A Case Study on

Lighting for Museums and Galleries











Australian Government

Department of Industry and Science









international conservation services

STEENSEN VARMING

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Project Team

Museums & Galleries Queensland: Rebekah Butler

Museums & Galleries of New South Wales: Michael Rolfe

Regional Calleries Association of Queensland: John Walsh

Regional and Public Galleries Association of New South Wales: Debbie Abraham

Steensen Varming: Chris Arkins Emrah Baki Ulas Ashleigh Bretherton

International Conservation Services: Julian Bickersteth Fiona Tennant

With special thanks to:

Simm Steel (Art Gallery of New South Wales), Debbie Abraham (Lake Macquarie City Art Gallery), Tania Creighton (UTS Gallery), Jane Cush (Goulburn Regional Art Gallery), Belinda Hanharan (Hazelhurst Regional Gallery and Arts Centre)

Authors

Emrah Baki Ulas Ashleigh Bretherton

Typeface

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Cover Image

Brett Whiteley Studio (Copyright © 2015, Steensen Varming)

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Whilst this document aims to provide information that is as accurate as possible for each case study, there may be a tolerance to the data provided. The energy saving figures act as an indication of the potential contribution that lighting upgrades can make to the overall gallery/museum building.

The views expressed herein are not necessarily the views of the Commonwealth of Australia and the Commonwealth does not accept responsibility for any information or advice contained herein.

This publication is primarily intended to provide guidance for facilities staff at museums, galleries, cultural and archival facilities. It is not intended to be exhaustive or definitive as the issues addressed continue to be a major topic of discussion and debate. It is recommended for users of this guide to exercise their own professional judgement and consult suitably qualified professionals when deciding whether to abide by or depart from it.

Foreword

When considering the different operating systems of a museum or gallery, lighting has perhaps undergone the greatest changes in recent times. Most notably these include the phasing out of inefficient incandescent lighting and the rapid development of new technologies and associated operating systems.

We have developed this resource, in the form of case studies, to assist museum and gallery staff to identify the best long-term lighting upgrade or replacement solution for their institution. The case studies presented draw on the direct experience of five Australian public galleries. They document their existing systems, lighting solution adopted, project costs and assessment of improved energy efficiencies following implementation.

This resource is intended to be used when working with stakeholders, consultants or suppliers to better understand the range of options, potential costs, benefits and practical feasibility of different lighting design solutions. It is also recommended that it be used in conjunction with A Practical Guide for Sustainable Climate Control and Lighting in Museums and Galleries¹ and that users seek appropriate professional advice.

Museums & Galleries Queensland could not provide such informative resources without the generous input and cooperation of:

- our project partners Museums & Galleries of New South Wales, Regional and Public Galleries Association of New South Wales and Regional Galleries Association of Queensland;
- our funding partners the Australian Government through the Department of Industry and Science; and the Visual Arts and Craft Strategy, an initiative of the Australian, state and territory governments;
- our respected project consultants, Steensen Varming and International Conservation Services; and
- the galleries/art museums featured in the case studies.

We acknowledge the support of each of these entities and their contribution to the publication of this resource.

Rebekah Butler Executive Director

Museums & Galleries Queensland

¹ Available from <u>www.magsq.com.au</u>

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1.0 Introduction

The aim of these case studies, is to canvass a range of different lighting solutions available today to museums and galleries. It is also hoped that they will inform the relevant decision makers on the various aspects of these solutions and assist in making sustainable decisions for future lighting upgrades for their institutions.

The document demonstrates, how today's museums and galleries can achieve extensive energy savings utilising energy efficient technologies that also provide suitable exhibition display conditions for collections, visual comfort, performance and enjoyment for visitors. The document studies a range of options and strategies for museums and galleries. It is not intended to preclude professional advice, rather it is developed to aid in identifying options suitable for a particular situation and in so doing, to act as a companion to, professional lighting design input.

This study received funding from the Australian Government as a part of the Energy Efficiency Information Grants Program and is designed to be most relevant to museums and galleries in Australia. It is worth noting, however, that it is developed with many years collective experience in the museum and gallery sector covering locations all over the world. The technical issues discussed are of regular debate and should always be considered with specific regards to the ongoing research and development in the related fields. This document provides principles that are largely applicable to, or at least informative for most facilities globally.

This document utilises a series of case studies as industry benchmarks to present how these technical issues have been addressed by like-minded galleries of varying scales and budgets. They offer ideas on a range of solutions that contribute towards energy savings, and provide feedback to other galleries looking to upgrade their facilities in the future.

