CITY OF ARMADALE

AGENDA

OF **TECHNICAL SERVICES COMMITTEE** TO BE HELD IN THE **COMMITTEE ROOM**, ADMINISTRATION CENTRE, 7 ORCHARD AVENUE, ARMADALE ON **MONDAY, 5 SEPTEMBER 2022 AT 7.00PM.**

A meal will be served at 6:15 p.m.

PRESENT:

APOLOGIES:

OBSERVERS:

IN ATTENDANCE:

PUBLIC:

*"For details of Councillor Membership on this Committee, please refer to the City's website – **www.armadale.wa.gov.au/your council/councillors**."*

DISCLAIMER

The Disclaimer for protecting Councillors and staff from liability of information and advice given at Committee meetings to be read.

DECLARATION OF MEMBERS' INTERESTS

QUESTION TIME

Public Question Time is allocated for the asking of and responding to questions raised by members of the public.

Minimum time to be provided – 15 minutes (unless not required)
Policy and Management Practice EM 6 – Public Question Time has been adopted by Council to ensure the orderly conduct of Public Question time and a copy of this procedure can be found at http://www.armadale.wa.gov.au/PolicyManual

It is also available in the public gallery.

The public's cooperation in this regard will be appreciated.

DEPUTATION

CONFIRMATION OF MINUTES

RECOMMEND

Minutes of the Technical Services Committee Meeting held on 1 August 2022 be confirmed.

ITEMS REFERRED FROM INFORMATION BULLETIN

Outstanding Matters and Information Items
Various Items
Monthly Departmental Reports
Technical Services Works Programme

If any of the items listed above require clarification or a report for a decision of Council, this item to be raised for discussion at this juncture.

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TECHNICAL SERVICES COMMITTEE

5 SEPTEMBER 2022

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1.1 - SMART LED STREETLIGHT PROJECT BUSINESS CASE

WARD	:	ALL
FILE No.	:	M/443/22
DATE	:	25 August 2022
REF	:	JL
RESPONSIBLE MANAGER	:	Executive Director Corporate Services

In Brief:

- The Business Case for bulk changeover of street lights to SMART enabled LED has progressed
- The total capital investment is $7.9m, including 50% of the RAB charge, with the State Government meeting the other 50%.
- Operating costs will reduce by $1m
- The project is proposed to be funded by loan
- CO_2 emissions will reduce by 2,328 tonnes of CO_2 per annum
- It remains for contracts and agreements to be negotiated with Western Power
- Recommend that Council approves the replacement of Western Power owned luminaires with Smart Enabled LED streetlights throughout the City, subject to the Local Government Consortium reaching an agreed position with Western Power.

Tabled Items

Nil

Decision Type

☐ **Legislative** The decision relates to general local government legislative functions such as adopting/changing local laws, town planning schemes, rates exemptions, City policies and delegations etc.

☒ **Executive** The decision relates to the direction setting and oversight role of Council.

☐ **Quasi-judicial** The decision directly affects a person's rights or interests and requires Councillors at the time of making the decision to adhere to the principles of natural justice.

Officer Interest Declaration

Nil

Strategic Implications

The subject of this report has impact on the following objectives of the Strategic Community Plan 2020-2030:

Objective:

2.1.4 Minimise corporate and community carbon footprints within the City of Armadale.

- Implement the Actions of the City's Corporate Greenhouse Action Plan

Strategies:

- Strategic Environmental Commitment
- Corporate Greenhouse Action Plan 2020/21 – 2029/30

The City's Corporate Greenhouse Action Plan at Recommendation 16 states:

When there is certainty over the implementation costs and ongoing Tariffs, provide a business case report to Council on a bulk changeover to LED Street Lights.

Legal Implications

A draft agreement for access to Western Power's Smart Network (known as *iTron*) has been received by the Street Lights Working Group and a legal review has commenced by Jackson McDonald on behalf of the Group. It remains for the Funding Agreement and Operating Protocol Arrangements to be drafted and considered.

Regulation 11(2)(e), of the *Local Government (Functions and General) Regulations 1996* permits the City to enter into a contract with Western Power to replace the Street Light Luminaire and install a Smart controller, as the goods or services are to be supplied by or obtained through the government of the State or the Commonwealth or any of its agencies.

Council Policy/Local Law Implications

Nil

Budget/Financial Implications

The Business Case for the bulk changeover of the City's street lights to SMART LED Luminaries requires an investment of $7.9m, which may be loan funded, with the savings from street lighting operating costs being utilized to service a ten-year loan. The payback period is 7.3 years and the Net Present Value over 15 years is $5.2m (or over 20 years, $9.3m).

Consultation

Cities of Melville, Cockburn, Canning and Albany
Western Power
Minister for Energy the Hon Bill Johnston MLA

BACKGROUND

The following documents refer:

December 2018	*CoA Street Lighting, Preliminary Report for a Business Case (Ironbark Consultants)*
August 2020	T36/8/20 Report to Council: Led Street Lights in the City of Armadale *(Attachment 1: City of Armadale Business Case LED changeover report (Maximoz Consultants))*
September 2021	T56/9/21 Report to Council: Led Street Lighting Project – Update *Attachment 2 Smart LED Streetlight Replacement Super Trial Proposal Perth Southern Metropolitan and Regional WA LED Street Lighting Business Case (Ironbark Consultants)*

Street Lights in Western Australia

Most street lighting in Australia is managed by Distribution Network Service Providers (DNSPs). The DNSP in Western Australia is Western Power, who own and operate the system.

Synergy, the State Government's 'Gentailer' (electricity generator and retailer) provides the monthly invoice, comprising a daily tariff (Z tariff) for each streetlight. The tariff comprises two components being electricity consumed and network charges.

Synergy retains a component of the payment to cover electricity used and regulatory return on capital; and remit the balance to Western Power to cover network charges, maintenance, depreciation and regulated return on capital.

There is limited transparency over the tariff, specifically the constituent components of electricity charges and maintenance costs. The current lighting stock largely consists of antiquated technology that is not energy efficient. In addition, there are environmental issues associated with disposal of the mercury vapour lights in the current stock (see section on Minamata Convention).

All of these streetlights are owned by Western Power, who own and have regulatory control over all aspects of streetlights across the South West Interconnected System (SWIS) grid. The SWIS covers all aspects of electricity delivery from Geraldton to Esperance and west of the line running between these two towns (commonly known as the poles and wires part of bringing electricity to the customer).

Western Power released an LED street light product in early 2019. However, transition has been slow as street lights are only replaced when the existing luminaires fail. Further, the quality of the Western Power adhoc LED retrofit is inferior as it utilizes an LED retrofit solution, i.e using screw in LED lamps in existing fittings. WALGA has raised concerns that this piecemeal approach has not been rigorously and independently verified to provide the lowest lifecycle cost and an acceptable quality of lighting.

More recently, Western Power adopted a corporate strategy to change over all street lights to LED luminaires by 2029 as it strives towards the Government's net zero target

www.westernpower.com.au However, this will be with an inferior luminaire than what this project proposes.

The Minamata Convention

Australia ratified the Minamata Convention on 7 December 2021. The Minamata Convention on Mercury is an international treaty that seeks to protect human health and the environment from anthropogenic (caused by humans) emissions and releases of mercury and mercury compounds. This is relevant in that 54% of the streetlights are Mercury Vapour (MV). It is evident that the future replacement of MV lights will be problematic due to worldwide manufacturing increasingly catering for LED lights.

City of Armadale Street Lights

There are 11,489 streetlights in the City of Armadale, attracting a daily flat tariff charge from Western Power. The annual street lighting bill to the City is $2.3M and there are no opportunities to seek alternative pricing options, as street lighting energy supply is not contestable in Western Australia.

Presently, 607 of the 11,489 street lights in Armadale are LED luminaires. The remainder comprise Mercury Vapour, Metal Halide and High Pressure Sodium.

City of Armadale Street Lighting Stock[1]	Types of Lighting	Number of Luminaires	% of Luminaires
P4/P5 Residential Road Lighting	80W Mercury Vapour	2,829	24.62%
	70W High Pressure Sodium	76	0.66%
	42W Compact Fluorescent	2,111	18.37%
P3 Residential Road Lighting	70W Metal Halide	246	2.14%
	125W Mercury Vapour	2,911	25.34%
V3 Main Road Lighting	250W Mercury Vapour	28	0.24%
	150W High Pressure Sodium	545	4.74%
	150W Metal Halide	180	1.57%
V1 Main Road Lighting	250W High Pressure Sodium	1,914	16.66%
	250W Metal Halide	42	0.37%
Subtotal		***10,882***	***95%***
Other Subcategories	LED	607	5.28%
Total Lighting		**11,489**	**100%**

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).

Western Power Access Arrangement No. 5

The proposed Western Power Access Arrangement 2022/23 – 2026/27 details a new proposal, aligned with the Western Power Corporate Strategy, to replace all streetlights with LEDs by 2029. It is proposed that this will be achieved by using screw in LED lamps in existing fittings and accelerate the current replacement rate by replacing the lamp whenever any of the luminaire components fails that require a technician to service the light. The additional lamp replacements are estimated to add $4.5 million per year to the maintenance costs during AA5. The published assessment only identifies two options, replace like for like (which is not feasible as the globes cannot be procured or imported) and the proposed reactive replacement with LED globes.

The Street Lights Working Group 'Super Trial'

As previously reported, a consortium of Local Governments formed, comprising the Cities of Cockburn, Melville, Armadale, Canning and Albany. The objectives of the *Street Lights Working Group (SLWG*) is to propose to replace 47,000 luminaires (streetlight light emitting diode (LED) and surrounding frame) of the 275,000 streetlights across the Western Power controlled SWIS grid. The SLWG was motivated by the benefits arising from the modernisation of the streetlight luminaire fleet, the substantial improvement in sustainability of the modern LED network and consequential reductions in power consumption and greenhouse gas emissions and financial benefits of shifting to lower tariffs, which will self-fund the transition.

One of the motivating factors of continuing to work with the SLWG is that the City can realise the benefits of LED streetlighting sooner, rather than later. The program for LED street lights under the Western Power program is slow and ad hoc. Local governments have to take the initiative if they are to realise the benefits sooner of lower CO_2 emissions and lower operating costs.

The proposal from the SLWG pools local government areas enabling Western Power to utilise its resources to coordinate and deliver a larger scale project over a shorter time frame.

The SLWG also commissioned a business case to support the luminaire replacement program prepared by consultants *Ironbark Sustainability*, to demonstrate the technical feasibility of the program. This was the subject of the LED Street Lighting Project Update report, presented to Council in September of last year.

The financial modelling which is included in the business case has been prepared with assistance from the City of Cockburn (and reviewed by Ironbark Sustainability) on behalf of the five councils. This financial model has formed the basis for the City's own business case modeling, which is presented in the attached Business Case Report.

A peer review of the SLWG business case was also commissioned by City of Albany (that can be found at the City of Albany Website), which supported the financial outcomes of the SLWG 'Super-Trial'.

Small Scale LED Street Lighting Trial

The SLWG Super-Trial follows two smaller trials undertaken by the City of Melville (smart enabled LED replacement lighting) and the City of Cockburn (standard, nonsmart enabled LED replacement lighting).

Both trials have been shown to be successful following testing the effectiveness and compatibility of smart streetlighting within Western Power's management systems. and consultation with the community on the quality of lighting. Comments included a better and more precise light diffusion and reduction of glare. (Attachment 3 - Community Engagement LED Street Light Trial - City of Cockburn. See also Wester Power Trial City of Melville)

City of Armadale Business Case Development

Preliminary Report

The City first commissioned a report in late 2018 to evaluate a large scale bulk replacement of street light luminaires for the City. The preliminary report examined luminaire replacement scenarios, a feasibility analysis, social, economic and environmental benefits, barriers and strategies to advance the initiatives.

The report concluded that the City should prepare to negotiate the preferred funding arrangements, ownership and maintenance in its negotiations with Western Power, to narrow the payback and improve the overall costs and benefits for Council and its community.

City of Armadale 2020 Business case

Later in 2019/20, a further business case report was commissioned by the City (the Maximox Business Case Report), which examined the proposal in more detail. This included the scope, Smart Lighting opportunities, options, assumption, dependencies and constraints, project approvals process (the project plan), and key stakeholder engagement. A summary of costs and findings was presented, which is summarised below, noting that a number of assumptions and uncertainties were required to be addressed, to firm up the business case analysis.

Extract from the Maximoz Report (2020)

Project Financial Summary Maximoz Preliminary Business Case Report 2019/2020	
Net Capital cost	$6,400,776
Net cash saving/(outflow) p.a.	$1,141,924
Interest rate	4.80%
Loan period	10 years
Payback period	5.61 years
NPV of project cashflows over ten years	$2,416,860

NPV is the Net Present Value of future cashflows in current dollar terms.
In this case, cash freed up by lower net operating costs.

Council received the report in August 2020, and approval was provided for City officers to continue to attend the SLWG (T36/8/20 refers):

> *"1. Authorise City officers to continue to attend the Street Lighting Working Group to further investigate a bulk changeover project and enhance the level of certainty over the LED Street Lighting Business Case before presentation to a future meeting of Council.*
>
> *2. Include the LED Street Lighting project in the City's Advocacy Strategy."*

Subsequently, the SLWG embarked on an advocacy campaign involving Western Power and the Ministers for Energy and the Environment. This Advocacy approach resulted in the SLWG Super-Trial receiving an allocation of funds in the recent State Government Budget.

The SLWG Commissioned Business Case Report

Subsequently, an update report to Council (T56/9/21) was provided to Council in September 2021. The report presented a further business case that was developed for the SLWG, to assist with the discussions on benefits which would be delivered to Local and State Government, Western Power and the West Australian community.

The SLWG Business Case analysed the costs and savings that can be expected from replacement of all non-LED light types across participating councils. The business case proposed to replace around 47,000 streetlights, across the participating councils, to more energy efficient and low maintenance LED luminaires. The program proposes funding by the participating councils. The table below provided a summary of the expected outcomes for the Local Governments and the potential, if extrapolated, across the entirety of the Western Power-managed SWIS Grid.

Region	Number of lights	Project Cost (incl. interest)	Total Cost Savings (20 years)	Total Energy Savings (MWh, 20 years)	Total Greenhouse savings (tCO_2-e, 20 years)	Payback (years)
Perth South Metro and Albany	47,000	$25 to 29m	$107 to $123m	300,000 to 370,000	210,000 to 250,000	5.0 to 6.3
All of Western Power SWIS Grid (est.)	276,000	$150 to $170m	$620 to $720m	1.7m to 2.2m	1.2m to 1.5m	5.0 to 6.3

*Ironbark's summary of results

The SLWG Business Case also reaffirmed at the time, the City of Armadale business case, with a payback period ranging from 5.5 to 7 years for the City.

City of Armadale Project Statistics

Project Scenario	Net Present Value of Future Cashflows	Capital Cost	Payback Period
Includes Smart Enabled (SED) and Regulated Asset Base Cost (RAB)	$10.4M	$7.9M	7 years
5% Discount + SED + RAB	$10.7M	$7.5M	6.75 years
10% Discount + SED + RAB	$11.0M	$7.2M	6.5 years
Include SED but no RAB	$11.3M	$6.8M	6.1 years
5% Discount + SED + No RAB	$11.6M	$6.4M	5.75 years
10% Discount + SED + No RAB	$11.9M	$6.1M	5.5 years

*RAB = Regulated Asset Base
*SED = Smart Enabled Device

The September 2021 report to Council also noted that uncertainties remain in relation to project implementation, and mainly around the treatment of the Regulated Asset Base charge. A recap of the main issues follows.

State Government Approval

An impediment to progressing the project business case was obtaining the support and approval of the Minister for Energy. In particular, there is a requirement that Local Governments should pay the full Regulated Asset Base Charge (explained below). The SLWG considered this to be unreasonable given Local Government funds the assets, and further discussions with Western Power were required to find a solution to this issue.

