Lighting Audit

for

Chard Guildhall

Prepared For

Chard Town Council – The Guildhall

September 23, 2021

Fore Street
Chard, Somerset
TA20 1PP

Prepared By: **UK Energy Watch**

TABLE OF CONTENTS

INTRODUCTION

Lighting has one of the highest shares in consumption rates in both residential and commercial buildings, accounting for roughly 20-30% of electricity consumption worldwide. Inefficient light bulbs are directly linked to increased energy wastage, running costs and carbon emissions. This is attributed to older models being seen to produce light as a by-product and a large portion of their energy consumption is spent producing heat.

LED (light emitting diode) lamps are more effective and have a longer lifetime than their predecessors, decreasing annual maintenance costs for organisations and reducing their impact on the current climate situation.

The scope of this report includes the evaluation of the current lighting systems throughout the Guildhall structure. Figures for fitting type and number of such were collected through manual counting during a walk-through audit conducted on 5th January 2021. Energy calculations based on consumption and cost were undertaken with potential savings and project costs should they upgrade their current lighting systems to LED fittings being summarised throughout.

The information highlighted throughout this report may be affected by external factors that are subject to change, some of those factors include but are not limited to:

- Variation in activity levels.
- Changes to tariff rates.
- If lamp or fitting undergo upgrade.

OVERVIEW

The Guildhall site is a grade 2 listed building and consists of a combination of three structures spanning around 4,000 square meters in area. The entrance is the earliest build and is made up of mainly ceremonial and reception office space over a two-storey structure, that of which was constructed around 1836. The latter two structures are made up of the rear main hall containing the auditorium, stage and changing rooms, constructed in 1890. The central linking section contains modern council employee offices on the upper floors, and the external rooms and peripheral roof area was made an addition in 2006.

Guildhalls noted occupancy is taken as 6.9 hours a day for 312 days per year, this has been used for the calculations found throughout this report, with an average 0.137 pence per kWh rate taken from energy bill and consumption data.