A number of Institutions have been studied in this document based on:

- Their potential to demonstrate sustainable approaches;
- Their relevance to Australian museums and galleries;
- The variety of solutions they have adopted in their lighting systems;
- Ease of access to their information and communication;
- Their recent lighting upgrade projects which can become a benchmark for other institutions.

The selected Institutions are:

- Brett Whiteley Studio (Managed by the Art Gallery of New South Wales (AGNSW)): Complete lighting and lighting control refurbishment, including new LED luminaires, new lighting track infrastructure and new Digitally Addressable Lighting Interface (DALI) lighting control system
- 2. **Lake Macquarie City Art Gallery:** Upgrade to LED luminaires and DALI control system, whilst keeping existing track infrastructure in place
- University of Technology Sydney (UTS) Gallery: Keeping the existing lighting control infrastructure and upgrading the lighting tracks and the luminaires
- 4. **Goulbourn Regional Art Gallery:** Minor upgrade on a small budget through relamping of existing luminaires with LED retrofit lamps
- 5. **Hazelhurst Regional Gallery and Arts Centre:** Upgrade keeping existing lighting track infrastructure, replacing existing luminaires and upgrading lighting control system (project not yet undertaken)

2.0 Objectives

Through in-depth analysis of the five different lighting upgrades, this document aims to address the following objectives.

2.1 Demonstrate energy saving initiatives

This document aims to demonstrate how to achieve extensive energy savings utilising energy efficient technologies that also provide suitable exhibition display and address conservation requirements.

In evaluating the success of an installation, it is important to address the public user experience alongside the facility management experience. Any energy saving initiatives should also offer an improved visual experience through quality of light, as well as improved long-term maintenance and efficiency of the system.

2.2 Be relevant for different project scales

Through inclusion of varying lighting upgrades this document aims to provide useful information for the benefit of museums and galleries in Australia, to suit varying budgets, sizes and to provide an understanding of real benefits that are achievable for different circumstances.

3.0 Case Study

3.1 Institution #1: Art Gallery of New South Wales Brett Whiteley Studio

3.1.1 Context

Size of Refurbishment: Approximately 360m²

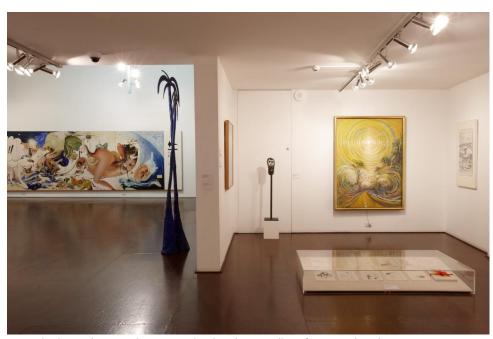
Project Price Bracket: Over \$200,000

Project Description: The Brett Whiteley Studio is a local gallery operating under the Art Callery of New South Wales (AGNSW). The LED lighting upgrade completed in 2014 acted as a pilot project for future lighting upgrades for the larger galleries within the AGNSW. A complete LED lighting refurbishment was undertaken, including new LED luminaires, new track infrastructure, and a new DALI lighting control system.

All outdated lighting tracks, track mounted luminaires, security lighting, emergency and exit lighting were replaced with an integrated system.

Previous Installation:

- Track layout and offset from the wall was not ideal for artwork lighting.
- Original tracks with incandescent fittings had high energy consumption and were utilising phased-out technology.
- Original lighting fixtures had limited optical control.
- Lighting control was via traditional rotary dimmers from 1996 offering limited flexibility.
- Exit and emergency luminaires consisted of a single point non addressable system with individual batteries. Fittings were obtrusive, large and less efficient than newer technology.
- Security lighting was through separate fluorescent battens with no optical control.
- Surface mounted conduits to other services such as smoke detectors were exposed and obtrusive.



Brett Whiteley Studio Pre-Lighting Upgrade. Photo by Art Gallery of New South Wales.



Brett Whiteley Studio Pre-Lighting Upgrade. Photo by Art Gallery of New South Wales.



Brett Whiteley Studio Pre-Lighting Upgrade. Photo by Art Gallery of New South Wales.

The main objectives of the refurbishment:

- Improve the gallery's performance in terms of sustainability, maintainability and safety;
- Provide lighting to optimise art viewing conditions with consideration to conservation and photo-degradation requirements;
- Minimise glare and discomfort;
- Provide a lighting solution that features intelligence and adaptability that is also in line with the original architectural fabric;
- Provide a lighting system that achieves energy savings through efficient luminaires and intelligent control;
- Minimise maintenance costs.