The Regulated Asset Base Charge

Discussions with Western Power suggested that the residual (or 'un-depreciated') cost of existing luminaires may be passed on to project proponents as a capital charge. This is known as the Regulated Asset Base (RAB) charge. In the City of Armadale's case, this is estimated at $1.01M.

The SLWG believed this to be unfair, as participants have been paying depreciation on these assets, through the tariff, over the last 50 or so years. In addition, many lights do not function properly.

Tariff

Western Power and Synergy both have published tariffs in relation to new LED streetlights. However, there appears to be a significant difference between the two in relation to the energy charge component. Here, the margin applied by Synergy is perceived to be excessive and lacks transparency. Again, it is the view of the SLWG that this should be modified.

Smart Enabled

Within the business case, it is proposed that new lights will be smart enabled. This means that they can be used to communicate with Western Power's control centre and improve the maintenance of faulty street lights. Currently, streetlight tariffs are charged at a daily rate. However, the technology enables lights to be centrally controlled and dimmed when not required. In conjunction with the installation of meters, this provides the opportunity for Local Governments to advocate for further savings, pay for only the electricity that they use and have recorded. This also opens up the possibility of street lighting electricity becoming a contestable supply, subject to a competitive process. Again this would require an advocacy approach to Government.

Potentially, in the future, it opens up the opportunity for other devices to be attached and communicate for a variety of purposes, such as traffic monitoring, Wi-Fi access, noise monitoring, etc. (the devices are not included in the project scope)

The 2021 report noted the uncertainty over the extent to which local governments will be given access to the data and functionality. However, Officers of the SLWG have progressed discussions with Western Power (refer section on project update).

Bulk Discount

It is hoped that any published capital cost of installation will be reduced due to economies of scale across the five local governments. However, the extent to which this may be the case is unclear. The Business Case analyses the further benefit accruing from bulk discounts.

Council's Decision

Following consideration of the report (T56/9/21) in September 2021, Council noted the update report and further actions, activities to be undertaken.

Report Purpose

The purpose of this report is to provide the updated business case for Armadale, having progressed a number of negotiated items with Western Power and the Minister for Energy, and to seek the reaffirmation of Council's support:

1. to continue with the project to replace the City's Mercury Vapour, High Pressure Sodium, Metal Halide and Compact Florescent lights, subject to contractual agreements being reached; and
2. to support the installation of SMART LED street light luminaires.

DETAILS OF PROPOSAL

Project Update

Regulated Asset Base Charge

Western Power have advised that the State Government has agreed and included in the State Budget the project costs for the SLWG Super Trial project and an amount equivalent to 50%

of the RAB cost, towards the RAB charge. This is a significant benefit to the SMART LED Project advancement.

SMART LED luminaires

The City's business case is premised on the installation and activation of SMART LEDs to optimize lighting and energy use, and to unlock other potential benefits. For SMART LED luminaires to be effective, Western Power will be required to facilitate the backend IT system (known as iTron) to activate the Smart Enabled LED streetlights through the photocontrollers. The iTron system is a proven system around the world and noting that the City of Melville trial was successful, WP recently conditionally committed to creating the IT back-end for Councils to take advantage of the iTron streetlight system. This is subject to the five (5) councils entering into an Agreement with Western Power for the costs of the smarts service.

The principle outcome of the SMART system is to provide Local Governments with energy use data and the ability to control energy use. The next step is for the SLWG Local Governments and Western Power to develop the operating protocol agreement, which sets out access and use of the smart service etc and agreed costs.

Legal/Contractual Agreement

Western Power recently provided the five Local Governments with a preliminary draft 'Smart Streetlights Pilot Program Project Agreement' (the SSPPP Agreement) to assist with further drafting and business case development. The Agreement relates to the 47,000 streetlights in the Local Government consortium districts being fitted with photocontrollers that allow for remote monitoring and control of LED luminaries through a software platform.

The draft Agreement is in the early stages of review and preliminary legal advice is currently being sought. It remains for the Funding Agreement for the Super Trial to be provided

Business Case validation

The City's of Albany and Armadale have each engaged consultants (respectively) to conduct an independent peer review of the SLWG Super Trial Business Case model and assumptions. The consultants have examined the LED lighting types, wattages, tarrifs, capital and operating costs, useful life, and business case risks. The recommendations from the respective consultants include enhancing the model to factor in dimming of LED lights, and firming up capital costs. Before commencing, the City's should engage a lighting designer, (for instance Western Power) to design the road lighting in conformance with AS/NZS 1158, and prepare a Lighting Master Plan, or at least a Lighting Policy, outlining their road lighting requirements in terms of the AS/NZS lighting Categories. Finally, after design and before the retrofit, the City should engage an independent design reviewer to check that the lighting designer has kept to AS/NZS 1158 Categories of the Lighting Master Plan, or Lighting Policy.

Other Local Government Decisions

For the 'Super Trial' Project to continue to advance, the other Local Governments have signaled their commitment, notwithstanding finalization of business cases and legal/contractual agreements.

Those decisions are:

City of Canning (October 2021)

1. *Approves the replacement of Western Power owned luminaires with Smart Enabled LED streetlights throughout the City, subject to the Local Government Consortium reaching an agreed position with Western Power.*
2. *Requests the Interim Chief Executive Officer to list a commitment of $5.8 million in the Long-Term Financial Plan, with in principle support for a WA Treasury corporation loan to be repaid over seven years.*
3. *Requests the Interim Chief Executive Officer to present Council with the Western Power contract that details the agreed terms and conditions no later than 30 June 2022.*

City of Albany (August 2022)

That:

1. *The replacement of Western Power owned Luminaires with Smart Enabled LED Luminaire Streetlights including the Smart iTron Streetlight System be APPROVED.*
2. *The expected cost of the replacement program of $2,615,000 to be considered as part of the 2023/24 and 2024/25 budgets be NOTED.*

City of Melville (June 2021)

That the Council

1. *Endorses the Smart LED Streetlight Replacement Proposal based on an estimated expenditure of $6.339 million over a two year period*
2. *Notes that the financial commitment and transfer of reserve funding to facilitate the Smart LED Streetlight Replacement proposal will be presented for Council consideration as part of the 2021/2022 Annual Budget.*

City of Cockburn (June 2021)

That Council:

1. *APPROVES the replacement of Western Power owned Luminaires with Smart Enabled LED luminaire Streetlights including the smart iTron streetlight system;*
2. *FUNDS the net cost of the replacement program of $6,913,630 from the Land Development and Investment Reserve, subject to a grant from the Clean Energy Fund reducing the net cost by the value of grant;*
3. *ESTABLISHES a repayment plan over the 6.25 years at the appropriate WATC borrowing rate for the 6.25 years to repay the Land Development and Investment Reserve; and*
4. *AMENDS the FY21 Amended Municipal Budget to include the Smart Enabled LED Streetlight Luminaire Replacement Project.*

City of Armadale Business Case (September 2022)

Capital Costs

The total cost of the project is estimated to be **$7,909,365,** comprising of the luminaire and fifty percent (50%) of the Regulated Asset Base charge. The total capital cost of the luminaires is estimated to be **$7,363,393.** This is based on an average costs of **$655** for a minor road and **$742** for a major road.

Also included as part of the capital cost is the regulated asset base cost. Western Power charges Local Government the written down value of the existing luminaires, with a cost of $1.01m for Armadale. This is known as the RAB or regulated asset base cost (streetlights are a regulated asset service controlled by the Economic Regulation Authority or ERA).

The State Government have agreed and included in the State Budget an amount equivalent to 50% of this cost, towards the RAB charge. The model therefore assumes that the City will be required to pay a net **$545,972** towards the RAB (its 50% share).

Operating Costs

Operational costs are projected to be $1.3m per year, based on the current tariffs for FY23. This is a $1m reduction on the current operating costs of $2.3m.

The model also includes an annual charge per street light of $12.50 for access to and operation of the SMART iTron Network. This results in an annual cost of $143,000.

Project Funding

The model proposes to raise funds through borrowings from the West Australian Treasury Corporation. Whilst alternative funds through cash reserves or grants can be modelled, no such provision has been made at this point in time. Application to the Clean Energy Future Fund (CEFF) by other Local Governments have not been successful, however the application of LRCI Grant funds has been proposed by other Local Governments.

Loan funds raised are therefore the equivalent of the total capital cost, based on a r**ate of 4.4%** plus the guarantee fee of 0.7%, taken over ten years. The estimated impact on the municipal fund is zero, as the savings in energy consumption (street lighting costs) funds the **debt servicing** requirement of **$1m** p.a.

The City's financial strategies adopted in the Four Year Budget by Council supports debt funding this project. Specifically, the Four Year Budget financial strategy pertaining to borrowings states:

> *Council consensus is to a $50M self-imposed cap, with option to go to $60M with a business case that pays for itself.*

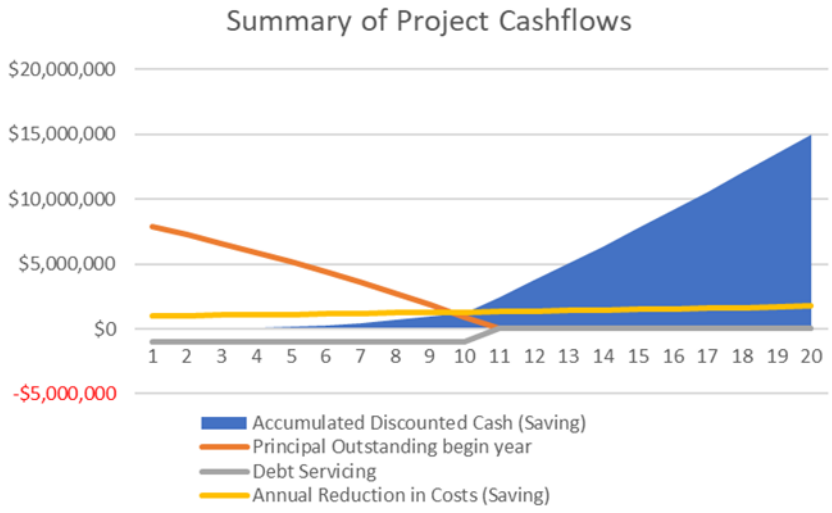
This will impact borrowing capacity for other projects.

Project Cashflow, Net Present Value and simple payback period

Based on total net capital costs outlined above of **$7.9 m** and annual operating cost savings of **$1m,** the project pays for itself in approximately **7** years. This assumes a **4%** internal discount rate (effectively the future cost of money), and a price escalation of **3%** over the entire period.

The net present value of the project cashflows over the next **15 years is $5.2 m or $9.3 m over 20 years,** the useful life of the LED Luminaire.

Business Case: City of Armadale	
Capital Cost	$7,363,000
Residual Asset Base Charge	$545,972
Annual Savings	$999,000
Debt Servicing - 10 years	$1,016,000
NPV (20yr)	$9,294,000
NPV (15yr)	$5,220,000
Simple Payback (yrs)	7



Environmental Outcomes

The City's Corporate Greenhouse Action Plan 2020/21 to 2029/30 contains the following recommendations/actions:

16. When there is certainty over implementation costs and ongoing tariffs, provide a business case report to Council on a bulk changeover to LED street lights	Manager Environmental Services Timescale Dependent on Western Power
17. Finalise, and present to Council, a Streetlighting Policy around the deployment of energy efficient lighting in the City	Manager Engineering Design 2021/22 - $Nil

The bulk LED street lighting retrofit is estimated to reduce the City of Armadale's greenhouse gas emissions from street lighting by approximately 50%.

The energy demands for LED lamps are up to 80% less than the current lamps in the street lighting network, with significant greenhouse gas savings. The LED replacement will be the single greatest energy reduction project the City has implemented.

The City's 11,489 streetlights use 6,742MWHrs of electricity annually and at a cost of $2.3m By changing to LED luminaires, the electricity consumption will fall to 3,340MWHrs of electricity. More importantly, the City emits 4,720 tonnes of CO_2 annually from streetlight electricity. The new LEDs will reduce this to 2,401 tonnes or 49% saving. Even though the asset is owned by WP, the City is accredited with the CO_2 emissions.

CO2 Reduction	
CO2 Emmissions tonnes (Current)	**4,720**
CO2 Emmissions tonnes (Smart LED)	**2,401**
Reduction in CO2 Emmissions	**-2,318**
Percentage reduced	*-49%*

The City will push for the non-mercury luminaires to be recycled back into the SWIS grid, saving WP even more capital expenditure by using the non-mercury luminaires rather than them ending up in landfill.

Benefits Realisation

Benefits of changing to Smart Enabled LED Streetlight Luminaires for the various stakeholders, being the City of Armadale, the community, Western Power, the State Government and Local Governments include:

Armadale

- Contribute to the City's goals to reduce energy consumption and achieve net zero emissions by 2030.
- Improved quality (colour temperature and light distribution) and reliability of public lighting.
- Lower electricity consumption and greenhouse gas emissions.
- Reduced light spill and light pollution.
- Lower waste to landfill through longer life-cycle.
- Reduced impact of maintenance operations (lane closures).
- Elimination of harmful mercury from the environment.
- Ability to actively manage lighting to meet changing needs and respond to environmental impacts in sensitive locations.

The Community

- Safer driving at night through better lighting.
- Safer communities as endorsed by the WA Police Service.
- Using technology to ensure 100% of the streetlights remain "on" rather than having 5% to 10% being "off" or operating at a level effectively being off but not broken to trigger replacement.

Western Power

- Public lighting that meets Australian Standards.
- Improved public perception through lower light failure rates and rapid maintenance response through smart control.
- Contribute to electricity network stability through reduced electricity demand in the peak evening and pre-dawn periods.
- Protect against the impact of a ban on manufacture and trade of mercury containing globes.

State Government

- Contribute to the Western Australia Climate Policy aspirations for net zero emissions (54,000 tonne pa reduction across the SWIS).
- Aligns to the Western Australian Climate Policy themes.
- Transforming energy generation and use
- Reduce crime by providing Police with superior night time lighting.
- Improve night time safety for all road users.
- Improved tourism opportunities in the region (reduced night light pollution for improved space/star viewing).

OPTIONS

Council has the following options:

Option One

The Council approves the replacement of the Western Power owned luminaires with the smart enabled LED luminaire street lights including the smart *iTron* Street lighting system, submits the project cost and funding to the draft four year budget and notes that a final approval for the project is contingent on agreements and contracts being confirmed.

The capital cost is:

LEDs	$5,452,393
Smarts	$1,911,000
Subtotal	*$7,363,393*
RAB	$545,972
TOTAL Capital Cost	**$7,909,365**

The Operating Savings are $998,500 pa.

Carbon emissions would reduce by 2,318 tonnes,

Option Two

The Council not approve the replacement of LED Street lights and Smart Street light system, and pursue an LED project of a smaller scale to occur over a number of years.

This option would spread the cost of the LED lights ($5,452,000) plus 100% RAB ($1,100,000) over a number of years. The savings in operating costs of $998,500 would also be spread over the time period.

Option Three
The Council not approve the Smart Street lighting system, which would see the City of Armadale fall away from the SLWG, and revert to Option Two. This will require the City to negotiate project delivery for a bulk changeover of LEDs.

Option Four
The Council not invest in LED streetlight replacement, and simply wait on Western Power to progressively change luminaires over the next 7 to 8 years with the retrofit solution.

It is uncertain whether Western Power will actually meet this corporate target, and in the mean time, the City will continue to pay the higher operating cost of $2.3m for the Mercury Vapour, High Pressure Sodium and metal Halide lights. This would progressively reduce as Western Power retrofits to LEDs in its adhoc approach, and for this reason, it is difficult to model the cost of this option.

