

DERBYSHIRE COUNTY COUNCIL

CABINET MEETING

21 October 2014

Report of the Strategic Director – Economy, Transport and Environment

**STREET LIGHTING SERVICE INVEST TO SAVE
PROPOSAL (JOBS, ECONOMY AND TRANSPORT)**

(1) Purpose of the Report

- (i) To inform Cabinet of the outcome of the public consultation on proposed changes to street lighting maintenance policy and the proposed introduction of LED lights with dimming; and
- (ii) To seek approval for an invest-to-save proposal and funding.

(2) Information and Analysis

Background

The Council is required to make £157 million of savings over the period 2013/14 to 2017/18 and street lighting like all other services has to achieve identified savings. Street lighting savings targets for 2014/15 are proposed to be £775,000 for regular maintenance and £50,000 from part night lighting and permanent switching off of lighting schemes.

A number of ways of achieving savings have been considered:

- undertaking reactive, rather than planned maintenance
- introducing limited LED lighting with dimming
- investing in significant replacement of lighting stock with LED lights as an invest-to-save proposal.

On 27 May 2014, Cabinet approved a public consultation on proposed changes to the Street Lighting Maintenance Policy. The proposal was to replace the current planned maintenance with a Reactive Maintenance Policy whereby lamps would not be replaced routinely, and failed lamps, which were not in defined priority areas, would only be repaired if resources were available. The consultation also asked whether there would be support for investment in LED street lights and to consider the possibility of dimming at

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certain locations at night. LED and dimming would not require lamps to be routinely replaced and would result in fewer failed lamps which could be contained within budget after a £775,000 reduction.

There would also be additional savings to future energy budgets of around £1.2 million per year, on current energy prices, and 6,000 Tonnes of carbon.

Cabinet also considered a report on 15 July 2014 identifying the potential benefits and affordability of an invest to save LED and dimming proposal for street lights in the 5 to 6 metres height range, typically those in residential areas. Since then, further detailed financial modelling and investigation has been carried out into how to deliver a value for money, medium to long term street lighting strategy utilising LED lights.

Falling costs of LED lights suggests proposed capital replacement cost estimated at £23.3m. Energy prices have increased by approximately 11% per year over the last 5 years and indications are that this trend will continue, resulting in a potential payback period (pre-financing), if funding was secured, of 8 years and 1 month; details of which are set out in Appendix 4.

Dimming Proposals

ELEXON, which governs how energy for street lighting is traded, has approved several switching regimes to incorporate dimming. The following is felt to provide the most appropriate level of multi-level static dimming currently available. The periods of 100% light output operate during the times of highest road usage, with the 50% reduction during lower night-time usage equivalent to a reduction of approximately one lighting class within the requirement of British Standards.

Time from	Time to	Light output
Dusk	21:30	100%
21:30	00.00	75%
00:00	05:00	50%
05:00	06:00	75%
06:00	Dawn	100%

Whilst it may be possible to use dimming in most locations, it would not be used in the following areas unless well evidenced risk management identified that a level of lighting appropriate to a reduced highway usage could be introduced:

- in town centres
- locations with a significant night-time traffic accident record
- areas with an above average record of crime

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- areas provided with CCTV, local authority or police surveillance equipment
- areas with sheltered housing and other residences accommodating vulnerable people
- areas with a 24hr operational emergency services site, including hospitals and nursing homes
- formal pedestrian crossings, subways, enclosed footpaths and alleyways and where there are potential hazards on the highway (roundabouts, central carriageway islands, chicanes, speed-humps etc)

LED Invest-to-Save Proposals

LED street lights have a projected life of 100,000 hours or 25 years allowing for 10% failures. This is much longer than the 15,000 – 20,000 hours (3-4 years) of conventional lamps.

The proposal includes the replacement of 22,236 lighting columns that are beyond their designed working life – referred to as ‘out of design life’ - to significantly improve the whole life cost benefits from the investment.

The following is proposed for street lights within the five to six metres height range:

- Replacement of existing lights with LEDs on 46,560 lighting columns
- Replacement of 18,379 out of design life 5 metres high columns including installation of an LED light
- Replacement of 3,857 out of design life 6 metres high columns including installation of an LED light
- Utilisation of dimming technology in association with the installation of LEDs so as to reduce light levels and energy consumption during the period of low highway usage

In total, 68,796 street lights in mainly residential areas would be converted to LEDs representing approximately 78% of the Council’s lighting stock. The remaining 22% of the Council’s street lights are over 6 metres in height, are primarily on the strategic road network and would continue to be upgraded via funding obtained through the Local Transport Plan (LTP).

There would be no adverse impact on the standard of street lighting as a consequence of this proposal. However, there are some health and environmental concerns which need to be considered. These concerns are also reflected within the comments received through the consultation, are set out in Appendix 1.

Public Consultation on Proposals

The proposals set out above have been subject to consultation.

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A public consultation on the proposed change to street lighting maintenance policy and the potential investment into LED and dimming took place between 15 June and 8 August 2014. An online questionnaire was produced and paper copies were made available in libraries and District Council offices. Awareness of the consultation was raised through the Council's website and extensive media coverage in the local press.

All 240 Parish and Town Councils were made aware of the consultation and several publicised it in the local community and provided a link to the questionnaire on their websites. The Council also utilised Facebook to raise awareness of the consultation and provided a reminder prior to the end of the consultation period.

A total of 538 responses have been received as part of the consultation process. The results of the consultation show that 55% of those people completing the questionnaire agreed with not routinely replacing lamps. However, evaluation of the comments revealed that an additional 15% of those who agreed with not routinely replacing lamps before they fail disagreed with not replacing failed lamps in all locations.

A significant number of respondents did support the proposal to invest in LED street lights (90%) and dimming (86%) provided that some health, environmental and financial concerns were considered.

There was concern about the scale of the investment costs if there was potential for this to reduce the budget available for other Council services.

A detailed analysis of the responses to the consultation is set out in Appendix 1.

Options for Consideration

There are 3 options available to the Council:

Option 1 – Retain the current status and not make the £775,000 cut to the street lighting revenue budget to fund routine replacement of lamps. The advantages of this would be:

- To recognise the concerns identified through the public consultation and responses from Parish and Town Councils Improving the ability to maintain non-working street lights in line with past performance
- A reduction in the perception of community risk from non-working street lights

The disadvantages of this option would be:

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- £775,000 would need to be found from other service area budgets to enable delivery of the required revenue savings.
- There is a potential this would limit the ability to invest in low energy lights like LEDs if outages are required to be less than 1%.
- Potential by 2020 for the Council's lighting energy bill to be approximately £5.5 million based on calculations by Laser, the biggest Local Authority energy buying group.
- Reduced ability to cut carbon from a service which is responsible for 20% of the Council's total carbon generation.
- Need for a year on year increase to the street lighting routine maintenance base budget to sustain outages at less than 1%.
- Significant future investment would be required as traditional lamps currently used for routine replacement cease to be manufactured due to the industry adopting LEDs and other energy efficient and long life options.

Option 2 - Implement the proposed street lighting maintenance policy change which would enable the £775,000 cut to be applied to the street lighting revenue budget agreed by Cabinet on 28 January 2014. The advantage of this would be to enable the delivery of the required savings identified in the Council's financial strategy.

The disadvantages of this option would be:

- Failure to recognise the concerns by both the public and Parish and Town Councils in response to the consultation of the adverse community impacts if the proposed policy change was implemented.
- Insufficient funding to carry out all reported faults which could result in up to a 30% (26,700) outage rate for street lights based upon other authorities who have operated a 'burn to failure' policy for lamps for an extended period.
- A perceived increased community risk due to non-working street lights and a potential for all increase in third party claims against the Council, particularly in streets where part night lighting has already been implemented.
- The potential for a significant maintenance backlog which would require considerable future investment to repair failed street lights in non-priority areas in order to reinstate a steady state maintenance regime as evidenced by Nottinghamshire County Council.
- No reduction in energy and carbon generation negating the £775,000 saving potentially within 3 years.
- The inability to consistently deliver the main community benefits of street lighting.
- Increased reports to the Authority of faulty lights leading to dissatisfaction with service provision which would be reflected in future National Highway and Transport Public Satisfaction Surveys.