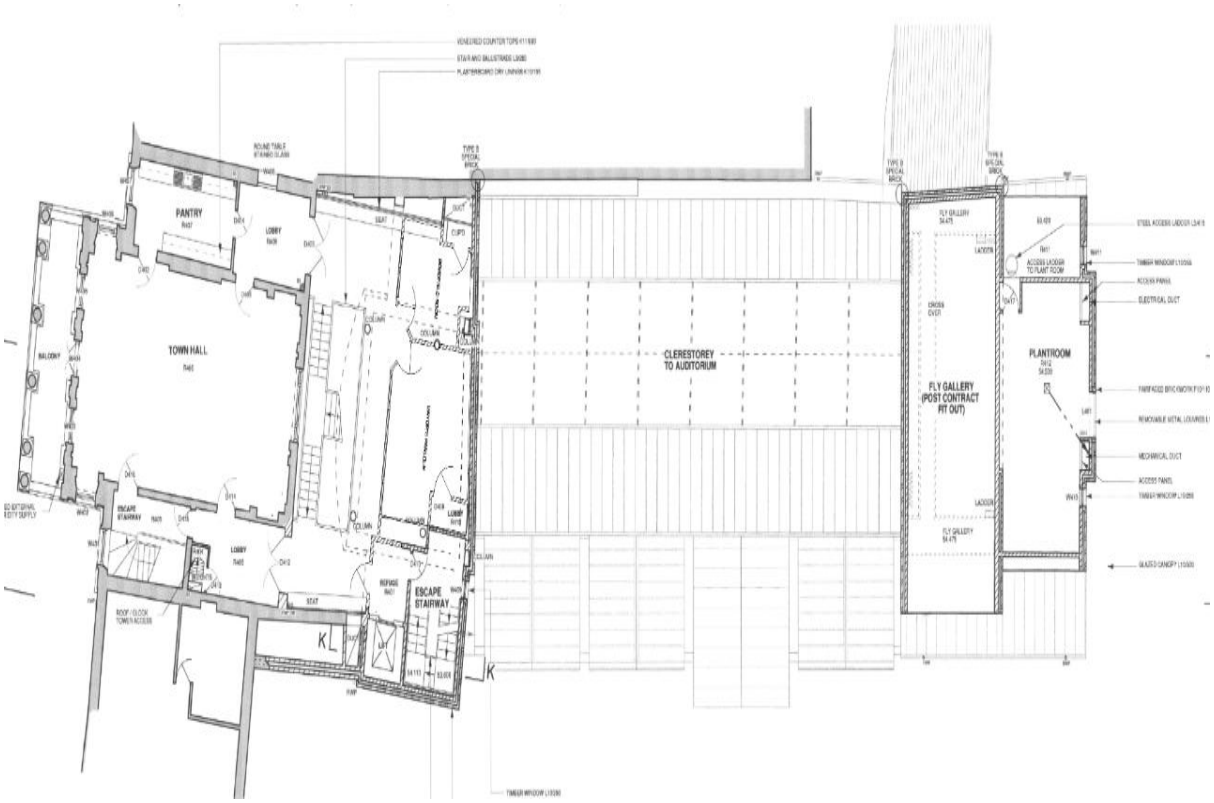
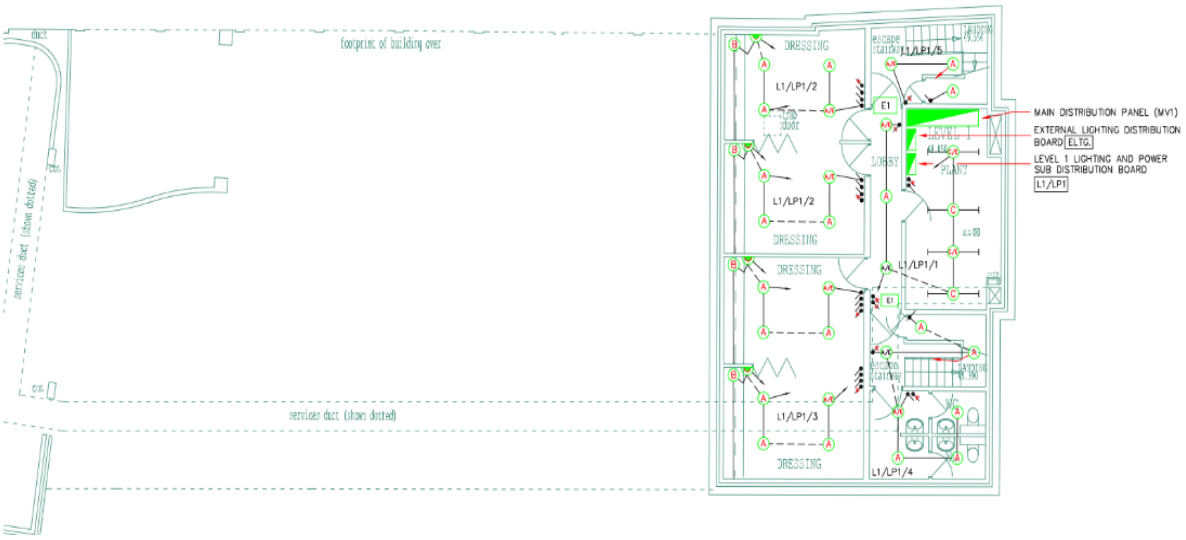
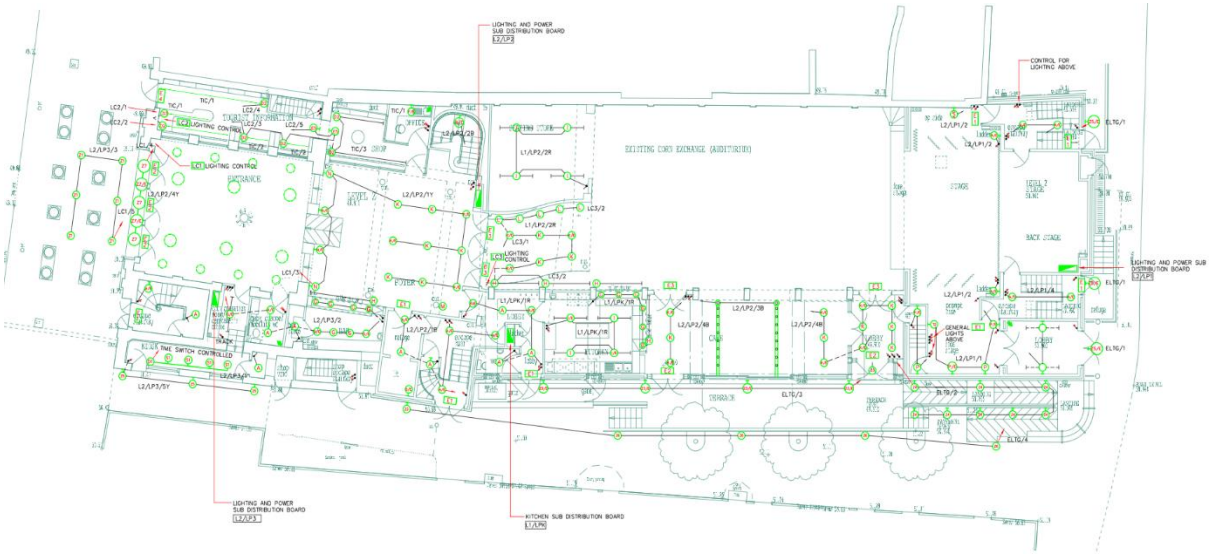
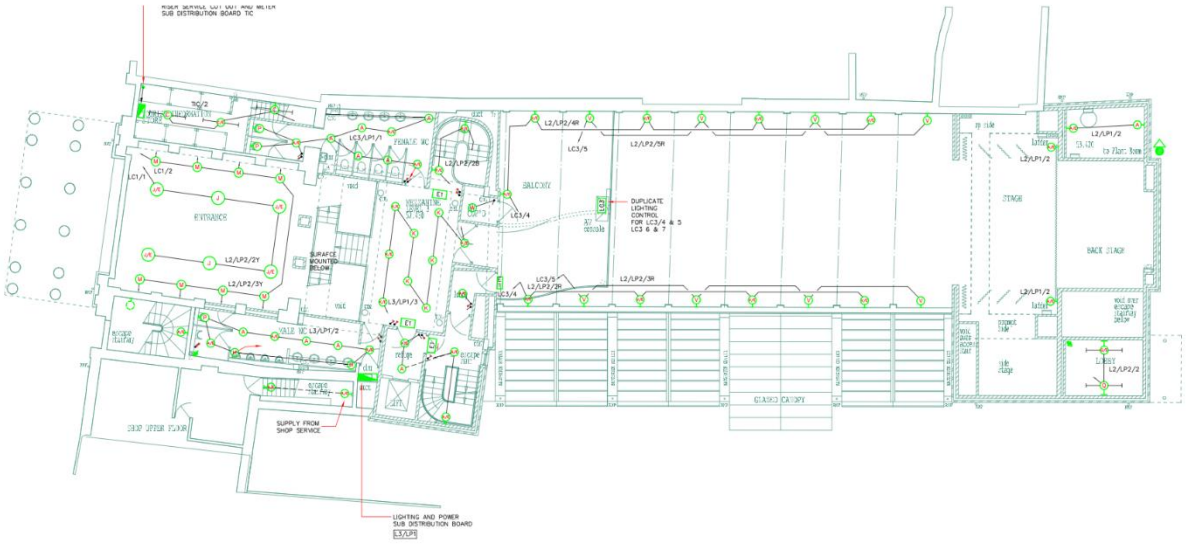