CONCLUSION

LED and smart-lighting technologies provide many social, environmental and economic benefits to the community. LED Street lighting has been proven to make roads safer, save money by using energy more efficiently, and cut greenhouse gas emissions by more than half.

The annual saving on electricity bills is projected at $1.0m in each case. Hence, even in a worst case scenario, the payback period is attractive at 7.3 years. This has the opportunity to improve if bulk discounts can be obtained.

Greenhouse gas emissions associated with streetlights (4,700tCO_2-e) will reduce by approximately 49%. This is a significant reduction and is comparable to approximately half of the City's carbon footprint associated with the City's building portfolio.

For every year that the project is not initiated, the City is missing out on a potential saving of potentially $1.0m. This, in the context of an asset that will pay for itself in, at most, 7.3 years and will last for at least 15 years, if not longer.

RECOMMEND

That Council:

1. **Approves the replacement of Western Power owned luminaires with Smart Enabled LED streetlights throughout the City, subject to the Local Government Consortium reaching an agreed position with Western Power.**

2. **Notes that the Business Case includes:**

   a. **the expected cost of the luminaire replacement program is $7,400,000;**

   b. **the Residual Asset Base charge is $1.1m of which the State will pay 50%.**

   c. **the capital cost and the 50% Residual Asset Base charge of the project is funded by a loan from the West Australian Treasury Corporation for the ten year period;**

   d. **the Annual debt servicing of a loan is estimated at $1,000,000 p.a. for the ten year period;**

   e. **the debt is to be serviced by a reduction in Street Light operating costs of $1,000,000 from $2,300,000 to $1,300,000**

3. **Request that the project costs and funding to be submitted to the *draft* Four Year Budget FY24 – FY27 and the Long Term Financial Plan for consideration;**

4. **Note that a further update report will be provided on the details of the draft Agreements, Contracts, Terms and Conditions with respect to funding, access and operations.**

5. **Note that final approval for this project is contingent on the Agreements and Contracts being confirmed**

ATTACHMENTS

1. ⇩ Attachment 1 Business case
2. ⇩ Attachment 2 Smart LED Streetlight - Replacement Super Trial Proposal
3. ⇩ Attachment 3 Community Engagement LED Street Light Trial - City of Cockburn

COUNCILLORS' ITEMS

Nil

EXECUTIVE DIRECTOR TECHNICAL SERVICES REPORT

Nil

MEETING DECLARED CLOSED AT _____

TECHNICAL SERVICES COMMITTEE

SUMMARY OF ATTACHMENTS

5 SEPTEMBER 2022

ATT NO.	SUBJECT	PAGE
1.1	**SMART LED STREETLIGHT PROJECT BUSINESS CASE**	
1.1.1	Attachment 1 Business case	23
1.1.2	Attachment 2 Smart LED Streetlight - Replacement Super Trial Proposal	59
1.1.3	Attachment 3 Community Engagement LED Street Light Trial - City of Cockburn	61

Draft
Business case for the bulk replacement of streetlights with SMART LED luminaires

City of Armadale

September 2022

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1 | Executive Summary

This project proposes a 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 proposes to permanently reduce the cost of lighting for the City of Armadale (CoA), to reduce the environmental impacts of street lighting, particularly carbon emissions and to deliver important safety and security benefits for the community.

Replacement programs are widespread in many other Australian jurisdictions. The local governments of Albany, Armadale, Canning, Cockburn and Melville have been working collaboratively with the South West Group of Councils, the Western Australian Local Government Association (WALGA) and Western Power to build the case for a large scale roll out in their local government areas.

This business case recommends a full changeover of **10,882** legacy streetlights to be replaced with SMART LED luminaires in the Armadale district.

The net capital cost of the project is $7.36m plus $546k being 50% of the Residual Asset Base charge. The proposed funding option is to use borrowings from the West Australian Treasury Corporation, with debt servicing funded by the commensurate reduction in operating costs of street lighting. The recurrent energy and maintenance operational savings resulting from the project is $1m, 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 3,312 MWh/yr which is a 49% 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 2,318 tCO2- e/yr, which is a 2,318 tCO2 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 7.3 years. This is based on total net capital costs of $7.3m offset by estimated subsequent annual energy and maintenance savings of $1m as shown in the tables above. The net present value of the project cashflows over the next 15 years is $5.2m.

This proposed project not only presents an attractive business case for the City, it is strongly supported by domestic and international precedents for large-scale LED and smart controls replacement programs as recognised by WALGA and the IPWEA's SLSC Programme.

Business Case: City of Armadale	
Capital Cost	$7,363,000
Annual Savings	$999,000
Debt Servicing - 10 years	$1,016,000
NPV (20yr)	$9,294,000
NPV (15yr)	$5,220,000
Simple Payback (yrs)	7

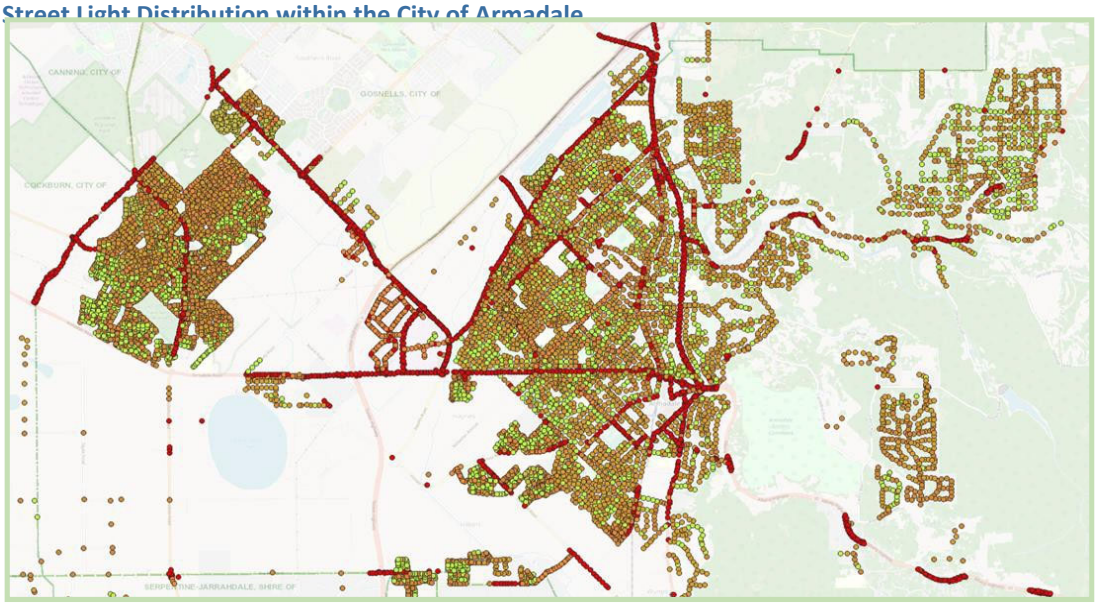
CO2 Reduction	
CO2 Emmissions tonnes (Current)	**4,720**
CO2 Emmissions tonnes (Smart LED)	**2,401**
Reduction in CO2 Emmissions	**-2,318**
Percentage reduced	*-49%*

An important external driver is the impact of the Minamata Convention on mercury. It is likely that replacement mercury vapour lamps for 50.2% of the City'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 City to consider a well-planned changeover. Street lighting is the largest source of greenhouse gas emissions from Australian local governments. As a consequence, many councils are looking to replicate models that reduce energy and greenhouse emissions by capitalising on the learnings, projects and latest technology trials from around Australia.

This proposed project not only presents an attractive business case for the City of Armadale, it is strongly supported by domestic and international precedents for large-scale LED and smart controls replacement programs.

Successful implementation of this project over the estimated two year deployment period depends firstly on securing the full cooperation with a number of key stakeholders identified in this business case including Western Power and the five collaborating Local Governments. Thereafter, project success will depend on managing the risks associated with a large-scale deployment, depending on the procurement and installation approach.

Street Light Distribution within the City of Armadale



42
70
80
125
150
250

Note: All Figures are expressed in Watts

2 | Project Scope and Context

Project Background

Most street lighting in Australia is managed by distribution network service providers (DNSPs), in Western Australia this is Western Power, on behalf of local councils and Main Roads Western Australia (MRWA). However, it is local councils and MRWA 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. LED Street lighting has been proven to make roads safer, save money by using energy more efficiently, and cut greenhouse gas emissions by more than half.

In its 2016 Street Lighting & Smart Controls (SLSC) Programme 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.

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.

Western Australian Context

For W.A. local governments and MRWA, 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.

Western Power & Synergy

All streetlights are owned by Western Power, who own and have regulatory control over all aspects of streetlights across the South West Interconnected System (SWIS) grid. The SWIS covers all aspects of electricity delivery from Geraldton to Esperance and west of the line running between these two towns (commonly known as the poles and wires part of bring electricity to the customer).

Synergy, the State Governments Gentailer (electricity generator and retailer) provides the monthly invoice comprising a daily tariff (Z-Tariff) for each streetlight. The tariff comprises of two components being

electricity consumed (power usage is estimated as streetlights are unmetered) and network charges.

Synergy will retain a component of the payment to cover electricity consumed and regulatory return on capital (profit) and remit the balance to Western Power to cover network charges, maintenance, depreciation and regulated return on capital (profit).

Western Power released an LED street light product in early 2019. However, transition has been slow as street lights are only replaced when the existing luminaires fail.

The proposed Western Power Access Arrangement 2022/23 – 2026/27 details a new proposal, aligned with the Western Power Corporate Strategy, to replace all streetlights with LEDs by 2029. It is proposed that this will be achieved by using screw in LED lamps in existing fittings and accelerating the current replacement rate by replacing the lamp whenever any of the luminaire components fails that require a technician to service the light. The additional lamp replacements are estimated to add $4.5 million per year to the maintenance costs during AA5. The published assessment only identifies two options, replace like for like (which is not feasible as the globes cannot be procured or imported) and the proposed reactive replacement with LED globes.

For Western Power (and for local governments that own the luminaires), 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.

The Western Australian Local Government (South Metropolitan and Albany) 'Super Trial' Group

In an effort to aid the transition to more efficient LED street lighting a group of five councils (Cockburn, Melville, Armadale, Albany and Canning) have come together to propose to replace 47,000 luminaires (streetlight light emitting diode (LED) and surrounding frame) of the 275,000 streetlights across the Western Power controlled SWIS grid.

The drivers of the Super-Trial are the modernisation of the streetlight luminaire fleet, the substantial improvement in sustainability of the modern LED network and consequential reductions in power consumption and greenhouse gas emissions and financial benefits of shifting to lower tariffs, which will self-fund the transition.

The Group commissioned a consortium business case (separately to this business case) to support the luminaire replacement program prepared by consultant Ironbark Sustainability, to demonstrate the technical feasibility of the program.

In addition, a financial feasibility has been prepared with assistance from the City of Cockburn (and reviewed by Ironbark Sustainability) on behalf of the five councils. The model has been used as the basis for this business case financial analysis, but modified for current rates.

A peer review of the Super-Trial business case was also commissioned by City of Albany, which supported the financial outcomes of the Super-Trial.

The Super-Trial is the follow-on from two small scale trials undertaken by the City of Melville (smart enabled LED replacement lighting) and the City of Cockburn (standard, nonsmart enabled LED replacement lighting). Both trials have been shown to be successful.

Strategic and Policy Alignment

This project is a collaboration of Local and State Government bodies to generate positive community outcomes from an environmental, social and economic perspective. The strategic intent of the various government bodies can be found in the respective strategic and corporate documents. Pertinent to Armadale, and its partners, the following strategic intent is illustrated.

City of Armadale

The City's Strategic Community Plan 2020-2030 states at *2.1 Conservation and restoration of the natural environment* that:

> 2.1.4 Minimise corporate and community carbon footprints within the City of Armadale.
>
> - Implement the Actions of the City's corporate Greenhouse Action Plan
>
> 2.1.4.2 Develop and implement an LED Street and Public Facilities Lighting Program.

In addition, the City's *Corporate Greenhouse Action Plan 2020 – 2030* sets out initiatives with respect to street lighting and specifically recommends:

> *Recommendation 16*
> When there is certainty over implementation costs and ongoing tariffs, provide a business case report to Council on a bulk changeover to LED street lights
>
> *Recommendation 17*
> Finalise, and present to Council, a Streetlighting Policy around the deployment of energy efficient lighting in the City
>
> *Recommendation 18*
> Prepare a business case for the potential changeover of decorative lights to more energy efficient models.

South East Regional Energy Group

The South East Regional Energy Group (SEREG) is comprised of a delegated Councillor and senior officer from each partner local governments of Armadale, Gosnells and the Serpentine Jarrahdale. The Group's Business Plan 2020/21 to 2024/25 specifically actions advocating for accelerated LED street lighting adoptions.

WALGA

The West Australian Local Government Association (WALGA) has an established policy/advocacy position with respect to LED Street Lights.

> ***Street Lighting Position Statement***
> *The Local Government sector supports the contestability of street lighting.*

Street lighting is not currently contestable and the government is required to review whether further competition should be introduced into the electricity market. Provision for street lighting represents a significant expenditure item for many Local Governments and one where there is little discretion, options or control available. Alternative market offerings would assist local governments seeking to utilise renewable energy and / or adopt innovative energy saving approaches.

LED Street Lighting *Position Statement*
All new street lighting installations, including replacement luminaires on existing installations, and all new street lighting in subdivisions, connected to the Western Power network, utilise LED technology.

Local Governments are seeking the ability to introduce more energy efficient street lighting technologies such as LED, to reduce costs, carbon emissions and deliver community benefits.
State Council Resolution

Supporting Documents Submission to the ERA on Western Power's Proposed Access Arrangement 2017-2022

https://walga.asn.au

WALGA notes that the proposed Western Power Access Arrangement No.5 (AA5) 2022/23 – 2026/27 details a new proposal, aligned with the Western Power Corporate Strategy, to replace all streetlights with LEDs by 2029. It is proposed that this will be achieved by using screw in LED lamps in existing fittings and accelerating the current replacement rate by replacing the lamp whenever any of the luminaire components fails that require a technician to service the light. There has been no demonstration of the lighting output provided by such lights, and the pricing tables proposed do not include any services that correspond to the listed light types with an LED installed. The additional lamp replacements are estimated to add $4.5 million per year to the maintenance costs during AA5.

Local Governments are very concerned that this piecemeal approach has not been rigorously and independently verified to provide the lowest lifecycle cost and an acceptable quality of lighting.

WALGAs advocacy document also notes that the Access Arrangement proposed by Western Power includes significant investment in the smart grid system and smart metering. The business case for including smart controllers in future streetlight deployments is not identified as a proposed investment in the coming regulatory period. Smart controllers avoid the need for night-time inspections, that would be required to comply with the Australian Standards, and importantly provide the opportunity to trim and dim lighting to reduce energy use and increase the life of the luminaire. Additionally smart controlled lighting allows regional and remote towns to capitalise on the growing astro-tourism industry, potentially dimming town lighting during events.

WALGA has also performed an assessment of whether streetlights are under the Operational Control of local governments. The review concluded that Western Power has control. Streetlights have therefore not been considered part of the City's carbon footprint, but nonetheless, the accruing benefits to the community support Local Government playing a lead role.

Western Power

Western Power's Corporate Strategy has a target to rreplace all streetlights with LEDs by 2029

https://www.westernpower.com.au/media/5843/corporate-strategy-summary-20211125.pdf

This is supported by Western Power's publication Greening the grid, one streetlight at a time, which also outlines initiatives to install SMART enabled LED Street Lighting.

https://www.westernpower.com.au/community/news-opinion/greening-the-grid-one-streetlight-at-a-time/#

The Western Power budget provides $30.9 million over four years for proactive replacement of existing streetlights with "smart-enabled" LED streetlights. Although the State Budget does not provide detail, it is understood this reflects advanced negotiations with the SLWG to largely fund a streetlight replacement program. The budget 2022/23 budget indicates 4,427 lights will be replaced for $2.445 million in the first year.

