



TreeGreen

LED Lighting Proposal – Your Company

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1. Introduction to TreeGreen

TreeGreen successfully helps **transform the energy efficiency of buildings.**

Our products are designed to reduce electric bills and ensure that appliances and lighting are managed to deliver significant savings on your energy bills. We offer a range of LED lighting products, electrical fittings and smart control services that are based on occupancy sensing. We have patented technology for occupancy sensing. When a room is not occupied lights can be dimmed or switched off and so to can appliances.

Saving wasted energy and helping you towards your carbon neutral goals!

Lighting may only represent a small part of a construction project but their collective effect on energy usage is significant. LED lighting is now a **cost effective technology.**

For organisations seeking to enhance the sustainability of their properties through the application of LED lighting and smart control technologies, TreeGreen can provide you with energy efficiency research and development, consultancy and a range of products to meet your energy saving needs.

2. Report Outline

This lighting energy report has been produced to show you the benefit of upgrading your lighting systems to TreeGreen's range of retrofit Light Emitting Diode (LED) technology. With a net payback period between 1 and 3 years for the various sites, generous savings can be made to your economic and environmental impact as shown in this report. In addition to a more even distribution of light, you shall see the cost savings from a reduced number of lights and a reduction of energy wattage by over half. This is in addition to the lowering of carbon emissions. We'll also supplement this with a range of complimentary activities that can further enhance your energy reduction strategy in the future. First things first, let's make an impact with our LED's.

TreeGreen offers:

- Lighting energy audits and lighting design that identifies where replacement lamps and luminaires can reduce your energy costs with detailed Return Of Investment (ROI).
- A robust plan for implementation, where if required, we can provide the necessary electrical specialists and engineers to carry out the installation work.
- A range of funding options from public and government backed sources



Stage 1

At this stage preliminary visual surveys have been carried out, and the attached proof of concept report has been produced to highlight the potential savings that can be achieved by installing LED lighting with integral controls to replace existing luminaires. We have made some assumptions to generate this report, and these are detailed overleaf.

Stage 2

An electrical and asbestos survey would be undertaken to ascertain additional wiring requirements, confirm quantities, types of legacy lighting and weekly burn hours. This will then enable us to provide a full and detailed proposal with accurate ROI and project installation costs.

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2.1. What is LED?

LED represents the single most significant development in lighting since the invention of electric light more than a century ago. Its wide scope for application, its flexibility in terms of shape and colour dynamics, and most importantly its outstanding efficiency and longevity make it the lighting tool of the future. LED technology enables solutions to deliver energy savings of at least 50% against fluorescent lighting and over 80% against incandescent bulbs.

LED lights come to full brightness without need for warm-up time, contain no environmentally harmful materials and reduce electrical noise and heat. They can also be coupled with sensors or control system to deliver even greater energy savings, and offer dimming and colour control capabilities to suit any application.

1. LED is a much more efficient technology for producing light relative to incumbent technologies, with higher longer-term upside.
2. LED offers a considerable lifetime advantage which results in much less replacement and thus lower potential operating costs over time:

Efficacy by lighting technology:

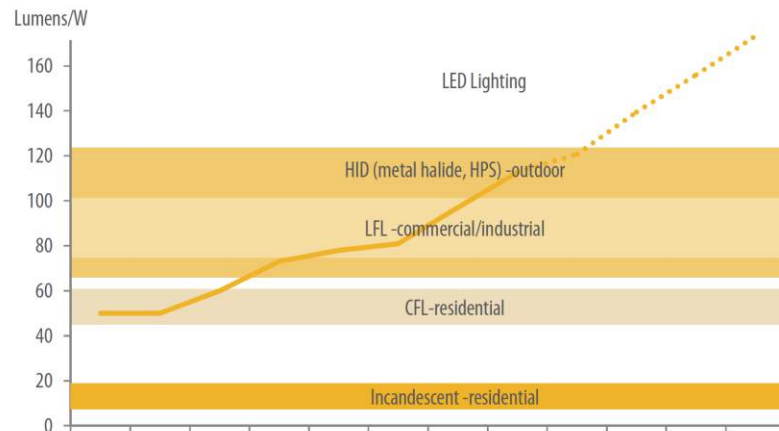


Figure 2-1

Lifetime by lighting technology:

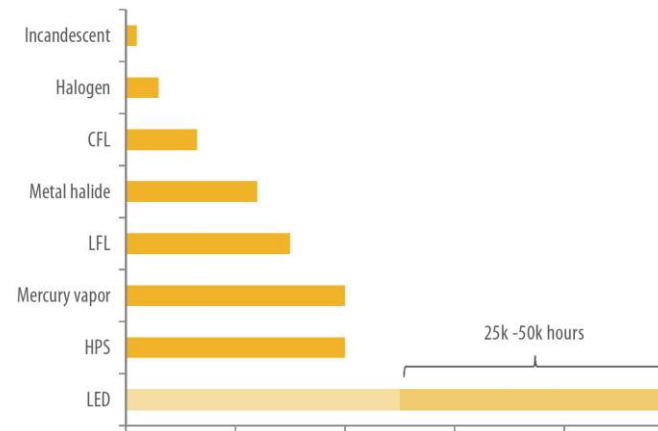


Figure 2-2

Source: Goldman Sachs Global Investment
TreeGreen Confidential, August 15 5

2.2. Energy Savings

Requirements to reduce energy consumption, from both an environmental and financial perspective, are increasingly at the forefront of organisation's focus. This is not always as straightforward to achieve, as it might seem.

Statistics published by the Building Research Establishment show that, across a broad selection of non-domestic applications, lighting represents, on average, 40% of a building's total energy consumption.

Lighting replacement is low hanging fruit in terms of its relative simplicity to install, and will achieve significant energy savings with immediate effect.

3. TreeGreen LEDs

Quality

Quality LED solutions deliver excellent results. Selection of the latest driver & control technologies plus A1 grade LED chips from leading manufacturers such as CREE, Seoul Semiconductor, Samsung, Citizen and Bridgelux ensure our lighting products provide:

- Full compliance with EN, BS, CE, UL, RoHS and LM standards or regulations
- All TreeGreen LED premium solutions are covered by an L70 warranty.
- Long term colour stability (generally 3 MacAdam step ellipses)
- Narrow colour binning range (generally 1/16 bin \pm 100 K CCT)
- High colour rendering indexes (Ra. >80)
- Power factors of >0.9
- Excellent thermal management
- Scope to integrate into existing BMS with DALI or Analogue dimming

Reliability



Reliable LED solutions feature good thermal management – effective cooling is essential to ensure long service life. If your replacement LED bulb gets hot in its fixture – you’ll probably be replacing it sooner than you’d expect.

Reliable LED solutions will have suitable driver technology – separate power drivers built with high quality components will last as long, or longer, than the LED chips. If your replacement LED bulb plugs directly into the mains (with a driver in the base of the bulb) – you’ll probably be replacing it sooner than you’d expect. Reliable LED solutions carry a long warranty, of at least 50,000 hrs. If your replacement LED bulb is only

covered by a 1 year warranty – you’ll probably be replacing it sooner than you’d expect.

Service

TreeGreen offer a full site surveying and energy savings evaluation service. In addition we are able to provide full lighting design services, including the implementation of control systems to further enhance energy efficiency. For special or legacy lighting applications we are able to offer bespoke luminaire manufacturing services if required.

4. Carbon and ROI Calculations

This document has been supplied by TreeGreen for illustration purposes only and is not be taken as a guarantee of performance, rather as an indication of Carbon Reduction and Return on Investment based on the variables indicated and the assumptions made.

Carbon emissions have been calculated using Standard Emission Factors from the Carbon Trust guidelines, which were updated in June 2013. This example has been based on a standard rate of carbon production from grid-produced electricity. One unit or one kilo watt hour (expressed as 1 kWh) releases 0.44548 kgco_{2e} (Kilograms of Carbon Dioxide equivalent).

This energy has already factored within it, the proportion of electricity supplied to the grid, as a whole, by renewable sources.

As an example... ten 100w light bulbs burning for 10 hours will produce 4.4548 kg of carbon dioxide having used 10 kWh of standard grid electricity. Luminaires (rated at 7 years to L70 at 50,000 hours) will deliver a projected useful lifetime, due to burn hours, of approximately 10 years.

Finally it is very important to note the unquantifiable effect that better lighting will have on the health and wellbeing of persons and staff throughout the buildings.



5. Funding Models

TreeGreen can provide different funding options to suit each individual client's requirements or situation. The funding models we can provide are:

- **Capital Expense**

Customer pays for the goods and all the Financial Benefits (Feed-in Tariff, Export Bonus and power savings) are theirs.

- **Lease Purchase (on balance)**

Customer leases the goods and the Financial Benefits pay for the costs of the lease (cost positive). There is usually a balance left for the customer from year one, at the end of the agreed lease period the customer pays a token fee and the goods and ongoing Financial Benefits are theirs.