3.1.2 Lighting Solution

Gallery Lighting

All lighting track was replaced with new DALI lighting track. In the traditional gallery spaces, the track was recessed in the plasterboard for a more seamless aesthetic. Track locations were revised to provide optimal offset from the gallery walls. Although this resulted in greater lengths of track than the previous installation, the luminaires can be located where they are needed to provide a seamless lighting scheme. This offset also reduces glare from the light source on the artwork glass, providing a more optimal location, enhancing the viewer experience.

All existing surface mounted conduits were re-located within walls for a cleaner visual environment.

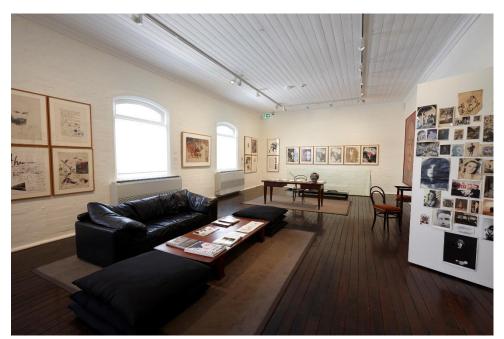
The original vertical tracks were also upgraded, however the visual intent remained in line with the original design. New LED fittings replaced previous incandescent fittings for general circulation and artwork lighting, and were programmed accordingly. Glare shields were added to fittings where required for visual comfort.



Brett Whiteley Studio Post-Lighting Upgrade. Photo by Art Gallery of New South Wales.



Brett Whiteley Studio Post-Lighting Upgrade. Photo by Art Gallery of New South Wales.



Brett Whiteley Studio Post-Lighting Upgrade. Photo by Art Gallery of New South Wales.

Emergency and Exit Lighting

New LED emergency and exit luminaires were provided, resulting in not only an energy benefit, but also a more integrated visual aesthetic. Where possible, the emergency luminaires were integrated into the base of the vertical tracks to reduce the visual lighting infrastructure and create a streamlined aesthetic. The new fittings were also provided with long-life lithium batteries for increased longevity of the installation, and reduced maintenance requirements.

Lighting Control

An intelligent DALI lighting control system was installed in the gallery to provide flexibility and adaptability of the lighting control system.

The gallery has been zoned to three DALI universes with specific gallery spaces assigned to each universe for ease of programming. A control universe refers to a network of fittings that can be controlled by one DALI controller. Each universe, or network, can control a maximum of 64 addresses, though it is recommended not to load the network to 100%. Within these universes all luminaires are separately programmable. These levels can be set by the gallery staff through a mobile device/

tablet application. Scenes can be selected through either the mobile device/tablet application or the dynalite switchpanel.

The general modes that have been considered include:

- 1. Open for Visitors: Artwork lighting luminaires are individually programmable and are set to levels to suit artwork requirements. A selection of fittings that face downwards, rather than at the artworks are set to a level to provide general circulation lighting. Each time an installation is changed the luminaire settings need to be reviewed and adjusted as required through individually addressing the lights from the mobile device/tablet application. The luminaires that are used for circulation lighting are also used in the following two settings.
- After Hours Security: Selected luminaires identified for circulation lighting are dimmed to 20% for this mode.
- 3. **Working/Cleaning:** Selected luminaires identified for circulation lighting are dimmed up to 100% for this mode.

The DALI control system provides adaptability and flexibility for the changing nature of a gallery space.

Spare capacity has been in-built into the system as a contingency for future additional luminaires.

3.1.3 Discussion

The Brett Whiteley Studio LED lighting upgrade achieves energy initiatives through implementation of the following:

1. Replacement of incandescent luminaires with LED

The original 60W R80 and 100W incandescent track luminaires were replaced with the following new LED luminaires:

43 x New Erco Lightboard 12W LED (Various lenses)

25 x New Erco Optec 12W LED (Various lenses)

58 x New Erco Optec 24W LED (Oval Flood)

The quantity of luminaires was replaced 'like for like', with the 60W incandescent fittings being replaced with 12W LED fittings and the 100W incandescent fittings being replaced with 24W LED fittings.

As a comparison of the energy reduction, the total wattage of the previous fittings resulted in a load of 9,880W which was reduced to 2,264W in the lighting upgrade. This produced an energy reduction of 77%.

Another benefit of moving to LED is the reduced maintenance costs that are anticipated, due to the longer life of the LED light source versus a traditional incandescent bulb. This is of particular importance for this installation due to the high mounting location of central vertical track fittings.