Australia and the Minamata Convention

The Minamata Convention, ratified by Australia, bans the importation of mercury vapour lamps from the end of 2020. Australia does not produce lamps for street lighting and the supply of mercury vapour lamps is already becoming constrained. 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.

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 Scope

Public lighting consists of unmetered street lighting that is confined to Public roads and Public thoroughfares which include lights in Public places such as beaches, parks, public facilities and car parks. The scope of this Business Case is limited to the management of street lights within City of Armadale's public lighting network.

Current lighting

As of July 2022, the total number of luminaires currently in operation within the jurisdiction of the City of Armadale is 11,489. Within this number, there are 607 LED luminaires that are to be excluded from consideration of upgrading in this business case, leaving 10,882 lights that are mecury vapour, metal halide or high pressure sodium.

The luminaires covered by this business case are currently all owned by Western Power and will remain

under their ownership in this business case.

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

Lighting Subcategory[1]	Types of Lighting	No of Luminaires	% of Luminaires
P4/P5 Residential Road Lighting	80W Mercury Vapour	2,829	24.62%
	70W High Pressure Sodium	76	0.66%
	42W Compact Fluorescent	2,111	18.37%
P3 Residential Road Lighting	70W Metal Halide	246	2.14%
	125W Mercury Vapour	2,911	25.34%
V3 Main Road Lighting	250W Mercury Vapour	28	0.24%
	150W High Pressure Sodium	45	4.74%
	150W Metal Halide	180	1.57%
V1 Main Road Lighting	250W High Pressure Sodium	1,914	16.66%
	250W Metal Halide	42	0.37%
subtotal		*10,882*	*95%*
Other Subcategories	LED	607	5.28%
TOTAL LIGHTING		**11,489**	**100%**

What this Project can deliver

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 if deployed with smart controls.

Well-designed street lighting solutions improve the safety and security of communities, while keeping them better connected.

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.

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.

[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).

Inclusions and Exclusions

This business case recommends a full changeover of **10,882 luminaires** to be replaced with LED luminaires.

All luminaires are proposed to be replaced under this business case, however the following types will need to be considered separately, as they have higher residual values[2] making the business case less attractive:

- All 460 Bourke Hill and 5 Kensington luminaires are decorative types to be dealt with separately.

Assumptions

The project is based in the following key assumptions:

- The implementation can be undertaken by Western Power;
- The Implementation commences in the calendar year 2023 subject to all contracts and agreements being ratified.
- The legal and regulatory frameworks for street lighting will remain consistent over the period modelled for this business case;
- The assumed start date of the project is four (4) months after award to a market based third-party tender.
- The internal **discount rate** assumed in the model supporting this business case is **4.0%**.
- The **price escalation** has been set at **3.0%** over the period
- Current indicative **borrowing rates** have been sourced from Treasury and are set at **4.4%**
- For the purpose of carbon footprint calculation and an indication of energy consumption the model is based on **0.7 kg per kWh**, which is considered reasonable for Western Australia.
- Luminaire brand and models as per current Western Power approved schedule and prices sourced from current supplier to Western Power, Philips Road Grace and Road Flair. Pricing may vary depending on quantities ordered;
- The modelling supporting this business case has been undertaken over a 15-year and 20-year period, on the basis that this reasonably captures the total costs and benefits over the expected lifetime; For their Roadflair luminaire, Philips quotes a life of 100,000 hours to 80% light output and for their Roadgrace luminaire, 100,000 hours to 70% light output. At 4000 hours per year, this represents 25 years of life. **AS/NZS 1158.6 requires a minimum design life of 20 years for road lighting luminaires**.
- Installation prices sourced from Western Power approved installation contractor. With the exception of Western Power crews, they are the single source bulk luminaire installation provider to Western Power;
- Tarrifs rates are as per the Western Power published rates for LED Street Lighting full contribution.
- The capital cost of the Luminaire is based on Westerrn Power pricing WP LED Pricing, plus an allowance for gateway connection, installation and management fee.
- No bulk discount is assumed, but is modelled in the scenarios.

- The capital cost of the Smart Controller is modeled at **$175 per luminaire**.
- A rate of **$12.50 per luminaire** has been modelled for access to the SMART iTron System (network) to be delivered by Western Power.
- The capital and BAU costs will fall within the forecasted amounts.

Dependencies and Constraints

Successful implementation of this project depends on but is not limited to the following:

- That Western Power committing to the SMART LED replacement program in a 'Super Trial' and approving the Western Power Business Case for the SMART iTron network.
- Agreements (contractual and service) between the parties is achieved
- That the smart 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;
- That financing of the project is secured.

Project Status and Approvals Process

For the 'Super Trial' Project to continue to advance, the other Local Governments have signaled their commitment, notwithstanding finalisation of business cases and legal/contractual agreements.

Those decisions are:

City of Canning (October 2021)

1. *Approves the replacement of Western Power owned luminaires with Smart Enabled LED streetlights throughout the City, subject to the Local Government Consortium reaching an agreed position with Western Power.*
2. *Requests the Interim Chief Executive Officer to list a commitment of $5.8 million in the Long-Term Financial Plan, with in principle support for a WA Treasury corporation loan to be repaid over seven years.*
3. *Requests the Interim Chief Executive Officer to present Council with the Western Power contract that details the agreed terms and conditions no later than 30 June 2022.*

City of Albany (August 2022)

That:

1. *The replacement of Western Power owned Luminaires with Smart Enabled LED Luminaire Streetlights including the Smart iTron Streetlight System be APPROVED.*
2. *The expected cost of the replacement program of $2,615,000 to be considered as part of the 2023/24 and 2024/25 budgets be NOTED.*

City of Melville (June 2021)

That the Council

1. *Endorses the Smart LED Streetlight Replacement Proposal based on an estimated expenditure of $6.339 million over a two year period*
2. *Notes that the financial commitment and transfer of reserve funding to facilitate the Smart LED Streetlight Replacement proposal will be presented for Council consideration as part of the 2021/2022 Annual Budget.*

City of Cockburn (June 2021)

That Council:

1. *APPROVES the replacement of Western Power owned Luminaires with Smart Enabled LED luminaire Streetlights including the smart iTron streetlight system;*
2. *FUNDS the net cost of the replacement program of $6,913,630 from the Land Development and Investment Reserve, subject to a grant from the Clean Energy Fund reducing the net cost by the value of grant;*
3. *ESTABLISHES a repayment plan over the 6.25 years at the appropriate WATC borrowing rate for the 6.25 years to repay the Land Development and Investment Reserve; and*
4. *AMENDS the FY21 Amended Municipal Budget to include the Smart Enabled LED Streetlight Luminaire Replacement Project.*

The Business Case is at the point where the preliminary contractual and legal agreements are to be drafted and reviewed by the Local Governments and Western Power. This is a precedent to the finalization of the business case.

It also remains for the terms of the access to and use of devices/data on the SMART *iTron* network to be confirmed. Lighting controls will cost about $2.3m ($175 x 10,882 lights), with an annual fee of about $150k per annum on current business case assumptions. There are risks associated with lighting controls in that Western Power does not yet have an established system and Synergy does not have a street light tariff structure for dimming, but these are matters to be resolved as part of the business case.

From a technical point of view, before implementing the LED retrofit, the City should engage a lighting designer, for instance Western Power, to design the road lighting in conformance with AS/NZS 1158.

Before engaging a lighting designer, the City should prepare a Lighting Master Plan, or at least a Lighting Policy, outlining their road lighting requirements in terms of the AS/NZS lighting Categories.

After design, and before the retrofit, the City should engage an independent design reviewer to check that the lighting designer has kept to AS/NZS 1158 Categories of the Lighting Master Plan, or Lighting Policy.

Key stakeholders

Large-scale deployment of LED lighting with smart control involves a range of stakeholders from national, state and local government City of Armadale's to Western Power and MRWA authorities, as well as a number of other community stakeholders. Through the Super Trial Group, the project in its concept stage has engaged with key Stakeholders, including Western Power, the two Ministers for Energy and the Environment, other Local Governments, WALGA and the Federal Government with respect to funding opportunities.

Key stakeholders in this project are:

- **City of Armadale**

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.

– Western Power:

Western Power is a key stakeholder as they own and manage all the luminaires encompassed in this project. Western Power therefore plays a significant role in facilitating the project. Councils recognise that, with a likely loss of revenue from the project, Western Power has limited incentive to expedite it and faces many competing priorities as street lighting is only a very small portion of its overall business. Western Power has two approved LED suppliers and require Class 2 approved luminaires with side entry on the network only. Western Power are currently going through a process to establish an approved list of smart control suppliers.

– Main Roads WA Authority (MRWA):

The MRWA authority is responsible for higher classifications of roads. Given their role as the peak road safety authority, the MRWA authority has an interest in ensuring consistent lighting quality. MRWA authority needs to be consulted on the specification, approve the replacement lighting and as it will be benefiting from the reduced operating cost it should be asked to fund or co-fund replacement of relevant luminaires. Currently MRWA subsidises 50% of the operating cost, for the current period this is approximately $75,000.

– Lighting and Smart Controller 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. Selecting a Smart Control supplier is an important decision because it will drive system capabilities. A detailed analysis of the City of Armadale's requirements should be made and what type of controls and in what configuration is necessary to obtain the desired outcomes. In this developing space it seems of great importance to work with open systems. The NEMA 7 pins connectors is the best ‘smart ready’ option providing access to global technologies and allowing competition in the bidding process.

With all luminaires being smart ready, at a later stage, controllers can be added as requirements may change and new software and readable devices become available.

– Installation Contractors

The installation contractor(s) must supply installation of luminaires and (smart) controls meeting the specification, where required upgrade the pole cabling and fuse box, provide appropriate traffic management within relevant timeframes under appropriate terms, providing post-sale technical and warranty support. Deployment priorities and staging approach to be agreed with Western Power and the five Local Governments.

– Advisor(s)

Internal, independent or other technical advisors supporting this project should be considered.

– Energy Regulator(s)

No interaction with the Energy Regulator seems to be required.

– 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.

– Other Stakeholders

Not identified at this stage

Options & Scenario Analysis

There are several 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. Western Power 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 City of Armadale. However, 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.

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 likely to deliver better returns on investment.

It is the approach proposed Western Power Access Arrangement 2022/23 – 2026/27, which details a new proposal, aligned with the Western Power Corporate Strategy, to replace all streetlights with LEDs by 2029. It is proposed that this will be achieved by using screw in LED lamps in existing fittings and accelerating the current replacement rate by replacing the lamp whenever any of the luminaire components fails that require a technician to service the light. This approach is not ideal as it is adhoc and the retrofitting yields an inferior LED Luminaire compared with the Business Case bulk changeover.

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. Its further streamlines maintenance, as the luminaires themselves can 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 (e.g.

adapting to traffic or weather) and by reducing light pollution in off-peak hours where dimming regimes are introduced.

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).

In conjunction with the installation of smart meters, this provides the opportunity for Local Governments to advocate for further savings, pay for only the electricity that they use and have recorded. This also opens up the possibility of street lighting electricity becoming a contestable supply, subject to a competitive process. Again this would require an advocacy approach to Government.

Project Implementation approach

Replacement of current luminaires for LEDs will see power consumption, and therefore electricity consumption, drop dramatically. It is unlikely that investment for Western Power in this revenue reducing replacement program will be a priority, although balanced by the State's 2030 emissions targets. At the same time Councils need to reduce their cost and reduce their environmental footprint. For the City of Armadale and other councils the investment is favourable.

3 | Project Business Case

This business case assumes a one-year deployment period but in reality, implementation will likely take two years. It also considers the project costs and benefits over a 15-year and 20-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).

Summary of costs and funding

Capital Costs

The total cost of the project is estimated to be **$7,909,365,** comprising of the luminaire and the Regulated Asset Base charge.

Luminaire

The total capital cost of the luminaires is estimated to be **$7,363,393.** This is based on an average costs of **$655** for a minor road and **$742** for a major road. The cost includes the luminaire, gateway, connection, installation and a management fee. It also includes **$175** for the SMART controller, but it excludes the operation and access to the SMART iTron network, which is proposed in the model to be delivered through an annual charge by Western Power.

Luminaire brand and models as per current Western Power approved schedule and prices sourced from current supplier to Western Power, Philips Road Grace and Road Flair. Pricing may vary depending on quantities ordered;

A mix of LED lighting types is required to replace the current lighting inventory. 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.

City of Armadale Street Lighting Stock	Types of Lighting	Number of Luminaires	% of Luminaires	Assumed Cost per light (Luminaire Only)	Assumed Cost per light (Luminaire & SMART)	Total Capital Cost
P4/P5 Residential Road Lighting	80W Mercury Vapour	2,829	24.62%	$ 480	$ 655	$ 1,852,995
	70W High Pressure Sodium	76	0.66%	$ 480	$ 655	$ 49,780
	42W Compact Fluorescent	2,111	18.37%	$ 480	$ 655	$ 1,382,705
P3 Residential Road Lighting	70W Metal Halide	246	2.14%	$ 480	$ 655	$ 161,130
	125W Mercury Vapour	2,911	25.34%	$ 480	$ 655	$ 1,906,705
V3 Main Road Lighting	250W Mercury Vapour	28	0.24%	$ 567	$ 742	$ 20,776
	150W High Pressure Sodium	545	4.74%	$ 567	$ 742	$ 404,390
	150W Metal Halide	180	1.57%	$ 567	$ 742	$ 133,560
V1 Main Road Lighting	250W High Pressure Sodium	1,914	16.66%	$ 567	$ 742	$ 1,420,188
	250W Metal Halide	42	0.37%	$ 567	$ 742	$ 31,164
Subtotal		***10,882***	***95%***			***$ 7,363,393***
Other Subcategories	LED	607	5.28%			
Total Lighting		**11,489**	**100%**			**$ 7,363,393**

Existing Stock Code	Traditional Description	CU Listing Classification		LED Stock Code	LED Description
HL6232	18W LED	_18		HL6300	20W LED
HL6231	42W CFL	_42		HL6300	20W LED
HL6140	125W MV	_125		HL6303	53W LED
HL6143	70W HPS	_70		HL6306	36W LED
HL6147	70W MH	_70		HL6306	36W LED
HL6145	150W HPS	-150 & _150W		HL6309	80W LED
HL6148	150W MH	-150 MH		HL6309	80W LED
HL6149	250W MH	_250 MH		HL6312	160W LED
HL6146	250W HPS	250 & _250W		NA	NA

Table 1 – LED equivalent for traditional classic luminaire range

Road Flair Luminaire

Road Grace Luminaire

Regulated Asset Base

Also included as part of the capital cost is the regulated asset base cost. Western Power charges Local Government the written down value of the existing luminaires, with a cost of $1.01m for Armadale. This is known as the RAB or regulated asset base cost (streetlights are a regulated asset service controlled by the Economic Regulation Authority or ERA).

The State Government have agreed and included in the State Budget an amount equivalent to 50% of this cost, towards the RAB charge. The model therefore assumes that the City will be required to pay a net **$545,972** towards the RAB.

Operating Costs

Operational costs are as following:

- Ongoing LED energy and maintenance costs resulting from the Z-Tariff and expected electricity charge are **$998,516** per year, based on the current tariffs for FY23;
- The Z-tariff includes an asset charge to cover the pole access and maintenance costs for the council provided luminaire.
- The Tariff also reflect 'full contribution' by the customer, in this case Local Government who are contributing the full capital cost of the Luminaire.
- The model includes an annual charge of **$12.50** for access to and operation of the SMART *iTron* Network. This results in an annual cost of **$143,000**. Note that this is an estimate and the SLWG are in discussions with Western Power regarding the proposed fee.