- **Operational lease (off balance)**

Customer effectively rents the equipment, thus deeming it off balance, the Financial Benefits go towards the costs and usually leave the customer with a small profit for years 1-7; after year 7 the customer can continue to rent the equipment and the costs are reduced leaving the customer with a larger profit.

- **Hire Purchase**

Customer takes out a loan and the Financial Benefits delivered by the LED installation and saving generated, go towards their quarterly costs.

Please note that all finance is subject to approval.



6. ROI Calculations

6.1. Key Metrics

The key metrics presented are the total savings for replacing existing lighting with LED highbays in the Highbay area including emergency lighting, electrical materials, and install costs. The calculations are over a 10 year period. For a further breakdown and details on replacement luminaires please refer to the relevant section.

For the purposes of generating this proposal, the existing lamps have been replaced with direct like-for-like LED luminaries. The replacement luminaries would both improve the lighting conditions in the areas as well as provide a fit-and-forget solution.

Please note the given details are subject to change as these have been generated based on several assumptions that are to be validated by the client.

Table 5-1 Project Assumptions*	
Business Case Length	10 years
Electricity Cost (pKw/h)	£0.09
Annual Maintenance Cost	£1,670.97
Energy Cost Inflation (YoY)	5.50%
Material/Labour Cost Inflation (YoY)	2.40%
Hours used per day (interior)	24
Hours used per day (exterior)	12

*All assumptions to be validated by the client

Luminaire Installation Summary		
	Existing	Replacement
Quantity of Lights	142	165
Total Wattage	55484	19205
Savings on Energy Consumption	65%	
Capital Expenditure	£36,275.00	
Installation Cost	£12,870.00	
Total Savings Over 10 Years		
Energy Savings	£314,735.19	
Maintenance Savings	£18,634.84	
Total Investment (LED Supply & Fit)	£49,145.00	
Grand Total Savings	£284,225.03	
ROI Details		
Annual Savings (Year 1)	£26,115.75	
Payback Period (Investment VS Savings)	1.88	
Green Savings – CO ₂ Reduction over 10 Years		
Tonnes of CO ₂ saved	1,420	
Cars Removed From Road	299	

