Takoma Park City Council Meeting – October 3, 2018
Agenda Item 2

Presentation
Informational Presentation on LED Streetlights

Recommended Council Action
Receive informational presentation from International Dark Sky Association Director, Jim Dougherty, on LED streetlights

Context with Key Issues
The City Council authorized staff to pursue the conversion of existing streetlights to LED technology via Resolution 2016-41. The Council Resolution directed the staff and Pepco to ensure that the replacement fixtures be International Dark Sky Association (IDA) Certified, and have a color temperature of 3000 Kelvin. Currently test fixtures have been installed on three City streets. Those test fixtures are in compliance with Resolution 2016-14.

IDA representative Jim Dougherty has engaged with interested residents to provide information and share IDA suggestions.

Council Priority
Environmentally Sustainable Community; Fiscally Responsible Government

Environmental Considerations
The conversion of the overhead streetlights will result in significant reduction in electricity use for this purpose; estimates at this time are 30 to 50% less energy. Additionally, the ground level lighting will be improved as the fixtures are International Dark Sky Association Certified and meet requirements for eliminating light pollution above the fixture and focusing the light on the areas below.

Fiscal Considerations
The City currently pays approximately $180,000 annually to Pepco for streetlight operation and maintenance, taxes, and fees; and pays another $53,000 for electricity to WGL (for 100% Wind) resulting in a total annual cost of $233,000 for streetlights. Based on Pepco's calculations, the reduction in energy use and maintenance costs will result in a savings of at least $50,000 to $60,000 annually and may be as much as $100,000. The overall cost of the program is expected to be $372,000 and the City anticipates a $260,000 rebate from the Empower Maryland Program, leaving a balance of $111,000. Based on the projected annual savings, the program will pay for itself in less than two years and those savings from reduced energy use and maintenance costs will carry through for the life of the fixtures.

Racial Equity Considerations
The conversion of existing street lighting will impact the entire City and affect all streets. The selected fixture will provide a uniform appearance of light fixtures throughout the City. Currently, there are numerous different styles of fixtures and wide variation in lighting levels. This will provide

a more uniform street light regardless of area or neighborhood, resulting in a more equitable and consistent manner to provide necessary street lighting throughout the city.