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Discussions have taken place with Western Power Distribution (WPD), which is responsible for the distribution network for the majority of Derbyshire, regarding energy usage reduction by removing non-operational lighting from the energy inventory used to generate bills. WPD has raised concerns of damage occurring to its distribution network from non-operational lighting and have said that it would impose conditions to protect its network from possible damage. These conditions would incur costs to the Authority which would outweigh the savings from a short period of energy reduction due to non-operational street lights.

Option 3 - Consider invest to save funding for the replacement of existing lights with LEDs and use of dimming technology on street lights in the height range 5 to 6 metres located mainly in residential areas. The advantages of this would be:

- Enables the £775,000 base revenue budget cut to street lighting
- Generates further year on year savings through around a 60% reduction in energy use for each LED light installed
- Improves asset whole life costing
- Reduces the potential community risk by providing the full delivery of the identified street lighting benefits in residential areas
- Reduces by approximately 6,000 Tonnes (33%) the carbon generated through electricity used for the whole street lighting asset.
- Provides an alternative to Part Night Lighting in urban areas where more concerns were raised during the consultation on this policy.
- Further reduces energy and carbon usage on street lights that are part night lit in rural areas whilst, together with dimming, minimising the impact of the LED white light source on the rural night time environment.

The disadvantages of this option would be:

- The need to replace out of design life street lighting columns to ensure the full whole life costing of the investment in LEDs is achieved.
- The higher colour temperature of LED has been posed as a possible risk to health and ecology.

Option Appraisal and Recommendation

Both options 1 and 2 will require significant investment in the medium to long term in order to maintain effective street lighting in residential areas.

Option 1 whilst recognising the concerns expressed through the consultation would require £775,000 of savings to be identified from other service areas and need annual increases to the base routine maintenance and energy budgets to maintain lighting outages at less than 1%.

Implementation of option 2 would potentially increase community risk and fear of crime and may increase residents' concerns and impact on quality of life

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and ambience of areas where lights fail. Option 2 would also limit the ability of the Council to achieve energy and carbon reduction commitments.

Option 3, whilst requiring significant investment in the shorter term, which is not required by either option 1 or 2, would better address the outcome of the public consultation and the identified support for LED and dimming investment if funding was to be made available. The possible health and ecology risks are considered to be minimal as indicated in Appendix 2 and could be managed through monitoring and through the careful selection of products incorporating a maximum LED colour temperature of 4,000K, modulation of flicker frequencies and the facility to limit glare through the use of shields, masks and dimming. A detailed health and safety assessment of these risks is set out in Appendix 2.

Proposed strategy for the delivery of an invest to save into LED and dimming

The progression of option 3 identified above would ensure that required revenue savings are achieved from street lighting over a sustained period, and that further budget savings from reductions in energy consumption can be achieved

Responses from community engagement on the introduction of part night lighting in urban areas and comments received through the consultation on the proposed maintenance policy change are indicative of concern at the switching off of lights or lights not being repaired when other energy reduction options are available to deliver savings.

Any approved invest to save funding for the installation of LEDs and replacement of columns would be programmed to be completed over a three year period.

The procurement of an external contractor would be required to support the internal workforce in the installation work and ensure completion within the required timescale to obtain the earliest maximum energy and carbon savings. It is anticipated that a contract could be in place for late spring/early summer 2015 so as to allow reasonable time for preparation of tender documentation and the necessary procurement process. There are an increasing number of local authorities undertaking similar projects but early indications from the market are that the proposed timescale for implementation is deliverable.

Implementation Proposals

The consultation has identified the public's concern that all lighting faults will not be repaired. Parish Councils and the public have identified concerns at the impact of not repairing lights where part night lighting is in operation on streets, as this will negate the risk assessment applied to scheme implementation.

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Whilst the routine replacement of existing lamps on street lights would not be an efficient use of public funds, if approval is given to implement an LED and dimming invest to save project, in order to address concerns raised during the consultation it is proposed that all reported street light faults should be repaired until the project is fully implemented. The approved general maintenance revenue budget for street lighting is insufficient to enable this to be achieved.

The following strategy is suggested in order to seek to sustain a £775,000 revenue budget reduction from street lighting:

2014/15

Further part night lighting in urban areas could be stopped. Instead, LEDs and dimming could be utilised from 2015/16 onwards so as to avoid the need to switch off street lights in urban areas. The remainder of the invest to save funding approved for implementing part night lighting could then be utilised to replace failed lamps with LED lights for the remainder of the 2014/15 financial year. Failed lamps on 5 and 6 metres high columns would be replaced with LED lights to the same specification as that which could be used for the major LED replacement contract to start in spring/early summer 2015. This would ensure that invest to save benefits from the approved part night lighting funding were still achieved whilst, at the same time, assisting to address the consultation concerns of street light failures not being repaired.

The street lighting asset management system would be updated to record any lights replaced on 5 and 6 metres columns with LED lights, so as to ensure that the planned contract replacements for 2015/16 onwards were reduced accordingly.

During the last quarter of 2014/15, the preparation of contract documents and commencement of the procurement of a three year contract for the replacement of LEDs and lighting columns would be progressed.

Failed light replacements on the strategic highway network, and residential network columns above 6 metres in height, would be replaced through utilisation of the significantly reduced revenue budget and could include upgrading to LEDs through approved 2014/15 LTP schemes.

The identification and submission of LTP schemes for consideration and approval in 2015/16 on the strategic route network would assist to progress the on-going phased upgrading of lighting with energy efficient equipment on this part of the highway network. LTP schemes would also need to be submitted for replacement of any end of life Council owned cables and control equipment.

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Any street lighting in rural and non-residential areas at the end of its life would be reviewed in line with current industry standards and the Council's risk assessment criteria for part night lighting, to determine if it is still delivering effective community benefits. If this is not the case, the lighting would be permanently switched off and lighting columns removed.

2015/16 and 2016/17

Approval in spring 2015 of the award of an external contract for the installation of LEDs and use of dimming on 5 and 6 metres high columns, and the replacement of 22,236 lighting columns. The timescale for the three year contract start date would be anticipated as being approximately Quarter 2 of 2015.

From April 2015, LED invest to save funding could also be used to enable the Council's in house street lighting team to carry out reactive LED replacement of failed lights on 5 and 6 metres columns that are not included in the first year of the contract. All lamps replaced would need to be recorded on the street lighting asset management system and the second and third years LED replacement contract programme adjusted accordingly. This would assist the Council to ensure that all failed lights continue to be repaired during 2015/16 and 2016/17.

It is proposed that the external LED replacement contract would target areas where lamps should have been changed through routine maintenance during 2014/15 and 2015/16 as these areas are likely to have the highest incidents of failure.

Continued investment for upgrading the strategic route network, residential network columns above 6m in height and Council owned cable networks would be through a further submission of LTP schemes for 2016/17 and 2017/18. Again, street lighting in rural and non-residential areas would be reviewed against industry standards and Council policy to determine if derived community benefits warrant its retention.

2017/18

It is proposed that the LED replacement contract resources would be utilised to ensure lamps on 5 and 6 metres columns, which would have been scheduled for replacement in 2016/17, are replaced with LED lights before the end of October 2017 when British Summer Time ends. The remaining replacements would then, in the main, be lamps which would have been due for routine replacement during 2017/18. Some reactive LED replacements to lamp failures would still need to be carried out by the in-house team although this would be more limited than during the first two years of the contract.

