****

**Acknowledgements**

IPWEA gratefully acknowledges the financial support of the Clean Energy Finance Corporation and the Australian Commonwealth’s Department of the Environment and Energy in producing this Model Business Case.

IPWEA also acknowledges the intellectual and financial support of our corporate, government and association partners in delivering the SLSC Programme. IPWEA’s SLSC Programme provides education and resources which assist our 4,000+ members make informed decisions about LEDs, smart controls and inter-related smart city deployments. In addition to providing education and resources in this area, IPWEA works jointly with our partners in advocating for regulatory change in order to address policy issues in a rapidly changing field.

**SLSC Partners**

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

i | Introduction

The need for a Model Business Case for Street Lighting and Smart Controls Upgrades was first recognised in 2016 stakeholder consultations during the establishment of IPWEA’s public private partnership for the Street Lighting and Smart Controls Programme (SLSC) and is described on IPWEA’s website [www.slsc.org.au](http://www.slsc.org.au) and [www.slsc.org.nz](http://www.slsc.org.nz).

Stakeholders noted highly disjointed approaches to early LED procurement that suggested
sub-optimal outcomes at a project-specific and at a broader national level.

In response, the SLSC launched two model specifications that are assisting public lighting buyers, vendors, contractors, funders and advisors to efficiently and economically engage in procurement of LED lighting and smart control systems for public lighting. These specifications are bringing tendering efficiency and certainty to the market.

The next part of the proposed suite of documentation is this Model Business Case, which is designed to complement the model technical specifications and assist local governments, main road agencies and utilities navigate the process of considering large scale LED lighting and smart controls upgrades.

i.1 Purpose and Target Audience

This document is targeted at local government, main road agency and distribution network service provider (DNSP) staff wanting to put forward a robust case for making the change to LED street lighting. It is a template document that can be adapted to suit individual circumstances, and contains instructions and prompts to guide the writer through the process.

A key objective of this document is to build bridges for organisations that would like to move forward with their LED street lighting projects but lack the time, resources or in-house expertise to complete the business case from the ground up.

Alongside the model technical specifications for LED street lighting and smart controls, this Model Business Case should equip any local government, main road agency and DNSP to move toward a confident outcome in their street lighting projects.

i.2 The Aim of Model Business Case

The aim of the Model Business Case for Street Lighting and Smart Controls Upgrades is to be:

1. Technically robust and current;
2. Written concisely in easy to understand English;
3. Applicable to large and small projects in urban and rural applications;
4. Structured to include a range of selectable options to be chosen by the user to deliver a customised document meeting their needs;
5. A living document, subject to ongoing review as the technology and market evolves; and
6. Widely and freely available to reduce barriers to the uptake of LEDs and dramatically increase the likelihood of procurement and application.

Suggestions for improvements are welcomed. Please forward suggestions to the IPWEA head office using the contact details provided at [www.ipwea.org](http://www.ipwea.org).

i.3 Document Guidance

This Model Business Case is a guidance document, not a finished product. It is intended to be edited and tailored to the precise circumstances of the application region and organisation. Any author customising this document will need to validate the contents for their circumstance and organisation.

As well as guidance notes throughout the document, which are inside a burgundy box (as shown below), the selectable content is divided into three categories:

1. Suggested text for inclusion in the document by **all** users is presented in normal black text;
2. Options considered suitable for **some** users, is presented in Bold Green Italic; and
3. Where text is used to instruct user action, this is identified by bold blue coloured and/or by brackets <>.

**Note:** Explanatory text to guide user customisation is in burgundy coloured text boxes (as per this example) **which is intended to be deleted** after users have finished compiling their own customised business case.

i.4 User Customised Specification - Source Acknowledgement

This IPWEA Model Business Case is free publication, available in editable Word format to allow for ease of customisation and general user convenience. Updated versions will be issued in future by IPWEA, as and when required on the [SLSC Website](http://www.slsc.org.au/home). When undertaking the compilation of a customised business case, users should ensure that they are using the most current version.

When compiling a customised business case IPWEA requests that users acknowledge the source of their customised business case (e.g. “Based on IPWEA Model Business Case for Street Lighting and Smart Controls Upgrades Version X.X”).

i.5 Disclaimer

Although the information in this publication is believed to be correct at the time of publishing, the Institute of Public Works Engineering Australasia (IPWEA), and its agents, contractors, directors, employees, subcontractors and officers, do not accept any contractual, tortious or other form of liability (including in negligence) arising from the information contained herein, to the extent permitted by law. The information included in this publication is intended as a general guide only and is not tailored to your needs and circumstances. People using the information contained herein should apply, and rely upon, their own skills and judgement to the particular lighting installations they are considering, and, seek appropriate professional lighting design, engineering and financial advice as needed. This document is not a substitute for specialist, professional advice.

i.6 Document Information

This work is licensed under the Creative Commons Attribution 3.0 Australia Licence. To view a copy of this license, visit the [creative commons website](https://creativecommons.org/licenses/by/3.0/au/).

The Institute of Public Works Engineering Australasia (IPWEA) through its Street Lighting and Smart Controls (SLSC) Programme asserts the right to be recognised as author of the original material in the following manner:

 © IPWEA (SLSC Programme) 2019

Contents

i | Introduction 1

i.1 Purpose and Target Audience 1

i.2 The Aim of Model Business Case 1

i.3 Document Guidance 2

i.4 User Customised Specification - Source Acknowledgement 2

i.5 Disclaimer 2

i.6 Document Information 2

Contents 3

1 | Executive Summary 4

2 | Project Scope and Context 6

2.1 Project Objectives and Background 6

2.2 Project Scope 7

2.3 Policy and strategy alignment 10

2.4 Project Status and Approvals Process 11

2.5 Key stakeholders 11

2.6 Options analysis 13

3 | Summary of Project Business Case 14

3.1 Summary of costs and funding 14

3.2 Project NPV and simple payback period 15

3.3 Project benefits 15

3.4 Mitigating the risk of harm from public lighting 16

4 | Funding Considerations 18

4.1 Summary of costs 18

4.2 Overview of financing options 20

4.3 Debt modelling 21

4.4 Preliminary recommendation on financing 22

5 | Implementation Approach 23

5.1 Procurement approach 23

5.2 Project management plan 24

5.4 Measurement and verification approach 26

5.5 Stakeholder communications plan 26

1 | Executive Summary

This Model Business Case is written from the perspective of a user who has ascertained and verified all the claims made in it. Any author customising this document for their organisation will need to validate these claims for their circumstance and organisation.

Throughout this document, when describing the details of the project, reference is made to LED lighting as well as smart controls. If smart controls are not part of your project, you should delete the text referring to smart controls.

Where appropriate, you may wish to replace the use of the word ‘organisation’ with the name of your local government, main road authority or DNSP.

This project proposes the large-scale changeover from older, less efficient, less reliable and more costly public lighting technologies, to current LED lighting technology with smart controls. This project would permanently reduce the cost of lighting for this organisation, would deliver important safety and security benefits for the community and would reduce the environmental impact of street lighting.

This business case recommends a full changeover OR a partial changeover of <insert number> legacy street lights to be replaced with LED luminaires ***and the deployment of smart controls at the same time*** <see Note 1 in Appendix: Notes for Users about considerations with respect to including smart controls>. Of these new LEDs, <insert number> will be LEDs with smart controls.

The net capital cost of the project, as detailed in Section 3.1, is <insert number>. The proposed funding option is <insert proposed approach to funding including summary of grants, debt, DNSP funding, internal funding or combination as appropriate>. The recurrent energy and maintenance operational savings resulting from the project are <insert estimated net cost savings per annum expected from model> which is supported in further detail in the financial model which accompanies this business case.