Attachments and Links

- IDA Presentation

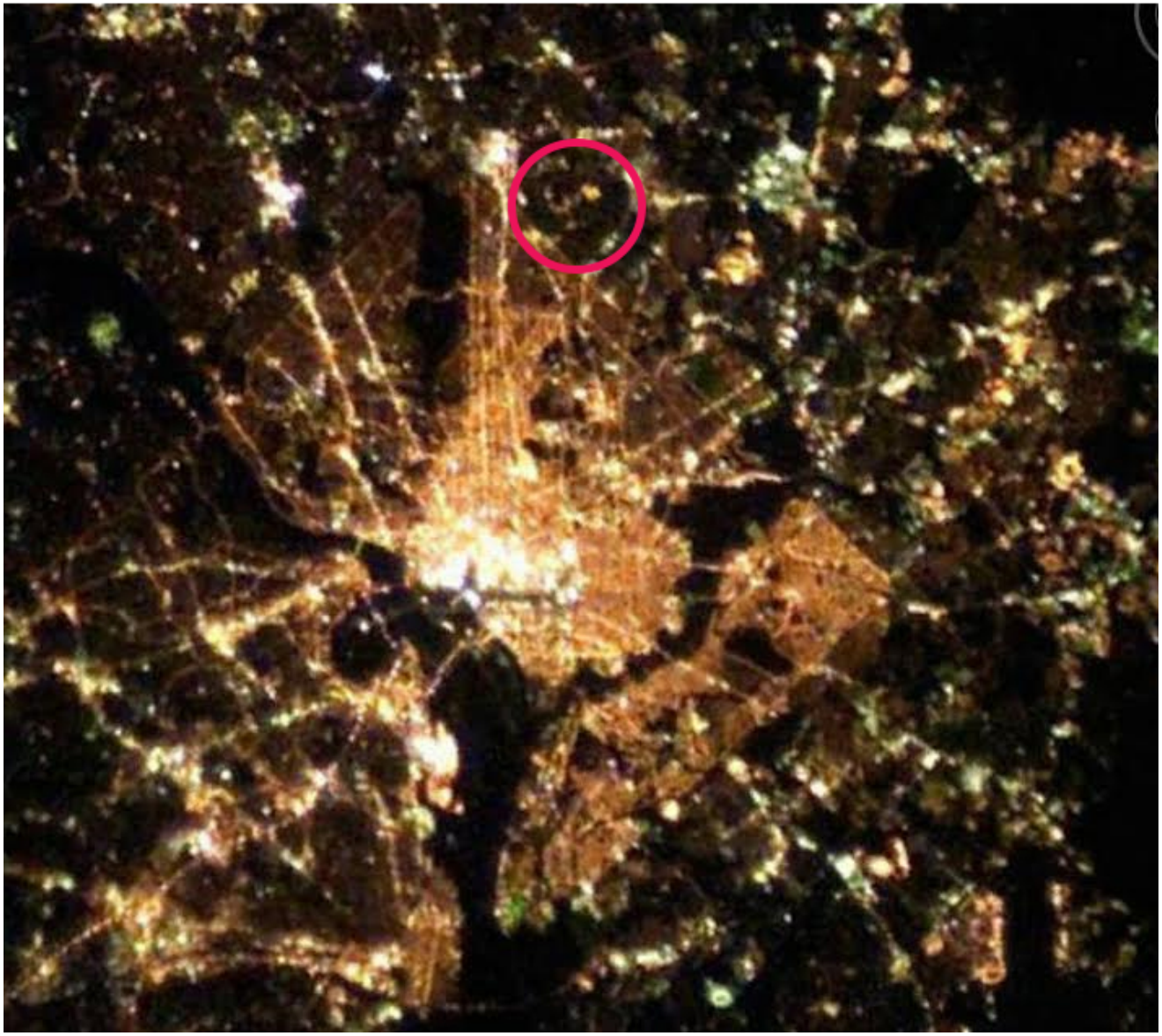
Smart, Eco Streetlighting 2018

Presentation to Takoma Park

City Council

September 18, 2018

Washington and Takoma Park by Satellite



The Consequences of Bad Lighting

- Adverse human health effects from light trespass
- Wasted energy
- Wasted money
- Needless greenhouse gas emissions/air pollution
- Loss of the night sky
- Wildlife and greenspace ecosystem impacts
- Safety reductions: impaired street-level visibility

UNIVERSITY OF EXETER

“Blue light” of LED streetlights linked to breast and prostate cancer

The “blue light” emitted by street lights including LEDs, and commercial outdoor lighting such as advertising, is linked to a significant increase in the risk of breast and prostate cancer, innovative new research has concluded.

New research suggests a link between the “blue light” emitted by street lights and an increased risk of certain cancers

A study led by the Barcelona Institute for Global Health (ISGlobal) and involving the University of Exeter found that participants living in large cities with heavy exposure to blue lights at night had double the risk of prostate cancer and 1.5 times higher risk of breast cancer. This was compared to populations with less exposure to blue light.

Older lighting schemes emit a glow within the “orange” spectrum, but new modern lighting creates a bright “blue” light emission. The researchers found the bluer the light emission that people in large cities were exposed to, the higher the risk of cancer. The study also found that people who lived in homes with darker rooms, by using window shutters for example, had lower risk than those who did not.

The study, published in Environmental Health Perspectives includes medical and epidemiological data of more than 4,000 people between 20 and 85 years of age in 11 Spanish regions. It particularly examined Madrid and Barcelona. Indoor exposure to artificial light was determined through personal questionnaires. In the first study of its kind, outdoor levels of artificial light were evaluated based on night-time images taken by astronauts aboard the International Space Station.

Impacts to Urban Fish & Wildlife

Mammals:
- Disruption of foraging patterns
- Increased predation risk
- Disruption of biological clocks
- Disruption of dispersal movements
- Diurnal species invade nocturnal niches

Birds:
- Disrupted predator/prey relationships

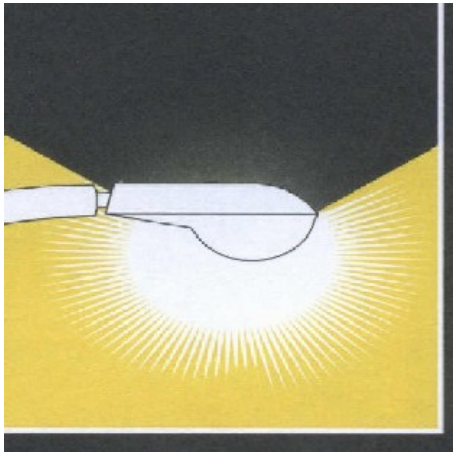
Invertebrates:
- Insects (drawn to lights) suffer increased mortality
- Pollination is impaired
- Migration is impaired