LTP schemes would be submitted for the continued upgrading of street lighting during 2018/19 on the strategic road network, and residential network

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columns over 6m in height, and the replacement of end of life Council owned cable networks. Again, out of design life street lighting in rural and non-residential areas would be reviewed to determine if it should still be retained.

2018/19

It is anticipated that the LED replacement contract would be completed by the end of spring/early summer 2018. Resources required for street lighting maintenance from 2018/19 would need to be reviewed and adjusted accordingly to reflect the significantly reduced maintenance requirements applicable to LEDs which would, by then, form the majority of the Council's street lighting stock.

(3) **Financial Considerations** A whole life cost model has been developed for the street lighting project which compares the cost of continuing with the maintenance and replacement of traditional lamps (i.e. the traditional solution) with the cost of fitting most street lights with LED lights and replacing columns where necessary (i.e. the LED solution). This is shown in Appendix 4.

The invest-to-save funds will be met through borrowing without the use of reserves.

Analysis demonstrates that net nominal savings after financing costs are taken into account range between £24.0m with modest energy price inflation of 2.5% and in excess of £60m for 10% energy inflation. Average annual savings range between £1.2m and £3.1m depending on the level of energy inflation. The length of time taken to recover the initial capital expenditure (pre-financing) or payback period ranges from 9 years and 6 months to 8 years and 1 month.

(4) **Legal Considerations** As the Highway Authority, the Council has a power, rather than a duty, under the Highways Act 1980 to provide and maintain road/street lighting. Where it is provided, it must be to the standard set in the Council's Street Lighting Policy. In exercising its powers in respect of the extent operation and maintenance of lighting, a highway authority should act reasonably.

The highway authority also has a duty under Section 17 of the Crime and Disorder Act 1998 to exercise its functions with due regard to their effect on crime and disorder in its area.

(5) **Equality and Diversity Considerations** Equality and Diversity considerations are considered within the main body of the report and an Equality Impact Analysis is attached as Appendix 3.

When considering the proposal in this report Members should have due regard, to protecting and providing for, the welfare and interests of persons

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who share a relevant protected characteristic (age, disability, gender reassignment, marriage and civil partnership; pregnancy and maternity, race, religion or belief, sex and sexual orientation).

(6) **Human Resources Considerations** The delivery of an invest to save project would require the in-house street lighting team to be supported through external contract arrangements to ensure lights and lighting column replacements are implemented within a three year period.

It is proposed that an additional post would need to be established and appointed to on a fixed term contract for the duration of the implementation to assist with:

- the development of contract documentation
- the procurement process applicable to a major project
- contract and financial management
- updating of asset management information to ensure the earliest benefit from energy and carbon savings
- contract work profiling to reflect necessary reactive LED replacements

This post would be subject to evaluation and a report submitted to the Cabinet Member for Jobs, Economy and Transport.

(7) **Health Considerations** The specific health impacts of the proposed invest to save project are evaluated in Appendix 2.

It is proposed that there should be ongoing monitoring and evaluation of research relating to the use of LED lights and of issues raised by residents following installation of LEDs to identify if there are issues relating to impacts on health.

This would include monitoring of:

- Residents' complaints/concerns about glare or other health and wellbeing related concerns.
- Pedestrian, cyclist and motor vehicle driver complaints/concerns about glare or other new lighting system issue.
- Complaints/concerns expressed by other local stakeholders' e.g. environmental groups, health groups, residents' associations, business groups, voluntary groups and charities.
- New research findings on LED street lighting and health and wellbeing published in a scientifically and/or governmentally recognised peer-reviewed scientific journal and/or undertaken by a recognised and respected individual/team of scientists.

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In this way, residents, users of the areas and local stakeholders would be given the chance to comment and express individual, site specific, concerns.

Monitoring new research would enable new information concerning health to be taken into account and help to inform on-going monitoring, evaluation and action.

(8) **Environmental Considerations** The implementation of LEDs and dimming will assist to reduce the total carbon produced from street lighting by 34% by 2020. Whilst the Council is not currently liable for carbon credits this reduction will assist to mitigate the risk of future changes in legislation with respect to carbon charges.

All artificial lighting impacts on the night time habits of nocturnal creatures such as bats, moths, insects and invertebrates. Sodium lights emit little or no light within the ultra violet or bluer portions of the light spectrum and therefore are the least attractive to insects, though reports indicate that as many as a third of flying insects that are attracted will die as a result of the high temperature of the light during operation. Sodium lights emit a significant proportion of light upwards into the night sky; light pollution has been identified as a possible contributing factor to a decline in the population of some moth species in Britain and also reduces our ability to see the night sky.

Recent changes to British Standards allow for a reduction in lighting levels when using LED lights which both reduce the overall intensity and glare. A reduction in intensity also reduces the amount of blue light and therefore the adverse impacts.

LED lights to be used within this proposal would incorporate technologies which reduce the impacts of LED.

(9) **Property Considerations** The Council's Street Lighting team utilises existing Council facilities in Chesterfield, Duffield and Chapel-en-le-Frith to deliver services. The property in Chesterfield on Turnoaks Business Park is leased and is the main stores for street lighting equipment. Any investment in LED technology would mean that a reduced lighting stock would be required to be held in future providing an opportunity to review the need to lease a property of that size. The Council has an option on the property lease until March 2022 with the next break identified in the lease agreement for March 2017.

In preparing this report the relevance of the following factors has been considered: prevention of crime and disorder and transport considerations.

(10) **Key Decision** Yes.

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(11) **Call-In** Is it required that call-in be waived in respect of the decisions proposed in this report? No.

(12) **Background Papers** Reports to Cabinet of 27 May and 15 July 2014. Officer Contact details – Debbie Anderson extension 38670

(13) **OFFICER'S RECOMMENDATIONS** That Cabinet:

- 13.1 Considers the responses to the public consultation on the proposal for a policy change to street lighting maintenance and the possible investment in LEDs and dimming of street lights, if funding was available and the Equality Analysis.
- 13.2 Approves the invest-to-save proposals for the introduction of LED lights and dimming identified within the report to improve the whole life costing of street lights in the height range 5 to 6 metres.
- 13.3 Approves the procurement of a contract to deliver the LED lighting project within a three year period and notes that a further report will be submitted to Cabinet for approval to award a contract.
- 13.4 Confirms that further part night lighting will not be implemented in urban areas and that invest to save funding will, instead, be used to install LEDs on reported street lamp failures for the remainder of 2014/15.
- 13.5 Notes that there will be ongoing monitoring and evaluation of any issues raised by residents following installation of LEDs and of new research to identify any impact on health.
- 13.6 Authorises the Cabinet Member for Jobs, Economy and Transport to consider a future report seeking approval to establish an additional post on a fixed term basis to assist in the delivery of the invest to save project.

Mike Ashworth
Strategic Director – Economy, Transport and Environment

APPENDIX 1 – PUBLIC CONSULTATION RESULTS AND ANALYSIS

A public consultation on the proposed change to street lighting maintenance policy and the potential investment into LED and dimming took place between 15 June and 8 August 2014. An online questionnaire was produced and paper copies were made available in libraries and District Council offices. Awareness of the consultation was raised through the Council's website and extensive media coverage in the local press.

All 240 Parish and Town Councils were made aware of the consultation and several publicised it in the local community and provided a link to the questionnaire on their websites. The Council also utilised Facebook to raise awareness of the consultation and provided a reminder prior to the end of the consultation period.

A total of 538 responses have been received as part of the consultation process. The relatively low number of responses received may have been due to a recent survey by the Neighbourhood and Home Watch Network together with the Suzy Lamplugh Trust who carried out a nationwide public survey during November 2013 entitled Street Lighting & Perceptions of Safety. There were 15,786 respondents to that survey with 433 from Derbyshire. Respondents to this survey may have been less inclined to contribute to the Derbyshire consultation. 92.9% of respondents to the national survey felt safe when walking in a well-lit neighbourhood compared with an un-lit or badly lit neighbourhood. 64.8% said that they avoid walking alone in un-lit or poorly lit areas after dark.