Electricity rates applied

The electricity rates were derived from the Western Power invoices to the City of Armadale, and the published tarrifs. The tarrifs are built up from different components:

1. Cost of energy distribution over the network;
    i. Fixed charge
    ii. Variable charge
2. An asset charge for use and maintenance of the luminaire;
3. A charge for the actual energy consumed by the luminaire. In case of a streetlight this is a fixed daily charge.

The table below sets out the current and proposed lighting stock, set against the respective street light tarrif.

Current Street Light Stock, Type & Tarrif Category						Proposed LED Stock & Tarrif			Proposed Rates & Costs		
A	B	C	D	E	F	K	L	M	Q		U
									P x .909		*E x Q*
Input	Input	Input	Input	Input	Input	Input	Input	Input	Calculated	Calculated	Calculated
Model	Type	Existing Wattage	Switch Off	Quantity	Tariff	Proposed Type	Proposed LED SL Wattage	Proposed Tariff	Current Rate ex GST	Current Rate + SAD Rate ex GST	Cost PA LED ex GST
Suburban Eco	CFL	42	C	1632	Suburban Eco	LED (Self Funde	20	Z105	0.1972	0.2314	$137,854
Bourke Hill	CFL	42	C	467	Bourke Hill	LED (Self Funde	20	Z105	0.1972	0.2314	$39,447
Bourke Hill	CFL	42	A	4	Bourke Hill	LED (Self Funde	20	Z105	0.1806	0.2149	$314
Kensington	CFL	42	C	5	Kensington	LED (Self Funde	20	Z105	0.1972	0.2314	$422
Suburban Eco	CFL	42	A	3	Suburban Eco	LED (Self Funde	20	Z105	0.1806	0.2149	$235
Bourke Hill	LED	17	C	44	Z95	LED	17	Z95	0.3550	0.3893	$6,252
RG-C	LED (Self Fund	20	C	100	Z105	LED (Self Funde	20	Z105	0.1972	0.2314	$8,447
RG-M	LED	20	M	2	Z89	LED	20	Z89	0.2248	0.2591	$189
C	LED	22	C	38	Z88	LED	20	Z89	0.2458	0.2800	$3,884
C	LED	36	C	95	Z90	LED	36	Z90	0.2792	0.3134	$10,869
RG-A	LED	36	A	2	Z90	LED	36	Z90	0.2475	0.2818	$206
Bourke Hill	LED	42	C	52	Z98	LED	42	Z98	0.4044	0.4386	$8,325
RG-C	LED	53	C	146	Z91	LED	53	Z91	0.3120	0.3462	$18,449
PK-C	LED	80	C	15	Z99	LED	80	Z99	0.5163	0.5505	$3,014
RF-C	LED	80	C	35	Z99	LED	80	Z99	0.5163	0.5505	$7,033
PK-C	LED	100	C	24	Z100	LED	100	Z100	0.5910	0.6252	$5,477
RF-C	LED	160	C	20	Z93	LED	160	Z93	0.5347	0.5690	$4,154
RF-C	LED	170	C	34	Z94	LED	170	Z94	0.5545	0.5887	$7,306
C	MV	80	C	2829	Z02	LED (Self Funde	20	Z105	0.1972	0.2314	$238,965
C	MV	125	C	2911	Z03	LED (Self Funde	53	Z107	0.2623	0.2965	$315,066
C	MV	250	C	28	Z07	LED (Self Funde	80	Z108	0.3155	0.3498	$3,575
C	MH	70	C	246	Z20	LED (Self Funde	80	Z108	0.3155	0.3498	$31,408
C	MH	150	C	180	Z21	LED (Self Funde	80	Z108	0.3155	0.3498	$22,982
C	MH	250	C	42	Z22	LED (Self Funde	160	Z109	0.4734	0.5076	$7,782
C	HPS	70	C	76	Z19	LED (Self Funde	36	Z106	0.2287	0.2630	$7,295
C	HPS	150	C	545	Z13	LED (Self Funde	80	Z108	0.3155	0.3498	$69,583
C	HPS	250	C	1914	Z15	LED (Self Funde	160	Z109	0.4734	0.5076	$354,631
				11489							$1,313,163

Project Funding

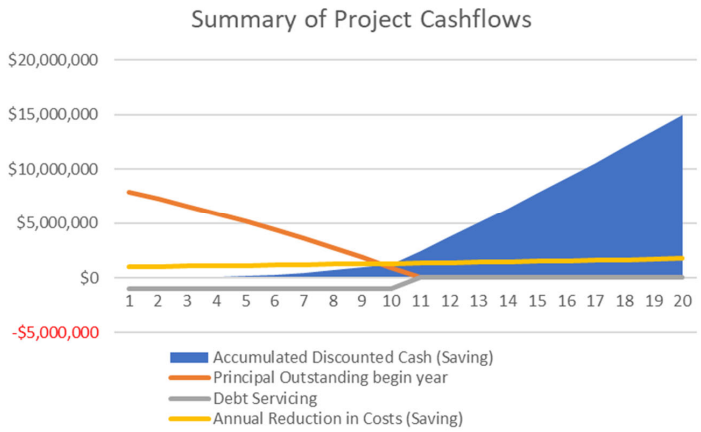
The model proposes to raise funds through borrowings from the West Australian Treasury Corporation. Whilst alternative funds through cash reserves or grants can be modeled, no such provision has been made at this point in time.

Loan funds raised are therefore the equivalent of the total capital cost, based on a r**ate of 4.4%** plus the guarantee fee of 0.7%, taken over ten years. The impact of the municipal fund in zero, as the savings in energy consumption (street lighting costs) funds the **debt servicing** requirement of **$1m** p.a.

Project Cashflow, Net Present Value and simple payback period

Based on total net capital costs outlined above of **$7,909,365** and annual operating cost savings of **$998,516**, the project pays for itself in approximately **7.3** years.

Assuming a **4%** internal discount rate, and a price escalation of 3%, the net present value of the project cashflows over the next **15 years is $5,220,000 or over 20 years, $9,294,000.**



Project benefits

Energy savings

Current energy consumption of the lighting to be replaced is **6,742,000** kWh/yr with the new LEDs expected to reduce this to **3,430,000** kWh/yr, which is a net saving of **49%**.

Z-Tariff savings

- Current energy costs of the lighting is **$2,322,000** per annum 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 **$1,313,000** per annum (exclusive of energy associated with smart controls), which is an annual saving of **$998,500** or **44%** of current energy costs.
- 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 enough;
  - **Streamlined maintenance processes**: With smart controls, the luminaires can 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 allows for maintenance to be organised much more efficiently.

Environmental benefits

- **Carbon emissions**: Current emissions of existing lights amounts to **4,720 t** CO2-e/year with the new LEDs this is expected to be reduce this to **2,401 t** CO2-e/year which is a saving of **2,318** t CO2-e/year and **49%** 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.

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;
- **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.

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. This was discussed in the SAGE Engineering report provided to the City of Albany;
- 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 should be smart ready to be able to communicate with future 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.

Smart lighting

'Smart street lighting' will see a 'controller' added to the streetlights enabling them to communicate via, amongst others, on the mobile network. Smart lights can further reduce energy consumption by dimming and turning off lights, depending on illumination needs. Smart controllers can transmit data that can be processed by various IT applications. This opens a whole new suite of possibilities such as, for instance, traffic monitoring or meter reading.

Smart controllers for streetlights are a developing field. There are different setups possible where one controller is fed information by neighbouring lights and functions as a transmitter station or, one controller as a master can have other streetlights linked to it as slaves. Depending on the need, a streetlight network can be developed into a smart network for a variety of functionalities.

With the technology developing and the 'internet of things' evolving quickly it is advised to install luminaires that are smart ready and specify 7 pin NEMA which can accept open system controllers (open API). By doing this the user can integrate systems that become available as the technology develops.

Based on current technology, it is likely that the setup will see a combination of master-slave and independent transmitters such as gateways and mesh networks communicating via 4G or Sub-1-gHz and NB-IoT.

4 | Funding Consideration

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.

Western Power financing

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

Embedded in the street lighting capital tariffs charged by the Western Power is both a cost of capital approved by the regulator and CPI indexing of the capital costs. Anecdotally, Western Power financing through provision of luminaires and installation of street lighting is often higher in cost than other options available to local government and MRWA authorities. Western Power 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 Western Power for all assets which it agrees that Western Power 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

The preliminary analysis show that this project could service debt from the operational cashflow savings. The City's financial strategies adopted in the Four Year Budget by Council supports debt funding this project. Specifically, the Four Year Budget financial strategy pertaining to borrowings states:

> *Council consensus is to a $50M self-imposed cap, with option to go to $60M with a business case that pays for itself.*

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. The 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.

1.2 Debt modelling

After consultation with the City of Armadale, at this stage there is no recommended funding option required. For the purpose of comparison this report only shows a private funding option to provide a first basis of comparison. For the Net Present Value Calculation an internal rate of return of **4%** was considered.

As per Section 3.1, the total net capital cost of the project is estimated to be **$7,909,000.**

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. Five years is consistent with typical LED luminaire warranties. 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 City of Armadale for a relatively long-lived asset.

The assumed cost of financing in the accompanying model is **4.80% (including the Guarantee Fee)** for 10-year fixed rate financing based on the latest Treasury estimates. It is assumed that the debt facility will be drawn up-front.

1.3 Preliminary recommendation on financing

It is recommended that the Business Case continues to be developed utilizing 100% debt funding from the West Australian Treasury Corporation.

5 | Implementation Approach

1.4 Procurement approach

***Option 1**: Western Power Procurement*
The procurement process for LEDs, smart controls, and lighting installation services will be undertaken by Western Power, 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 Western Power and its replacement is non-contestable. There is therefore no current option for the City of Armadale to lead these procurement processes. However, the City of Armadale will review the current Western Power specifications to ensure that they reasonably meet its technical objectives, are technically current and are commercially competitive.

The City has progressed discussions with Western Power with respect to establishing their current specifications, confirm the cost estimates underpinning this business case, and secure an indication of the likely timelines for deployment and go forward costing (new tariff).

1.5 Project management plan

1.5.1 Timeline

It is anticipated that concurrently run procurement processes for LED lighting (including upgrade of the fuse box and pole wires), smart controls, and an installation contractor (including traffic management) will take approximately five months and that the lead time from awarding of contracts to mobilisation will be at least four months. It is expected that this deployment will take place over one to two years at an average relight rate of 500 to 1,000 units month.

1.5.2 Project risk management

There are a few risks associated with this project. Negotiations with Western Power are in progress and have not yet concluded, therefore the risk assessment can only be done at a global level.

Negotiation delays and approvals	Low Risk	**Moderate Risk**	High Risk

Negotiations with Western Power are ongoing. Both Western Power and the respective Local Governments have draft business cases with conditions precedent on Agreements and Contracts being finalized.

There is therefore a risk that negotiations with Western Power might not proceed in a timely manner with respect to the deployment schedule or agreed technical specification, delaying timelines, and affecting costs.

- *Continue negotiations and in a transparent manner with Western Power, seeking specialist external technical support and senior management intervention as needed;*
- *Make awarding of all supply contracts contingent on formal agreement with Western Power.*

Inventory Issues	Low Risk	**Moderate Risk**	High Risk

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

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

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, particularly with current supplies of materials and contractors. These risks also 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 (by Western Power) 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;*
- *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:

- *Shifting the risk to Western Power who has the expertise in managing this risk*
- *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;*
- *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:

-
- *Trials of the technology to demonstrate and test the network*
- *Seeking specialist external advice as required;*
- *Significant weighting in the tender evaluation being placed on the suppliers' track records with equipment supply;*

limit cost implications).

Failure to realise the benefits of the Smart enabled LED	Low Risk	**Moderate Risk**	High Risk

The benefits of Smart LEDs include improved fault rectification, and to trim and dim lighting to reduce energy use and increase the life of the luminaire. Additionally, future benefits include attaching other smart enabled devices and potentially, reducing energy costs through contestable energy retailing.

- *Ensure the outcomes sought (the return on investment) is clearly enunciated=ated in the Agreements and contracts.*
- *This includes the access protocol to the smart iTron network*

1.5.3 Project oversight and management

Assuming the project would be executed as Option 2, at this stage it is undecided whether the City of Armadale or an independent project manager will manage the bulk changeover. At a later stage when negotiations with Western Power are completed and the parameters for the project agreed, a tender process and project management plan needs to be produced, outlining project management and oversight.

1.6 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.

Prior to tendering a detailed audit of the GIS data and infield inspections is recommended to ensure that the replacement program equipment will fit, upgrades to infrastructure identified upfront and properly replace the existing streetlights, delivering the specified illumination performance. Performance should at least equal the existing illumination performance.

1.7 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 the City of Armadale, 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, Western Power, MRWA, 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;
- **Communications channels** – The most effective communications channels for each stakeholder group will be identified

The City of Armadale 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

1.8 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, the City of Armadale 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
2	Taiwan	692,000
3	New York, USA	500,000
4	Georgia Power, USA	400,000
5	Chicago, USA	270,000
6	Oklahoma Gas & Electric, USA	250,000
7	Madrid, Spain	225,000
8	Houston, USA	165,000
9	Hampshire & Winchester, UK	155,000
10	Los Angeles, USA	142,000

End of the MaximOz Group report

6 | Appendices

- Base Case Low BYO 0% controllers SLSC model:
  - Lighting Assumptions
  - Lighting Outputs
  - Loan Schedule
  - Cashflow
  - Financing Outputs
  - Lighting Calculations

Lighting Assumptions

Model Description:

Base Price + $12.50 SED Service+50%RAB

INPUTS

Cost per Luminaire (Minor Road)	
Wood	$500
Wood (Weighting)	10%
Double	$440
Double (Weighting)	5%
Metal	$480
Metal (Weighting)	85%
Weighted Avg	**$480**
Plus: Smart Enabled Device (SED)	$175
TOTAL inc SED	**$655**
..with 5 % Bulk Disc	$631
..with 10 % Bulk Disc	$607
MODEL ADOPT Cost Per Luminaire	**$655**

Financing	
7 year WATC Loan	**4.40%**
Loan Guarantee Fee	**0.70%**
Loan Term	**10**
Annual Discount Rate	**4.00%**
Indexing	**3.00%**
Other Funding Sources:	
Grant	**$0**
Reserve	**$0**

Total Capex	
SMART LED Capital Cost	**$7,363,393**
RAB COST	**$545,972**
TOTAL Capital Cost	**$7,909,365**

Energy Consumption and CO2 Emmissions	
Total Energy Consumed (kW/h	**1.15**
Total Energy hours (kWh/Day)	**12**
Tonnes CO2 produced (MWh)	**0.7**

Cost per Luminaire (Major Road)	
Wood	$590
Wood (Weighting)	5%
Double	$525
Double (Weighting)	10%
Metal	$570
Metal (Weighting)	85%
Weighted Avg	**$567**
Plus: Smart Enabled Device (SED)	$175
TOTAL inc SED	**$742**
.. with 5 % Bulk Disc	$713
.. with 10 % Bulk Disc	$685
MODEL ADOPT Cost Per Luminaire	**$742**

Non Standard Charges	
Smart LED Tarrif (iTron)	**$12.50**

Lighting Outputs

OUTPUTS

Total Street Lighting Stock	
Minor Roads/Streets	**8,756**
Major Roads/Routes	**2,164**
LED Lights	**569**
Total Street Lights	**11,489**

Cost per Luminaire	
Avg Capital Cost per luminaire	**$674**

Total Capital Cost	
Total Capital Cost	**$7,363,393**

Financing Costs	
Principal Repayments (Total)	**$7,909,365**
Interest Repayments (Total)	**$2,246,457**
Debt Servicing (per annum)	**$1,015,582**
Loan Term	**10**