6.1.1. Payback Details

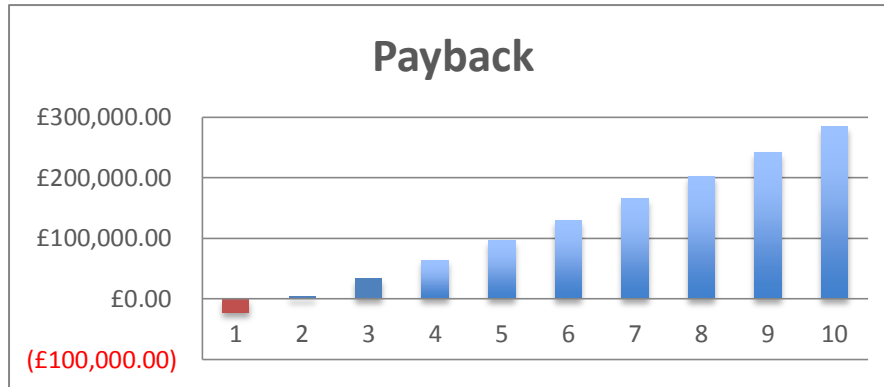


Figure 6-1

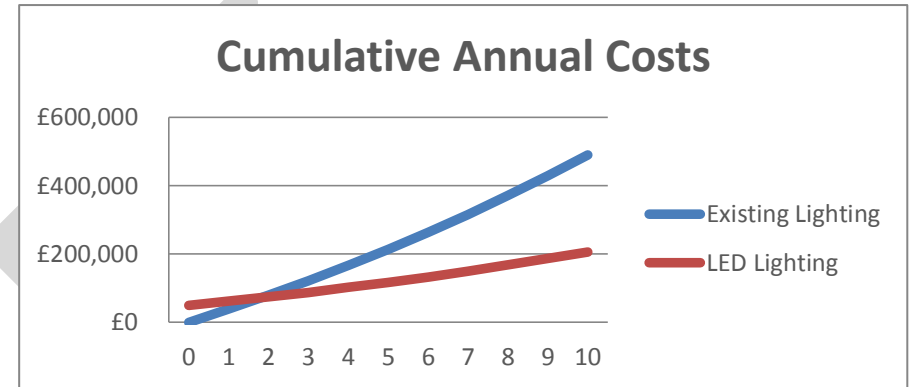


Figure 6-2

6.1.2. Payback Breakdown

Figure 6-3	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Current Elec Spend	£36,617	£38,631	£40,755	£42,997	£45,362	£47,857	£50,489	£53,266	£56,195	£59,286
LED Elec Spend (Inc. controls)	£12,172	£12,841	£13,548	£14,293	£15,079	£15,908	£16,783	£17,706	£18,680	£19,708
Electricity Savings	£24,445	£25,789	£27,208	£28,704	£30,283	£31,948	£33,706	£35,559	£37,515	£39,578
Maintenance Savings	£1,671	£1,711	£1,752	£1,794	£1,837	£1,881	£1,926	£1,973	£2,020	£2,069
Net Cash Saving	£26,116	£27,500	£28,960	£30,498	£32,120	£33,830	£35,632	£37,532	£39,535	£41,647
Cumulative Savings	£26,116	£53,616	£82,576	£113,074	£145,194	£179,024	£214,656	£252,188	£291,723	£333,370
Payback	-£23,029.25	£4,471	£33,431	£63,929	£96,049	£129,879	£165,511	£203,043	£242,578	£284,225

6.1.3. Purchase Detail

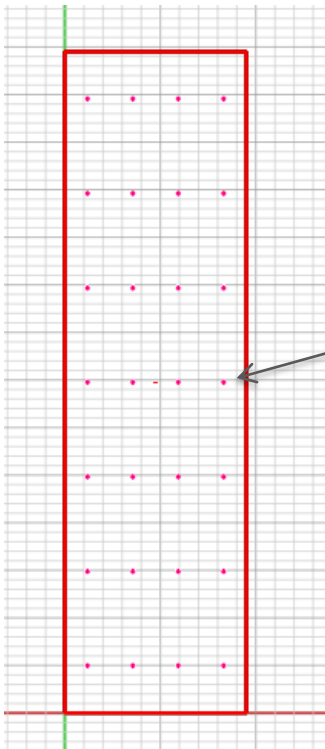
A		Lighting and Controls		
	Description	Unit	Quantity	Amount
A.1	LED Lighting	200W LED High Bay Luminaires TG-240Wi	28	Included
A.2	LED Lighting	160W LED High Bay Luminaires TG-160Wi	43	Included
A.3	LED Lighting	120W LED High Bay Luminaires TG-120Wi	38	Included
A.4	LED Lighting	150W Linear LED Highbay	14	Included
A.5	LED Lighting	13W LED High Bay Emergency Bulkhead	40	Included
A.6	LED Lighting	LED Wall Pack 32.5W	2	Included
Subtotal			165	£36,275.00
B		Installation		
B.1	Removal and Disposal of existing		1	Not Included
B.2	Installation		1	Included
B.3	Electrical Materials		1	Not Included
Subtotal			3	£12,870.00
Total				£49,145.00