The Derbyshire consultation questionnaire contained four questions.

Question 1 asked respondents to agree or disagree with a change in policy to not routinely replace street lights and only repair street lights at priority locations when they fail.

There were 527 responses to this question, 55% agreeing and 42% disagreeing with the proposal, however, a further 15% of respondents who agreed with not routinely replacing lamps disagreed with only repairing lights in priority locations. Evaluation of the 218 comments provided can be summarised as follows:

Number of comments	Issue Identified
113	Personal safety and potential for increase in crime and fear of crime concerns
82	All lights that fail should be replaced
81	LED lighting would be a better alternative
29	Adverse impacts in areas where part night lighting is operating

26	Independence and mobility concerns due to irregular light patterns
15	Impacts on quality of life and ambience of area

Question 2 requested any additional priority locations which respondents felt had not been highlighted in question 1.

There were 186 comments on the priority locations which have been summarised below.

Number of comments	Issue Identified
43	All locations where people live or congregate
43	Specific locations named
31	Areas with part night street lights
28	Outside schools, doctors, community centres
16	On blind bends, brows of hills
15	Crime areas and community safety areas

Question 3 asked whether respondents would support investment into LED street lights.

There were 520 respondents to this question with 90% in support of an investment into LED street lights. There were 67 comments which are summarised below:

Number of comments	Issue Identified
22	Concern over high investment cost
13	In support of LED street lighting
8	Health concerns of blue light
8	Queried if the technology was sufficiently advanced
6	LEDs should only be installed when the old light fails
5	Glare
4	Concerns of irregular lighting patterns

Question 4 asked if we were to install LED street lights would there be support for them being dimmed in certain locations at night.

86% of the 516 respondents to question 4 supported the use of dimming to maximise energy savings, there were 77 comments given, these can be summarised as follows:

Number of comments	Issue Identified
23	Insufficient lighting impacts on quality of life
15	Fear of crime concern
9	Concerns of irregular lighting patterns
9	Impact on pedestrian safety
9	LED should save enough money so dimming not required

Comments within the consultation responses highlight the following community benefits of street lighting:

- Contributing to the reduction of night time personal injury accidents
- Reducing street crime
- Reducing the fear of street crime
- Promoting the use of public transport, cycling and walking
- Providing the freedom to walk along and use streets after dark

There were 13 Parish and Town Councils who responded to the consultation, 12 identifying their disagreement with the proposed maintenance policy change. All who responded broadly supported the introduction of LED and dimming.

The Parish and Town Councils who responded were primarily those where part night lighting has already been implemented, their main concern was that over time the proposed policy change would result in many areas finding themselves in darkness which could lead to an increased fear of crime and personal safety concerns.

County Council Member feedback - during the consultation comments were received from two Elected Members who, whilst appreciating the need to reduce costs, expressed concern at the potential impacts on road safety, and the fear of crime, and of irregular lighting patterns caused by an increase in random light failures.

Other interest group responses – whilst responses in this area were quite low, there was concern raised by members of Guide Dogs for the Blind Association highlighting that good uniform lighting is required to provide adequate depth perception for many sight impairment conditions. Respondents also highlighted the need for well controlled LED lights which do not create glare or irregular pools of light whether at full power or dimmed.

Consultation conclusions - The results of the consultation show that 55% of those people completing the questionnaire agreed with not routinely replacing lamps. Evaluation of the comments however revealed that an additional 15% of those who agreed with not routinely replacing lamps before they fail disagreed with not replacing failed lamps in all locations. The cost of repairing

all lights which fail could not be contained within the remaining street lighting revenue after the proposed £775,000 budget cut. This would inevitably result in a maintenance backlog which was identified to be as many as 6,000 lights by the end of 2014/15 out of the 89,000 street lights maintained by the Council and could be as much as 20-30% of the lighting stock within three years.

15 respondents who provided comments noted that LED lighting would be a better alternative to no lighting and the impact on community safety this may have.

The comments received through this consultation reflect those received through community engagement during the implementation of the first two years of the part night lighting project which also highlights increasing concern over implementation of part night lighting within a more urban environment and the potential for new technologies to provide a sustainable alternative.

This is supported by the experiences of Nottinghamshire County Council which instigated a Reactive Maintenance Policy in 2011. It has demonstrated that the savings cannot be sustained over a period of time without an increase in the number of random failures. In 2014, Nottinghamshire has returned to a planned lamp replacement policy at an additional cost of £600,000 over two years. It is also investing in LED technology and dimming where funding permits.

APPENDIX 2 – HEALTH AND SAFETY ASSESSMENT OF LED LIGHTING

LED lights are considered a safe light source within the Control of Artificial Optical Radiation at Work Regulations (AOR) 2010 and guidance provided by the Health and Safety Executive. They provide improved night-time visibility when compared to existing street lights and could provide a safer night-time environment by deterring crime and anti-social behaviour through this improved visibility.

Health concerns were identified in the previous Cabinet report of 15 July 2014 and were also raised within the consultation. These are evaluated as follows;

Excessive glare of LED light sources

All light sources produce glare, this is not specific to LEDs and can be a very subjective issue. Individual concerns about glare may be mitigated by product design which restricts visibility of the light source to drivers, bicyclists or pedestrians unless they are directly under the fixture, the introduction of shields, masks and dimming through site specific assessments of concerns raised.

Blue Light

LEDs are produced in a variety of light colours (Correlated Colour Temperature (CCT)); the higher this temperature the more blue light is emitted. High blue light content of LED, over 5000K, has been cited as having the potential for stimulating the circadian rhythm and disrupting sleep patterns. A mid-range light colour (CCT) of 4000K with a colour rendering index greater than 80 would create a balance between the need to keep energy consumption to a minimum and limiting the amount of blue light emitted.

Sleep deprivation through suppression of the hormone melatonin

Melatonin is naturally produced by the body in the evening and contributes to the circadian rhythm in human beings and animals. The studies referred to below have evaluated that LED street lights are unlikely to produce alterations in melatonin levels due to the low intensity of light and low duration and intermittent pattern of exposure. It is also noted that self-illuminated electronic displays such as televisions, iPads and mobile telephones can suppress melatonin by around 20%. Stimulating the human circadian system to this level may affect sleep in those using the devices prior to bedtime.

Flicker

Flicker is present in some light sources; this could, potentially, cause distortion of the visual field and could be particularly problematic to some health conditions such as epilepsy and migraine. The flicker of LED lights has been discussed with Public Health England which is producing guidance for manufacturers to ensure that the flicker frequency is modulated away from frequencies likely to cause concern.

The optical safety of LEDs was considered in the following reports;

Effects of Light-emitting Diode Radiations on human retinal pigment epithelial cells in vitro, Saez-Ramoa C et al, Photochemistry and Photobiology Vol 89 No 2, March 2013, Pages 468-473

The potential of outdoor lighting for stimulating the human circadian system by the Alliance for Solid State Illumination Systems and Technologies (ASSIST), New York in May 2010 and revised in December 2012

Health effects of artificial light by the Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) European Commission, Brussels, March 2012

Limiting the impact of light pollution on human health, environment and stellar visibility. Falchi F et al. Journal of Environmental Management Vol 92, No 10, October 2011, Pages 2714–2722

LED Street Light Research Project. Remaking Cities Institute, Pittsburgh, September 2011

ELCF and CELMA Optical Safety of LED Lighting 1st Edition, July 2011

Effects of Exterior Lighting on Human Health, IES Position Statement (PS-03-10), New York, 2010

Guidance for Employers on the Control of Artificial Optical Radiation at Work Regulations (AOR) 2010, HSE May 2010

The indications of these reports are that the intensities used within street lighting are insufficient to cause harm, provided they are used properly and that considerations are given to mitigating specific concerns raised by individual residents.