The recurrent energy consumption savings resulting from this project are <insert total energy savings in MWh/yr> which is a <insert percentage reduction from BAU energy usage> reduction as compared to the current energy usage of the portfolio of lighting to be replaced. The recurrent greenhouse gas (GHG) reductions resulting from this project are <insert total GHG savings in tCO2-e/yr> which is a <insert percentage reduction from BAU GHG emissions> reduction as compared to the current GHG emissions attributable to the portfolio of lighting to be replaced. These figures are supported in further detail in the financial model which accompanies this business case.

In simple payback terms, the overall project would pay for itself in about <insert number> years. This is based on total net capital costs of <insert total net project capital cost> offset by estimated subsequent annual energy and maintenance savings of <insert total annual savings> as shown in the tables above. The net present value of the project cashflows over the next 10 years is <insert NPV savings>.

This proposed project not only presents an attractive business case for the organisation, it is strongly supported by domestic and international precedents for large-scale LED and smart controls replacement programs as recognised by the IPWEA’s [SLSC Programme](http://www.slsc.org.au/home).

<insert if of significant relevance for your organisation> An important external driver is the impact of the Minamata Convention on mercury. It now appears likely that replacement mercury vapour lamps for *<insert percentage of mercury vapour lighting>* of this organisation’s legacy lighting stock which uses this technology will become hard to procure in the next few years. This would result in a forced replacement of this lighting stock and is an additional reason for the organisation to consider a well-planned changeover.

Indicative modelling suggests that an annual operational cashflow saving OR outflow of [xx] is achieved OR required if the model is funded by long-term external financing under the assumptions outlined above. **<If preliminary analysis shows that this project could service debt from the operational cashflow savings then this should be recognised here, including consideration of how using debt financing would allow the identified council funds to be re-allocated for other projects which do not generate a cashflow saving or return. The graph below, taken from the accompanying model illustrates this point graphically and can be inserted here.>**

**

***Project Net Cashflow:*** *The cumulative cash balance for the organisation after debt servicing*

***Debt Closing Balance:*** *The closing balance of debt facilities*

***Annual Debt Service:*** *Annual debt servicing including principal and interest*

***Annual Operating Cost Saving:*** *Annual operating cost saving before debt servicing*

Successful implementation of this project over the estimated <insert number> year deployment period depends firstly on securing the full cooperation with a number of key stakeholders identified in this business case including <insert top stakeholders>. Thereafter, project success will depend on managing the risks associated with a large-scale deployment including <insert top risks identified in Section 5 depending on the procurement and installation approach>.

2 | Project Scope and Context

The Model Business Case is based on a capex model of project funding. Alternative funding models such as Lighting-as-a-Service, Energy Performance Contracts and other similar models while widely used internationally are not generally an option for Australian local governments so are not considered in this Model Business Case but may be valid in some jurisdictions.

2.1 Project Objectives and Background

Project Objectives

The primary objective of this project is to affect the changeover from older, less efficient and more costly public lighting technologies, to current LED lighting technologies with smart controls. LED luminaires are more efficient and more reliable than any previous lighting technology by a significant margin. This project would drive a number of related objectives:

* provide reliable high-quality public lighting that delivers equivalent or improved lighting levels for pedestrians and road users;
* reduce overall energy consumption and consequent energy costs and carbon emissions;
* reduce the cost and frequency of both spot and preventative maintenance;
* streamline and optimise maintenance processes (using the capabilities of smart controls);
* provide consistent and adaptable lighting for the safety and amenity of the public; and
* deploy enabling infrastructure to support the future smart connected community.

Project Background

Most street lighting in Australia is managed by distribution network service providers (DNSPs) on behalf of local councils and main road authorities. However, it is local councils and main road authorities that have the exclusive legal responsibility to decide whether to light a road (or other public space), to what level and in what manner.

With the advent and commercial maturation of LED lighting and smart control systems in recent years, public lighting is undergoing a period of rapid change after many decades of relative stability.

In its 2016 Street Lighting & Smart Controls (SLSC) Programme [Roadmap](http://www.slsc.org.au/slsc/slsc-publications/slsc-roadmap), IPWEA identified typical energy and maintenance savings from a mixed portfolio as generally exceeding 50% and resulting in an overall total cost of ownership reductions of typically greater than 25%. The prospect of significant energy, greenhouse and overall cost savings offered by LED luminaires is motiving all players to consider wholesale replacement of legacy public lighting around Australia and internationally.

<If a significant proportion of your organisation’s lighting portfolio is mercury vapour lighting, see Note 2 in Appendix: Notes for Users and consider inclusion of a summary of this important external driver here as well as the percentage of your portfolio affected.>

The Minamata Convention, if it is ratified by Australia, will ban the importation of mercury vapour lamps from the end of 2020. However, irrespective of the decision that Australia takes on Minamata, most lamp producing countries have already ratified the convention. Australia does not produce lamps for street lighting and hence the issue of future mercury vapour lamp supply is emerging as a significant risk necessitating the consideration of large-scale luminaire replacements. The supply of mercury vapour lamps is already [becoming constrained](https://higherlogicdownload.s3.amazonaws.com/IPWEA/86668664-2b52-4cc1-bf25-86692c04c947/UploadedImages/PDF/201718_Minamata_start_date_1_Jan_2021.pdf). It now appears inevitable that almost 40% of Australian public lighting that is currently based on mercury vapour technology will need to be changed in the next few years.

For local governments and main road authorities, the use of LEDs is financially and strategically advantageous, and even more so when used with smart controls which offer further energy savings, improved reporting, improved confidence in service levels and the potential to support a variety of other smart city devices. For DNSPs, LEDs can deliver demonstrably higher levels of service to customers, dramatically reduce the heavy maintenance burden of current legacy lighting and, with smart controls, deliver a variety of asset management, maintenance efficiency and billing administration benefits.

*<Insert any relevant background specific to your organisation’s lighting and this project here.>*

2.2 Project Scope

Current lighting

The total number of luminaires currently in operation within the jurisdiction of the organisation is <insert total number of luminaires>. Within this number, there are <insert current total of excluded luminaires> luminaires that are to be excluded from consideration of upgrading in this business case.

Use this table if any luminaires covered by this business case fall under different ownership arrangements, or delete:

The luminaires covered by this business case come under the following different <insert ownership, cost-sharing OR approvals arrangements as appropriate>:

|  |  |  |
| --- | --- | --- |
| **Organisation** | Number of Luminaires Covered by this Business Case | Notes |
| <Insert name of local government> | <insert number of luminaires> | <insert notes on any special consideration such as cost-sharing, subsidy arrangements or approvals of 3rd parties needed> |
| <Insert name of main road authority> | <insert number of luminaires> | <insert notes on any special consideration such as cost-sharing, subsidy arrangements or approvals of 3rd parties needed> |
| <Insert name of DNSP> | <insert number of luminaires> | <insert notes on any special consideration such as cost-sharing, subsidy arrangements or approvals of 3rd parties needed> |

Use this table to summarise the different types of existing street lights and other public lighting (if applicable) to be replaced:

The number of existing luminaires proposed for replacement in this business case is summarised in the following table by lighting category and lighting type:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Assumed Lighting Subcategory[[1]](#footnote-1)** | **Types of Lighting** | **Number of Luminaires** | **% of Luminaires** | **Notes** |
| **P4/P5 Residential Road Lighting** | <insert total of this category> | <insert # of each lighting type> | <insert % of each lighting type> | <insert notes on any special considerations for particular lighting types> |
| **P3 Residential Road Lighting** | <insert total of this category> | <insert # of each lighting type> | <insert % of each lighting type> | <insert notes on any special considerations for particular lighting types> |
| **V5 Main Road Lighting** | <insert total of this category> | <insert # of each lighting type> | <insert % of each lighting type> | <insert notes on any special considerations for particular lighting types> |
| **V3 Main Road Lighting** | <insert total of this category> | <insert # of each lighting type> | <insert % of each lighting type> | <insert notes on any special considerations for particular lighting types> |
| **V1 Main Road Lighting** | <insert total of this category> | <insert # of each lighting type> | <insert % of each lighting type> | <insert notes on any special considerations for particular lighting types> |
| **Other Subcategories of Road or Public Space Lighting** | <insert summary other lighting types as needed> | <insert # of each lighting type> | <insert % of each lighting type> | <insert notes on any special considerations for particular lighting types> |
| **TOTAL LIGHTING** |  | <insert total # of luminaires> |  |  |

<If the organisation’s lighting portfolio is large and diverse, consideration should be given to including a more detailed inventory summary as an appendix. See Note 3 in Appendix: Notes for Users for a suggested approach.>

Inclusions and Exclusions

This business case recommends a full changeover OR a partial changeover of <insert number> luminaires to be replaced with LED luminaires. Of these new LED luminaires, <Insert number> will be LED luminaires with smart controls.