Business Case: City of Armadale	
Capital Cost	$7,363,000
Annual Savings	$999,000
Debt Servicing - 10 years	$1,016,000
NPV (20yr)	$9,294,000
NPV (15yr)	$5,220,000
Simple Payback (yrs)	7

Street Lighting Operating Cost (per Annum)	
Cost of Street Lights Per Annum (Current)	**$ 2,311,679**
Cost of Street Lights Per Annum (Smart LED)*	**$ 1,313,163**
Saving	**$ 998,516**
**Cost of Smart Device per Annum*	*$ 143,613*
**Cost of LED Luminaire per Annum*	*$ 1,169,551*

Street Lighting Operating Cost (per Month)	
Cost of Street Lights Per Month (Current)	**$ 196,334**
Cost of Street Lights Per Month (Smart LED)*	**$ 111,529**
Saving	**$ 84,805**
**Cost of Smart Device per Month*	*$ 12,197*
**Cost of LED Luminaire per Month*	*$ 99,332*

Consumption	
MWh (Current)	**6,742**
MWh (Smart LED)	**3,430**
Reduction in Energy Consumption	**-3,312**
	-49%

CO2 Reduction	
CO2 Emmissions tonnes (Current)	**4,720**
CO2 Emmissions tonnes (Smart LED)	**2,401**
Reduction in CO2 Emmissions	**-2,318**
Percentage reduced	*-49%*

Loan Schedule

WA Treasury Corporation
External Loan Schedule

LED Street Lighting Project

Loan Amount	$7,909,365
Term of Loan	10 years
Payments P.A.	2
Interest Rate	4.40%
Guarantee fee	0.70%
Commencement	1 July 2021

Repayments commencing FY23

	Rate	Total Repayments	Payments p.a.	Payment Period from	Payment Period to	Loan Amount	Principal	Interest	Guarantee Fee	Principal Outstanding
2021/22	4.40%	20	2	0	0	7,909,365	0	0	0	7,909,365
2022/23	4.40%	20	2	1	2	7,909,365	645,202	340,992	54,027	7,264,163
2023/24	4.40%	20	2	3	4	7,909,365	673,903	312,291	48,653	6,590,260
2024/25	4.40%	20	2	5	6	7,909,365	703,881	282,313	43,242	5,886,380
2025/26	4.40%	20	2	7	8	7,909,365	735,192	251,002	37,793	5,151,188
2026/27	4.40%	20	2	9	10	7,909,365	767,896	218,297	32,306	4,383,291
2027/28	4.40%	20	2	11	12	7,909,365	802,055	184,138	26,780	3,581,236
2028/29	4.40%	20	2	13	14	7,909,365	837,734	148,460	21,216	2,743,502
2029/30	4.40%	20	2	15	16	7,909,365	875,000	111,194	15,612	1,868,502
2030/31	4.40%	20	2	17	18	7,909,365	913,923	72,270	9,969	954,578
2031/32	4.40%	20	2	19	20	7,909,365	954,578	31,615	4,287	0
2032/33	4.40%	20	2	21	22	7,909,365	0	0	0	0
2033/34	4.40%	20	2	23	24	7,909,365	0	0	0	0
2034/35	4.40%	20	2	25	26	7,909,365	0	0	0	0
2035/36	4.40%	20	2	27	28	7,909,365	0	0	0	0
2036/37	4.40%	20	2	29	30	7,909,365	0	0	0	0
2037/38	4.40%	20	2	31	32	7,909,365	0	0	0	0
2038/39	4.40%	20	2	33	34	7,909,365	0	0	0	0
2039/40	4.40%	20	2	35	36	7,909,365	0	0	0	0
2040/41	4.40%	20	2	37	38	7,909,365	0	0	0	0
2041/42	4.40%	20	2	39	40	7,909,365	0	0	0	0
2042/43	4.40%	20	2	41	42	7,909,365	0	0	0	0
2043/44	4.40%	20	2	43	44	7,909,365	0	0	0	0
2044/45	4.40%	20	2	45	46	7,909,365	0	0	0	0
2045/46	4.40%	20	2	47	48	7,909,365	0	0	0	0
2046/47	4.40%	20	2	49	50	7,909,365	0	0	0	0
2047/48	4.40%	20	2	51	52	7,909,365	0	0	0	0
2048/49	4.40%	20	2	53	54	7,909,365	0	0	0	0
2049/50	4.40%	20	2	55	56	7,909,365	0	0	0	0
2050/51	4.40%	20	2	57	58	7,909,365	0	0	0	0
2051/52	4.40%	20	2	59	60	7,909,365	0	0	0	0
1899/00	4.40%	20	2	61	62	7,909,365	0	0	0	0
					TOTAL		7,909,365	1,952,572	293,885	

Operating and Debt Cashflow Summary

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Old Streetlight cost	-$2,311,679	-$2,381,030	-$2,452,460	-$2,526,034	-$2,601,815	-$2,679,870	-$2,760,266	-$2,843,074	-$2,928,366	-$3,016,217	-$3,106,704	-$3,199,905	-$3,295,902	-$3,394,779	-$3,496,622	-$3,601,521	-$3,709,567	-$3,820,854	-$3,935,479	-$4,053,543
LED Street Light cost	-$1,313,163	-$1,352,558	-$1,393,135	-$1,434,929	-$1,477,977	-$1,522,316	-$1,567,985	-$1,615,025	-$1,663,476	-$1,713,380	-$1,764,781	-$1,817,725	-$1,872,257	-$1,928,424	-$1,986,277	-$2,045,865	-$2,107,241	-$2,170,459	-$2,235,572	-$2,302,640
Annual Reduction in Costs (Saving)	**$998,516**	**$1,028,472**	**$1,059,326**	**$1,091,105**	**$1,123,839**	**$1,157,554**	**$1,192,280**	**$1,228,049**	**$1,264,890**	**$1,302,837**	**$1,341,922**	**$1,382,180**	**$1,423,645**	**$1,466,354**	**$1,510,345**	**$1,555,655**	**$1,602,325**	**$1,650,395**	**$1,699,907**	**$1,750,904**
	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Principal Outstanding begin year	-$7,909,365	-$7,264,163	-$6,590,260	-$5,886,380	-$5,151,188	-$4,383,291	-$3,581,236	-$2,743,502	-$1,868,502	-$954,578	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Principal Repayments	-$645,202	-$673,903	-$703,881	-$735,192	-$767,896	-$802,055	-$837,734	-$875,000	-$913,923	-$954,578	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Interest Repayments	-$340,992	-$312,291	-$282,313	-$251,002	-$218,297	-$184,138	-$148,460	-$111,194	-$72,270	-$31,615	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Guarantee Fee	-$54,027	-$48,653	-$43,242	-$37,793	-$32,306	-$26,780	-$21,216	-$15,612	-$9,969	-$4,287	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Debt Servicing	**-$1,040,221**	**-$1,034,847**	**-$1,029,436**	**-$1,023,987**	**-$1,018,500**	**-$1,012,974**	**-$1,007,409**	**-$1,001,806**	**-$996,163**	**-$990,480**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Cash Result	**-$41,705**	**-$6,376**	**$29,890**	**$67,119**	**$105,339**	**$144,580**	**$184,871**	**$226,243**	**$268,727**	**$312,357**	**$1,341,922**	**$1,382,180**	**$1,423,645**	**$1,466,354**	**$1,510,345**	**$1,555,655**	**$1,602,325**	**$1,650,395**	**$1,699,907**	**$1,750,904**
	0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Discounted Cash (Saving)	**-$41,415**	**-$6,287**	**$29,271**	**$65,272**	**$101,728**	**$138,654**	**$176,061**	**$213,963**	**$252,375**	**$291,310**	**$1,242,805**	**$1,271,191**	**$1,300,225**	**$1,329,923**	**$1,360,298**	**$1,391,368**	**$1,423,147**	**$1,455,651**	**$1,488,899**	**$1,522,905**
	$0	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Accumulated Discounted Cash (Saving)	**-$41,415**	**-$47,702**	**-$18,431**	**$46,841**	**$148,569**	**$287,223**	**$463,283**	**$677,247**	**$929,622**	**$1,220,933**	**$2,463,738**	**$3,734,929**	**$5,035,154**	**$6,365,077**	**$7,725,375**	**$9,116,743**	**$10,539,890**	**$11,995,541**	**$13,484,440**	**$15,007,345**
	$0	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Simple Payback	**-$6,910,849**	**-$5,882,377**	**-$4,823,052**	**-$3,731,946**	**-$2,608,108**	**-$1,450,554**	**-$258,273**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	$0	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
NPV (20 Years)	**$9,293,624**																			

Financial Summary

Key Project Outputs

Net cash saving/(outflow) p.a	$998,516
Payback period in years	7.00
NPV of project cashflows (20 years)	$9,293,624
Reduction in energy usage	-49.1%
Emissions abated (t CO2-e/yr)	-2,318

The estimated annual cash SAVING as a result of the street lighting upgrades

Timeframe over which the annual cash savings of the Project can repay the Project Capital Cost

Net Present Value of the Project cash flows using your organisation's Internal Project Discount Rat

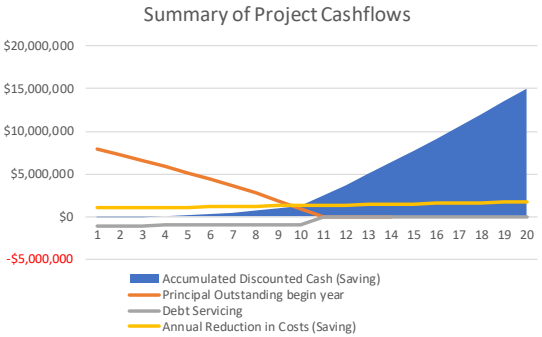
Reduction in energy usage compared to before the street lighting upgrades

Roughly equivalent to taking -504 passenger vehicles off the road

Debt Financing Summary

Assumed Interest Rate on Borrowings	4.40%
Debt term (years)	10
Estimated annual repayment	$1,015,582

Estimated annual repayment of debt financing



Project Net Cashflow: The cumulative cash balance for your 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

Lighting Calculations

CITY OF ARMADALE - STREETLIGHT CHANGEOVER - SMART ENABLED LED LIGHTS

Invoice	Invoice	Invoice	Invoice	Invoice	Invoice	Jason	Stuart	Jason	Jason	Jason	Jason
Current Street Light Stock, Type & Tarrif Category						Proposed LED Stock & Tarrif			Proposed Rates & Costs		
A	B	C	D	E	F	K	L	M	Q		U
									P x .909		E x Q
Input	Input	Input	Input	Input	Input	Input	Input	Input	Calculated	Calculated	Calculated
Model	Type	Existing Wattage	Switch Off	Quantity	Tariff	Proposed Type	Proposed LED SL Wattage	Proposed Tariff	Current Rate ex GST	Current Rate +SAD Rate ex GST	Cost PA LED ex GST
Suburban Eco	CFL	42	C	1632	Suburban Eco	LED (Self Funded	20	Z105	0.1972	0.2314	$137,854
Bourke Hill	CFL	42	C	467	Bourke Hill	LED (Self Funded	20	Z105	0.1972	0.2314	$39,447
Bourke Hill	CFL	42	A	4	Bourke Hill	LED (Self Funded	20	Z105	0.1806	0.2149	$314
Kensington	CFL	42	C	5	Kensington	LED (Self Funded	20	Z105	0.1972	0.2314	$422
Suburban Eco	CFL	42	A	3	Suburban Eco	LED (Self Funded	20	Z105	0.1806	0.2149	$235
Bourke Hill	LED	17	C	44	Z95	LED	17	Z95	0.3550	0.3893	$6,252
RG-C	LED (Self Fund	20	C	100	Z105	LED (Self Funded	20	Z105	0.1972	0.2314	$8,447
RG-M	LED	20	M	2	Z89	LED	20	Z89	0.2248	0.2591	$189
C	LED	22	C	38	Z88	LED	20	Z89	0.2458	0.2800	$3,884
C	LED	36	C	95	Z90	LED	36	Z90	0.2792	0.3134	$10,869
RG-A	LED	36	A	2	Z90	LED	36	Z90	0.2475	0.2818	$206
Bourke Hill	LED	42	C	52	Z98	LED	42	Z98	0.4044	0.4386	$8,325
RG-C	LED	53	C	146	Z91	LED	53	Z91	0.3120	0.3462	$18,449
PK-C	LED	80	C	15	Z99	LED	80	Z99	0.5163	0.5505	$3,014
RF-C	LED	80	C	35	Z99	LED	80	Z99	0.5163	0.5505	$7,033
PK-C	LED	100	C	24	Z100	LED	100	Z100	0.5910	0.6252	$5,477
RF-C	LED	160	C	20	Z93	LED	160	Z93	0.5347	0.5690	$4,154
RF-C	LED	170	C	34	Z94	LED	170	Z94	0.5545	0.5887	$7,306
C	MV	80	C	2829	Z02	LED (Self Funded	20	Z105	0.1972	0.2314	$238,965
C	MV	125	C	2911	Z03	LED (Self Funded	53	Z107	0.2623	0.2965	$315,066
C	MV	250	C	28	Z07	LED (Self Funded	80	Z108	0.3155	0.3498	$3,575
C	MH	70	C	246	Z20	LED (Self Funded	80	Z108	0.3155	0.3498	$31,408
C	MH	150	C	180	Z21	LED (Self Funded	80	Z108	0.3155	0.3498	$22,982
C	MH	250	C	42	Z22	LED (Self Funded	160	Z109	0.4734	0.5076	$7,782
C	HPS	70	C	76	Z19	LED (Self Funded	36	Z106	0.2287	0.2630	$7,295
C	HPS	150	C	545	Z13	LED (Self Funded	80	Z108	0.3155	0.3498	$69,583
C	HPS	250	C	1914	Z15	LED (Self Funded	160	Z109	0.4734	0.5076	$354,631
				11489							$1,313,163

Calculated	Calculated	Calculated	Calculated	Calculated
AH	AI	AJ	AK	AL
E x 5				AI+AJ+AK
Calculated	Input/Calc	Calculated	Calculated	Calculated
Cost per group of luminaires	New LED Base Tariff	Less Capital Contribution	Smart LED tariff $12.50	New LED Tariff
$1,068,960	0.1950	-	0.0342466	0.2293
$305,885	0.1950	-	0.0342466	0.2293
$2,620	0.1950	-	0.0342466	0.2293
$3,275	0.1950	-	0.0342466	0.2293
$1,965	0.1950	-	0.0342466	0.2293
$0	0.1895	-	0.0342466	0.2237
$0	0.1950	-	0.0342466	0.2293
$0	0.3055	-	0.0342466	0.3398
$0	0.1950	-	0.0342466	0.2293
$0	0.2245	-	0.0342466	0.2587
$0	0.2245	-	0.0342466	0.2587
$0	0.1950	-	0.0342466	0.2293
$0	0.2558	-	0.0342466	0.2900
$0	0.3055	-	0.0342466	0.3398
$0	0.3055	-	0.0342466	0.3398
$0	0.5870	-	0.0342466	0.6212
$0	0.4529	-	0.0342466	0.4871
$0	0.5362	-	0.0342466	0.5705
$1,852,995	0.1950	-	0.0342466	0.2293
$1,906,705	0.2558	-	0.0342466	0.2900
$20,776	0.4529	-	0.0342466	0.4871
$161,130	0.3055	-	0.0342466	0.3398
$133,560	0.3055	-	0.0342466	0.3398
$31,164	0.4529	-	0.0342466	0.4871
$49,780	0.2245	-	0.0342466	0.2587
$404,390	0.3055	-	0.0342466	0.3398
$1,420,188	0.4529	-	0.0342466	0.4871
$7,363,393				