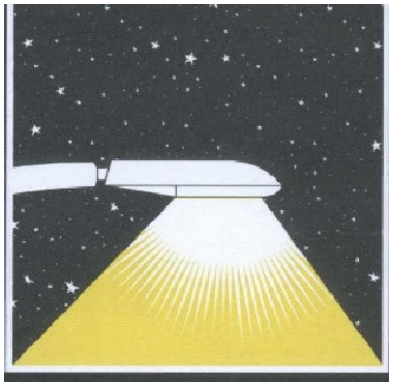
Fish:
- Aquatic ecosystems are impaired

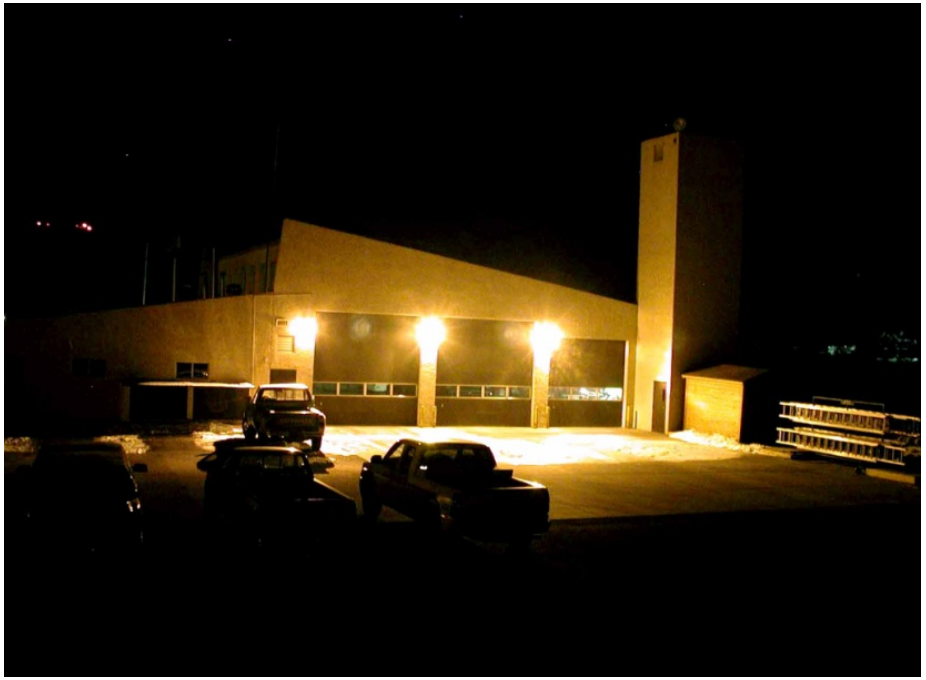
IDA's Design Objectives for Streetlights and other outdoor lighting

- Proper brightness (tested to standard)
- Full shielding
- Color temperature at 2,400 - 3,000° K
- Adaptive control technology, e.g., dimmers

Full Shielding







Shielding enhances our vision

Excessive brightness

LIGHT-METER READINGS ON SELECTED STREETS

- Joshua Barney Drive N.E. (official DDOT test site)
  –Local residential street with asphalt surface / – One 196-watt LED lamp and other LED lamps of unknown wattage
  Average illuminance: 1.92 foot-candles (**4.8 times AASHTO**)

- N Street S.E. in front of baseball stadium (official DDOT test site)
  –Local commercial street with asphalt surface / –Various globe LED fixtures
  Average illuminance: 0.26 foot-candles (**68% less than AASHTO**)

- 800 block of Rittenhouse Street N.W.
  –Local residential street with asphalt surface / –110-watt LED fixtures
  Average illuminance: 2.56 foot-candles (**6.4 times AASHTO**)

- 6100 block of 9th Street N.W.
  –Local residential street with asphalt surface / –110-watt LED fixtures
  Average illuminance: 2.33 foot-candles (**5.8 times AASHTO**)