2. Improved Light Quality

Extensive testing of a range of LED suppliers was undertaken to provide the best solution for the gallery space to ensure that the use of LED would improve the user experience. The quality of light, fitting aesthetic, power consumption, fitting size, fitting flexibility and cost were all evaluated. The selected fitting offers a range of lenses and wattages within the same family, which was a benefit for this gallery space. Circular fittings were utilised with elliptical beams for general wall lighting with a range of spot and flood lenses used where required. As the lenses are interchangeable, this improves the flexibility and adaptability of the gallery lighting scheme. The LED colour rendering was found acceptable when compared to the older incandescent fitting with good differentiation between the whites in the paintings.

3. Upgrade of Emergency and Exit Luminaires

New LED Emergency and Exit luminaires with long-life lithium batteries reduce maintenance requirements and also reduce energy consumption. This is a low-cost option to achieve an energy saving.

4. Intelligent Programmable Lighting Control and Lighting Optimisation

The lighting control in the Brett Whiteley Studio plays an important role in operational savings for electrical consumption, in extending the lifetime of the luminaires and in reducing system maintenance.

Programming of the intelligent lighting control system allows the setting of lighting control scenes to reduce illuminance levels where possible and conserve energy. Efficient aiming of light at dimmed levels is also beneficial from a conservational point of view, reducing the lux hours on the artwork.

This is supported by the after hours lighting strategy which utilises a select group of fittings dimmed to a low level, and aimed at the floor to provide safe movement. This is an improvement on the previous design that utilised fluorescent battens for security lighting with little optical control. The same luminaires are also programmed to different dimmed levels to carry out the functions of circulation and working/cleaning. The multi-functional use of these luminaires assists in reducing capital costs.

Whilst the initial programming of luminaire dimming levels requires greater time, skilled labour and cost than a traditional lighting control system, the long-term maintenance is anticipated to be reduced. Re-programming fittings or programming new fittings requires staff training, however the flexibility and adaptability offered by the system is a big benefit for changing gallery installations and offers a high level of control.

3.1.4 Lessons Learnt

The gallery has noted some technical issues with the operation of the system with a lag when connecting from the tablet to the AGNSW server when re-setting the dimmed levels. Due to the specific control set-up requirements of this gallery, the local lighting control system communicates with the main gallery. Options need to be further investigated to increase the speed with the server communication, to improve response time.

3.2 Institution #2: Lake Macquarie City Art Gallery

3.2.1 Context

Size of Refurbishment: Approximately 435m²

Project Price Bracket: \$100,000 - \$200,000

Project Description: The Lake Macquarie City Art Gallery is a renowned regional gallery. The proposed lighting upgrade forms part of the gallery's sustainability and environmental strategy to minimise the building's carbon footprint. The lighting upgrade proposes retaining the existing track infrastructure, and providing new LED track fittings and a new lighting control system. It should be noted that this project is in progress and was not completed at the time of producing this resource, however the information endeavours to be as factual as possible.

Previous Installation:

- Traditional, mostly incandescent lamp track fittings that had a considerable footprint on the building performance, both in terms of direct lighting load as well as air conditioning cooling load.
- Lighting infrastructure had become obsolete due to the phasing out incandescent light sources and the difficulty of finding replacement lamps.
- Existing leading edge dimming system was not compatible with dimming new LEDs to low levels. This is a common issue with existing controls and new LED systems as the new LED luminaires may not fully dim, often dimming from 10% to 0% rather than smoothly dimming down.

The main objectives of the refurbishment:

- Reduce the lighting consumption load to reduce the building's carbon footprint;
- Provide a new lighting scheme that addresses quality of light and sustainability of the lighting systems;
- Retain functional track element.

3.2.2 Lighting Solution

General Gallery Lighting

As the existing track infrastructure is in good working condition, and already located in suitable locations and offset from the walls, it is proposed to be retained in the upgrade. The existing Erco track is to be re-configured to take the DALI dimming protocol of the new LED luminaires.

The existing Clipsal leading edge dimming system operating luminaires in the gallery's exhibition space is to be replaced with a Tridonic DALI lighting control system to allow a more flexible lighting solution that is more compatible with LED sources. The DALI system allows greater control over the lighting pre-sets and individual addressing of artwork lighting luminaires to specific levels. The existing Clipsal dimming system will be retained for the lighting control of areas outside of the upgrade.

The existing incandescent fittings of the exhibition space are proposed to be replaced with new LED track luminaires for greater energy efficiency, reducing energy consumption of the lighting load and a reduction in the heat load.