Calculated	Calculated	Calculated	Calculated	Calculated
Consumption				
W	X	Y	Z	AA
Calculated	Calculated	Calculated	Calculated	Calculated
consumed per day Kwhrs	consumed per year Mwhrs	consumed per day Kwhrs	consumed per year Mwhrs	Energy Saving per Class
0.5796	345.26	0.28	164.41	-52%
0.5796	98.80	0.28	47.05	-52%
0.5796	0.85	0.28	0.40	-52%
0.5796	1.06	0.28	0.50	-52%
0.5796	0.63	0.28	0.30	-52%
0.2346	3.77	0.23	3.77	0%
0.276	10.07	0.28	10.07	0%
0.276	0.20	0.28	0.20	0%
0.3036	4.21	0.28	3.83	-9%
0.4968	17.23	0.50	17.23	0%
0.4968	0.36	0.50	0.36	0%
0.5796	11.00	0.58	11.00	0%
0.7314	38.98	0.73	38.98	0%
1.104	6.04	1.10	6.04	0%
1.104	14.10	1.10	14.10	0%
1.38	12.09	1.38	12.09	0%
2.208	16.12	2.21	16.12	0%
2.346	29.11	2.35	29.11	0%
1.104	1,139.97	0.28	284.99	-75%
1.725	1,832.84	0.73	777.12	-58%
3.45	35.26	1.10	11.28	-68%
0.966	86.74	1.10	99.13	14%
2.07	136.00	1.10	72.53	-47%
3.45	52.89	2.21	33.85	-36%
0.966	26.80	0.50	13.78	-49%
2.07	411.77	1.10	219.61	-47%
3.45	2,410.20	2.21	1,542.53	-36%
34	6742	23	3430	-49%

Calculated	Calculated	Calculated
CO2 Emmissions		
AB	AC	AD
Calculated	Calculated	Calculated
Tonnes CO2 for current	Tonnes CO2 for LED	Tonnes CO2 Avoided
241.68	115.09	-126.59
69.16	32.93	-36.23
0.59	0.28	-0.37
0.74	0.35	-0.39
0.44	0.21	-0.23
2.64	2.64	0.00
7.05	7.05	0.00
0.14	0.14	0.00
2.95	2.68	-0.27
12.06	12.06	0.00
0.25	0.25	0.00
7.70	7.70	0.00
27.28	27.28	0.00
4.23	4.23	0.00
9.87	9.87	0.00
8.46	8.46	0.00
11.28	11.28	0.00
20.38	20.38	0.00
797.98	199.50	-598.49
1282.99	543.99	-739.00
24.68	7.90	-16.78
60.72	69.39	8.67
95.20	50.77	-44.43
37.02	23.69	-13.33
18.76	9.65	-9.11
288.24	153.73	-134.51
1687.14	1079.77	-607.37
4720	2401	-2318

SMART LED STREETLIGHT

REPLACEMENT SUPER TRIAL PROPOSAL

The local governments of Albany, Armadale, Canning, Cockburn and Melville have been working collaboratively with Western Power to deliver innovative, intelligent and future-focussed solutions for streetlighting. The proposal is subject to Council approval by the respective local governments.

An ambitious and widespread rollout program to replace approximately 47,000 streetlights with energy efficient and low maintenance Smart LED streetlights across the five local government areas is being proposed as a *Super Trial* covering almost 17% of streetlights across the South West Interconnected System (SWIS) power grid.

FAST FACTS

Smart LED has the potential to achieve a:

65% Reduction in greenhouse gas emissions compared to standard streetlights and

major energy savings of up to **40%** for each participating Local Government.

Streetlighting represents **40-50%** of total energy costs for most local governments

47,000 streetlight lamps in the Cities of Albany, Armadale, Canning, Cockburn and Melville

Approx. **278,000** streetlight lamps across the SWIS network covering the Perth Metropolitan Area and South West Region.

Western Power have already trialled **SMART LED** streetlights in the City of Melville

BACKGROUND

The five participating local governments have prepared a business case and are already advancing detailed replacement proposals with Western Power, based on the local governments meeting the capital cost of progressively replacing approximately 47,000 inefficient and poorer quality streetlights including mercury vapour streetlights that will need to be phased out under the Minimata Convention.

In the future, LED Smart Poles could be installed in key activity centres and popular community spaces with smart technology applications to facilitate art experiences, Wayfinding, PA systems, SOS, Public Wi-Fi, etc.

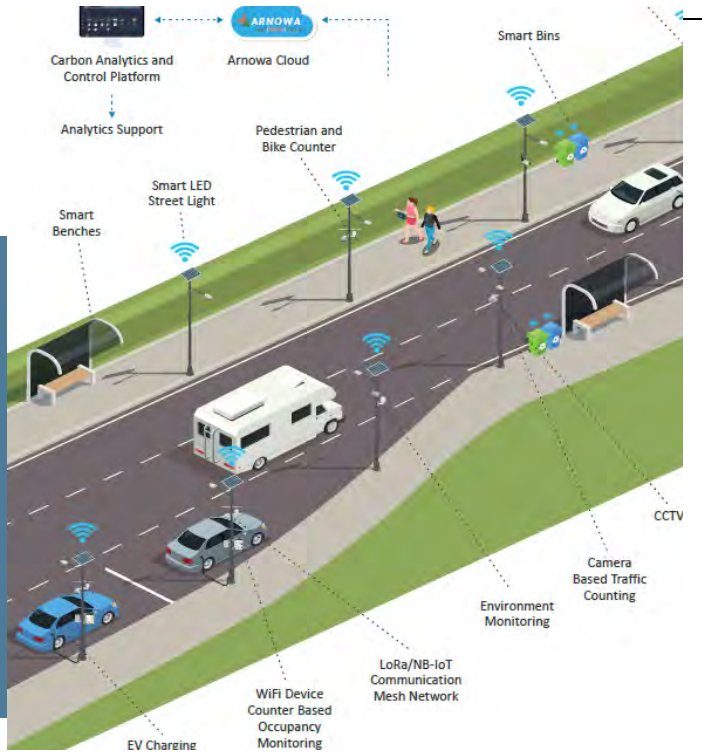
Sensors and cameras could also be installed for traffic counting, surveillance, environmental monitoring, etc. on poles as a valuable community asset supporting Smart City capability.

Albany · City of Armadale · City of Canning · City of Cockburn · City of Melville

BENEFITS OF REPLACING STREETLIGHTS WITH SMART LED

- Accurate light dimming control on every streetlight
- Sensor mounting capability for various applications
- User-centric smart infrastructure to provide spatial intelligence and comfort
- Customisable LoRa, NB-IoT, RF, WIFi wireless networks
- End-to-end ecosystem including hardware, software and analytic support.

Image Source: ARNOWA Smart Street Infrastructure



COMMUNITY

- Safer driving at night through better lighting
- Safer communities as endorsed by the WA Police Service
- Using technology to ensure 100% of the streetlights remain “on”
- More efficient and better performing streetlights with superior lighting quality

LOCAL GOVERNMENT

- Improved quality (colour temperature and light distribution) and reliability of public lighting
- Lower electricity consumption (up to 50%) and greenhouse gas emissions (up to 65%)
- More efficient operating and maintenance costs reflected in reduced tariffs
- Reduced light spill and light pollution
- Lower waste though longer life-cycle
- Reduced impact of maintenance operations (lane closures etc)
- Elimination of harmful mercury from the environment especially landfill
- Ability to actively manage lighting to meet changing needs and respond to environmental impacts in sensitive locations

STATE GOVERNMENT

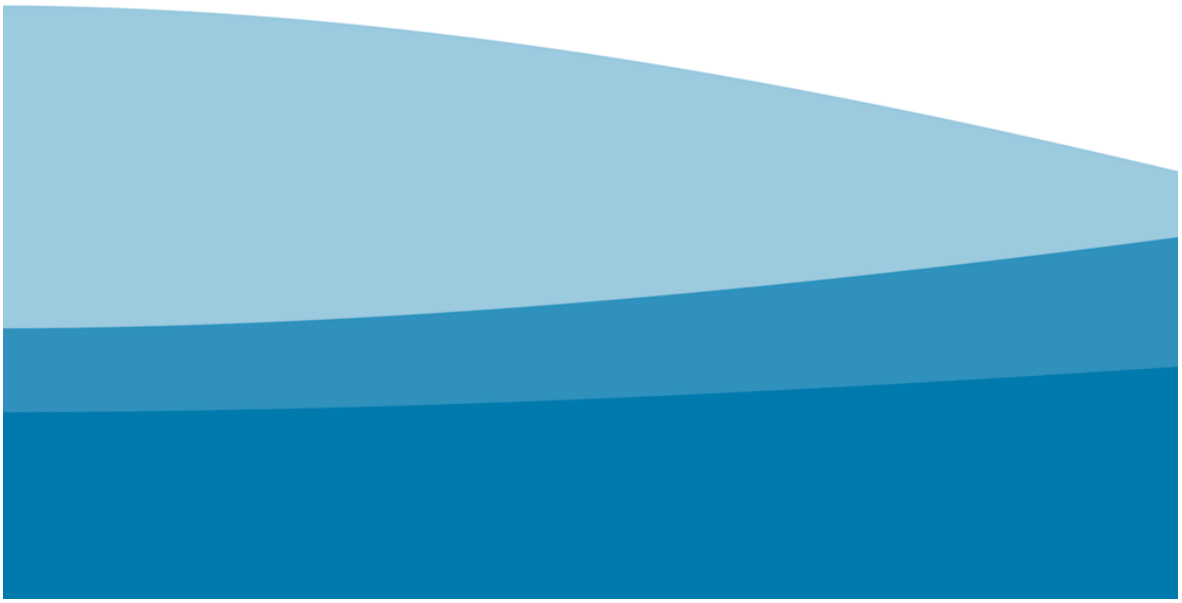
- Contribute to greenhouse gas emissions reductions of up to 7,250 tonnes CO_2per year
- Create jobs from change over program
- Reduce crime by providing Police with superior night time lighting
- Improve night time safety for all road users
- Improved tourism opportunities in the region (night time –space/star viewing)

WESTERN POWER

- Lower operating costs and improved efficiency for Western Power
- Low or no capital investment required for street lights.
- Public lighting that better meets Australian Standards.
- Improved public perception through lower light failure rates and rapid maintenance response using smart controls
- Contribute to electricity network stability through reduced electricity demand in the peak evening and pre-dawn periods
- Protect against the impact of a ban on manufacture and trade of mercury containing globes.
- Lower transition cost than the alternate "replace on failure" approach

LED Street Light Trial, Atwell and Spearwood

Community Feedback Summary
April 2021



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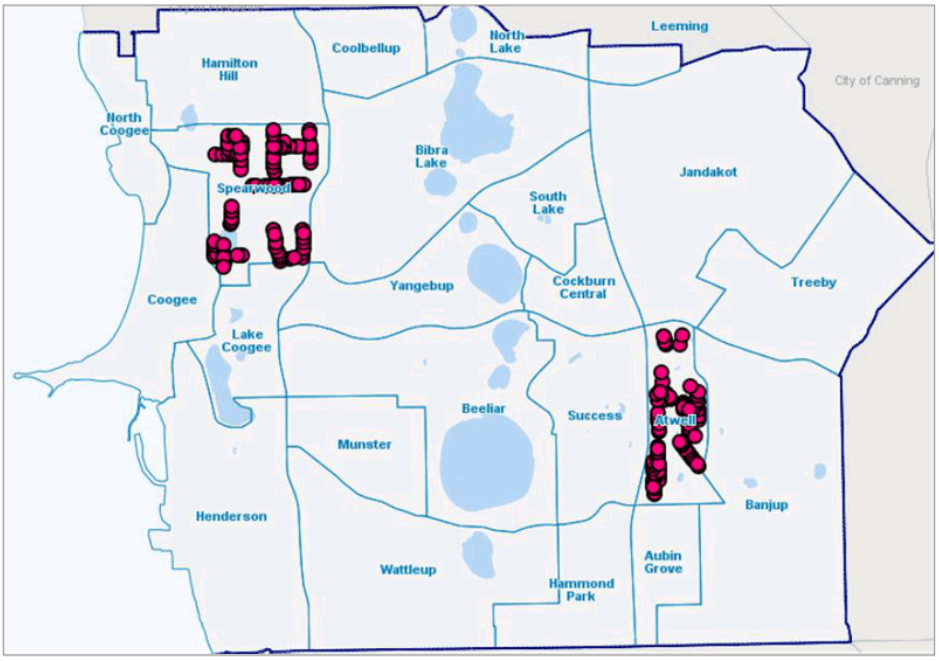
1. Context

The City's operational activities generate over 30,000 tCO2-e per annum. This equates to 1.2% of emissions in the Cockburn municipality. Purchased electricity and gas are the second largest source of emissions (35%) and include energy used in street lighting, facilities, parks and sporting facilities.

Street lighting contributes to almost half of the City's electricity consumption at a cost of $2.7 million per annum. Wider implementation of LEDs could reduce the City's street lighting emissions by around 50% while saving ratepayers.

Between December 2020 and March 2021, Western Power and the City of Cockburn trialled the use of 169 new LED luminaires on existing streetlight poles in sections of Spearwood and Atwell.



Above: Locations of the LED luminaires.

This trial was funded by the Australian Government (through the Local Roads and Community Infrastructure Program) and the City of Cockburn.

The purpose of this trial was to identify whether the existing streetlight poles are suitable for the LED luminaires, given LEDs have a different brightness and colour tone to the traditional mercury vapour/compact fluorescent luminaires.

Required luminance levels differ from area to area because of factors like road conditions. For this reason, the trial was carried out in areas of Spearwood and Atwell that reflect the variety of infrastructure in place across the City.

If the existing poles are considered suitable, it means LEDs could potentially be installed throughout Cockburn, without replacing the actual streetlight infrastructure.

While trial outcomes will be determined by technical criteria, community feedback provides valuable insight into the potential suitability of the LED luminaires on the existing poles. As such, the City invited feedback from residents who live near the modified luminaires during the trial. This document provides a summary of this process and the feedback received.

Above: LED street light, Spearwood.

2. Summary of Process

Information about the trial was communicated via the following channels:

- Letters to 2,236 households within the immediate vicinity of the trial areas.
- Signage affixed to street light poles at the following locations:
  - 5 Gerald Street, Spearwood;
  - 4 Kent Street, Spearwood;
  - 79 Edeline Street, Spearwood;
  - 22 Garden Road, Spearwood;
  - 4 Marvell Avenue, Spearwood;
  - 73 Beenyup Road, Atwell;
  - 10 Molloy Circuit, Atwell;
  - Intersection of Lydon Boulevard and Lipton Mews, Atwell.
- Footpath stickers with QR codes located under LED street lights along streets where the new luminaries were installed.
- A project page located on the City's consultation website, Comment on Cockburn.
- Social media posts.
- Articles in the City's Cockburn Soundings magazine.
- References and web-links in the City's e-newsletters.
- Media releases.
- Information on the City of Cockburn website.

Above: Footpath sticker.

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The purpose of seeking feedback was to understand whether residents in the impacted areas felt the new LED lighting was adequate and whether there were specific design issues that needed to be considered.

Thus the feedback process actively targeted households within close proximity to the trial area. Participants were asked to share their views on the level of luminance, colour and brightness. An open ended section was provided for respondents to go into further detail or to provide any other suggestions.

While input was sought from those most impacted, the feedback form was available online to anyone and therefore a handful of non-local respondents submitted feedback. These responses are considered separately in the key findings.

The feedback period was open between 25 November 2020 and 31 March 2021.

Respondents were encouraged to wait a couple of weeks after the new luminaires were installed to adjust to the new lighting, before providing feedback.