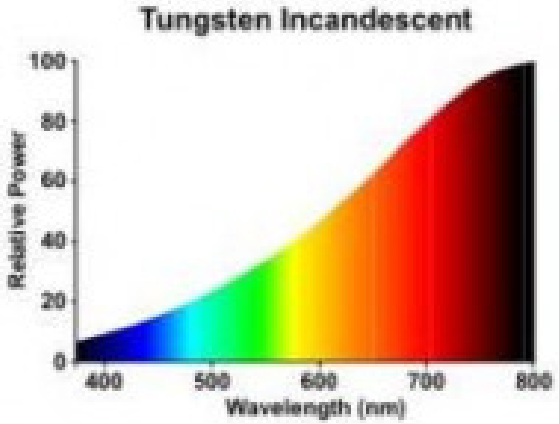
- 6300 block of 8th Street N.W.
  –Local residential street with asphalt surface / –LED fixtures of unknown wattage
  Average illuminance: 1.63 foot-candles (**4 times AASHTO**)

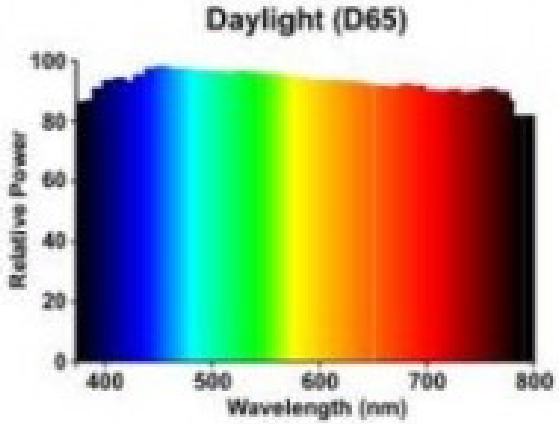
- 700 block of Peabody Street N.W.
  –Local residential street with asphalt surface / –50-watt LED fixtures
  Average illuminance: 0.53 foot-candles (**33% greater than AASHTO**. For a new installation, this is appropriate.)

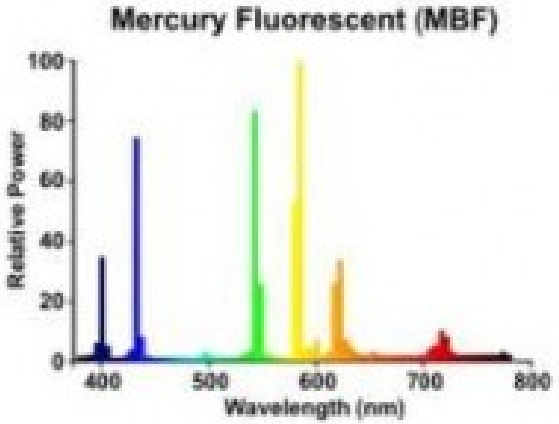
- 800 block of Tewkesbury Place N.W.
  –Local residential street with concrete surface / –150-watt HPS fixtures
  Average illuminance: 3.63 foot-candles (**9 times AASHTO**)

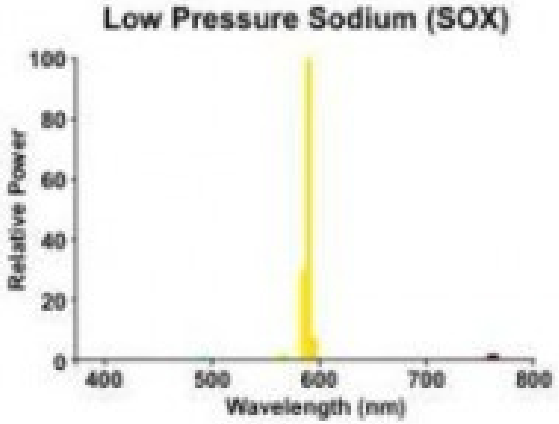
- 6100 block of 8th Street N.W.
  –Local residential street with concrete surface
  Average illuminance: 0.42 foot-candles (**40% greater than AASHTO**)