The luminaires that are not proposed to be replaced under this business case are the following types: <insert categories of luminaires>. The reasons for not replacing these luminaires are cost factors (eg luminaires are decorative types to be dealt with separately or luminaires have very high residual values***[[2]](#footnote-2)*** making the business case unattractive) OR luminaires were recently upgraded to LEDs OR there are planned road changes OR other.

Assumptions

The project, as it currently stands, is based in the following key assumptions:

* the assumed start date of the project is <insert start date> with the project assumed to take approximately <one year assumed as default – change if needed> to implement;
* the implementation will be undertaken by <insert DNSP or contractor or other party as appropriate>;
* the legal and regulatory frameworks for street lighting will remain more or less consistent over the period modelled for this business case;
* the capital and BAU costs will fall within the forecasted amounts, and funding will be successfully secured as discussed in Section 4: Funding Considerations which assumes 10 year debt financing as the base case <change as appropriate>;
* the impact of the Minamata Convention may affect the supply of mercury vapour lamps in the medium-term necessitating upgrade of these luminaires which make up <insert percentage> of the total portfolio to be replaced irrespective of whether this particular project is approved or not;
* the modelling supporting this business case has been undertaken over a <insert number of years with 10 years being the suggested default>year period on the basis that this reasonably captures the total costs and benefits over the minimum expected lifetime;
* the internal discount rate assumed in the model supporting this business case is <insert organisation’s internal discount rate used for project assessment. Check with your organisation’s finance team on the applicable internal discount rate used for project evaluation.>;
* the total cost of all charges proportional to energy consumption assumed in the model supporting this business case is <insert assumed total energy cost in c/kWh including ALL costs proportional to energy consumption of luminaires (eg retail energy, losses, network distribution charges, environmental charges, market charges as they apply to the organisation’s street lighting costs)>and this is assumed constant across the period modelled <insert assumption about proposed price path if inflation or other price path has been modelled>; and
* <insert any other key modelling assumptions>.

Dependencies and Constraints

Successful implementation of this project depends on the following:

* that <insert LGAs, Main Road Authority and/or DNSP as appropriate> are willing to actively cooperate throughout the course of the project in its approval and implementation through <insert a brief summary of the nature of support needed (eg technical approvals, co-funding, tariff agreement, agreement to allow approved contractors to deploy or for a DNSP to lead deployment)>;
* that the <insert as appropriate: LED, smart controls and/or installation contractor> tendering processes are managed successfully and to budget;
* that all works take place within planned timeframes, not limited or disrupted by equipment supply availability, technical challenges, labour availability, weather events or other unforeseen events; and
* that financing of the project is secured (see Section 4).

2.3 Policy and strategy alignment

If your organisation has specific policies or strategies that are supported by this project, include the following. If there are not, you can delete it (see next burgundy box for alternative).

The project is aligned with the following organisational policies and strategies:

|  |
| --- |
| **Relevant strategies and policies** |
| **Insert strategy or policy** | Briefly describe how the project is aligned |
| **Insert strategy or policy** | Briefly describe how the project is aligned |
| **Insert strategy or policy** | Briefly describe how the project is aligned |
| **Insert strategy or policy** | Briefly describe how the project is aligned |

In the absence of a specific policy framework clearly supporting the deployment of upgraded lighting, local governments may wish to use the following:

This project sits strongly within the strategic priorities for Australian local government, as set out by the Australian Local Government Association. Relevant priorities are summarised in the table below.

|  |
| --- |
| **Strategic priorities for local government 2017-2020** |
| Strengthened local government financial stability | This project delivers lower total costs for public lighting due to significant on-going energy and maintenance cost savings of at least 50%, and potentially more than this when deployed with smart controls. |
| Strengthened regions and cities | Well-designed street lighting solutions improve the safety and security of communities, while keeping them better connected. |
| Infrastructure that meet the needs of local communities | LED lighting provides high-quality white light, is significantly more reliable and, with smart controls, can more readily be controlled to better meet local community needs. |
| Innovation and digital transformation in local government | As evidenced in large LED and smart controls deployments globally, these projects and the associated communications networks provide not just better control over and information about street lighting but are also provide a key enabling backbone for many smart city applications. |

2.4 Project Status and Approvals Process

**<Insert a short bullet point summary of the internal approvals process for this project for your organisation, what step the project is currently at and the likely timing for each stage of the approvals process through the Department driving it, the Executive Team and a Council/Board as appropriate.>**

2.5 Key stakeholders

Large-scale deployment of LED lighting with smart control involves a range of stakeholders from national, state and local government organisations to DNSPs and main road authorities, as well as a number of other community stakeholders. Given the scale of the project and the range of stakeholders, a high-level stakeholder engagement plan will be developed if this project is approved.

Key stakeholders and their likely involvement in this project are:

*This list of stakeholders in the section below assumes that the writer of this business case is a local government or a group of local governments. If the writer is a main road authority or DNSP,* then many of the stakeholders below will still be relevant, albeit with some having a different role in the project from the perspective of the proponent. *The writer is therefore encouraged revise or delete as appropriate.*

*Stakeholders here are described generally, but all of these paragraphs can be edited to include further details of stakeholders including the names of organisations as well as specific considerations and priorities. Other known stakeholders can be added to this list as needed.*

1 - LGA: **<replace with name or names of all responsible LGAs covered by this business case>**

As the road authority and public authority with exclusive powers to decide whether to light, to what level and in what manner, the local government(s) carries the ultimate financial responsibility for public lighting and ultimate oversight of this project and its longer-term community benefits.

2 – DNSP: **<replace with name of DNSP or DNSPs>**

The DNSP is a key stakeholder as they own and manage *<most* OR *all>* of the luminaires encompassed in this project. The DNSP therefore plays a significant role in facilitating the project. Council(s) recognise that, with a likely loss of revenue from the project, the DNSP has limited incentive to expedite it and faces many competing priorities as street lighting is only a very small portion of its business. <Clarify the precise role of the DNSP in your jurisdiction (e.g., In this project, the DNSP will choose the LED luminaires and/or smart controls suppliers and/or the installation contractors, and/or will lead the project management.)>

3 - Main road authority: **<replace with name of main road authority>**

The main road authority is responsible for higher classifications of roads including **<Customise as appropriate to your jurisdiction describing the classes of main roads for which the main road authority directly manages or pays for or co-pays for or subsidises street lighting>**. Given their role as the peak road safety authority, the main road authority has an interest in ensuring consistent lighting quality. The main road authority’s primary roles in this project are **<Customise as appropriate if the main road authority needs to be consulted on the specification for main road lighting, approve replacement lighting and/or will be asked to fund or co-fund replacement lighting>**.