Lighting Control

A new DALI lighting control system is proposed to provide complete flexibility of the lighting control system. Programming and other functions, such as addressing and commissioning new luminaires, is to be carried out through a tablet application.

The gallery's exhibition space will be divided into three DALI universes. Spare capacity has been built into this assessment for future additions. Within these universes, luminaires are proposed to be individually addressable as well as controllable in groups. It is anticipated that the lighting design, layout and programming will be undertaken for each new exhibition every six weeks. Each new lighting design is to be saved, becoming part of the Open/Close pre-set function for the gallery's entire lighting control system. This system encompasses both the DALI and Clipsal c-bus systems for the operation of all internal and external gallery building lights.

The system is to have a number of pre-set functions which are to be operated from two small lighting control panels, one to be situated in the gallery foyer, and the other at the back exit to the gallery. The system will also be controlled through the tablet application. Pre-set functions are anticipated to include the following scenarios:

- 1. **Open/Closed**: The exhibition space, and all other building lights, are to be switched on or off, most commonly at the start and close of business.
- 2. **Installation**: All exhibition luminaires dimmed up to 100% to maximise visibility during exhibition installation.
- 3. **Pre-design**: All exhibition luminaires are to be dimmed to 80% as a baseline for preparing a new exhibition lighting design.
- 4. **Wall washes 1-8**: Wall washes are to be grouped into 8 pre-sets, enabling scenarios where entire gallery walls require uniform levels
- 5. **Universe 1-3**: All luminaires (excluding wall washes) are to be grouped into 3 pre-sets, enabling the three most common exhibition floor-layouts to be lit at uniform levels.
- 6. **Cleaning**: For occasions when staff or cleaners are moving through the exhibition space outside of public opening hours, a small number of selected luminaires throughout the entire exhibition space are to be dimmed up to 100% to provide safe visibility levels.

3.2.3 Discussion

The Lake Macquarie City Art Gallery LED lighting upgrade proposes energy initiatives through implementation of the following:

1. Replacement of incandescent with LED

A study was undertaken prior to the lighting upgrade to assess the project energy savings and maintenance savings that could be achieved.

Based on an operation of approximately 2,340 hours a year, the analysis indicated an energy saving of 37,674 kWh annually. Considering the impact on the mechanical cooling and heating systems the total expenditure savings, on energy consumption alone, is predicted at \$7,997.65 per annum.

The projected expenditure savings for lamp replacement moving from incandescent to LED is predicted at \$4,922.06 per annum.

The total predicted expenditure savings for energy, operational and maintenance is \$12,919.71 per annum.

This analysis was based on the replacement of the following existing fittings:

88 x Erco Wallwashers (150W) 62 x Erco Spot (Unipar Par 30) (100W) 6 x Erco Pollux (50W)

The upgrade will replace these with the following DALI LED luminaires:

150 x 24W Erco Light Board Wallwasher 10 x 6W Erco Pollux contour framing spotlight To provide future flexibility, the track mounted wallwasher luminaires are to be supplied with 170 interchangeable lenses of varying distributions including wallwash, flood and spot to suit the changing needs to the gallery space.

As a comparison of the energy reduction, the total wattage of the previous fittings results in a load of 19,700W which will be reduced to 3,660W in the lighting upgrade. This will result in an energy saving of 82%, plus additional savings for the reduced heat load of the luminaires and the implication of this on the mechanical cooling systems.

2. Improved Light Quality

The new LED track fittings had to offer a solution that was acceptable in terms of the presentation of the cultural material on display and also in consideration of the preventative conservation requirements of the gallery. The new LED fittings:

- have a high colour rendering index;
- are dimmable to suit the specific display requirements;
- have controlled optics; and
- have interchangeable lenses to place light where needed.

3. Intelligent Programmable Lighting Control and Lighting Optimisation

The new lighting control system will allow individual and grouped luminaires to be programmed to the required dimming levels, thus optimising the lighting scheme.

The system will utilise internet (Cloud) monitoring to track and record all lighting activity, including energy use, DALI line features, failed ballast, lamp failures, emergency function and duration test results, thereby streamlining maintenance procedures. This information will be accessible remotely and at any time by gallery staff for reporting and analysis. The use of this monitoring function offers the potential for savings in maintenance and the potential to increase longevity of luminaires through analysis of use. It will also assist the gallery in planning for future expenses and its maintenance regime.

The use of three DALI universes maximises the efficiency and ease of programming. The use of defined pre-set scenes will assist in maximising the life of the luminaires and in providing the required illuminance where needed.

The new lighting control system will be programmed to align with the open/close function of the entire building, streamlining the control between the new and existing systems.