Trafford Council also commissioned a Health Impact Assessment (HIA) published in June 2013 carried out by the Institute of Occupational Medicine. A criticism of the methodology of this report has been received in response to the consultation. It is considered that the methodology used was appropriate based upon the information available at the time and that the outcome would not be different if further reports were commissioned.

The HIA concluded *“the proposed LED street lighting programme has overall no (neutral) or a minor positive health and wellbeing impacts for residents, workers and visitors to Trafford compared to the existing type of street lights being used”*.

The Trafford HIA identified that, though there is some research that shows a relationship between exposure to artificial light and physical and mental wellbeing effects, the research evidence is weak, and these are not likely to occur through LED Street Lighting because of the type and intensity of light likely to be emitted and the low duration and intermittent pattern of exposure that may be encountered.

The report considers that mitigation measures such as shields, masks and dimming mentioned previously, and also measures which allow scope for procurement of any improvements to technologies within the duration of the contract, are likely to ensure that the majority of negative health and wellbeing impacts of LED street lights are mitigated and the positive health and wellbeing benefits enhanced.

The use of systematic monitoring and evaluation of any issues raised by residents following installation of LEDs would be carried out. The criterium for monitoring and evaluation are considered further in this report.

Trials of dimming currently taking place suggest that small changes in light levels in street lights are not noticeable to most people. Dimming does however have the potential to deliver increased energy savings, particularly in the urban environment. Risk assessments into lower night-time usage would support a reduction in lighting levels in locations where part night lighting would be less welcomed due to a fear of, rather than an actual recorded level of, crime.

Other authorities are also considering measures to reduce the energy and carbon consumption of street lighting. Durham County Council carried out an equalities and diversities impact analysis in September 2010 on the dimming of lights or switching off all together after dark in residential areas. This analysis concluded that street lighting is an important part of the Authority's sustainable transport policy and supports the council plan and should have due consideration for night-time road users. The reduction in street lighting should be assessed carefully to determine if this might have the effect of exacerbating the feeling of social exclusion for certain identifiable groups within the community (for instance, women, elderly or young people may not feel confident to walk alone late at night if there is poor or no lighting).

A review of the Durham County Council assessment in 2013 considered that dimming to 50% of illumination is of a standard to allow safe use of both pavements and highways and is not usually perceptible to the human eye.

An Equalities Impact Analysis has been undertaken and is attached as Appendix 3 to this report. This sets out an action plan to consider and monitor the impacts of LED and dimming, if Cabinet approves the recommendations of this report.

The main concerns highlighted a perceived increase in the fear of crime and personal safety within areas where lighting is reduced or dimmed. Current evaluations from the part night lighting project have, however, highlighted that there is no significant impact of actual recorded crime in locations where lighting has been reduced within the risk assessment strategy used by the Council.

Further concerns related to a potential for slips, trips and falls as a result of inconsistent lighting levels from dimming. Current trials however suggest that dimming of LEDs does not reduce the overall uniformity of lighting from that of the full power installations and therefore this impact is not anticipated.

LED lights emit a broad spectrum of light, some of which falls within the blue range. Whilst this enables humans to discern colours much more effectively than sodium lights, research indicates that LEDs which concentrate on the bluer part of the light spectrum may impact on the breeding and feeding habits of some bats, moths, insects and invertebrates. Blue light sources are also more readily scattered into the atmosphere and therefore limit our ability to see the night sky.

Many modern LED street lights have been designed to significantly reduce the upward light ratio as compared to standard lights and also allow the light to be better targeted towards the road, reducing the overall energy required and also reducing the light spill outside the ribbon of the road. LED street lights do not produce ultra violet light which is perceived to be the most damaging to ecology. Dimming is also practicable and cost effective within LED street lights and has the potential for lighting intensities to be reduced in more rural locations and during periods of lower traffic and pedestrian usage.

The following reports identified these concerns;

Shedding light: a survey of local authority approaches to lighting in England. Campaign to Protect Rural England (CPRE), London, 2014

A Review of the Impact of Artificial Lighting on Invertebrates

The Invertebrate Conservation Trust Charlotte Bruce-White and Matt Shardlow March 2011

Visibility, environmental and astronomical issues associated with blue-rich white outdoor lighting, International Dark-Sky Association, Washington DC, May 2010.

APPENDIX 3 - EQUALITIES IMPACT ANALYSIS

Derbyshire County Council

Equality Impact Analysis Record Form 2014



Department	Economy, Transport & Environment
Service Area	Street Lighting
Changes or proposals	Changes to the street lighting maintenance policy and the possible introduction of LED lighting with dimming to deliver sustainable revenue budget reductions
Chair of Analysis Team	Peter Booth - Head of Commercial Services
Date of Analysis	15 September 2014
Version	02

1. Prioritising what is being analysed

a. Description of current service arrangements

The Council maintains 89,000 street lights and the outturn energy cost for 2013/14 was £3,142,000. Laser, the largest local authority energy purchasing group buying for 110 local authorities has identified that energy costs are likely to rise by a further 80% by 2020. This would mean that the Council's energy bill would be approximately £5.5 million, significantly increasing the cost of maintaining street lighting.

Energy reduction initiatives have been introduced or trialled to seek to reduce the amount of energy used in the provision of street lighting. These have included the introduction of a Part Night Lighting policy in 2012, utilisation of energy efficient equipment, trials of LED lighting and dimming.

Part Night Lighting has been well supported in the rural communities of Derbyshire but from consultation carried out at the time, urban communities had more concern and identified a need for alternatives to switching off to be considered.

LED lighting trials in Derbyshire have also been well received. Although 5 concerns of glare have been raised, these have been resolved satisfactorily through changes to product design.

Trials of dimming have also been carried out, and to date no comments or concerns have been raised.

The Council has set challenging carbon reduction targets. Street lighting accounts for 20% of the total carbon the Council generates and has been targeted to reduce carbon by 34% by 2020, assisting to demonstrate the Council's sustainability leadership.

Street lighting is an important part of the Council's sustainable transport policy and service provision impacts on most communities in the County apart from the more rural parts in the west. The greatest street lighting provision is down the urbanized eastern side of the County.

b. Details of proposals or changes

The proposal is to replace the current planned maintenance policy with a reactive maintenance policy whereby lamps are not replaced routinely, and failed lamps which are not in defined priority areas would only be repaired if resources were available.

To mitigate the increased number of street light faults it is proposed to replace lights with LED and, where appropriate through risk assessment, dimming. This would assist in the reduction of energy usage and carbon generation from service provision. Dimming in conjunction with low energy lights will enable the level of lighting to be reduced during the night when highway usage is at a minimum. Risk management will be utilised to establish locations where dimming would not be appropriate, however, dimming to 50% of illumination is considered to allow safe use, of both pavements and highways, and is not usually perceptible to the human eye.

LEDs and dimming are being utilised by an increasing number of local authorities to reduce the cost of service provision without the need to restrict availability through switching off as with Part Night Lighting. This could provide a more acceptable energy reduction option within urban areas of Derbyshire.

c. Rationale for proposed changes

There is a need to reduce energy usage associated with street lighting provision to assist the Council in achieving required budget reductions. The service can also significantly contribute to the Council's carbon reduction target. In seeking to achieve these objectives the following community benefits of street lighting will be considered:

- Contributing to the reduction of night time personal injury accidents
- Reducing street crime
- Reducing fear of street crime
- Promoting sustainable transport by promoting the use of public transport, cycling and walking
- Facilitating social inclusion by providing the freedom to walk along and use streets after dark
- Promoting economic development by supporting the 24-hour leisure

- economy and distribution
- Facilitating lifelong learning by providing after dark access to educational facilities
- Assisting the emergency services to identify locations and carry out their duties (without modern street lighting the time taken to attend an incident could be increased)

Existing equipment is primarily based on a Low Pressure Sodium (SOX) light source. The characteristics of this light source are such that the light does not remain stable when the voltage is varied and cannot therefore be dimmed.