4 - Lighting and smart controls suppliers

The supplier(s) must supply luminaires and smart controls meeting the specification within relevant timeframes under appropriate terms, providing post-sale technical and warranty support. **<Customise as appropriate if the local government is to specify some aspects of the lighting and smart controls to be deployed or wishes to propose an alternative technical approach to the DNSP or will lead the procurement of equipment>.**

5 - Installation contractors

<Customise as appropriate if the local government is to directly lead the procurement of installation services (and potentially on-going maintenance services) or wishes to work jointly with the DNSP and the contractor to agree on the deployment priorities and staging approach>.

6 - Project Management

Project management is central to the timely completion of the project. Project management is to be led by <Customise based on whether Council, the DNSP or a 3rd party will lead the project management and summarise how this will be overseen and reported on>.

7 – Financier

The key financing is expected to come from in-house funds / loans from <insert entity> / grants from <insert scheme>.

Eligibility for <insert scheme> also depends on the successful energy savings outcomes.

8 – Advisor(s)

<If there are any internal, independent or other technical advisors involved in this project they should be described here.>

9 – Energy Regulator(s)

<If there are any changes or approvals by an energy regulator specifically for the project (eg new AEMO Unmetered Load Table listings, new luminaire tariff approvals).>

10 - The Community

The community’s engagement and understanding regarding the benefits of this project is crucial to their buy-in. They must see the potential of the proposed lighting technologies if they are to support the project. Communication of project benefits for the community as well as any likely disruption should be consistently delivered at every stage.

11 – Other Stakeholders

<If there are any stakeholders with direct local interest in the project include here (eg the police seeking lighting improvements in particular areas, astronomical groups with particular concerns about light pollution, environmental NGOs with concerns about the impact of public lighting on wildlife or human health).>

2.6 Options analysis

There are a number of options to deliver LED street lighting upgrades over the coming years, summarised as follows:

The ‘Business-As-Usual’ approach

In this option, costs continue to rise in line with electricity price movements and regulatory pricing decisions. The DNSP <insert name> will replace legacy lighting on an as-needs basis, typically at 3-5% per year as luminaires reach the end of their useful life. The changeover will therefore happen progressively over typically 20 years and will not deliver any significant cost saving or short-medium term strategic benefits. This option does not require intensive management attention or large-scale investment by the organisation. <While ostensibly not requiring any large-scale investment, continuing with BAU practices may not be feasible in the case of councils, road authorities or utilities with high levels of mercury vapour lighting. See discussion on Minamata Convention in Appendix: Notes for Users>.

Partial changeover to LED

This option involves upgrading luminaires of certain types or luminaires found on certain classes of roads. This does not achieve the full potential energy and maintenance savings, as it is only a partial changeover. However, where financing is highly constrained, it may be the most practical option and has been a common characteristic of many early LED deployments in Australia.

One additional consideration is that in areas where there is a partial changeover and some legacy lighting continues to operate, not only is the individual maintenance on all the older luminaires still costly, the entire proactive maintenance cycle will likely need to remain frequent enough to service the worst performing luminaires. The full maintenance cost savings of LEDs may therefore not be achievable until the great majority of legacy lighting is removed.

Full changeover to LED

In this option, all luminaires are upgraded to LEDs. This approach delivers significant energy savings and improves maintenance costs by figures typically exceeding 50% across a diverse portfolio but has higher capital costs than a partial or staged approach (though perhaps offers greater cost efficiencies at scale). Such an approach is, however, more readily communicated to the public, and is highly like to deliver better returns on investment.

Full changeover to LED with smart controls

This option captures all the benefits of the LED changeover in terms of energy savings; and allows further energy savings potential of up to 20% by increasing the adaptability of lighting timing and lighting levels. It further streamlines maintenance, as the luminaires themselves are able to communicate effectively regarding their maintenance needs. This option also builds the infrastructure towards future smart cities, and eliminates double-up on installation costs when smart devices are ultimately rolled out across Australian cities in the future. This option may also deliver a range of social, astronomical, environmental and indirect financial benefits by, for example, allowing for more responsive lighting (eg adapting to traffic or weather) and by reducing light pollution in off-peak hours where dimming regimes are introduced.

The IPWEA’s SLSC Programme has noted that most large deployments globally since 2016 involve both LEDs and smart controls for the reasons summarised above. A full changeover with smart controls, however, has the highest capital costs and additional energy savings from smart controls may not result in energy cost reductions as the current approach to billing for unmetered street lighting in the National Electricity Market assumes lighting runs at full power from sunset to sunrise (though a fixed dimming regime with smart controls can potentially achieve such savings).

3 | Summary of Project Business Case

This business case assumes a one-year deployment period and considers the project costs and benefits over a 10-year period compared to business-as-usual. The costs and savings outlined in this document are based on a supporting Excel-based workbook. All costs in the associated model are expressed in today’s terms (i.e., real values).

3.1 Summary of costs and funding

The total net capital cost of the project is estimated to be <insert total project cost>. Funding options are discussed in detail in Section 4: Funding Considerations.

The project capital costs can be broken down as follows:

* Capital equipment costs are estimated to be <insert procurement cost>;
* Installation costs are estimated to be <insert installation cost>;
* Residual capital costs that must be paid on existing lighting are <insert total residuals>;
* Other capital costs are <insert other capital costs such as required bracket replacements or electrical works>;
* Specialist consultant costs are <insert total consulting costs>; and
* Project management costs are <insert total project management costs>.

Reducing the required capital investment are the following avoided costs, credits and grants:

* Avoided bulk lamp replacement costs of this project are <some utilities offer a credit to customers for the avoided cost of the next bulk lamp replacement which they collect annual maintenance revenue for but only conduct typically every 3-4 years. If applicable insert avoided BLR credits.>;
* Available energy efficiency / environmental credits <insert estimate of available energy efficiency / environmental credits (eg VEETs, ESCs, ERUs)>; and
* Available grant funding <insert estimate of available grant funding)>.

Operational costs are as following:

* Ongoing BAU capital, energy and maintenance costs are <insert annual cost> per year; and
* Ongoing LED energy and maintenance costs (having paid all capital costs) are <insert annual cost> per year.

The recommended funding option is / recommended funding options are <insert brief discussion of proposed funding approach based on consideration of the organisation’s financial reserves and its ability to fully or partly fund capital projects of this nature and size and any external borrowings required.>

3.2 Project NPV and simple payback period

Based on total net capital costs outlined above of <insert total project cost from model> and annual operating cost savings of <insert net cash saving p.a from model>, the project pays for itself in approximately <insert number of years from model> years.

Assuming a <insert Internal Project Discount Rate used in model. Check with your organisation’s finance team on the applicable internal discount rate used for project evaluation>% internal discount rate, the net present value of the project cashflows over the next 10 years is <insert NPV from model>.

If external financing is used, the operating cost savings generated by the Project enable debt to be repaid over <insert loan term from model> years with an annual cash *<surplus* OR *deficit* of <insert net cash saving/(outflow) p.a if debt funded from model>.

This is based on the financial assumptions described in Section 2 and the summary of costs above.

3.3 Project benefits

3.3.1 Energy savings

* Current energy consumption of the lighting to be replaced is **<insert current energy consumption in MWhr/yr>** with the new LEDs expected to reduce this to **<insert projected energy consumption in MWh/yr>,** which is a net saving of **<insert percentage savings.>**
* Current energy costs of the lighting to be replaced is **<insert current energy costs in $/yr for all charges proportional to energy consumption including retail energy, losses, network distribution, environmental and market charges>** with the new LED luminaires expected to reduce this to **<insert projected energy costs in $/yr (ensuring inclusion of energy associated with smart controls if applicable)>,** which is an annual saving of <insert net cash saving/(outflow) p.a> or **<insert percentage savings.>** of current energy costs.

