energy Consumption and $CO_2$
Cost Model

## Preferred LED Solution

Technical Specification
Energy Consumption and $CO_2$
Cost Model

## Financial Appraisal

Affordability
Financing
Financial Model
Comparison of Options
Sensitivity Analysis

## Value For Money

Qualitative Issues
Risk Factors
Summary of Quantitative and Qualitative Appraisal

## Procurement

Project Arrangements
Financing and Contracting Considerations
Timescale
Next Steps

# Appendices

## Appendix A: Street Lighting Asset Data Collection Required for a Business Case

### Introduction

The Toolkit has been developed so that it can be used with a minimum level of data of the street lighting assets. However, if having used the Toolkit, users decide to explore the feasibility of a street lighting upgrade further then a detailed business case will need to be developed. This will require a more detailed understanding of the condition and performance of the current lighting assets. Also, should the project then be progressed, particularly if a service concession is adopted, then detailed asset data will be needed in order to tender the contract. This appendix provides, in a checklist format, guidance on the information needed to assess, develop and tender an upgrade programme.

| | |
|---|---|
| Basic Asset Information | Unique asset Reference Number<br>Street name/location<br>Geographic coordinates<br>Road classification |
| Geometric Data | Lantern/column height<br>Distance to adjacent lanterns (LHS/RHS)<br>Road width/footpath |
| Equipment details | Mounting style<br>Column type, material, manufacturer<br>Lantern type, manufacturer<br>Lamp type, manufacturer<br>Control gear type, manufacturer<br>Feeder post/cabling details<br>Accessories |
| Performance details | Wattage/Circuit wattage<br>Control strategy (trimming/dimming) |
| Dates | Original installation date<br>Column age (if different)<br>Lantern age/installation date<br>Lamp age/installation date<br>Control gear age/installation date<br>Cabling age/installation date |
| Inspections/surveys/ Maintenance | Dates of condition surveys and statutory electrical testing<br>Findings of condition surveys<br>Details of maintenance records<br>Summary condition category |
| Predictive information | Anticipated re-lamping date<br>Anticipated life expectancy of column/lantern/control gear/cabling<br>Planned work details |

## Appendix B1: Case Study on Outsourcing via Joint Ventures – Salford City Authority

| Salford: JV for retrofit LED street lighting | | |
|---|---|---|
| Parties | Principle parties | Urban Vision comprising Salford City Authority, Capita Symonds, Galliford Try |
| | Supporting parties | LED Roadway Lighting, Lantern provider (lanterns manufactured by Sony within the UK) |
| Infrastructure | Brief description | The Authority had previously procured a JV – Urban Vision – to deliver its road maintenance services which also covered street lighting. The JV shareholding is 19% Salford City Authority, 30% Galliford Try and 51% Capita Symonds.<br><br>The JV investigated the benefits of a LED retrofit of existing street lighting with repair or replacement of failing columns. The savings generated from reduced energy and maintenance charges were then applied to financing the replacement or repair of failing columns.<br><br>A pilot scheme totalling 2,000 units was designed and installed to test the concept. A business case has been approved to roll out the scheme over the entire asset of 24,000 lanterns from Autumn 2012. |
| Project Details | Commercial structure | The JV placed the contract for the purchase of lanterns. |
| | Form of principle contract | Supply contract with warranty arrangements covering the 20 year lifespan of the lights. |
| | Who installs/ maintains the facility/ kit | The JV (Galliford Try) under the terms of the JV partnership arrangement. |
| | Who owns the site/ kit | Salford City Authority |
| | Who does the facility/ kit revert to on contract expiry | Not Applicable |
| Street Lighting | Does it include LED lighting | Yes |
| | Does it include a central management system to enable dimming and trimming | The LED lights selected include a GPS dimming and trimming module which allows future changes to dimming and trimming regimes. |