Trials of LED lighting have shown increased efficiency and energy reduction over conventional light sources during the last 3 years, with energy saving of 60% now being achievable. Several different styles of lights have been trialled, some units have led to perceived concerns of glare when the light source can be viewed and some ability to shield direct view of the LED is considered important.

Trials of dimming have taken place in Derbyshire over the last three years and these have not resulted in any concerns from service users regarding either the utilisation of the technology or the reduced lighting levels applied.

The use of dimming would also assist to reduce glare from LED lights.

Of the LED lights currently installed premature failures have been approximately 2% and in connection with the control equipment not the LED. Failures at this level in addition to the extended lifetime expectations of LED (approximately 25 years) would deliver continuing savings in future maintenance activities.

Manufacturers of LED street lights are indicating that improvements to product manufacturing processes and components may reduce premature failures to below 1% within 12 months without increasing production costs. This is much less than the 10% anticipated early failure rate of conventional lamps.

2. The team carrying out the analysis

Name	Area of expertise/ role
(Chair) Peter Booth	Head of Commercial Services
Debbie Anderson	Street Lighting Manager
Ray Holmes	Street Lighting Designer
Alison Chandler	Community Safety
Neill Bennett	Consultation Data Analysis
Vicky Fox	Performance and Engagement
Simon Tranter	Principal Engineer Traffic and Safety
Jennie Hodgkinson	Senior Communications Officer

3. Existing information and consultation based feedback

a. Sources of data and consultation used

Source	Reason for using
Public consultation on the proposed service change and possible investment into LED and dimming	To evidence public reaction to proposed changes
Dimming trial sites utilised in Derbyshire	To evidence any concerns raised by service users regarding the utilisation of the technology or the reduced lighting levels applied
LED sites within Derbyshire	To evidence any concerns raised by service users regarding the utilisation of the technology and change of light source
Consultation outcomes identified in the EIA for the Part Night Lighting policy introduction	Identification of the main concerns of service users in the reduction of street lighting provision
Durham County Council Cabinet Report November 2013 and supporting EIA. Seeking approval of a revised street lighting policy which included utilisation of dimming	Provides evidence outcomes of consultation with service users on policy change including dimming in a similar shire county. An EIA supporting the Cabinet report identifies the impacts on characteristic groups in County Durham
Trafford LED Street Lighting Programme Health Impact Assessment	Provides a balanced assessment of the potential health and wellbeing impacts of implementing LED street lighting which can be dimmed
CELMA Optical Safety of LED Lighting	Research document to evidence the potential effects of optical radiation on eyes and skin
Effects of light-emitting diode radiations on human retinal pigment epithelial cells	Research document to evidence the potential effects of optical radiation on eyes
Scientific Committee on Emerging and Newly Identified Health Risks (SCENHIR) health effects of artificial light March 2013	Research document to evidence the potential health effects of artificial light
The potential of outdoor lighting for stimulating the human circadian system	Research document to evidence the potential health effects of artificial light
Effects of exterior lighting on human health	Research document to evidence the potential health effects of artificial light
British Standard BS5489, Code of Practice for the design of road lighting - Part 1: Lighting of road and public amenity areas	This industry standard provides for the ability to vary the lighting provision of a road where demand varies during the course of the night. Dimming technology

Source	Reason for using
	allows road lights to be dimmed during periods of lower traffic usage
Institution of Lighting Professionals Guidance Notes for the Reduction of Light Pollution	Identifies ways of reducing obtrusive light by the use of equipment specifically designed to minimise the upward spread of light near to, or above the horizontal
Institution of Lighting Professionals Code of Practice for Variable Lighting Levels for Highways	Best practice guidance on the use of dimming in street lighting
Institution of Lighting Professionals Lighting for Subsidiary Roads	Identifies the needs of pedestrians and other non-vehicular road users' dependant on the type of lamp as well as the class of road and how reductions in lighting levels can be applied
Campaign to Protect Rural England (CPRE) report Shedding Light	To contribute to the understanding of how local authorities are approaching LED lights and dimming
International Dark-Sky Association report on Visibility, Environmental, and Astronomical Issues Associated with Blue-Rich White Outdoor Lighting	To contribute to the understanding of the impacts of outdoor lighting on the environment
Neighbourhood and Home Watch Network and Suzy Lamplugh Trust Street Lighting and Perceptions of Safety Survey November 2013	To contribute to the understanding of public perceptions on the need for street lighting
A review of the impact of artificial lighting on invertebrates	To contribute to the understanding of the impacts of outdoor lighting on the environment
Guidance for Employers on the Control of Artificial Optical Radiation at Work Regulations (AOR) 2010	Research document to evidence the potential health effects of artificial light

4. Known impact on different protected characteristic groups

- a. From existing data and information – who is likely to be adversely affected, how, and to what degree? Will anyone gain or benefit from the proposals?

Protected Group	Findings
Age including children and families, older people	Consultation outcome for the EIA produced by Durham County Council identified a potential for increased fear of crime being a high concern to older people
Disabled people including mobility, sensory, learning, mental health, HIV, and also include carers and relatives	Quality and level of lighting can affect those with some disabilities – consultation by Durham that identified replacing old yellow lighting with whiter light source can help individuals with cataracts. Research by CELMA indicates that some light sensitive conditions, such as Age-related Macular Degeneration (AMD), may be

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	aggravated by high intensity blue light. Disabled people in previous consultations have expressed concern over the potential for slips, trips and falls in areas of lower lighting levels
Gender (Sex) including men and women, boys and girls	Females could have personal safety concerns at reduced levels of lighting when walking alone during the hours dimming would be applied
Gender reassignment – including impact if any on Transgender people	Possible community safety concerns that reduced light levels could increase the potential for ‘hate crime’ in known areas for anti-social behaviour
Marriage and civil partnership – also include impacts on lone parents and unmarried couples	No identified impacts
Pregnancy and maternity – including new mothers/ parents	Concern that reduced lighting levels may impact on late night/early morning travel for maternity care
Race – including all racial groups, including impact if any on Gypsies and Travellers	Possible community safety concern that reduced light levels could increase the potential for ‘hate crime’ in known areas for anti-social behaviour
Religion and belief including non-belief, including religious minority communities, Humanists	Possible community safety concern that reduced light levels could increase the potential for ‘hate crime’ in known areas for anti-social behaviour
Sexual orientation – including the impact, if any, on LGB people	Possible community safety concern that reduced light levels could increase the potential for ‘hate crime’ in known areas for anti-social behaviour

Non-statutory

Poorer and disadvantaged communities and groups, including people who experience financial exclusion	Low income people or people who work shifts and walk/cycle to work may be adversely affected by proposed reduced lighting levels in terms of community safety
Rural communities	Dimming potentially could assist to minimise the environmental impact on rural communities of modern whiter light source such as LED's for street lighting

Impact on employees of Derbyshire County Council or prospective employees

There are no additional identified specific impacts on employees of Derbyshire County Council or prospective employees which are not identified within the statutory and non-statutory groups above

- b. From existing customer and other feedback – who is likely to be adversely affected, how and to what degree? Will anyone gain or benefit?