3.3.2 Maintenance savings

* Current maintenance costs of the lighting to be replaced is **<insert current maintenance costs in $/yr>** with the new LEDs expected to reduce this to **<insert projected maintenance cost in $/yr>,** which is a net saving of **<insert percentage savings.>**
* Maintenance cost savings are driven by:
* **Lower spot failure rates:** While legacy lighting usually has spot lamp failure rates of 7-15% per year, failure rates of LEDs is typically less than 1% per year;
* **Longer preventive maintenance cycles**: Lamps in legacy luminaires must be periodically replaced every 3 – 4 years (known as ‘Bulk Lamp Replacement’) to maintain required light output and avoid high spot failure rates found at end of life. As they contain mercury, lamps must also be safely disposed of through an approved recycling contractor. In comparison, LED lighting output declines only very slowly with cleaning and inspection cycles of at least 5 - 6 years likely to be sufficient; and
* **Streamlined maintenance processes**: With smart controls, the luminaires are able to communicate automatically back to the operators when luminaires are not working properly. This eliminates the need for regular physical visits (known as ‘night patrols’) to check lighting and also allows for maintenance to be organised much more efficiently.

3.3.3 Environmental benefits

* **Carbon emissions**: Current emissions as a consequence of powering the lighting to be replaced is **<insert current emissions in t CO2-e/yr>** with the new LEDs expected to reduce this to **<insert projected emissions in t CO2-e/yr>** which is a saving of <insert emissions abated tCO2-e/yr from model> and **<insert percentage savings from model>** of current emissions.
* **No more mercury:** This project would eliminate the use of mercury-containing lamps if all legacy lighting is changed. Almost all legacy lighting types including mercury vapour, high pressure sodium, metal halide and fluorescent lamps contain mercury. Mercury is a powerful neurotoxin and consequently lamps must be handled with extreme care and be carefully recycled to avoid potential harm to both humans and the wider environment.
* **Reduced light pollution**: Properly selected LED luminaires together with good lighting design provide better optical control than legacy lighting and can significantly reduce obtrusive light beyond the road reserve into private properties. The reduced upward waste light of LED lighting will also significantly reduce light pollution to the night sky as a result of this project, and smart controls can adapt the level of lighting to be no more than necessary including dimming or switching off lighting during off-peak periods.

3.3.4 Other benefits

* **Improved lighting service**: LED lighting provides a higher quality white light with improved uniformity compared to the legacy lighting being removed.
* **Improved road safety**: The impact of street lighting in reducing the number of road deaths and serious injuries at night has been substantiated by international research, and the high-quality white light of LEDs has been shown to deliver road safety benefits.[[3]](#footnote-3)
* **Improved pedestrian amenity and safety**: LED lighting provides improved quality lighting (both in terms of spectral characteristics and higher colour rendering) making people feel safer and more comfortable using public spaces at night, while smart controls provide the ability to adjust lighting levels up or down depending on community needs.
* **<Insert any other benefits to your organisation or key stakeholders not covered by the above>**

3.4 Mitigating the risk of harm from public lighting

It is increasingly recognised that all public lighting has the potential to cause harm to human health and to the environment. To mitigate the risks of harm, guidance of the IPWEA’s Street Lighting and Smart Controls Programme will be followed in implementing this project.

In summary:

* To maximise road safety outcomes, 4000K LED luminaires will be specified for main or arterial roads requiring AS/NZS 1158 Category V lighting;
* Where the lighting needs of pedestrians predominate for roads and other public spaces lit with AS/NZS 1158 Category P lighting, warmer 3000K LED luminaires will be used for comfort and to mitigate a range of health and environmental concerns;
* **<In some specific environments (e.g. near astronomical observatories or near sensitive ecosystems) lighting with colour temperatures well below 3000K, or with very particular spectral power distributions, may be most appropriate. In considering whether such additional options are required for a project, specialist advice should be sought>; and**
* ***All replacement luminaires will include smart lighting controls and a Central Management System so that all luminaires can be controlled individually and en masse for the purposes of trimming excess light, dimming/brightening lighting when appropriate, and switching off lighting when not needed, subject to a business case assessing their suitability.***
* An MIESANZ-qualified lighting designer (or equivalent) will be appointed to ensure selection of appropriate luminaires and good photometric design that minimises glare, light spill and, upward waste light; and is fit for the environment for which it is to be deployed.

4 | Funding Considerations

4.1 Summary of costs

Capital and installation costs

The total capital cost of the new LED luminaires is <insert total>. A mix of LED lighting types is required to replace the current lighting inventory. The breakdown of current lighting types was discussed in Section 2.2, with different lighting categories requiring a different specification of replacement LED light. The table below summarises the assumed LED replacement types to be used for each lighting category, their assumed cost and the number of each required.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Assumed Lighting Subcategory[[4]](#footnote-4)** | **Most common current lighting types** | **Assumed replacement LED lighting type** | **Number of luminaires** | **Assumed cost per light** | **Total Cost** |
| **P4/P5 Residential Road Lighting** | <insert examples of most common current types from Sec 2.2> | <insert type> | <insert #> | <insert cost> | <insert cost> |
| **P3 Residential Road Lighting** | <insert examples of most common current types from Sec 2.2> | <insert type> | <insert #> | <insert cost> | <insert cost> |
| **V5 Main Road Lighting** | <insert examples of most common current types from Sec 2.2> | <insert type> | <insert #> | <insert cost> | <insert cost> |
| **V3 Main Road Lighting** | <insert examples of most common current types from Sec 2.2> | <insert type> | <insert #> | <insert cost> | <insert cost> |
| **V1 Main Road Lighting** | <insert examples of most common current types from Sec 2.2> | <insert type> | <insert #> | <insert cost> | <insert cost> |
| **Other Subcategories of Road or Public Space Lighting** | <insert examples of most common current types from Sec 2.2> | <insert type> | <insert #> | <insert cost> | <insert cost> |
| **TOTAL** |  |  | <insert total #> | <insert total cost> | <insert total cost> |

The table below summarises the assumed installations costs for each lighting subcategory and the number of each required.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Assumed Lighting Subcategory[[5]](#footnote-5)** | **Assumed replacement LED lighting type** | **Number of** Luminaires | **Assumed installation cost per light** | **Total Cost** |
| **P4/P5 Residential Road Lighting** | <insert type > | <insert #> | <insert cost> | <insert cost> |
| **P3 Residential Road Lighting** | <insert type > | <insert #> | <insert cost> | <insert cost> |
| **V5 Main Road Lighting** | <insert type > | <insert #> | <insert cost> | <insert cost> |
| **V3 Main Road Lighting** | <insert type > | <insert #> | <insert cost> | <insert cost> |
| **V1 Main Road Lighting** | <insert type > | <insert #> | <insert cost> | <insert cost> |
| **Other Subcategories of Road or Public Space Lighting** | <insert type > | <insert #> | <insert cost> | <insert cost> |
| **TOTAL LIGHTING** |  | <insert total #> | <insert total cost> | <insert total cost> |

Cost estimates in the above tables are based on <insert summary of where cost estimates have come from (eg defaults suggested in IPWEA model, comparable projects, informal feedback from suppliers, EOI process, tender, specialist advice or other>.

Residual asset values of existing lighting **(if applicable)**

The current residual value of existing lighting to be removed is <insert total>. These residual values are based on <insert description of how residual value has been determined (eg a lump sum, a flat amount per luminaire or a specific amount that varies with each luminaire depending on age and tariff type).>

Energy and maintenance costs

Current energy and maintenance costs are detailed in the supporting model and have been obtained from <insert description of where energy cost information has been obtained from (eg defaults suggested in IPWEA model, recent energy bill) and where maintenance costs for current and replacement LED luminaires have come from (eg defaults suggested in IPWEA model, published DNSP tariffs, DNSP forecasts or other).>

Environmental credit schemes

<insert description of which energy efficiency / environmental credit scheme applies (eg VEETs, ESCs, ERUs), any special considerations and whether accreditation under that scheme has been sought for the project.>

4.2 Overview of financing options

All financing comes with costs and these costs can vary considerably, depending on the source of financing. There are typically three categories of financing available to councils. For this project, consideration has been given to the following possible financing options for this project **<This section, written from a typical local government perspective, needs to be carefully tailored to the organisation’s situation and non-relevant options should be deleted.>**:

DNSP financing

The capital costs can often be financed by the DNSP, to be repaid via on-going capital charges as approved by the pricing regulator.