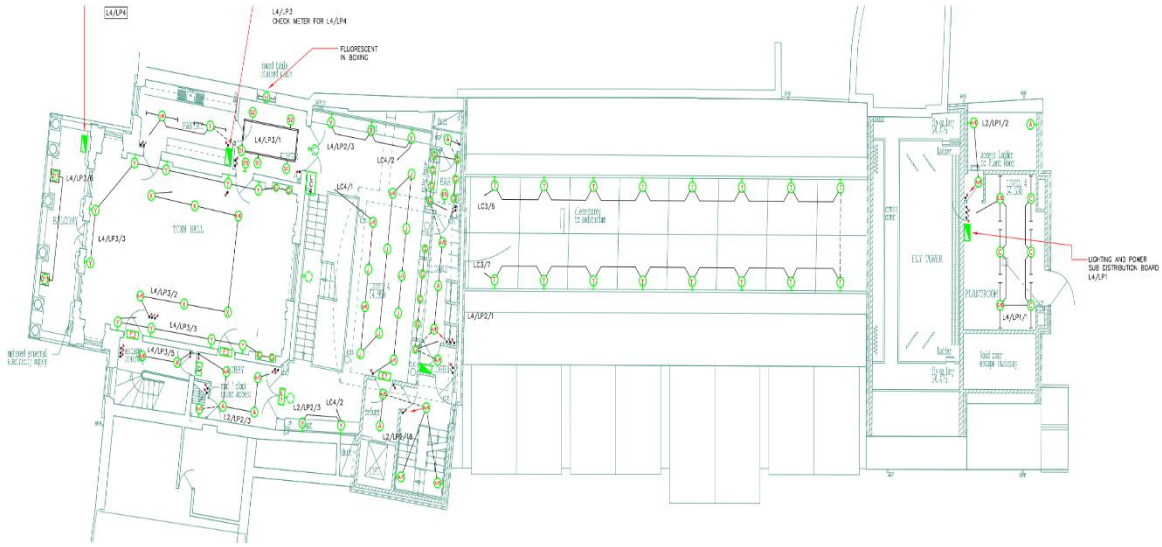
Figure 1. Site diagram – Chard Guildhall Redevelopment – Level 4 Plan.