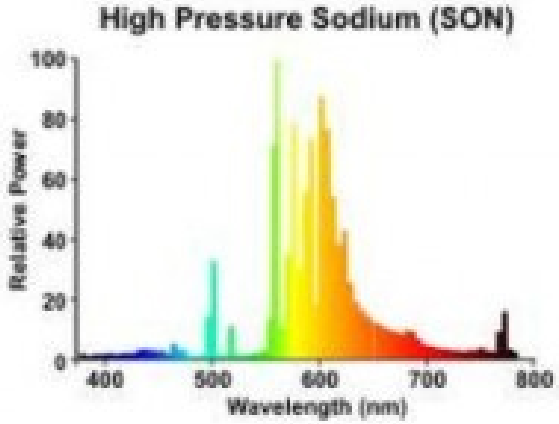
Lighting Color

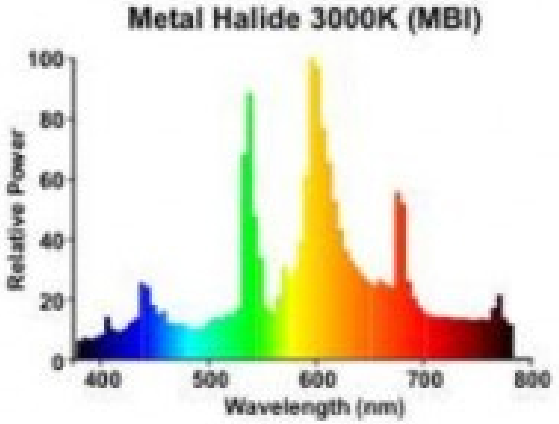




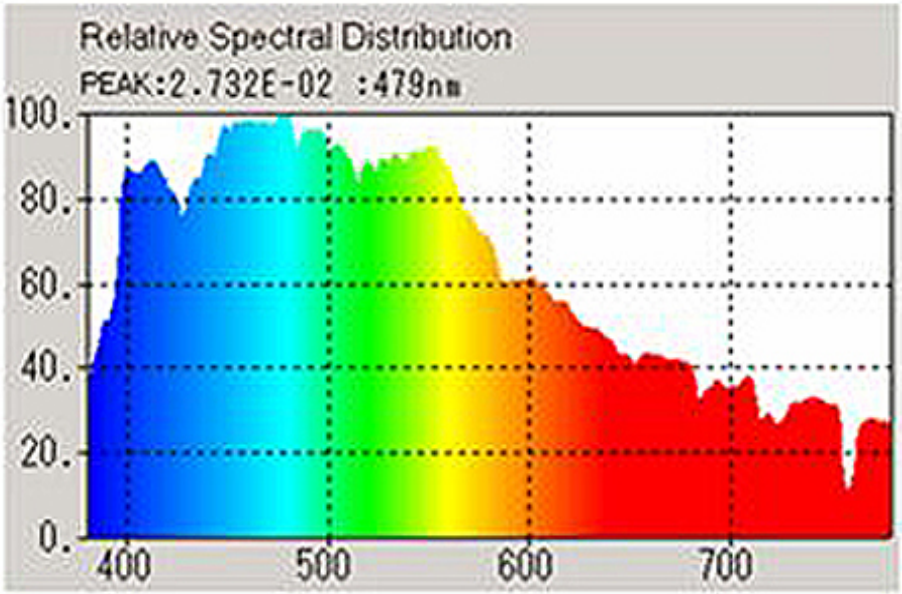




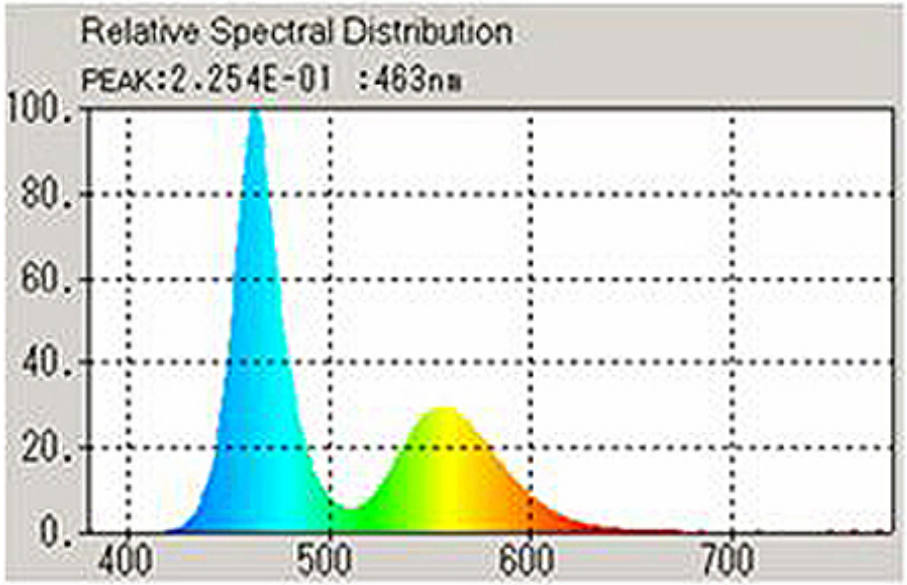




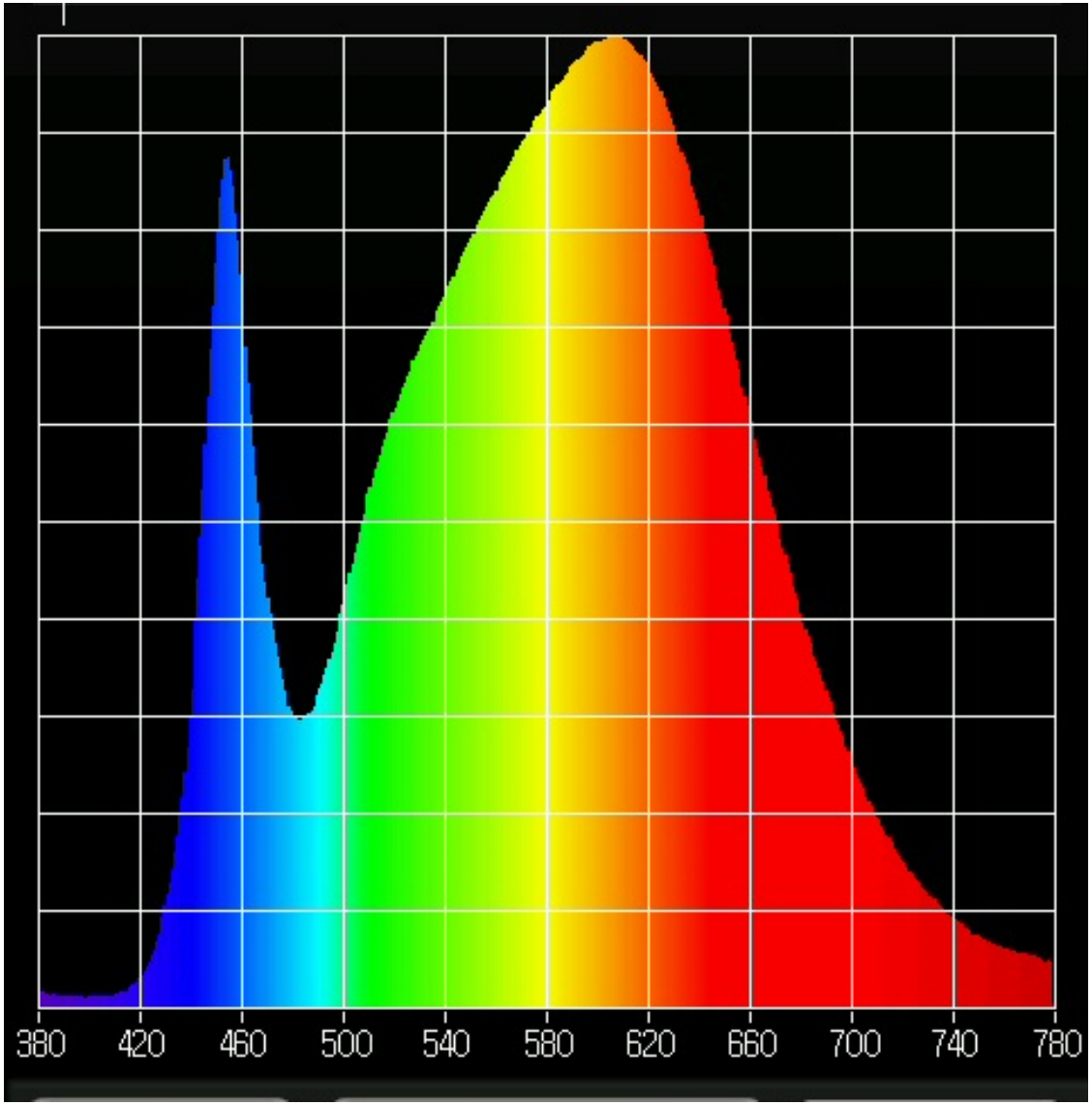
Daylight



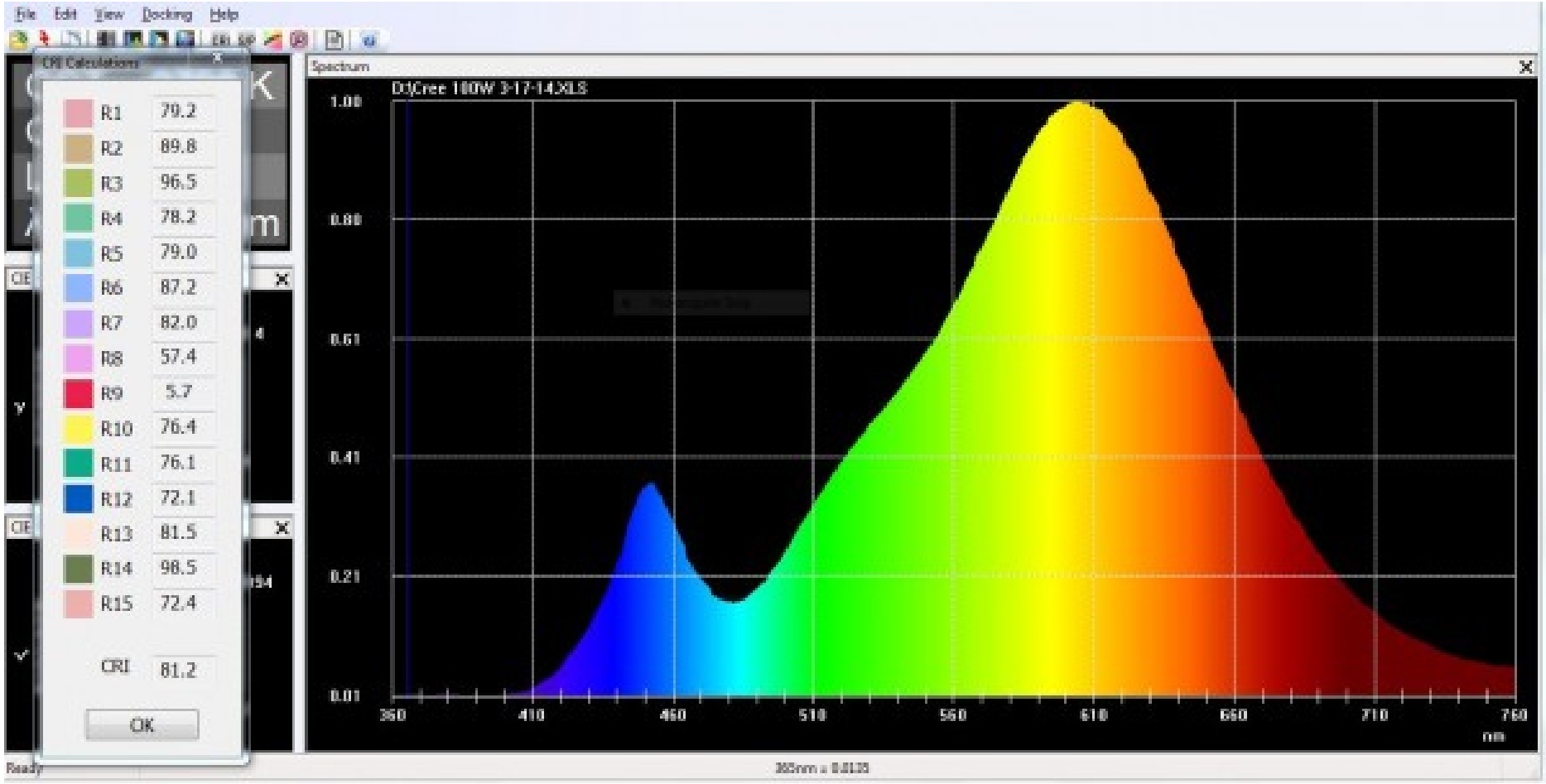
White LED



- 4900K CCT LED



SPD – 3000°K


File Edit View Docking Help
CRI Calculations