Embedded in the street lighting capital tariffs charged by the DNSP is both a cost of capital approved by the regulator and CPI indexing of the capital costs. **<In practice, DNSP financing of street lighting is often higher in cost than other financing options available to local government and main road authorities but the author will need to assess capital costs specific to their DNSP to judge this.>** DNSP financing of street lighting upgrades is also subject to some degree of uncertainty because the cost of capital embedded in tariffs and the value of asset types can be revised at each regulatory pricing review, irrespective of the basis on which the business case was assessed or the replacement agreed to.

While neither a loan nor a lease, council would nonetheless have a financial obligation to the DNSP for all assets which it agrees that the DNSP will fund. Council may wish to put a note in its financial accounts about this obligation if the project is financed in this manner.

Debt financing

A variety of parties are willing to provide long-term, commercial debt financing for LED street lighting upgrade projects on reasonable terms. Debt can be obtained from state treasury corporations, local government finance authorities, the CEFC and a variety of commercial financiers. **<The author should check their organisation’s borrowing guidelines in the first instance to determine eligible financing options. Some states/territories offer financing programs for local governments through state treasuries or other entities. If preliminary indicative costs have been discussed with any of these parties, the author may wish to summarise this here. If preliminary analysis shows that this project could service debt from the operational cashflow savings then this should be recognised here, including consideration of how using debt financing would allow the identified council funds to be re-allocated for other projects which do not generate a cashflow saving or return>.**

Internal funds

Council could fund this project from its reserves, allocating the project costs within future years' forward estimates. This project may present a higher rate of return than currently earned on council reserves. Council’s opportunity cost in using reserves to fund this project are estimated at **<Council should explicitly recognise the typical percentage rate of return on its reserves as the opportunity cost here as well as the limits of any reserves and the degree to which the use of reserves for this project may constrain other projects>**.

4.3 Debt modelling

As per Section 3.1, the total net capital cost of the project is estimated to be <insert total project cost>.

The debt modelling section in the accompanying financial model, assumes that the capital cost is 100% debt financed with a fixed interest rate over a 10-year period. There are a lot of options for how to structure a debt financing solution (e.g., percentage of capital expenditure financed by debt, loan term, fixed vs variable or a combination, different repayment profiles). The accompanying financial model does not seek to provide a fully flexible debt analysis tool, rather it provides a debt scenario for analysis with the reasons for the assumptions outlined below.

A 10-year period has been chosen as the basis of modelling as it reasonably captures the total costs and benefits over the minimum expected lifetime. 10 years is consistent with typical LED luminaire warranties and is the basis of DNSP LED tariffs in some jurisdictions. This is a conservative assumption based on the typical warranty period. The useful life of an LED may be longer and different debt modelling periods can be chosen.

A fixed interest rate and equal annual repayments have been assumed in the accompanying financial model as this would deliver budgeting certainty for the organisation for a relatively long-lived asset.

The assumed cost of financing in the accompanying model is **<in the accompanying model, the indicative rate used is 4.25% for 10-year fixed rate financing. The rate is for illustrative purposes only and will need to be updated by the author.>**

It is assumed that the debt facility will be drawn up-front **<vary as appropriate>.**

**<Insert tabular summary here of finance options considered above outlining the cost of financing under each option over x years (based on stated assumptions), how finance is to be repaid from (or largely offset) from operational cost savings as well as the pros and cons of each approach to create a comparison between the different funding options available to the organisation.**

**Depending on the options considered and the organisation’s circumstances and policies, the author should also consider including a short discussion of such issues as the benefits of budget certainty from fixed rates vs variable rates, the risk of pricing reset with a new regulatory determination if DNSP funded, the obligations that will need to be met including payments, information reporting and granting security from rates base, the borrowing capacity of the organisation and the borrowing guidelines of the organisation.>**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Funding Option** | **Cost of Financing Over *X* Years** | **Repayment Approach** | **Pros** | **Cons** |
| 1. **DNSP Financing**
 |  |  |  |  |
| 1. **Debt Financing**
 |  |  |  |  |
| 1. **Internal Funding**
 |  |  |  |  |

Please note that the financial model does not assume any price escalation for costs. That is, the costs are entered as “year 1” costs and remain unchanged for the total modelling period. While these costs will fluctuate year on year, this is a simplified modelling assumption and flagged for the author’s awareness when using the financial model.

Also note that the discount rate for financial analysis is an “input figure” for the author to insert an appropriate internal discount rate. As a result of the cost base being in real terms, the author may need to adjust the calculation of the discount rate for escalation to align both cost and debt forecasts. In all cases, the discount rate assumed in the model should be determined in accordance with internal policies and return benchmarks.

4.4 Preliminary recommendation on financing

Based on the organisation’s circumstances and consideration of the above options and analysis, and in accordance with internal policy on borrowing and treasury management the project team recommends that this project is financed by <Insert recommended option and basis for that recommendation including summary of any external advice sought or analysis conducted. If this project could service debt from the operational cashflow savings, then consideration should be given to the use of debt and therefore keeping council funds for other projects which do not generate a cashflow saving or return (a large part of services that council seeks to provide)>.

5 | Implementation Approach

5.1 Procurement approach

*This section assumes that the writer of this business case is a local government or a group of local governments. If the writer is a main road authority or DNSP, then the sub-sections and text below will require adaptation consistent with Departmental, State Treasury or corporate procurement and debt management requirements as applicable. The author is therefore encouraged to consider the suggestions below and revise or delete as appropriate.*

Choose from the following three options as appropriate to your jurisdiction and circumstance:

Option 1: DNSP Procurement

The procurement process for LEDs, smart controls and lighting installation services will be undertaken by the DNSP, who will source and select appropriate lighting and installation services according to road category and lighting requirements.

The lighting to be replaced is currently owned by the DNSP and its replacement is non-contestable. There is therefore no current option for the council to lead these procurement processes. However, council will review the current DNSP specifications to ensure that they reasonably meet its technical objectives, are technically current and are commercially competitive.

The next step is to meet with the DNSP and establish their current specifications, confirm the cost estimates underpinning this business case and secure an indication of the likely timelines for deployment.

Option 2: Local Government Procurement in Conjunction with the DNSP

The procurement process will be undertaken by this organisation in consultation with the DNSP (and where appropriate, the main road authority) to ensure that the technical specification meets the DNSP’s requirements while also meeting council’s technical objectives and observing the relevant tendering requirements and guidelines for local government.

The current DNSP requirements, the specifications of any regional joint procurement initiatives (if applicable) as well as the IPWEA SLSC Programme [**Model Specifications**](http://www.slsc.org.au/slsc-publications/model-specifications) for LED lighting and smart controls will be considered as the basis for the equipment specifications. Council will review the current DNSP requirements to ensure that they reasonably meet its technical objectives and are technically current.

At the end of the procurement and installation process, it is expected that the luminaires will be gifted to the DNSP, making close cooperation throughout the process necessary for a satisfactory outcome. The DNSP will have ownership of the luminaires thereafter and maintenance responsibility.

Option 3: Local Government Procurement

The procurement process will be undertaken by this organisation (and where appropriate, in coordination with the main road authority) to meet council’s technical objectives and observing the relevant tendering requirements and guidelines for local government.

The IPWEA SLSC Programme [**Model Specifications**](http://www.slsc.org.au/slsc-publications/model-specifications) for LED lighting and smart controls will be used as the basis for the equipment specifications.