| Salford: JV for retrofit LED street lighting | | |
|---|---|---|
| | Does it include investment in new columns? | Yes. New columns where they were at the end of their life and they could not be economically repaired to give a further 10 year life span.<br>In terms of replacing columns due to spacing issues, investment in new columns was minimised through the use of individually designed lanterns which maximised the energy efficiency savings and prevented the development of "over lit" areas where columns were located close together and "under-lit" areas where column spacing was further apart. |
| Inputs and Outputs | Set up costs (inc. procurement and D&B) | The total project is forecast to cost £13.8m, but this includes £3m of column replacements/ repairs and £9m of lanterns. The remainder is installation and management fees. |
| | Reduction in energy consumption | For whole asset: forecast reduction of 50% on the current street lighting energy bill of £1.2m |
| | Reduction in maintenance costs | For whole asset: forecast reduction of 63% on £800k maintenance budget |
| | Total savings | Expected lifetime savings of £13.8m over 20 years after repayment of capital and finance costs. |
| | Reduction in carbon emissions | Expected reduction of emissions: 50% |
| Timing | Approval status | April 2012: approval to whole asset retrofit |
| | Procurement status | Lanterns procured through the JV |
| | Service commencement | 2011: 2,000 lanterns installed<br>2012-2014: 24,000 lanterns to be installed |
| | Contract duration | Not Applicable supply only contract entered into by JV. JV was part of an existing roads maintenance contract. |
| Funding | Funding source<br>Funding term | Public Works Loan Board<br>20 years to match the life span of the lanterns. |
| Background to decision making: | Key drivers | Affordability – any solution must self finance the retro-fit of the existing street lighting lanterns and the cost of addressing the existing life-expired column stock. |

| Salford: JV for retrofit LED street lighting | | |
|---|---|---|
| | | Risk reduction – mitigating the risk of:<br>• future increases in energy costs<br>• potential liabilities relating to column failure<br>• requirement to meet carbon reduction targets |
| Project successes | | • met one third of the Authority's carbon reduction target<br>• electricity and maintenance cost savings<br>• risk profile of street lighting decreased<br>• new lighting stock<br>• the requirement for in-year savings |
| | Any barriers to success | Cautious approach to new technology, which was overcome by undertaking a full market assessment. |
| Further details | Contact, website address, publications | Capita Symonds, Simon Butt:<br>**simon.butt@capita.co.uk**<br><br>Salford City Authority,<br>Chris Findley : **chris.findley@salford.gov.uk**<br>Website: **www.urbanvision.org.uk** |

## Appendix B2: Case Study on PPP Contracts – Birmingham City Authority

| Birmingham: Street Lighting PPP including LED installation | | |
|---|---|---|
| Parties | Principle parties<br>Supporting parties | Amey and Birmingham City Council |
| Infrastructure | Brief description | The 25 year contract is for the management, refurbishment, upgrading and maintenance of 2,250km of road network and associated street assets within the Councils highway authority jurisdiction, including the replacement of c.90,000 street lights. |
| Project Details | Commercial structure | The entire works are contracted to an SPV who in turn subcontract the work to an Amey operational company. |
| | Form of principle contracts | Bespoke Project Agreement and operating subcontract. |
| | Who installs/ maintains the facility/ kit | Amey |
| | Who owns the site/ kit | Birmingham City Council |
| | Who does the facility/ kit revert to on contract expiry | Birmingham City Council |
| Street Lighting | Does it include LED lighting | Yes |
| | Does it include a central management<br><br>system to enable dimming and trimming | Yes. The system allows full dynamic control of each unit with flexibility to remotely dim (vary the light output) of individual or groups of street lights and for switching on and off times for precisely controlling lit periods and luminance levels. This approach promotes greater management capability over energy consumption with intervention potential. |
| | Does it include investment in new columns? | Yes. Approximately 42,000 new replacement street lighting columns are being installed during the first 5 years, most of which will have LED luminaires fitted. A further 53,000 lights will be replaced in the remaining contract period. |
| Inputs and Outputs | Set up costs (inc. procurement and D&B) | The capital cost and design of the c.42,000 new street lighting columns complete with luminaires is c.£70m. |
| | Reduction in energy consumption | Typical energy consumption for LED luminaires is 50% less than traditional sodium equivalents. |