4. Retaining working/functional existing equipment

The re-use of working/functional existing track infrastructure equipment not only reduced the capital costs of the new installation but also offered an environmentally considerate approach.

3.3 Institution #3: University of Technology Sydney (UTS) Gallery

3.3.1 Context

Size of Refurbishment: Approximately 180m²

Project Price Bracket: \$25,000 - \$100,000

Project Description: The UTS Gallery is a small, privately-run flexible gallery space within the UTS campus. The gallery showcases a wide range of interdisciplinary works requiring a flexible lighting solution. The lighting upgrade involved replacement of lighting track and upgrade to new LED luminaires. The lighting control system was left in place, rather than removed, and is used as a time clock to turn the fittings on and off to suit the gallery occupancy requirements. The new LED luminaires are dimmed on-board.

Previous Installation:

- Luminaires breaking due to location and mounting of track.
- Leading edge dimming 15-20 years old (spare parts and replacement parts no longer stocked and are difficult to source).
- Existing luminaires were a combination of tungsten halogen, incandescent and dichroic, contributing to a significant lighting load.

The main objectives of the refurbishment:

- Provide a lighting upgrade within budget with a simple user interface;
- Provide a cohesive lighting solution to the gallery space;
- Reduce the incidence of luminaire and track adapter breakages by addressing the track luminaire mounting issues;
- Consider future proofing of the lighting scheme.

3.3.2 Lighting Solution

Gallery Lighting

Although the existing track was still in good working condition, the mounting arrangement and type of track limited the options of compatible new fittings. All existing track and track luminaires were therefore replaced with new Erco lighting track and new Erco LED luminaires. The new track was mounted flush within the existing track support channel to ensure new fittings could be easily inserted and removed, which was a significant improvement on the previous arrangement.

Whilst the existing leading edge dimming system was not compatible with the new LED luminaires, it was retained to act as a time clock to turn the lighting on and off as per the existing settings for the gallery occupancy requirements.

Due to the size and nature of the gallery, as well as budget constraints, it was decided that the new LED luminaires were to be individually dimmed on-board at each fitting. Whilst this is a labour intensive exercise for each exhibition, and does not provide the same level of accuracy that is offered by an intelligent programmable dimming system, it is a simple and cost effective solution suitable for this gallery space. In addition, as the fittings do not need to be programmed or individually addressed on the lighting control system, no user training is required, thus eliminating this cost.



UTS Gallery Post-Lighting Upgrade. Photo by Emrah Baki Ulas

3.3.3 Discussion

The UTS Gallery LED lighting upgrade achieves energy initiatives through implementation of the following:

Replacement of Halogen, Incandescent and Dichroic luminaires with new LED luminaires

Though a small lighting upgrade, the change to LED has improved the efficiency of the gallery.

The original installation was comprised of the following track luminaires (approximate):

20 x 100W Bi-Pin Incandescent Spotlights 12 x 300W Tungsten Halogen Wallwashers 10 x 35W Dichroic Luminaires

These were replaced with:

24 x 24W Erco Optec 9 x 24W Erco Lightboard

Due to a consistent lighting typology and optic that was more suitable for the gallery design, the quantity of fittings was reduced. As a comparison of the energy reduction, the total wattage of the previous fittings results in a load of 5,950W which was reduced to 792W in the lighting upgrade. This resulted in an energy reduction of approximately 87%.

Another cost benefit of the new installation is the revised mounting location of the track, which allows luminaires to be easily fitted in the track, significantly reducing the potential for breakages that was prevalent in the previous installation. This significantly reduces maintenance costs of the luminaires.

2. Re-use of existing functional equipment

Retaining the existing leading edge lighting control system not only minimised the associated labour costs of the removal of the system, but also eliminated the need to install a new time clock. Whilst the functionality as a dimming system was obsolete, the infrastructure still functioned successfully for the new required purpose.

3.3.4 Lessons Learnt

Whilst the on-board dimming function was selected for simplicity and cost implications, recent short-term exhibitions/events within the space have highlighted the limitations of this type of control. As fittings are individually set and not able to be dimmed in a group, setting the levels is a time consuming process and cannot be carried out at short notice if requested. It has also been noted by the gallery that the on-board dimmer knob is stiff and can be difficult to move to the right dimming level.

3.4 Institution #4: Goulbourn Regional Art Gallery

3.4.1 Context

Size of Refurbishment: Approximately 400m²

Project Price Bracket: Under \$25,000

Project Description: Goulburn Regional Art Gallery is administered by Goulburn Mulwaree Council, NSW. It showcases regional and national exhibitions, and presents a range of education and public program activities. A minor lighting upgrade was undertaken, retaining existing track, track fittings and control system, and upgrading the existing luminaire with LED replacement bulbs.