Figure 6-4

7. Lighting Design

7.1. Area 1

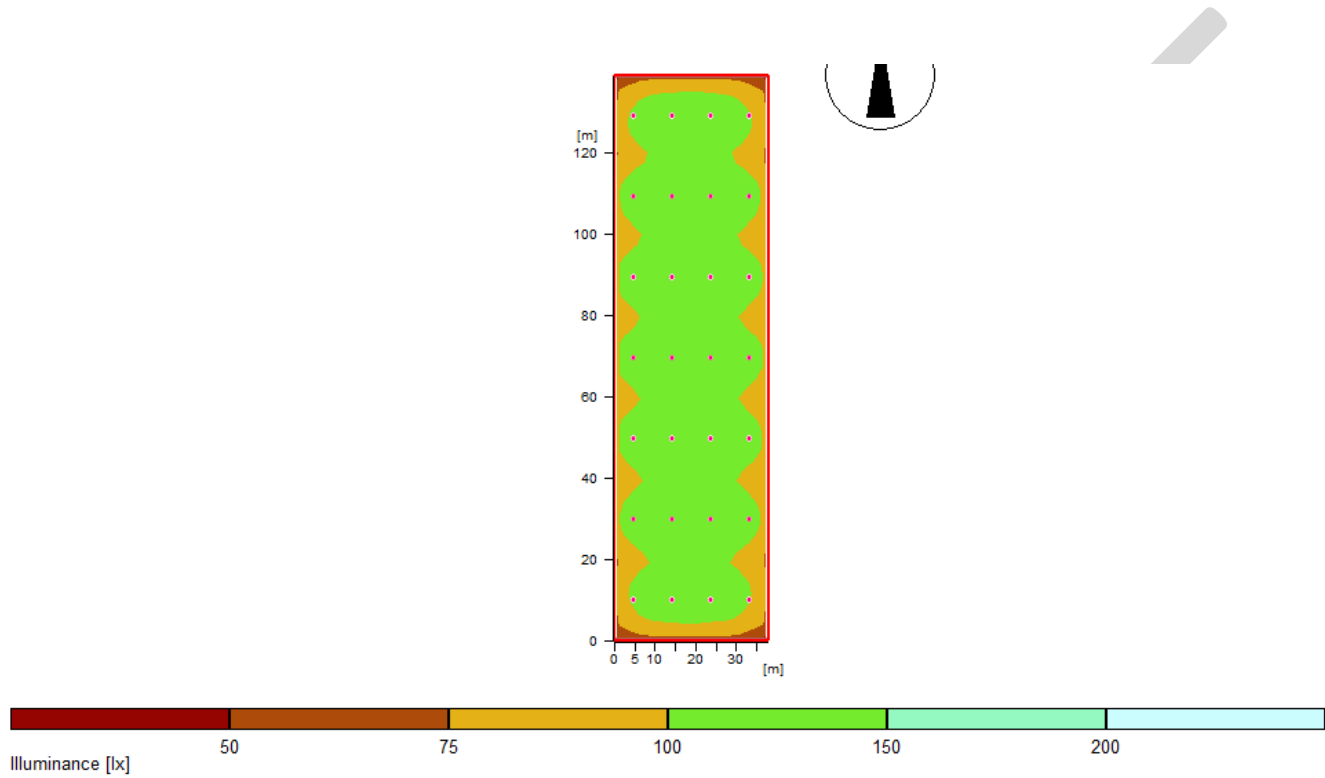
Floor Plan



Luminaires required: 28x 240W LED High Bay, 100 deg lens

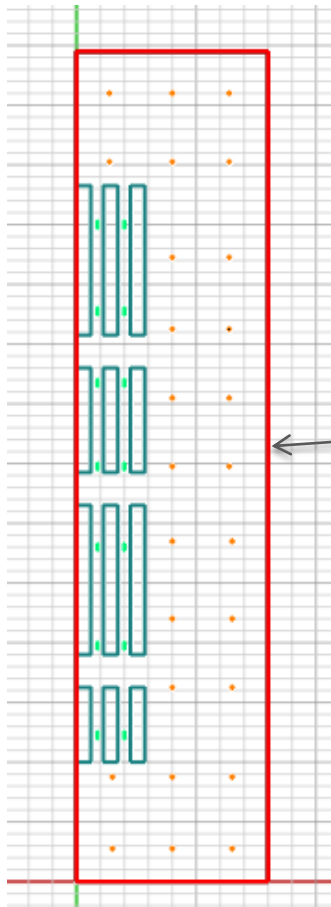
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Evaluation Area