Feedback was invited in the following ways:

- An online form available on the Comment on Cockburn website;
- Email
- Phone

In addition to the advertised feedback channels, a door-knock of a sample of households within the trial area was undertaken. Of the 33 properties door-knocked, 14 opted to provide feedback. City staff completed the feedback form with those interested in sharing their comments.

3. Key Findings

- During the feedback period, the project website on Comment on Cockburn had 221 visitors.
- A total of 28 responses were received:
    - 10 online feedback form responses were received.
        - Four responses were from residents outside of the trial area. These responses were about LEDs in general.
    - 14 online feedback forms were completed during the door-knock.
    - Four submissions were received via email.
- Responses received via the feedback form (from those that live in the trial area) indicated:
    - The majority of respondents are satisfied with the new LED lights in terms of overall lighting level in their street (75% said it was just right) and brightness of individual lights (70% said they were just right).

- Most respondents said the new LED lights made them feel either more safe (45%) or just as safe (25%) as before.
- The colour of the new lights attracted less feedback than brightness levels. 50% said the colour was just right, however 45% had no opinion.
- Of those less satisfied with street lighting (20%), all but one suggested this was a pre-existing concern as opposed to a result of the new lighting (e.g. “lights are blocked by trees”; “it is lighter than before but still not light enough”).
- Overall, respondents were either very positive about the new lighting or had not particularly noticed (e.g. “I think they are great, thank you for changing them”; “Haven’t noticed a difference, but I don’t go out at night”).

- Responses received via the feedback form (from those that do not live in the trial area) were general in nature and not specifically related to the trial lights. As feedback was unrelated to the trial lights, responses to the luminance, brightness and colour tones are omitted from the below points. General comments included:
  - Support for LED use elsewhere in Cockburn.
  - Comments on light colouring and the relationship to melatonin production.
  - How cost savings would flow on to ratepayers.
  - Technical queries regarding light patterns and illuminance distribution.
  - Comments on the intensity of LEDs and the potential for this to distract drivers.
- Responses received via email were mostly general in nature, including:
  - Support for LED use.
  - How cost savings would flow on to ratepayers.
  - The purpose of the trial.
  - Whether the trial includes smart lights (and a preference for smart LED lights not to be used in proximity to the respondent’s home).

Feedback form responses and submissions are provided in full in Section 2.

4. Next Steps

The feedback received will be considered alongside other technical information as part of the trial review.

Depending on the outcomes, the City plans to work with Western Power towards replacing incandescent street lighting throughout Cockburn with more energy efficient LED lighting.

For more information on the City's vision and roadmap towards a more climate resilient and sustainable future, view the City of Cockburn's Climate Change Strategy available at www.cockburn.wa.gov.au.

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5. Results

5.1 Feedback Form Responses

In the interest of transparency, responses are as they appeared in the survey with minimal editing. Therefore some spelling and/or grammatical errors may exist.

Q1. What suburb do you live in?

Response	Count of responses
Spearwood	13
Atwell	7
Jandakot	1
Coogee	1
Success	1
Not specified	1

Q1b. (asked of those living in other suburbs) Do you have any other comments or feedback on the LED street lighting trial?

Comments
I like the idea, please do it in Jandakot.
Please use Warm yellower LED light as it is healthier than blue white lights. Warm light has a lower percentage of blue & green wavelengths. Blue & green wavelengths severely block melatonin production at night, leading to many of the maladies associated with shift work syndrome. Gingin's Observatory Discovery Centre astronomers talked about this on my visit there & advises our street lights should be warm white NOT blue white for this reason. Fauna also are affected by too much bright blue/white lighting.
Sounds like a great proposal for saving energy etc but we need to consider light pollution. Below is from the FAQ page. When compared to existing street lighting, LEDs may appear both brighter and whiter. This is largely due to the colour of the lights. See this article below which highlights some concerns. https://www.thenicee.com/Article/what-is-light-pollution Is it possible to consider utilising less bright or 'warm' coloured rather than white lights. We know that light pollution has a considerable impact on both people and animal populations especially ones who are nocturnal. With less bright, warm coloured light that is shielded and facing downwards rather than upwards into the sky and radiating further.
I have observed that the LED lights appear to be a high intensity type where the light

source causes intense glare and detracts from their lighting function of street furniture and the ground. Conventional lighting tends to use diffuser type covers or the light source itself is shaded from direct view of the observer. The intense LED light source tends to be visible to the observer and therefore causes distraction. How are the proposed energy savings going to be recouped by the rate payer? As I would understand it, street light circuits are not metered. How do LED lights perform in fog conditions? Is there information available on light pattern and illuminance distribution? Will street light distances need to change where existing conventional installations exist? The concept of reduced energy consumption and reduced maintenance costs is great but I remain to be convinced that the glare emitted from most I have seen is a good thing. Is any information available on the reasoning for the light colour selected in relation to observer (motorist) detecting movement such as pedestrians?

Q2. Now that the new LED lights have been installed, is the overall level of lighting in your street…

Response	Count of responses
Just right	15
Not light enough	5
Too light	1
No opinion	3

Q3. Compared to the previous street lights, do the new LED lights make you feel…

Response	Count of responses
More safe	10
Just as safe as before	5
Less safe	2
No opinion	7

Q4. Is the brightness level of the individual LED lights…

Response	Count of responses
Just right	14
Too dim	3
Too bright	1

No opinion	6

Q5. Is the colour of the new LED lights…

Response	Count of responses
Just right	10
Too warm	2
Too cool	1
No opinion	11

Q6. Do you have any other comments or feedback on the LED street lighting trial?

Comments
They are lighter, it's a good thing. The more light the better.
Brighter than the old lights. It's a good light up there.
Better than it was. Way brighter.
Fairly dark near my house, but a little brighter than before. Very sparse across the street – the path is not lit up. More light now, but still dark.
Could do with a few more street lights – it's a bit dark at this end of the street especially near the footpath.
Better lighting, it's brighter and the flood is wider. The colour is just right.
Lighter than before which is a good thing. Reduces crime.
Noticed the new lights were quite bright. No complaints. They are quite good. They are brighter so you can see things clearer when it's dark. I'm happy with them.
Did not notice a difference
Haven't noticed a difference, but I don't go out at night
I hadn't noticed but I have the blinds pulled down at night so I don't see it
No different - I hadn't noticed. I don't go out after dark. It's a good idea, they will be more economical.
The lights are crap. It's completely dark because the trees on the street are too thick and block the lights. My house is very dark at night. The lights do not shine at all to my house. It's pitch black. I haven't noticed any difference since the new lights were installed.
I am not living in the area where the lighting trial is in place. So I cant comment other than what I have been advised by the astronomers at Gingin who are asking for warm lighting not Blue White lighting in our street lighting.
please consult with an expert on light pollution if the project hasnt already been.

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There is one up the corner i like to see another one down the middle of the street that is Daffodil Court
We've had the new LED fitted to a light post outside our house now for about 6 months. It's reduced the glare and although just as bright does not reflect back into the house or in eyes as you drive by. Great to see the rest of the street the same.
I am right outside a light pole and have been since 2001. [address] Fallow Crescent. the new LED light is not as bright, or at least it should much cooler in colour, the current light is too warm in colour, makes the area look definitely not as bright. thank you.
I think they are great, thank you for changing them.
This feedback form is pointless because your information provided does not name the streets in Spearwood that had new LED lights installed. I have checked twice - maybe I am blind. This does not surprise me though. Have you considered actually testing your consultation material to check you have provided enough information to allow the community to respond and make an informed decision or provide informed feedback? Whilst I support the concept of changing lights to LED for their cheaper running costs and less replacement requirements, LED street lights are known to cause undue and unnecessary brightness for some houses which affect peoples circadian rhythm and ability to rest and sleep. Again your consultation material lacks because it implies you are just straight out changing bulbs over. This does not address light direction, glow and spill. AS a result i dont think you're trial will be accurate and does not bode well for future decision making. Can you please confirm that the following national guidelines have been taken into account in this trial, given that we apparently have " world class wetlands" in Cockburn, but we also have protected marine species along the coast which is really the jewel in Cockburn's crown. There are roads and footpaths within proximity to the coast and the lightspill needs considering. ttps://www.environment.gov.au/biodiversity/publications/national-light-pollution-guidelines-wildlife
I live in Mac Morris Way Spearwood We have ongoing anti social behaviour drug houses nearby PowerWatch security light shining into Bavich Park and up the public access way.Improving the street lighting all the way along MacMorris Way would only improve the safety of residents and allow us to indentify the individuals who are creating problems for us and people who use the Park and Access Way to get to the Phoenix Shopping Centre

5.2 Email Submissions

Note: In the interest of transparency, responses are as they appeared in the survey with minimal editing. Therefore some spelling and/or grammatical errors may exist.

Comments

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I have viewed the LED lights trialled in Kent Street and Sussex Street in Spearwood and have found them to be brighter than the original lighting, to look at as you drive down the street but seem to light the area directly below a little less, in my opinion. However, it's modern times and we must go with the times. LED lighting is the way to go and I'm all for it. One small detail in the letter sent, the wattage consumption of the existing lighting was mentioned but not of the new lighting. My understanding is the new lighting uses considerably less power, not just 50% as presented. Anyhow, I'm all for the new lights and it will be a saving in energy bills and maintenance for Cockburn in the future.
I have received the council letter with regards to the above subject. It's a great work, and I hope it all goes well. If the trial is deemed successful and the new LED lights are installed across the Atwell suburb, would it reduce our annual council rate? I presume that a portion of the council rate goes towards the street lighting. I look forward to hearing from you.
My house is on the corner of [street] in Atwell. I note that there will be a LED street lighting trial. I have a street light right outside the main bedroom and do not wish to have a smart LED street light right outside my bedroom. How can I opt out of having this installed on this particular corner? Is this street light going to be a 'smart' LED streetlight? Why I ask is because on Western Power`s website they talk of smart enabled LED streetlight technology. If it is a 'smart' LED streetlight, could you please tell me the radiofrequency electromagnetic energy associated with this infrastructure.
I don’t understand why you have to waste ratepayers money with a trial before retrofitting all lights poles to LED, if you already know, it will save costs and CO2 emissions? Why not just go straight to the retrofitting to a cold LED lighting (the brighter of the two). No question they reduce cost and are more reliable than incandescent lighting. You could have saved money by just rolling them out. Jobs could have been created for a faster roll out, people may feel safer on the streets, with brighter lighting. Sometimes I don’t understand local government, you spend a lot of money beautifying the streetscapes, median strip, not thinking how will this look in ten years? Ok when it is done but as trees grow can create blinds spots for traffic . One example is along Rockingham Rd, out front of KFC, the verge is tall with weed creating a not only danger to see cars coming if you come out of KFC or the bottle shop but unsightly, the verge is high than the road so it needs to be either concreted or some

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Appendix A - List of Streets in Trial

Atwell trial streets (parts of the following roads):

Beenyup Road, Pindan Elbow, Avon Crescent, Lakehurst Way, Molloy Circuit, Jenniphur Court, Chivalry Way, Lyon Road, Congenial Loop, Balance Lane, Flourish Loop, Woodhead Way, Folland Parade, Nancarrow Way, Turnbull Close, St Claire Gardens, Freshwater Drive, Brenchley Drive, Mayhew Cross, Connolly Mews, Daley Court, Hedges Retreat, Haring Green, Dunnage Court, Kinship Way, Bartram Road & Bendee Drive.

Spearwood trial streets (parts of the following roads):

Gerald Street, Macmorris Way, Glendower Way, Gurney Road, Blunt Place, Bushy Road, Bolingbroke Street, Sussex Street, Hotspur Road, Edeline Street, Zlinya Circle, Mell Road, Bosnich Way, Newton Street, Ionesco Street, Fallow Crescent, Garden Road, Trellis Place, Daffodil Road, Marvell Avenue, Skeahan Street, Poins Place, Vernon Place, Kent Street, Leaside Way, Gerovich Way, Chesterton Street and Malcolm Street.

Appendix B – Frequently Asked Questions

What is the trial?
Western Power and the City of Cockburn have come together to trial new LED streetlights on existing street light poles in selected Cockburn suburbs.

What is the aim of the trial?
During the trial, existing street lights, which consist of old technology, will be replaced with modern LED lights in selected streets in Atwell and Spearwood. The LED lights will be retrofitted onto existing street light poles.

The trial will provide Western Power and the City of Cockburn with insight for the potential replacement of Western Power street lights in Cockburn.

Where is the trial happening?
This trial is occurring in two City of Cockburn suburbs, Atwell and Spearwood. The two suburbs were selected as they reflect both types of power infrastructure (underground and overhead).

A selection of streets in Atwell and Spearwood have been identified for the trial so that a range of new LED types can be tested.

Atwell trial streets (parts of the following roads):
Beenyup Road, Pindan Elbow, Avon Crescent, Lakehurst Way, Molloy Circuit, Jenniphur Court, Chivalry Way, Lyon Road, Congenial Loop, Balance Lane, Flourish Loop, Woodhead Way, Folland Parade, Nancarrow Way, Turnbull Close, St Claire Gardens, Freshwater Drive, Brenchley Drive, Mayhew Cross, Connolly Mews, Daley Court, Hedges Retreat, Haring Green, Dunnage Court, Kinship Way, Bartram Road & Bendee Drive.

Spearwood trial streets (parts of the following roads):
Gerald Street, Macmorris Way, Glendower Way, Gurney Road, Blunt Place, Bushy Road, Bolingbroke Street, Sussex Street, Hotspur Road, Edeline Street, Zlinya Circle, Mell Road, Bosnich Way, Newton Street, Ionesco Street, Fallow Crescent, Garden Road, Trellis Place, Daffodil Road, Marvell Avenue, Skeahan Street, Poins Place, Vernon Place, Kent Street, Leaside Way, Gerovich Way, Chesterton Street and Malcolm Street.

When is the trial happening?
The trial is expected to begin in December 2020 and be completed by March 2021. Feedback is invited until 31 March 2021.

Why do the street lights need upgrading?

Street light upgrades are being undertaken for a number of reasons:

- A number of current light types are no longer available, especially the 80w and 125w mercury vapour lights. Manufacturing here and overseas is moving to LED lights only.
- A coordinated move by both Western Power and the City of Cockburn to be more sustainable by reducing electricity consumption and the generation of carbon dioxide. This changeover will see a 50% reduction in CO2 production.
- LED lights are longer lasting and retain the quality of the light for a longer period, reducing ongoing maintenance expenditure.
- *"Smartlights"* – one of the trial's aims is to introduce smart-enabled lighting. These lights can alert Western Power when they fail, speeding up the replacement time.
- Improved lighting enhances safety on our roads and in our neighbourhoods. Consultation with the Western Australia Police favours the introduction on the new LED street lighting.
- LED street lighting is now being installed in Melbourne, Sydney, Adelaide and Brisbane.
- Western Power are currently installing LED lights on an ad-hoc basis and the proposed trial and replacement program will be the first retrofit program undertaken by Western Power and a council in WA.

What is the difference between LED lights and existing street lights?

Compared to existing street lights, LED street lights:

- Are more focussed, ensuring more of the light shines onto the street and sidewalks, with less light spill into adjacent areas.
- Provide a more uniform illumination of the area.
- Are brighter.
- Require less maintenance and last a lot longer than standard lighting.
- Use about 30% less energy than current street lighting technology.
- Reach full brightness instantly.
- Contain no mercury or lead which is better for our environment.
- Emit no UV rays or infrared radiation.
- Operate at a much cooler temperature, making them a safer option.
- Cut greenhouse gas emissions and reduce landfill.

Source: westernpower.com.au

Are LEDs brighter than previous street lights?

When compared to existing street lighting, LEDs may appear both brighter and whiter. This is largely due to the colour of the lights.
Fortunately, the direct light from LEDs will minimise glare which also reduces light into and onto properties in most situations.

Source: westernpower.com.au

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