Previous Installation:

- Traditional, mostly 120W PAR38 incandescent lamp track fittings and 50W MR16 wall mounted spotlights with large energy consumption
- Traditional on/off lighting control with no dimming function

The main objectives of the refurbishment:

- Provide a more energy efficient solution through LED sources on a limited budget.
- Provide a lighting scheme that enhanced the appearance of the artworks showcased in the space and responded to conservation requirements.

3.4.2 Lighting Solution

Gallery Lighting

Due to a limited budget, the scope of work for the lighting upgrade was minimal. All existing track infrastructure, track luminaires and traditional lighting control were retained. The existing luminaires were upgraded with 18W LED Par38 replacement bulbs and the existing wall luminaires were replaced with 10W LED MR16 fittings. These were controlled through the existing on/off lighting control system.

The new LED bulbs and LED luminaires offer good colour rendering and spectral distribution to enhance the user experience, and provide suitable lighting to address conservation requirements.



Goulburn Regional Art Gallery Post-Lighting Upgrade. Photo by Mim Stirling.

3.4.3 Discussion

The Goulburn Regional Art Gallery LED lighting upgrade achieves energy initiatives through implementation of the following:

Replacement of existing traditional light sources with new LED replacement bulbs

The lighting upgrade offers the gallery a more energy efficient lighting solution, with the replacement bulbs having a lower power consumption with a greater lighting output. The main energy savings are seen through this reduced power consumption.

The original installation was comprised of the following luminaires:

55 x 120W Par38 Incandescent Track fittings 12 x 50W MR16 Wall mounted spotlights

These were replaced with:

 $55 \times 18W$ Par 38 LED Philips replacement bulbs to existing spotlights $12 \times 10W$ LED MR16 Gamma Illumination Fex wall mounted spotlights

As a comparison of the energy reduction, the total wattage of the previous lighting scheme results in a load of 7,200W which was reduced to 1,110W in the lighting upgrade. This resulted in an energy reduction of 84%.

2. Reduced maintenance costs

Due to the longer life expectancy of LED bulbs versus traditional light sources, the gallery can expect to see savings in maintenance and replacement of lamps.

3.4.4 Lessons Learnt

The project demonstrates how extensive energy savings can be achieved and maintenance requirements can be drastically improved even on limited budget, while also improving the lighting conditions for the display of the artworks.

3.5 Institution #5: Hazelhurst Regional Gallery and Arts Centre

3.5.1 Context

Size of Refurbishment: Approximately 180m²

Project Price Bracket: N/A (Proposed Upgrade Only)

Project Description: Hazelhurst Regional Gallery and Arts Centre is a regional gallery, community gallery, arts centre and café. A lighting upgrade has been proposed for the main community gallery area. The proposed lighting upgrade is yet to be implemented, however the design offers examples of lighting upgrade initiatives, including upgrade of existing track to suit DALI protocol, upgrade of existing track luminaires to LED luminaires, and upgrade of existing fluorescent cove lighting to LED strip lighting.

Previous Installation:

- Existing luminaires for general gallery lighting were a combination of 150W
 Erco wallwashers and mono-points.
- 3-Circuit Erco track in good working condition.
- Architectural lighting through fluorescent batten uplighting of cove and wall mounted 150W metal halide uplighters.

The main objectives of the refurbishment:

- Provide a more coherent visual aesthetic that provides energy savings and is suitable for a gallery space;
- Increase flexibility of lighting control and operation from wireless device;
- Reduce gallery energy consumption.

3.5.2 Lighting Solution

Gallery Lighting

New Erco LED, DALI dimmable track luminaires are proposed to replace the older Erco track luminaire technology, aiding in reducing the energy footprint of the lighting scheme and assisting in providing greater flexibility in the lighting control approach. Additional spotlight LED track luminaires are proposed to be introduced into the lighting system for further control and flexibility of the lighting solution.

As the existing Erco 3-circuit track is in good working condition, it is proposed that this is retained in the upgrade and electrically re-configured to accept the new DALI dimming protocol.

As the existing mono-point luminaires are in good working condition, but are redundant in the space, it is proposed that these are removed and returned to the gallery for future use elsewhere.

Architectural Lighting

Though not directly lighting artworks within the space, the architectural lighting significantly contributes to the sense of brightness and openness of the space and enhances the viewing experience.