| Birmingham: Street Lighting PPP including LED installation | | |
|---|---|---|
| | Reduction in maintenance costs | Dependant on the design, manufacturer and burn hours, the LED luminaires can have a design life in excess of 30 years and require little or no operational maintenance compared to traditional sodium luminaires. Operational costs for LED luminaires are typically 70% less than sodium luminaires. |
| | Total savings | Expected lifetime savings in excess of £100m over 25 years which includes energy savings |
| | Reduction in carbon emissions | Expected reduction of carbon emissions of over 50% (i.e. over 17,000t pa) related with energy consumption. In addition savings and the supply chain and related with operational maintenance i.e. reduced vehicle movements and site visits. |
| Timing | Approval status | The PFI contract was signed in May 2010. |
| | Project status | In the initial capital replacement period |
| | Service commencement | June 2010 |
| | Contract duration | 25 years, including a Capex period of 5 years. |
| Funding | Funding source(s) | Senior debt, equity and unitary charge revenues |
| | Funding term | 25 years |
| Background to decision making: | Key drivers<br><br><br><br>ambitious targets | • Ageing of stock, and to create energy efficiencies along with the Council's column replacement programme.<br>• To promote and be seen as the leader of sustainability and carbon reduction with<br><br>• Birmingham asperation to be a world class city attracting business and tourism<br>• To support a vibrant night-time economy<br>• To promote and be recognised internationally for innovation and use of leading technology<br>• Improvement to the Street Scene |
| | Project successes | • Improved quality and performance of the lighting across the City (improved lighting standards and quality colour recognition<br>• Improved feeling of wellbeing and reduced accidents and crime<br>• Improved energy efficiency<br>• Reduction in energy and carbon taxation costs |
| | Any barriers to success | No |
| Further details | Contact, website address, publications | Jay Doshi – Amey ventures<br>**Jay.doshi@amey.co.uk**<br>**www.amey.co.uk** |

## Appendix B3: Case Study on PPP Contracts – Hampshire County Council PFI

| Hampshire: Street Lighting PFI including LED installation | | |
|---|---|---|
| Parties | Principle parties | Hampshire County Council |
| | Supporting parties<br>Mayflower CLC | Tay Valley Lighting, SSE Lighting Services, |
| Infrastructure | Brief description | PFI contract to invest in new columns, implement a central management system and LED lighting |
| Project Details | Commercial structure | PFI arrangement. Project Agreement between Hampshire County Council and Tay Valley Lighting SPV with SSE Contracting (SSE Lighting Services) as the Operating Subcontractor to deliver the project. |
| | Form of principle contracts | Project Agreement, Maintenance Agreement, Payment Mechanism, Finance Agreement |
| | Who installs/ maintains the facility/ kit | SSE Lighting Services |
| | Who owns the site/ kit | Hampshire County Council |
| | Who does the facility/ kit revert to on contract expiry | Hampshire County Council |
| Street Lighting | Does it include LED lighting | Yes. 3,000 lanterns were replaced with LED units |
| | Does it include a central management system to enable dimming and trimming | Yes, Mayflower Complete Lighting Control monitors, dims and trims on all fitted units. 26,686 nodes fitted at end August 2012.<br><br>Dimming 25% Dusk to 00:00, 50% from 00:00 to 05:00, 25% 05:00 to Dawn |
| | Does it include investment in new columns? | Yes. Columns are being replaced as part of the upgrade of the street lighting network. At July 2012, 20,594 columns and 18,651 lanterns had been replaced |
| Inputs and Outputs | Set up costs (inc. procurement and D&B) | Total capital cost of £122 million<br>Capital Investment over a 5 year core investment period<br>Concession length of 25 years |
| | Reduction in energy consumption | The CIP is ongoing and dimming regimes being agreed with the council for different locations. At July 2012, 5.75m kWh energy saved since 2009 |

| Hampshire: Street Lighting PFI including LED installation | | |
|---|---|---|
| | Reduction in maintenance costs | Reduced maintenance due to LED lanterns and removing the need for night scouting in the areas where Mayflower is monitoring the stock. |
| | Reduction in carbon emissions saved. | At July 2012, 3,110 tonnes of CO2 had been |
| Timing | Approval status | Preferred Bidder confirmed in August 2009. Financial close in December 2009. |
| | Project status | Replacement and upgrading between 2010 and 2015 |
| | Service commencement | April 2010 |
| | Contract duration | 25 years |
| Funding | Funding source(s)<br>Funding term | Bank debt from Lloyds TSB and Nationwide.<br>Over PFI project term |
| Background to decision making: | Key drivers | • Affordability<br>• Ageing street lighting network<br>• Energy and Carbon Saving |
| | Project successes | • Large savings on dimming and trimming<br>• Fruitful debate and negotiation with residents on dimming levels to be provided |
| | Any barriers to success | |
| Further details | Contact, website address, publications | Enquiries please phone **0845 070 2019**<br><br>Or e-mail to **enquiries@ssecontracting.com** or **streetlighting@hants.gov.uk**<br><br>**www.ssebusiness.com** |

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