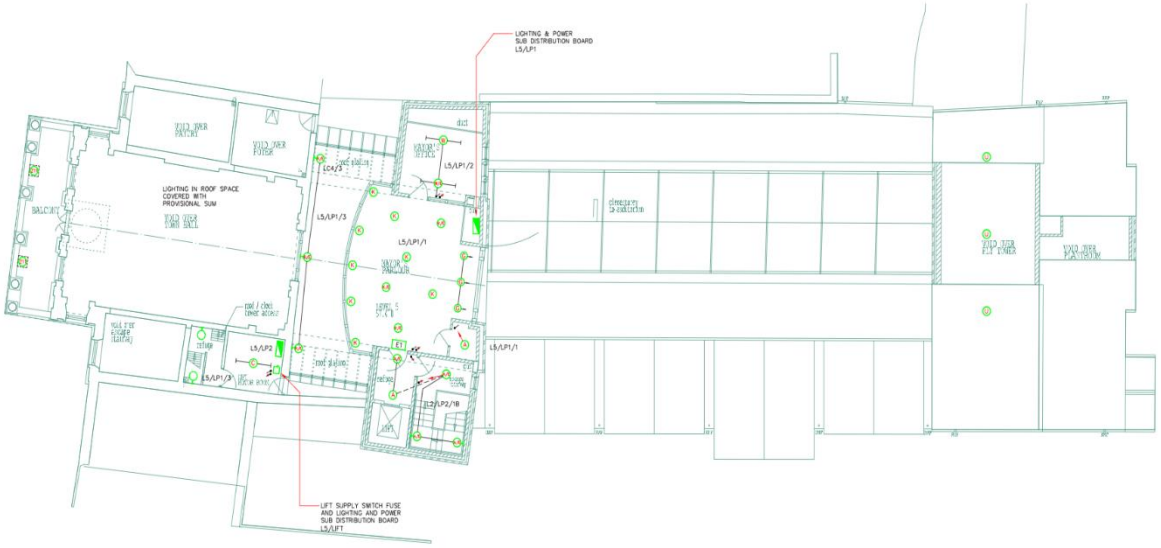
Electrical Installation Layout Diagrams for Levels 1 through 6, Issues by Plymouth Office:

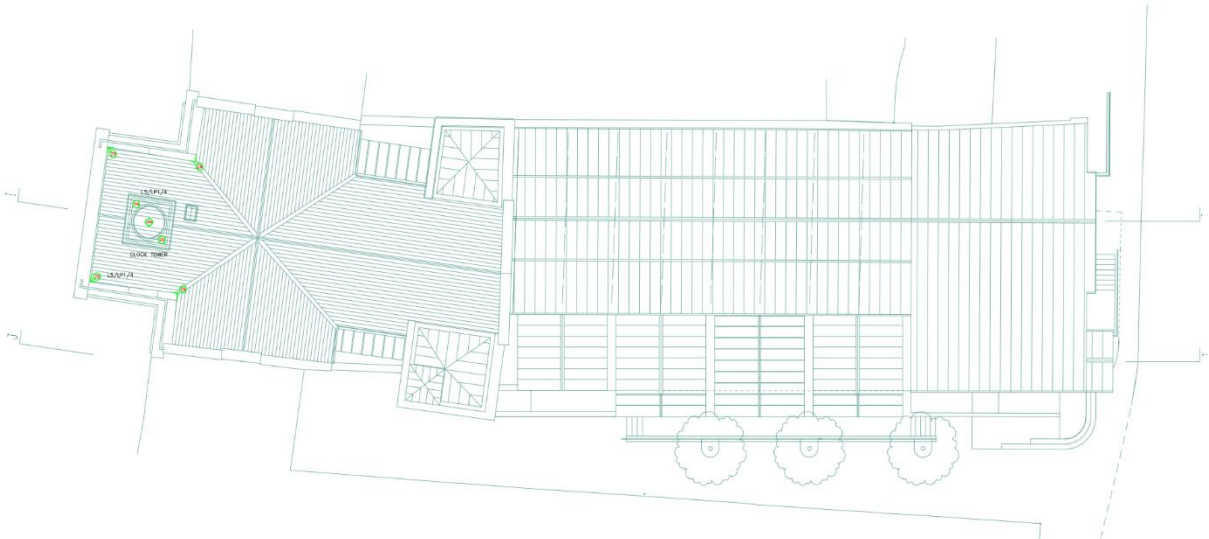







L4/LP4
L4/LP3
CHECK METER FOR L4/LP4
FLUORESCENT
IN BOXING
L4/LP3/1
L4/LP2/3
LC4/2
LC4/1
L4/LP3/6
L4/LP3/3
L4/LP3/2
L4/LP3/5
L4/LP3/4
L2/LP2/3
LC4/2
L2/LP2/2
LC3/6
LC3/7
L4/LP2/1
L2/LP1/2
LIGHTING AND POWER
SUB DISTRIBUTION BOARD
L4/LP1
L4/LP1/1


LIGHTING & POWER
SUB DISTRIBUTION BOARD
L5/LP1
LIGHTING IN ROOF SPACE
COVERED WITH
PROVISIONAL SUM
LC4/3
L5/LP1/3
L5/LP1/2
L5/LP1/1
L5/LP2
L5/LP1/3
L2/LP2/1B
L5/LP1/1
LIFT SUPPLY SWITCH FUSE
AND LIGHTING AND POWER
SUB DISTRIBUTION BOARD
L5/LIFT


L5/LP1/4
CLOCK TOWER
L5/LP1/4

EXISTING FITTINGS

The current lighting throughout the hall consists of a mixture of LED spotlights, traditional large pendant globes with fluorescent lamps and wall mounted uplighters. Some examples are given below:

Surface Mounted IP44 Sealed Fluorescent

Recessed Wall Mounted Downlight

Linear Fluorescent

Suspended Globe Pendant

Table 1. Current fittings based on basic unit code, watts, and cost.