It is proposed that the existing fluorescent lamps in the architectural cove are replaced with a simple, energy efficient linear LED strip light with diffuser to uplight the ceiling. Consideration may be given to re-painting the ceiling in a matt white to increase the diffusion of light across the surface.

It is proposed that the existing metal halide wall uplights are retained but re-lamped to reduce the energy consumption.

Lighting Control

It is proposed to install an intelligent DALI lighting control system for this area of the gallery to provide greater flexibility and allow individual luminaires to be programmed and set to the required dimming level.

It is anticipated that as the institution upgrades adjacent gallery areas, these could be connected to the central intelligent lighting control network for consistency, maintenance and monitoring of the lighting installation in the building.

It is proposed that a mobile device/tablet be purchased by the gallery to undertake lighting control changes as the programmer moves around the space. This allows real time setting of the fittings in the context of the exhibition.

General modes may be considered for day-to-day use including use of the lighting to provide circulation, night time security and cleaning modes as well as general gallery lighting.

3.5.3 Discussion

The proposed lighting upgrade of the Hazelhurst Regional Gallery and Arts Centre aims to achieve energy initiatives through implementation of the following:

Replacement of existing luminaires with more efficient light sources and new LED luminaires

The current installation is comprised of the following:

8 x 150W metal halide uplights 8 x 150W Erco monopoint luminaires 25 x 150W Erco track wallwashers 9 x 36W T8 Fluorescent battens

These are proposed to be replaced with:

8 x 35W metal halide lamps to existing wall fittings 30 x 24W LED DALI Erco track mounted wall washers 8 x 26W LED DALI track mounted spotlight projectors 11,600mm x 17W/m LED strip light with diffuser

The luminaire quantity is proposed to be slightly increased to provide greater flexibility to the gallery. The energy consumption, however, proposes to offer a significant saving. As a comparison of the proposed energy reduction, the total wattage of the existing lighting scheme results in a load of 6,474W which is proposed to be reduced to a load of 1,405W in the lighting upgrade. This results in a potential energy saving of 79%.

2. Intelligent Programmable Lighting Control and Lighting Optimisation

The proposed lighting control system offers a key contribution to the operational savings of the electrical consumption of the lighting upgrade. Through the programming of individual luminaires and lighting scenes, the gallery will be able to provide the required illuminance levels without over-lighting the space. This is also beneficial from a conservation point of view, reducing the lux hours on the artwork.

4.0 Summary

With changes in legislation and greater public awareness of energy consumption, moving towards LED light sources assists in reducing the energy load of a gallery or museum and achieving compliance whilst responding to wider public concerns.

Case study analysis indicates that there are a wide range of lighting upgrade initiatives that can be undertaken to achieve an energy efficient and better suited lighting solution no matter the size or budget of the gallery. The key issues to consider include:

LED Luminaire Upgrade Benefits

All case study galleries have shown a significant energy saving when moving from traditional light sources such as incandescent and halogen, to newer LED lighting technology. As well as the energy savings, the case studies demonstrate that LED technology can improve the light quality of the space and be suitable for museum and gallery lighting requirements. The type of LED upgrade is determined by the available funding and condition of the existing lighting infrastructure. Energy savings are achievable through a simple LED lamp replacement upgrade to a more complete luminaire, lighting control and track upgrade.

Lighting Control Upgrade Benefits

A variety of lighting control solutions are available to suit different gallery-specific requirements. Whilst intelligent lighting control provides far greater flexibility and monitoring of a lighting system, more traditional lighting control methods may be more suitable in some contexts due to monetary or functional requirements. Intelligent lighting control can be utilised in a variety of configurations to provide the level of flexibility required by the gallery. Whilst the Brett Whiteley Studio utilises individual programming for complete flexibility of the lighting control system, other galleries may prefer a simplified user interface with pre-programmed scenes or dimming control over larger groups of fittings. As noted in the case study feedback, all lighting control solutions have benefits and drawbacks. It is important to assess each gallery on a case-by-case basis to suit the functional and budget requirements.

Payback

One of the main concerns when it comes to lighting upgrades is the payback of the installation. Whilst smaller galleries with reduced opening hours may see a longer period of payback in terms of purely monetary return on capital outlay, there are many other factors that play an important role in assessing the overall payback of a lighting upgrade.

The perception of prestige plays a crucial role in the profile of the gallery in the industry and also in the public realm. A gallery seen to be constantly striving to improve the user experience, responding to environment issues of energy consumption and embracing new technology, is likely to increase visitation and be more attractive to potential exhibitors. By enhancing their long-term sustainability and energy efficiency, museums and galleries can also set a positive example and educate their communities.