7.2. Area 2

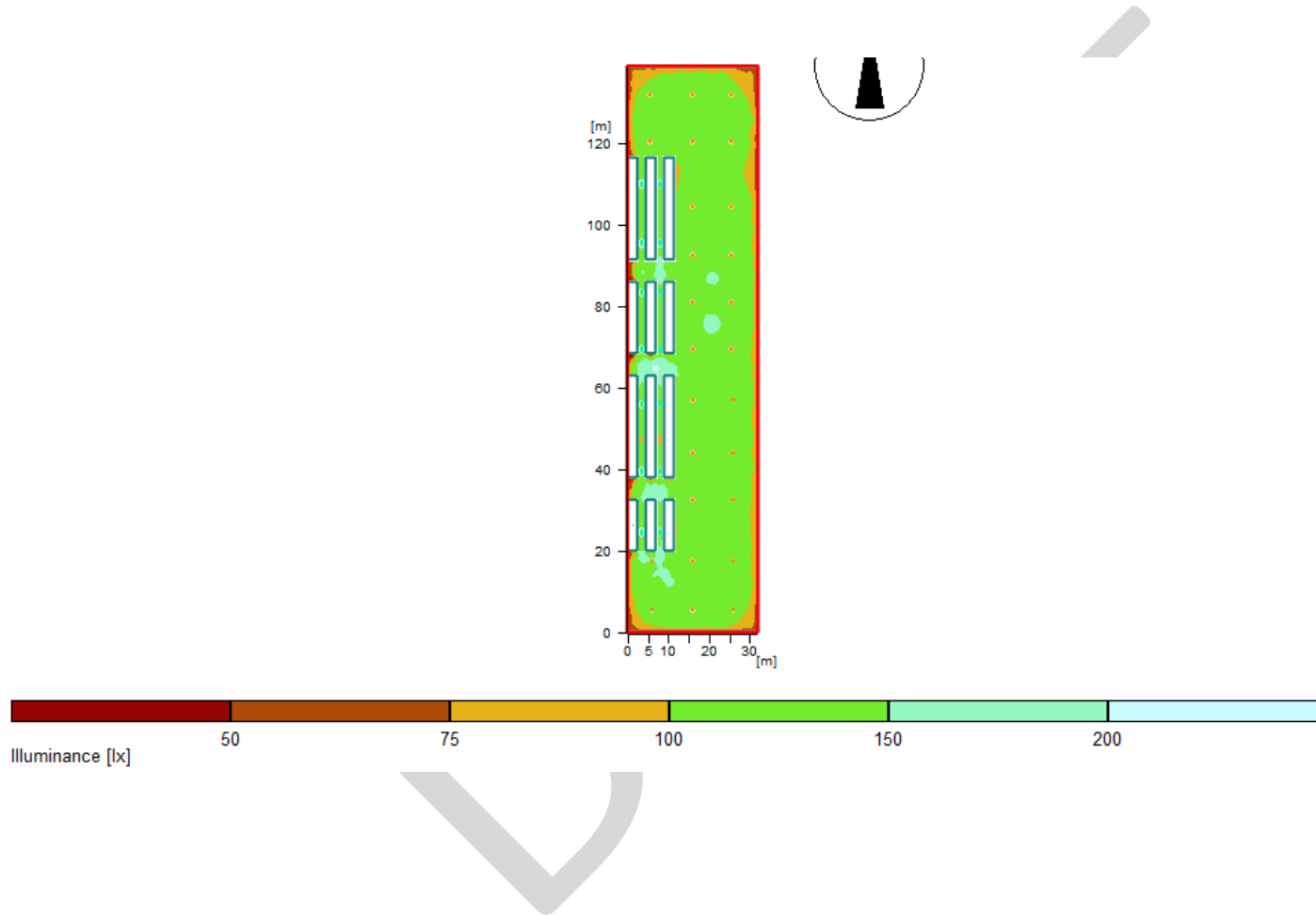
Floor Plan



Luminaires required: 14x LED Linear High Bay, 60 deg lens + 26x 160W LED High Bay, 100 deg lens

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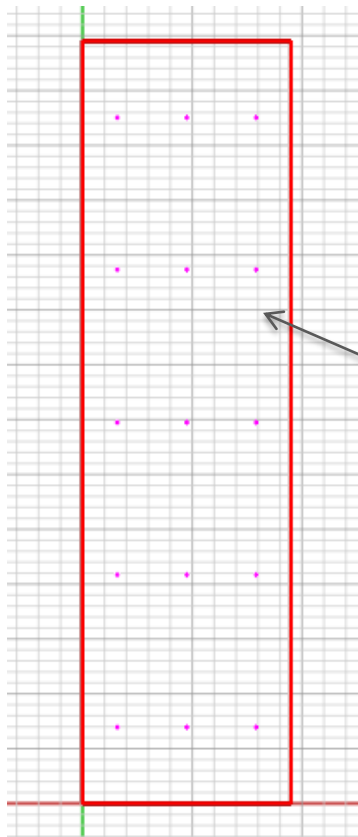
Evaluation Area