Lamp Type	Total Lamps	Total Watts	Total Unit Cost	Hours Life
100W HPS-T METAL ARC	5	500	£90.50	5000
150W HOI	6	900	£156.00	5000
150W SON	1	150	£17.00	5000
250W HQI	4	1000	£112.00	5000
26W F SQ TC-D	10	260	£85.00	3000
26W G24D-3	9	234	£76.50	3000
26W PL	13	338	£71.50	3000
26W TC-TEL	15	390	£82.50	3000
2D	108	6264	£874.80	3000
32W	107	3424	£588.50	3000
35W LV DICHROIC	34	1190	£132.60	1000
42W TC-TEL	12	504	£74.40	3000
50W LV DICHROIC	3	150	£11.70	1000
55W T8	25	1375	£127.50	3000
70W MT/HIT/CDWM-T	9	630	£162.00	5000
70W T8	35	2450	£217.00	3000
80W T5	4	320	£24.00	3000

Table 2. Consumption and cost per annum for current fittings located within the building.

Quantity	Total Watts	Total Daily kWh	Total Annual kWh	Total Annual Cost
458	3,134	126	39,229.18	£5,374.40

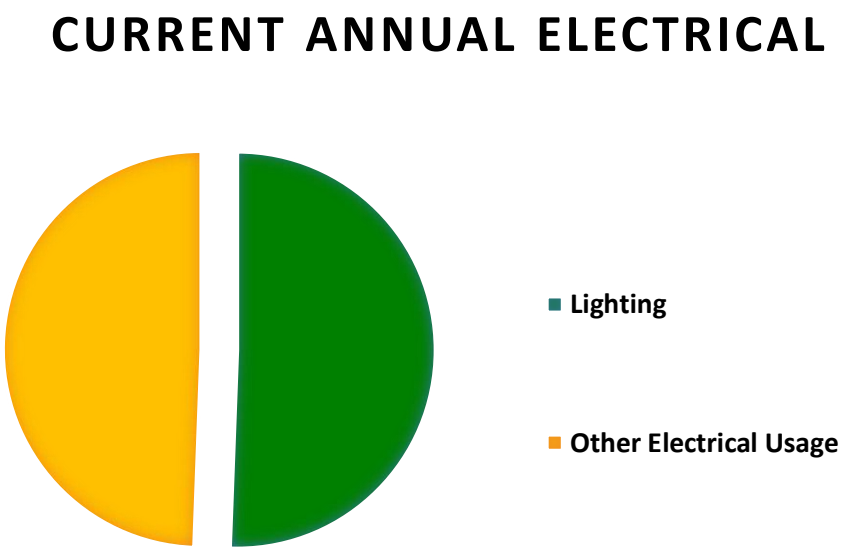


Figure 2. Annual electrical usage split per annum for current lighting and other sources.

Through analysis of consumption data, cost breakdown and kWh usage per fitting it was found that lighting accounts for 51% of Guildhalls electrical consumption, as shown in Figure 2. This equates to £5,374.40 of the annual £10,624.75 electrical bill.

With lighting consuming over half of the stated electricity per annum for the whole structure it can be assumed that this is largely due to inefficient bulbs, upgrade to LED could see this drop by up to 70%.

PROPOSED FITTINGS

Potential energy saving and costs following project implementation are calculated through the following equations:

Daily Energy Consumption / kWh = $\frac{\textit{(Number of Fittings x Wattage x Operating Hours)}}{\textit{1,000}}$

Energy Savings / kWh = *Current System Consumption – Proposed System Consumption*

Annual Cost Savings / £ = *Energy Savings x Electricity Tariff*

Tariff assumed to increase 5% per annum.

Table 3. Consumption and cost per annum for proposed fittings.

Quantity	Total Watts	Total Daily kWh	Total Annual kWh	Total Annual Cost
455	1,047.2	56	17,336	£2,375.04

Table 4. Cost of proposed fittings and install.

Cost of Fittings	Cost of Labour	Combined Total Cost
£42,325.97	£15,350.00	£55,675.97

Table 5. Proposed fitting quantity, wattage, and energy cost for first year post install.