5.2 Project management plan

5.2.1 Timeline

It is anticipated that concurrently run procurement processes for LED lighting, smart controls and an installation contractor will take approximately <insert number of months applicable to your organisation> and that the lead time from awarding of contracts to mobilisation will be at least four months <insert alternative as appropriate but note that lead times of 12-16 weeks for larger volume equipment orders are typical>. It is expected that this deployment will take place over less than a year <insert alternative as appropriate but note that deployments across all but the very largest councils would typically be expected to be completed within a year>.

5.2.2 Project risk management

In this section, a number of possible project risks and management strategies have been suggested. Select only the risk factors in green that apply to your organisation and amend as required in accordance with the internal risk assessment procedures used by your organisation adding any others as required. It is suggested that a simple coloured traffic light system is used to identify the seriousness of each risk after assessment by the author.

There are a number of risks associated with this project. Key risks and how they are to be mitigated are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Unforeseen delays | Low Risk | Moderate Risk | High Risk |

As with any large project, there is the risk that issues during procurement and installation could cause delay. These risks include procurement delays because of unfamiliarity with the types of equipment being procured, delays in the supply of goods because of significant current global demand and delays in installation due to weather or labour issues.

Strategies to be used to mitigate these risks include:

* Significant weighting in tender evaluation being placed on the suppliers’ track records with on-time product supply/installation services and inclusion in contracts of incentives/penalties for performance/non-performance;
* Clear written division of responsibilities and regular reporting by suppliers and project management meetings with both suppliers and key external stakeholders; and
* Appointment of a dedicated internal/external project manager to ensure full on-going oversight of all aspects of the project including the earliest possible identification of and response to emergent issues.

|  |  |  |  |
| --- | --- | --- | --- |
| Cost escalation | Low Risk | Moderate Risk | High Risk |

As with any large project involving multiple suppliers, there is the risk that the initially assumed costs will be higher than expected. The key strategies to mitigate this risk include:

* Running procurement processes in parallel and not awarding any contracts under this project until all major procurement processes are complete, with costs of each well understood;
* Dividing up supply contracts for major lighting product and service categories to mitigate the risk of any one supplier failure with the need to create a new tender at an unknown cost; and
* Push back on foreign currency conversion clauses and/or hedge currency risk.

|  |  |  |  |
| --- | --- | --- | --- |
| Technical risks | Low Risk | Moderate Risk | High Risk |

As with any large project involving relatively new technology, there is the risk that the technology will not perform as expected. This includes most importantly the risks of higher than expected failure rates or aberrant electrical or controls behaviour that would necessitate replacements. The key strategies to mitigate this risk include:

* The use of the IPWEA Model Specifications to minimise the risk of sub-standard, unreliable or incompatible equipment being procured and to ensure robust warranty conditions;
* Seeking specialist external advice as required;
* Significant weighting in the tender evaluation being placed on the suppliers’ track records with equipment supply; and
* Inclusion of labour contributions to warranted failures (most likely for an initial period only to limit cost implications).

|  |  |  |  |
| --- | --- | --- | --- |
| Inventory Issues | Low Risk | Moderate Risk | High Risk |

This organisation recognises that street lighting inventories represent decades of accumulated history with data entry having been made by multiple parties, with inventories typically having an unclear audit history. Further, some road usage has varied over time - originally classed as minor roads, are now high-volume traffic routes with existing street lighting reflecting the history as a minor road. Therefore, risks of both inventory errors (including phantom lights, duplication, other agencies equipment and omissions) and inventories containing legacy lighting (which should not be replaced directly with the modern equivalent) exist. The key strategies to mitigate these risks include:

* If recent history suggests any risk of appreciable inventory errors (eg if this has been an issue in billing or in lighting upgrades), a review of GIS data and a sample audit will be conducted to identify the likely degree of inaccuracy and its potential impact on the project; and
* A review of AS/NZS 1158 road lighting sub-categorisation will be undertaken prior commencement of works.

|  |  |  |  |
| --- | --- | --- | --- |
| Failure to secure funding or environmental certificates | Low Risk | Moderate Risk | High Risk |

Failure to secure funding support for this project or a key component of funding support such as environmental certificates presents a material risk to the project. The key strategies to mitigate this risk include:

* The use of this model business case and the accompanying financial modelling tool to ensure the preparation of a robust business case and ensure it can be effectively communicated to all stakeholders; and
* The use of specialist external advice as needed (eg with respect to environmental certificates and tender specifications).

|  |  |  |  |
| --- | --- | --- | --- |
| Negotiation hold-ups with the DNSP | Low Risk | Moderate Risk | High Risk |

This organisation recognises that negotiations for lighting upgrades have been protracted in some jurisdictions due to misaligned incentives. There is therefore a risk that negotiations with the DNSP might not proceed favourably with respect to the deployment schedule or agreed technical specification, delaying timelines and affecting costs.

* Initiate negotiations early and in a transparent manner with the DNSP, seeking specialist external technical support and senior management intervention as needed; and
* Make awarding of all supply contracts contingent on formal agreement with DNSP.

5.2.3 Project oversight and management

<Insert text here outlining which individual or individuals will have carriage of the project on a day-to-day basis, what their specific responsibilities and authority will be, who they will report to on the project and what their reporting requirements will be. Preparation of a detailed project management plan and timeline would be the most appropriate first step for the project manager once a decision is taken to proceed with the project.>.

5.4 Measurement and verification approach

A baseline street lighting inventory will be provided to all stakeholders at the outset of the project to act as the primary reference for all measurement and verification under the project.

<If recent history suggests an any risk of appreciable inventory errors (eg if this has been an issue in billing or in lighting upgrades), text should be inserted here about a review of GIS data and a sample audit being conducted prior to implementation of the project to identify the likely degree of inaccuracy and how best to manage this in the course of undertaking upgrades to ensure robust before and after data is collected>.

<Where required, the user may insert reference here to the use of European Standard EN 13201-5: Energy Performance Indicators as the basis of a robust systemic energy measurement and verification approach (likely to be shortly adopted as an optional part of AS/NZS 1158.3.1 and AS/NZS 1158.1.1)>.

5.5 Stakeholder communications plan

If properly delivered, this project presents a significant opportunity for council to demonstrate financial, social and environmental sustainability to a wide variety of stakeholders. Put simply, the project would permanently reduce the cost of lighting for this organisation, would deliver important service level improvements as well as safety and security benefits for the community and would reduce the environmental impact of street lighting.

If well communicated, the benefits of this project can therefore be leveraged to create ongoing community support while also clearly communicating the reasons for any short-term disruption created by the project.

Key aspects of a communications plan, to be developed in detail by the project management team, are as follows:

* **Stakeholder identification** – Including the community, community organisations, the DNSP, the main road authority, suppliers, advisors, financiers and council staff;
* **Messaging** – The communications plan will detail key messages and messaging timing to ensure that the right information is delivered consistently by all parties involved in the project at the right time for each stakeholder group; and
* **Communications channels** – The most effective communications channels for each stakeholder group will be identified

Council recognises that developing a proactive communications plan in early stages of the project can help ensure effective cooperation and support for the project. Its development will therefore be one of the first tasks of the team once this project is approved.

5.5.2 Project Case Studies

A key benefit for councils, road authorities and utilities, both domestically and internationally, from large-scale LED lighting upgrades is strong positive media and community engagement once work commences. In considering the merits of this proposed project and any subsequent communications strategy, this organisation should be mindful of the strong successful precedent of other similar deployments.