Protected Group	Findings
Age	Elderly residents may feel more vulnerable in areas of lower lighting levels Children may feel more vulnerable walking to and from school in areas of lower lighting levels
Disability	Partially sighted people may perceive difficulties in changes between light and dark area. RNIB data suggests over 25,000 residents of Derbyshire have some sight loss. People with mobility concerns may feel at greater risk of slips and falls in areas of lower lighting levels
Gender (Sex)	In general, females perceive a greater risk of crime in areas of lower lighting levels. Dimming provides the ability to retain a level of lighting rather than switching off some lights to deliver required budget savings
Gender reassignment	May feel more vulnerable in areas of lower lighting levels but dimming of lights may be viewed as preferable to the complete switching off of lights in urban areas during periods of low highway usage
Marriage and civil partnership	No identified impacts
Pregnancy and maternity	May possibly perceive reduced lighting levels could impact on access to maternity care
Race	May feel more vulnerable in areas of lower lighting levels but dimming of lights may be viewed as preferable to the complete switching off of lights in urban areas during periods of low highway usage
Religion and belief including non-belief	May feel more vulnerable in areas of lower lighting levels but dimming of lights may be viewed as preferable to the complete switching off of lights in urban areas during periods of low highway usage
Sexual orientation	May feel more vulnerable in areas of lower lighting levels but dimming of lights may be viewed as preferable to the complete switching off of lights in urban areas during periods of low highway usage

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Non-statutory

Poorer and disadvantaged communities	Residents may feel more vulnerable in areas of lower lighting levels particularly those who walk or use public transport. Dimming would assist to retain lighting all night rather than switching some lights off to make energy and carbon savings
Rural	People in rural areas may perceive a lower standard of service provision particularly as part night lighting is already utilised in these areas. Consultation has though identified a concern regarding the environmental impacts of modern lighting on the rural environment and dimming could assist to mitigate this

Employees or prospective employees

There are no additional identified specific impacts on employees of Derbyshire County Council or prospective employees which are not identified within the statutory and non-statutory groups above

- c. Are there any **other** groups of people who may experience an adverse impact because of the proposals?

None identified

d. Gaps in data

What are your main gaps in information and understanding of the impact of your policy and services? Please indicate whether you have identified ways of filling these gaps.

Gaps in data	Action to deal with this
There were very few responses from some protected strand groups	Street lighting is present in most communities and so the effects are considered to be relevant to all groups

5. From the consultation you have carried out specifically in relation to proposed changes, what views or issues have been raised by those who have responded?

a. Please summarise the consultation which has been carried out

Consultation was carried out between 15 June and 8 August 2014 asking whether residents would support a change to the street lighting maintenance policy and the introduction of LED lighting with dimming in residential areas to assist the Authority in meeting its budget reduction and energy and maintenance reduction targets.

538 responses were received with, 288 (55%) agreeing to a change in maintenance policy, 442 (86%) respondents supporting the utilisation of dimming in certain locations at night and 467 (90%) of respondents also supported the investment in LED lights.

82 (15%) of respondents who provided comment disagreed with setting any priority for the repair of faulty street lights

b. Please summarise the feedback received. This should make clear where those who have responded have highlighted any potential adverse impact as well as their opinions on the proposals.

In total 128 comments contained concerns that the proposals to change the street lighting maintenance policy could lead to an increase in crime, the fear of crime and also in potential for personal safety concerns if street lighting failed and was not repaired promptly.

81 respondents felt that LED lights and dimming was preferable to not working at all, "why should a town have more light than anywhere else".

29 respondents, who provided comment, felt that the impact of the proposed policy change would be greater in locations where part night lighting has already been implemented.

15 respondents were concerned that dimming of street lights would increase fear of crime.

9 respondents, who provided comment, highlighted that dimming may cause irregular patterns of light on the road which could impact on personal safety and also fear of crime.

8 respondents, who provided comment, expressed concern regarding the possible impact of blue light in LED street lights on health and wildlife.

Although few, there were as many comments concerned that LED lights may be too bright as those who felt LED lights may be too dim.

Some respondents felt it made sense to plan for the future but felt that it may be a more cost effective option to consider a rolling programme of replacement when

conventional lights fail rather than a large scale replacement programme.

2 respondents also suggested that street lights be fitted with motion sensors

6. Are there any ways of avoiding or reducing likely possible adverse impact on any groups of people, what are those actions, and how will they assist?

Street lighting provides improved safety standards for all highway users and should have due consideration for night-time users. Irregular light patterns due to faulty street lights may result in some communities feeling more vulnerable. Social exclusion may occur because of fears about community safety or road safety or because poorly lit areas are less attractive to visit. The introduction of LED lights which are less likely to fail would reduce the number of faulty street lights and reduce the likelihood of irregular light patterns.

The use of dimming technology for street lighting would better assist to manage the use of modern energy efficient white light sources identified through local and national consultation as being perceived to be brighter than current lights. Dimming would reduce, at times of low highway usage, the brightness of lights and therefore provide a positive impact on controlling modern light sources. British Standards for lighting design allow for some reduction in luminance levels to recognise the better colour rendering of white light sources. Dimming to 50% of illumination is of a standard to allow safe use of both pavements and highways and is not usually perceptible to the human eye.

Research by CELMA has identified that the blue light radiance of diffuse light sources is relatively low and are considered safe but direct viewing of all light sources should be avoided especially at short distances. This research identifies that the reflexive reaction of the human eye to turn away from bright light sources is such that sufficient exposure times to cause damage are not reachable.

International Dark-sky Association document identifies blue-rich light as having an effect on the circadian function of mammals, however research shows that the levels of exposure need to be far in excess of that produced from street lighting to affect humans. Dimming in areas of low priority will reduce further any potential impacts on mammals. The use of handheld phones, tablets and computers are likely to have a greater impact on sleep patterns in humans. Light intrusion into properties and specific concerns about glare can also be reduced by the use of lights with flat glass and, where necessary, shields.

Whilst it may be possible to use dimming in most locations, it would not be used in the following areas unless well evidenced risk management identified a level of lighting appropriate to a reduced highway usage could be introduced:

- town centres,
- locations where there is a significant night-time traffic accident record.
- areas with an above average record of crime
- Areas provided with CCTV, local authority or police surveillance equipment

- Areas with sheltered housing and other residences accommodating vulnerable people unless there is a community need and support
- Areas with a 24hr operational emergency services site including hospitals and nursing homes
- Formal pedestrian crossings, subways and enclosed footpaths and alleyways
- Where there are potential hazards on the highway (roundabouts, central carriageway islands, chicanes, speed-humps, etc.)

There are improvements to road safety through the use of LED due to the improved colour rendition and long distance visibility, however dimming at locations where there is a significant night-time accident record or where there are potential hazards on the highway would reduce the visual acuity of drivers and would therefore be used with caution.

The fitting of motion sensors is currently being trialled in Europe but the technology within street lighting is currently a far more significant investment.

7. Main conclusions and Recommendations

Conclusions

Based on the analysis the following is believed to be of importance and should be noted by decision-makers:

From the consultation, 86% of respondents supported the use of dimming to maximise energy savings and 90% supported the use of LED lights. Comments received indicated that dimming is not appropriate for all areas and risk assessment would need to be utilised to ensure its use has been properly evaluated to avoid, as reasonably as possible, adversely impacting on the fear of crime and the potential for slips, trips and falls.

From earlier consultation on the introduction of the Part Night Lighting policy by the Council there has been a concern relating to the switching off of lighting in urban areas of the County. This recent street lighting consultation has identified concern at the suggestion that street lights in non-priority areas would not be repaired in order to achieve needed budget reductions. In urban areas the availability of some level of lighting from all street lights throughout the night is considered appropriate to achieve the identified community benefits. Use of dimming, in conjunction with LEDs, provides an opportunity to retain lighting and still achieve against energy and carbon reduction targets. The consultation outcome would suggest that this would provide a more acceptable alternative to switching off lights in urban areas.

The blue light content of LED is of concern to some respondents, although, whilst there is some perception that this may be detrimental to health, there is little supporting evidence to suggest that this is particular to street lighting, and not from other sources used in daily life. The indications are that the impact of LED street lighting with dimming would have no greater impact on health than other modern

street light sources.