Description	Quantity	Watts	Unit Cost	Energy Used kWh/Year	First Year Energy Cost Post LED Install
18W LED 2D	47	18	£ 38.28	1,821.27	£ 249.51
18W LED 2D EMG	55	18	£ 65.53	2,131.27	£ 291.98
10 METER LED Strip	4	50	£ 232.00	430.56	£ 58.99
6FT Single LED Non Corrosive	9	27	£ 46.54	523.13	£ 71.67
6FT Single LED Non Corrosive - Emergency	5	27	£ 109.89	290.63	£ 39.82
LED 5ft T8/T5 Tubes	6	30	£ 40.00	387.50	£ 53.09
LED 5ft T8/T5 Tubes	1	30	£ 40.00	64.58	£ 8.85
3w 6IN1 LED EMG Exit Sign	18	3	£ 69.45	116.25	£ 15.93
3w 6IN1 LED EMG Exit Sign	7	3	£ 69.45	45.21	£ 6.19
3w 6IN1 LED EMG Exit Sign	4	3	£ 69.45	25.83	£ 3.54
3w 6IN1 LED EMG Exit Sign	1	3	£ 69.45	6.46	£ 0.88
3w LED Emergency Bulkhead	4	3	£ 22.58	25.83	£ 3.54
Downlight/Uplight Hacel Breeze Light replacement	1	11.9	£ 158.10	25.62	£ 3.51
15w PRO LED Downlight	31	15	£ 59.50	1,001.05	£ 137.14
15w PRO LED Downlight emg	3	15	£ 80.50	96.88	£ 13.27
6FT Single LED Non Corrosive	8	27	£ 46.54	465.00	£ 63.71
6FT Single LED Batten	7	50	£ 49.47	753.48	£ 103.23
6FT Single LED Batten - Emergency	3	50	£ 109.89	322.92	£ 44.24
J SUSPENDED GLOBE PENDANT X9	9	60	£ 498.50	1,162.51	£ 159.26
JE SUSPENDED GLOBE PENDANT X9	9	60	£ 558.50	1,162.51	£ 159.26
15W LED DOWNLIGHT	28	15	£ 31.00	904.18	£ 123.87
15W LED DOWNLIGHT EMG	19	15	£ 79.25	613.55	£ 84.06
22W LED Downlight	3	22	£ 59.40	142.08	£ 19.47
8" LED Downlight	9	19	£ 15.05	368.13	£ 50.43
Up Down Wall Mounted Light LED	2	19	£ 118.75	81.81	£ 11.21
Up Down Wall Mounted Light LED / EMG	2	7.6	£ 258.30	32.72	£ 4.48
18W LED 2D	6	18	£ 40.48	232.50	£ 31.85
18W LED 2D EMG	3	18	£ 70.53	116.25	£ 15.93
18W LED 2D	1	18	£ 38.28	38.75	£ 5.31
18W LED 2D EMG	2	18	£ 65.53	77.50	£ 10.62
Up Down Wall Mounted Light LED	6	19	£ 118.75	245.42	£ 33.62
Suspended/ Surface Stand Alone/ Continuous LED	4	19.9	£ 129.90	171.36	£ 23.48
Wall Mounted LED Fitting Up / Downward Light	16	11.9	£ 98.10	409.89	£ 56.16
TRACK 3W	5	3	£ 89.90	32.29	£ 4.42
TRACK 4M	3	0	£ 239.60	0.00	£ -
TRACK 9M	2	0	£ 539.10	0.00	£ -
TRACK SPOTS	20	9.1	£ 112.10	391.81	£ 53.68
Wall Mounted LED Fitting Up/ Downward Light	8	11.9	£ 98.10	204.95	£ 28.08
Wall Mounted LED Fitting Up/ Downward Light / EMG	9	11.9	£ 158.10	230.56	£ 31.59
Suspended/ Surface Stand Alone/ Continuous LED	1	30	£ 149.90	64.58	£ 8.85
Suspended/ Surface Stand Alone/ Continuous LED / EMG	1	30	£ 209.90	64.58	£ 8.85
5W LED Bulb	8	5	£ 5.00	86.11	£ 11.80
5W LED Bulb EMG	4	5	£ 5.00	43.06	£ 5.90
18W LED 2D	15	18	£ 40.48	581.26	£ 79.63
12W LED 2D	6	12	£ 35.24	155.00	£ 21.24
SGL/LED/1380/TAR	1	7.5	£ 149.50	16.15	£ 2.21
SGL/LED/1380/TAR	1	7.5	£ 149.50	16.15	£ 2.21
SGL/LED/1380/TAR/EMG/ST	4	7.5	£ 209.50	64.58	£ 8.85
SGL/LED/1380/TAR	8	7.5	£ 149.50	129.17	£ 17.70
SGL/LED/1380/TAR	3	7.5	£ 149.50	48.44	£ 6.64
SGL/LED/1380/TAR/EMG/ST	3	7.5	£ 209.50	48.44	£ 6.64
BY OTHERS	4	0	£ -	0.00	£ -
SGL/LED/1230/HAY/IP65	3	8.6	£ 56.10	55.54	£ 7.61
SGL/LED/1230/HAY/IP65/EMG/ST	2	8.6	£ 116.10	37.03	£ 5.07
25W Street Light	4	24.9	£ 95.00	214.42	£ 29.38
25W Street Light	2	24.9	£ 95.00	107.21	£ 14.69
25W Street Light	1	30	£ 95.00	64.58	£ 8.85
45W Street Light	4	45	£ 122.50	387.50	£ 53.09