7.3. Emergency Lighting

7.3.1. Area 1

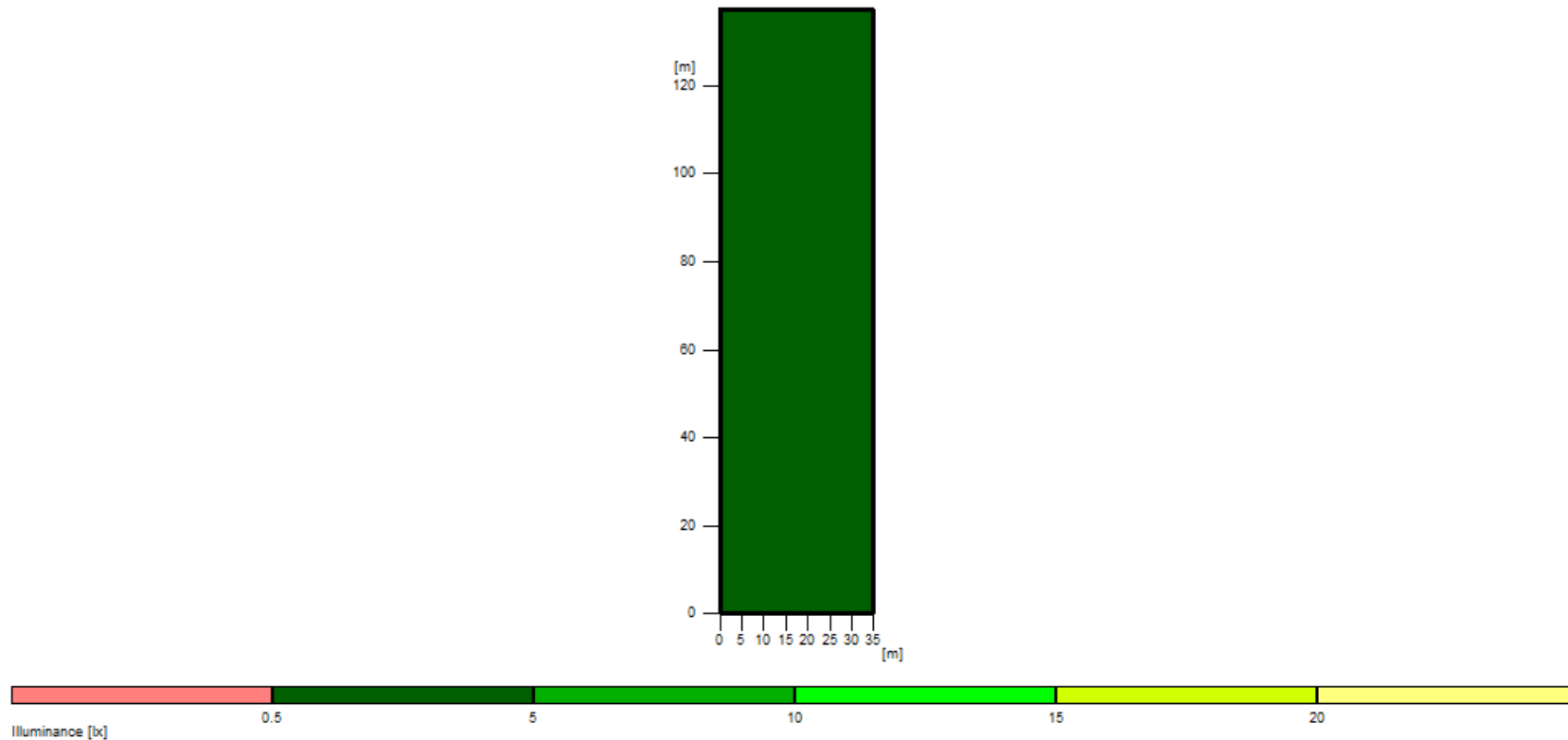
Floor Plan



Luminaires required: 15x LED High Bay Bulkhead

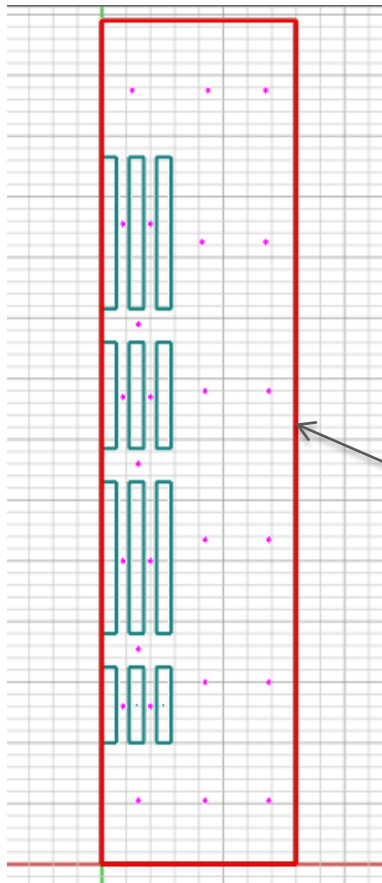
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Evaluation Area