The recent consultation feedback is indicative of a greater concern regarding the health impacts of street lighting not being available either through a controlled switching off policy or lights not being repaired.

Recommendations

It is recommended that:

1. The use of dimming is subject to risk assessment prior to implementation.
2. Consideration is given to utilising dimming in conjunction with LEDs for street lights in urban areas rather than implementing the use of part night lighting.
3. The use of systematic monitoring and evaluation of issues raised by residents following installation of dimming and LEDs to identify if there is any impact on health.

Monitoring options include:

- Residents' complaints/concerns about glare or other health and wellbeing related issues.
- Pedestrian, cyclist and motor vehicle driver complaints/concerns about glare or other new lighting system issue.
- Complaints/concerns expressed by other local stakeholders' e.g. environmental groups, health groups, residents' associations, business groups, voluntary groups and charities.
- New research findings on LED street lighting and health and wellbeing published in a scientifically and/or governmentally recognised peer-reviewed scientific journal and/or undertaken by a recognised and respected individual/team of scientists.

In this way, residents, users of the areas and local stakeholders are all given the chance to comment and express concerns.

8. Action planning in response to the completed analysis

Objective	Planned action	Who	When	How will this be monitored?
What you want to achieve	What you intend to do	Responsible person or department	Timing of action	Monitoring and review arrangements
Lessons learnt reviews from dimming installations to refine risk assessment criteria for new installations	Monitor feedback on installations particularly comments from representational groups to develop improved risk management	Project Team (Senior Project Engineer - Street Lighting) in liaison with Community Safety	From 2015/16 as part of any implementation of dimming on the lighting network - see implementation proposals in section 2 of the report	Consideration of feedback on installations in liaison with Community Safety
Understanding of the effectiveness of dimming on modern light sources to assist and manage concern at the brightness of white light against the concerns of reduced lighting levels	Determine if applied dimming regime is appropriate to all locations Refine options other than dimming to mitigate glare and light intrusion Ensure the ability to utilise improved equipment during the life of any contracts	Street Lighting Team (Senior Project Engineer - Street Lighting) and Project Team	From 2015/16 as part of implementation of major light replacement programmes – see section 2 of the report	Six monthly reviews of any identified community issues
Review impacts of dimming application times to ensure energy reduction is being achieved in a reasonable manner	Monitor community feedback to assist or refine switching times if necessary Monitor any changes to dimming regimes that may be applied by Distribution Network Operators	Senior Project Engineer - Street Lighting in liaison with Community and Highways Safety Teams	From 2015/16s part of implementation of major light replacement programmes – see section 2 of the report	Six monthly reviews of any identified community issues
Monitoring of any possible	Record any concerns raised and	Senior Project	During first year	Six monthly reviews and

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indirect health concerns and corrective actions	<p>the supporting evidence on the level of impact</p> <p>Review with Public Health if any concerns raised require corrective action</p> <p>Consider equipment selection to assist or mitigate any health impacts</p>	Engineer - Street Lighting in liaison with Public Health	(2015/16) of initial equipment installation	reporting on any issues arising
Review findings on LED street lighting health and wellbeing published in scientific and government recognised peer reviewed journals	<p>Consider any health impacts identified from LED street light replacements already implemented in major urban conurbations both in this country and internationally</p> <p>Review any benefit dimming combined with use of LEDs provided to manage community concerns regarding brightness and glare from implemented schemes in this country and internationally</p> <p>Determine any research findings identifying the level of health impacts due to exposure times to all LED source equipment utilised by the public and any areas of concern.</p>	Senior Project Engineer - Street Lighting in conjunction with Public Health	On-going Research	Review by Street lighting and Public Health to determine if any finding outcomes require further action.

9. Monitoring and review arrangements

Please outline what steps will be taken to monitor and review the implementation of proposals if they are agreed here:

Carry out further opinion surveys annually after implementation
Report on the number of residents' complaints/concerns about glare or other health concerns
Monitor any increase in the rate of road traffic accidents within areas where LED lighting with dimming has been implemented.

10. Confirmation that equality impact analysis (EIA) completed and read

Name of officer signing off EIA as completed

Date:

This Equality Impact Analysis has been read by

Name	Date	Position

Where and when published e.g. with Cabinet Report, on DCC website

Decision-making processes

Attached to report (title): Street Lighting Service Delivery Strategy

Date of report: 21 October 2014

Author of report: Debbie Anderson

Audience for report: Cabinet

Public

Web location of report:

Decision in relation to report

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Details of follow-up action or links to further EIAs

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Updated by:

Date:

APPENDIX 4 – FINANCIAL ASSESSMENT

Assumptions The traditional solution assumes that the current 4 year lamp replacement cycle continues without switching to LED lights. However, as many columns are old it is assumed that the operating costs will include the replacement of a small percentage of defective columns each year. At the same time these will be fitted with LEDs. There will be energy reductions associated with the increasing proportion of LEDs in the traditional solution and this has been accounted for in the analysis. Current budget information was used to provide energy and maintenance costs.

The LED solution assumes that 68,796 lights will be replaced with LEDs over a three year period commencing in the summer of 2015. In addition, 22,236 old columns will also need to be replaced as it is not cost effective to put a new LED light with a life expectancy in excess of 25 years on a column that is already past its design life. The financial analysis is based on a three year transition period during which the proportion of LED lights increases until by the end of 2018/19 all 68,796 street lights will have been replaced with LEDs. It is assumed that maintenance costs will be minimal and will include an annual structural inspection. It is also assumed that dimming savings will be achievable. The total capital requirement to replace lights and columns has been estimated at £23.3m.

Sensitivities

Sensitivity analysis was undertaken by assigning different values to key variables such as borrowing costs, general and energy inflation and capital expenditure with the outputs analysed to identify which variable had the most impact on future costs/savings.

This showed that the extent of costs/savings was most sensitive to the degree by which future energy prices rise. Therefore, the outputs from the model are based on varying future energy prices, with future energy indexation at 2.5%, 5%, and 10%. Note that the actual energy price inflation experienced by the Council over the last four years was 11% p.a. and the forecast is for rises of 10% p.a. until 2020.

Key financial outputs

Costs and savings have been evaluated over 20 years commencing on 1 April 2015 as this was considered to be a prudent approach for lights that are expected to have a design life of 25 years. For modelling purposes, the project is assumed to be financed using a 20 year loan from the Public Works Loan Board (PWLb) on an annuity basis.

The following table shows the savings that could be achieved over 20 years by the Council for different energy inflation rates if an LED solution is implemented:

Energy inflation	Net nominal savings (cost) after financing costs (annuity basis)	Annual saving in 1 st full year of operation in 2019/20 (post financing)	Average annual saving (post financing)	Payback period (pre-financing)
2.5%	£24.0m	£1.0m	£1.2m	9 yrs 6 mths
5%	£32.7m	£1.2m	£1.6m	9 yrs 0 mths
10%	£61.4m	£1.6m	£3.1m	8 yrs 1 mths

This shows that net nominal savings after financing costs are taken into account range between £24.0m with modest energy price inflation of 2.5% and in excess of £60m for 10% energy inflation. In the early years of implementation of LED lights, the debt charges will exceed savings but by the time all LED lights are operational savings will be £1m or more per annum. However, if the debt charges are profiled to match the drawdown of funds then there can also be savings in the early years. Average annual savings range between £1.2m and £3.1m depending on the level of energy inflation. The length of time taken to recover the initial capital expenditure (pre-financing) or payback period ranges from 9 years and 6 months to 8 years and 1 month.

The above analysis is indicative and is based on an estimate of the expected costs of purchasing and installing LED lights. Only when the procurement process commences will there be a better indication of the annual cost savings and the impact on budgets.