Table 6. Current system bill cost per annum with proposed costs and savings

YEAR	COSTS				SAVINGS	
	Existing		LED			
	Existing	Inc. Maintenance	Proposed	Inc. Install	Annual	Cumulative
1	5,374.40	5,874.40	2,375.04	58,051.01	2,999.36	2,999.36
2	5,624.31	6,124.31	2,485.48	2,485.48	3,138.83	6,138.18
3	5,885.84	6,385.84	2,601.06	2,601.06	3,284.78	9,422.97
4	6,159.53	6,659.53	2,722.00	2,722.00	3,437.52	12,860.49
5	6,445.95	6,945.95	2,848.58	2,848.58	3,597.37	16,457.86
6	6,745.68	7,245.68	2,981.04	2,981.04	3,764.65	20,222.51
7	7,059.36	7,559.36	3,119.65	3,119.65	3,939.70	24,162.21
8	7,387.62	7,887.62	3,264.72	3,264.72	4,122.90	28,285.11
9	7,731.14	8,231.14	3,416.53	3,416.53	4,314.61	32,599.72
10	8,090.64	8,590.64	3,575.40	3,575.40	4,515.24	37,114.97

Table 6 shows the annual bill for Guildhall based on their current lighting system, made up of mainly fluorescent bulbs, against the proposed savings created by installation of energy efficient LED bulbs. Yearly progressions are based upon expected tariff increase and are further displayed in Figures 3 and 4 found below.

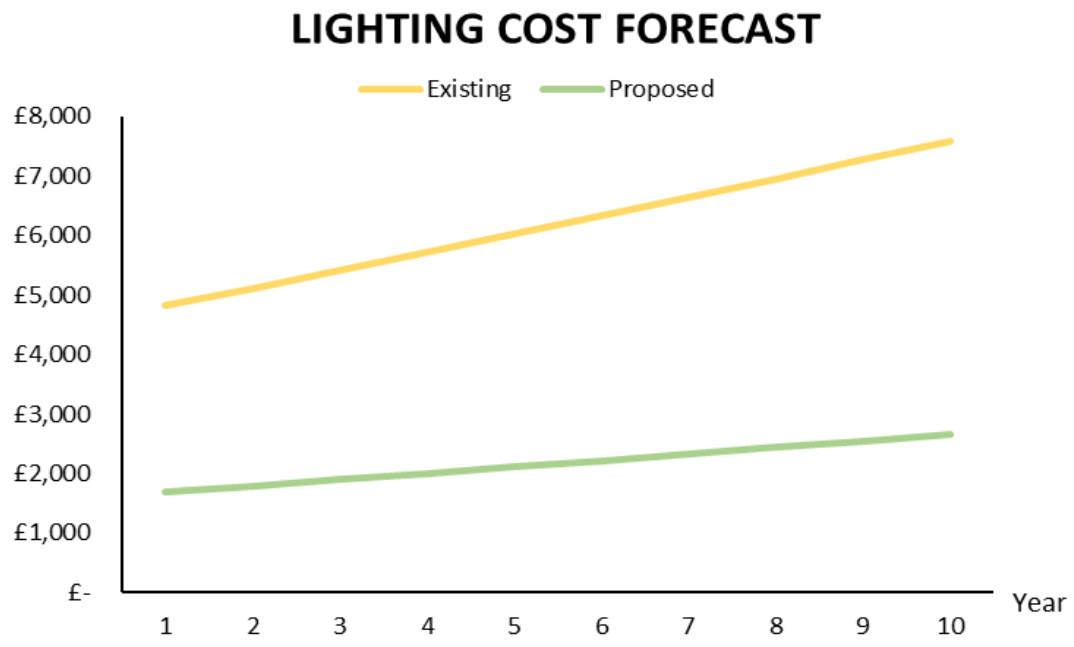
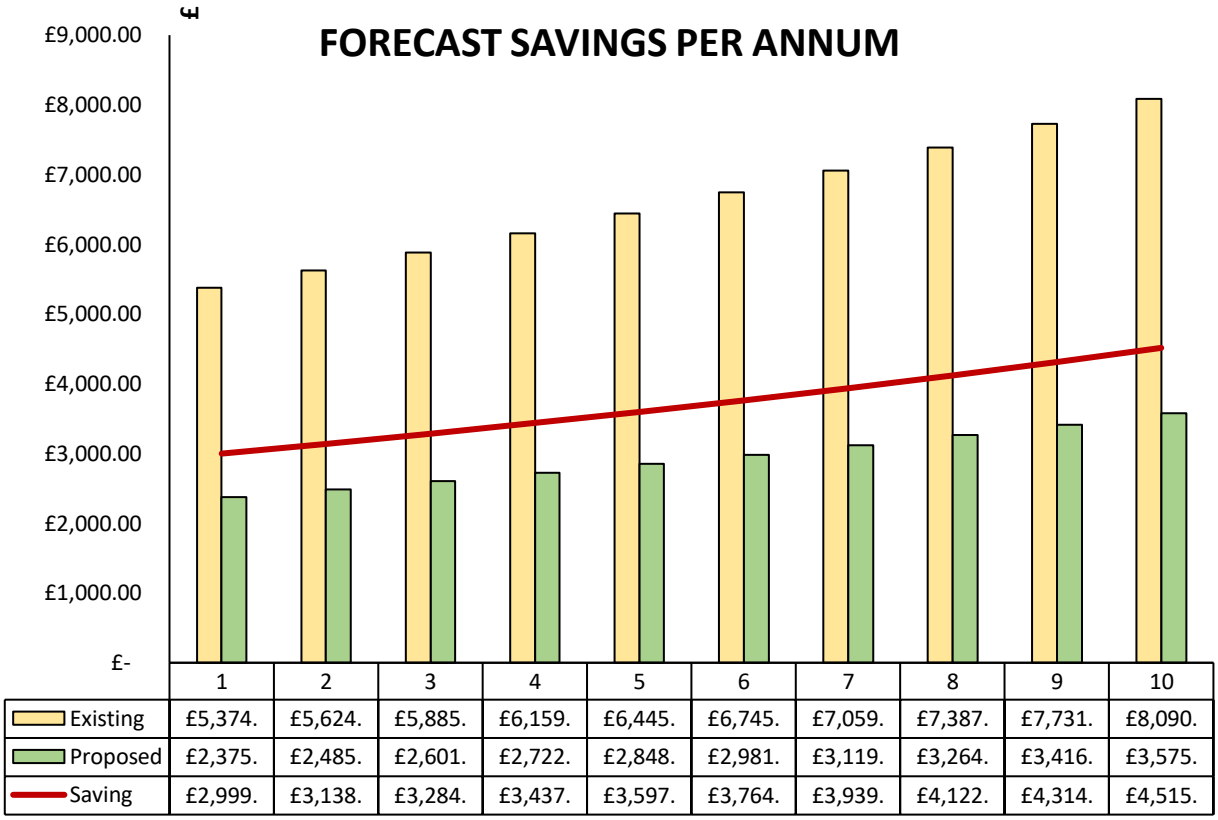