Reference is made to the following case studies identified by IPWEA as some of the globally leading LED and smart controls deployments:

|  |  |  |
| --- | --- | --- |
| **#** | **Location** | **Number of Luminaires** |
| 1 | India | [8,600,000](https://slnp.eeslindia.org/) |
| 2 | Taiwan | [692,000](https://english.ey.gov.tw/News_Content2.aspx?n=8262ED7A25916ABF&sms=DD07AA2ECD4290A6&s=0AF82CB7F36728A0) |
| 3 | New York, USA | [500,000](https://www.governor.ny.gov/news/governor-cuomo-announces-smart-street-lighting-ny-program-all-municipalities-across-state) |
| 4 | Georgia Power, USA | [400,000](https://higherlogicdownload.s3.amazonaws.com/IPWEA/86668664-2b52-4cc1-bf25-86692c04c947/UploadedImages/SLSC/Conference%20Presentations/ELECTRICITY%20NETWORKS%20EMBRACING%20CHANGE_Challenges%20of%20leading%20an%20electricity%20utility%20to%20convert%20more%20than%20600%2C000%20street%20lights%20to%20LED%20and%20controls%20Scotty%20Hutto.pdf) |
| 5 | Chicago, USA | [270,000](http://chicagosmartlighting-chicago.opendata.arcgis.com/) |
| 6 | Oklahoma Gas & Electric, USA | [250,000](https://www.smartcitiesworld.net/news/news/smart-street-lighting-for-oklahoma-1355) |
| 7 | Madrid, Spain | [225,000](https://www.philips.com/a-w/about/news/archive/standard/news/press/2014/20141219-Madrid-upgrades-city-infrastructure-with-Philips-lighting.html) |
| 8 | Houston, USA | [165,000](https://www.c40.org/case_studies/cities100-houston-led-street-light-conversion-yields-big-savings) |
| 9 | Hampshire & Winchester, UK | [155,000](https://www.ledsmagazine.com/articles/print/volume-13/issue-9/features/smart-cities/english-county-shows-the-way-in-smart-street-lighting.html) |
| 10 | Los Angeles, USA | [142,000](http://bsl.lacity.org/led.html) |

**APPENDIX: NOTES FOR USERS**

1. **Smart Controls**As outlined in the IPWEA SLSC Roadmap, smart controls offer a range of potential benefits including:
* further energy savings potential of up to 20% by allowing lights to be dimmed, trimmed or implement constant light output controls;
* maintenance efficiencies as the luminaires themselves are able to communicate effectively regarding their maintenance needs;
* asset management benefits including auto-location and potentially, auto-population of asset registers;
* energy measurement; and
* a range of social, astronomical, environmental and indirect financial benefits by, for example, allowing for more responsive lighting that adapts to traffic volumes or weather and by reducing light pollution in off-peak hours where dimming regimes are introduced.

The IPWEA’s SLSC Programme has noted that most large deployments globally since 2016 involve both LEDs and smart controls for the reasons summarised above. While widely adopted internationally, achieving the full financial benefits of smart controls has been particularly challenging in Australia as the current approach to billing for unmetered street lighting in the National Electricity Market implicitly assumes that lighting runs at full power from sunset to sunrise, and does not yet recognise the metering capabilities of smart controls which could be used to measure reduced energy consumption where dimming, trimming and constant light output controls are implemented. However, as has been noted by AEMO, there is nothing to prevent a fixed street lighting dimming regime being implemented with smart controls under the current unmetered model if put through the same testing procedure as any other new luminaire. This approach is already used for unmetered traffic signals in the National Electricity Market. Implementing a fixed dimming regime offers a mechanism to capture much of the additional energy savings benefits of smart controls.

1. **Minamata Convention**The Minamata Convention, if it is ratified by Australia, will ban the importation of mercury vapour lamps from the end of 2020. However, irrespective of the decision that Australia takes on Minamata, most lamp producing countries have already ratified the convention. Australia does not produce lamps for street lighting and hence the issue of future mercury vapour lamp supply is emerging as a significant risk necessitating the consideration of large-scale luminaire replacements. The supply of mercury vapour lamps is already [becoming constrained](https://higherlogicdownload.s3.amazonaws.com/IPWEA/86668664-2b52-4cc1-bf25-86692c04c947/UploadedImages/PDF/201718_Minamata_start_date_1_Jan_2021.pdf). It now appears inevitable that almost 40% of Australian public lighting (currently based on mercury vapour technology) will need to be changed in the next few years.

If your organisation has a significant proportion of mercury vapour lighting, reference to this important external driver, which is increasingly likely to necessitate replacement of large volumes of lighting in the next few years, should be made in the finalised business case.
2. **Detailed Inventory Summary**

Depending on the diversity of the organisation’s inventory, the author may wish to include a more detailed breakdown of the luminaires proposed for replacement in this business case as an Appendix in the following suggested format:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Assumed Lighting Category[[6]](#footnote-6)** | **Types of Lighting** | **Number of Luminaires** | **% of Luminaires** | **Notes** |
| **P4/P5 Residential Road Lighting** | * 50W Mercury Vapour
* 80W Mercury Vapour
* 50W High Pressure Sodium
* 70W High Pressure Sodium
* 32W CFL
* 42W CFL
* 1\*40W Fluorescent
* 2\*20W Fluorescent

<insert other lighting types as needed> | <insert # of each lighting type> | <insert % of each lighting type> | <insert notes on any special considerations for particular lighting types> |
| **P3 Residential Road Lighting** | * 70W Metal Halide
* 125W Mercury Vapour

<insert other lighting types as needed> | <insert # of each lighting type> | <insert % of each lighting type> | <insert notes on any special considerations for particular lighting types> |
| **V5 Main Road Lighting** | * 100W HPS
* 100W Metal Halide

<insert other lighting types as needed> | <insert # of each lighting type> | <insert % of each lighting type> | <insert notes on any special considerations for particular lighting types> |
| **V3 Main Road Lighting** | * 250W Mercury Vapour
* 150W High Pressure Sodium
* 150W Metal Halide

<insert other lighting types as needed> | <insert # of each lighting type> | <insert % of each lighting type> | <insert notes on any special considerations for particular lighting types> |
| **V1 Main Road Lighting** | * 400W Mercury Vapour
* 250W High Pressure Sodium
* 250W Metal Halide
* 400W High Pressure Sodium
* 400W Metal Halide

<insert other lighting types as needed> | <insert # of each lighting type> | <insert % of each lighting type> | <insert notes on any special considerations for particular lighting types> |
| **Other Subcategories of Road or Public Space Lighting** | <insert other lighting types as needed> | <insert # of each lighting type> | <insert % of each lighting type> | <insert notes on any special considerations for particular lighting types> |
| **TOTAL LIGHTING** |  | <insert total # of luminaires > |  |  |



1. Approximate AS/NZS 1158 road lighting classification which can vary *in situ* as particular lighting types can be used across multiple road lighting subcategories (and, if smart controls are being used, the subcategories may change over the course of the night according to traffic activity). [↑](#footnote-ref-1)
2. The term ‘residual values’ is used throughout this document as this phrase is widely used by Australian DNSPs and pricing regulators. IPWEA however recognises that the term ‘residual value’ is inappropriate in an accounting sense and that the correct term is ‘carrying amount’. [↑](#footnote-ref-2)
3. *The Safety Effects Of Road Lighting –What International Research Tells Us,* Dr. Ronald Gibbons, Virginia Tech Transportation Institute, Road Lighting 2015, March 2015, Auckland New Zealand [↑](#footnote-ref-3)
4. Approximate AS/NZS 1158 road lighting classification which can vary *in situ* as particular lighting types can be used across multiple road lighting subcategories (and, if smart controls are being used, the subcategories may change over the course of the night according to traffic activity). [↑](#footnote-ref-4)
5. Approximate AS/NZS 1158 road lighting classification which can vary *in situ* as particular lighting types can be used across multiple road lighting categories [↑](#footnote-ref-5)
6. Approximate AS/NZS 1158 road lighting classification which can vary *in situ* as particular lighting types can be used across multiple road lighting subcategories [↑](#footnote-ref-6)