7.3.2. Area 2

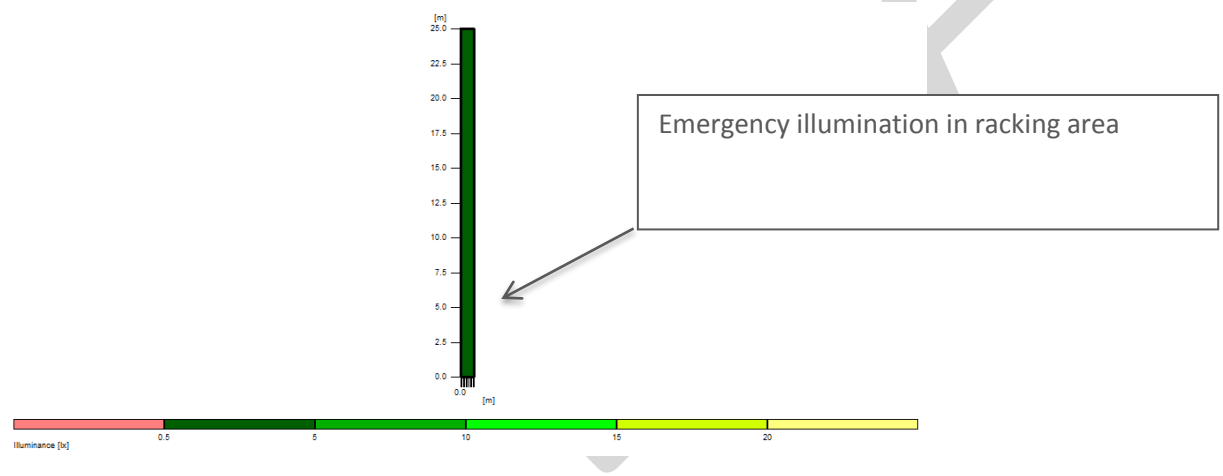
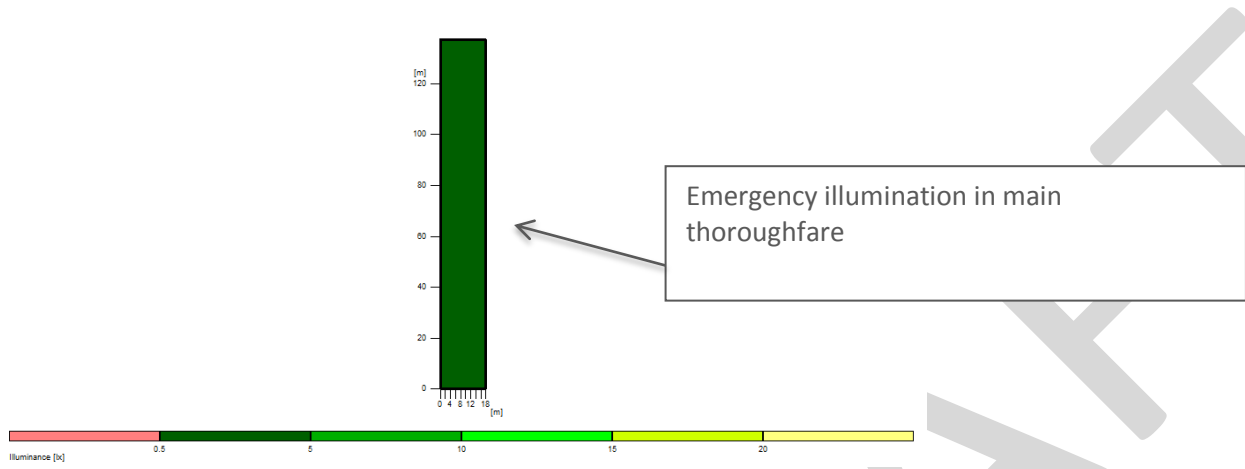
Floor Plan



Luminaires required: 25x LED High Bay Bulkhead

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Evaluation Area



INTERNATIONAL
YEAR OF LIGHT
2015

8. Our Solution

From concept, through installation to completion, TreeGreen guides our clients through their renewable energy requirements. In fact, it is the close partnerships we have with clients that allows us to offer such a comprehensive service. We have an enviable supply chain and offer technical support that is second-to-none.

With long-standing industry experience, we are the experts in renewable technologies and as with all our system offerings, we strive to give our clients the very best of the technological expertise they have come to expect, while simultaneously helping reduce both energy consumption and carbon emissions.

- High Quality Products
- Performance Requirements Calculations and Specifications
- Contract Management
- After Sales Service and Support
- Warranties and Guarantees for products and FiT (where applicable)

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