Figure 3. Lighting forecast cost for Guildhall based on current and proposed system, with expected 5% tariff increase per annum.



	1	2	3	4	5	6	7	8	9	10
Existing	£5,374.	£5,624.	£5,885.	£6,159.	£6,445.	£6,745.	£7,059.	£7,387.	£7,731.	£8,090.
Proposed	£2,375.	£2,485.	£2,601.	£2,722.	£2,848.	£2,981.	£3,119.	£3,264.	£3,416.	£3,575.
Saving	£2,999.	£3,138.	£3,284.	£3,437.	£3,597.	£3,764.	£3,939.	£4,122.	£4,314.	£4,515.

Figure 4. Forecast cost for pre and post LED installation, with savings. Based on tariff increase per annum.

DISCUSSION

The savings throughout the report are based around a stated maintenance cost of £500 per annum for the current fittings located within Guildhall. Variation around this would impact on the annual savings achieved through implementation of the lighting upgrade project.

Securing accurate maintenance costs for Guildhall would allow for an accurate account of financial costs of the current systems and thus provide LED savings and a project payback time to aid towards possible funding.

It should be stated that the total energy usage and costs for current systems are based around given wattage per fitting, some of which were not provided. For these fittings it was assumed that the current wattage stands half that of the proposed, this being a lenient figure, which would impact the stated savings when comparing to proposed fittings. It can be presented that the stated savings are in the lower percent of what is possible through install.

Total cost of the project is stated at its maximum end, with a lowered cost being available through upgrade of bulb alone, without altering the fitting. This route was chosen for the 'Pendant Globe 32W' and 'Pendant Globe 32W Emergency' as fitting replacement and install with the stated 'Saturn Ring LED Slim-Line' and 'Saturn Ring LED Slim-Line Emergency', would reach a total cost of £5,383.20.

CONCLUSION

Following LED upgrades Guildhall would expect to see an initial saving of **£2,999.36** in year one with predicted cumulative savings of **£37,114.97** over a 10-year period following expected tariff price increase.

Energy consumption can be shown to reduce by a total of **21,893.18 kWh** should LED upgrades be implemented, which equates to an annual reduction of **4.6 tCO2e** in carbon emissions produced.

We look forward to working in partnership to help Guildhall become more energy efficient.

Hannah Lee and Lee Steer

UK Energy Watch Group