R1 79.2
R2 89.8
R3 96.5
R4 78.2
R5 79.0
R6 87.2
R7 82.0
R8 57.4
R9 5.7
R10 76.4
R11 76.1
R12 72.1
R13 81.5
R14 98.5
R15 72.4
CRI 81.2
OK
Spectrum
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710
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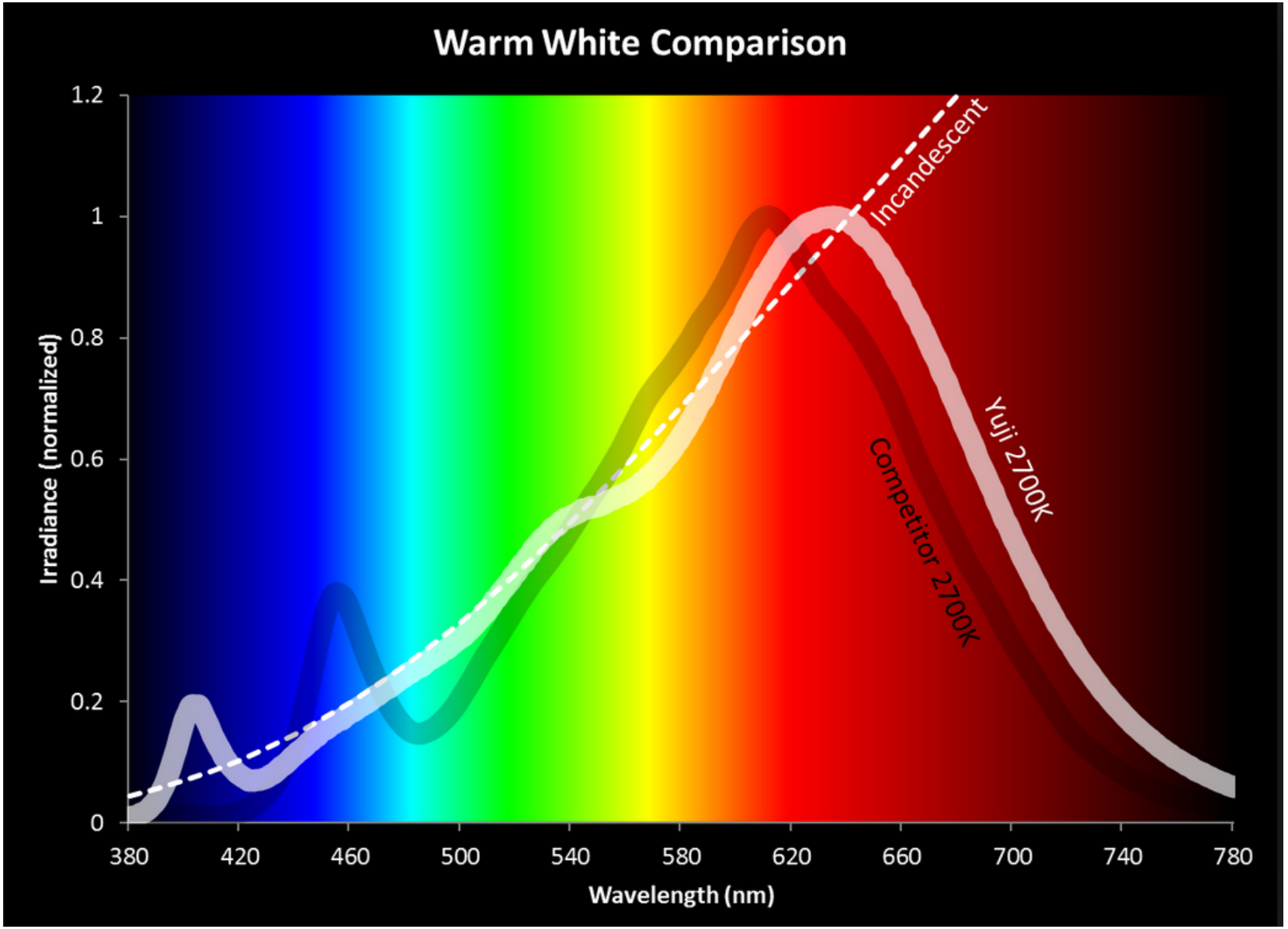
Ready

SPD – 2,700°K


Warm White Comparison
Irradiance (normalized)
1.2
1
0.8
0.6
0.4
0.2
0
380
420
460
500
540
580
620
660
700
740
780
Wavelength (nm)
Incandescent
Yuji 2700K
Competitor 2700K

Technological controls are gaining acceptance

The Telegraph

Two-thirds of councils turning street lights down, research finds

Hundreds of thousands of street lights dimmed or switched off as councils seek to save money but AA and Rospa warn of greater accident risks

Photo: ALAMY

By Tim Ross, Political Correspondent
7:45AM GMT 10 Nov 2013

Two-thirds of councils are dimming their street lights or switching them off to save money, raising fears of an increase in accidents and crime on darkened roads.

Crime: Light Doesn't Equal Security

• In 1999, Chicago increased alley lighting wattage from 90 to 250. Reported crime actually increased by 21%.

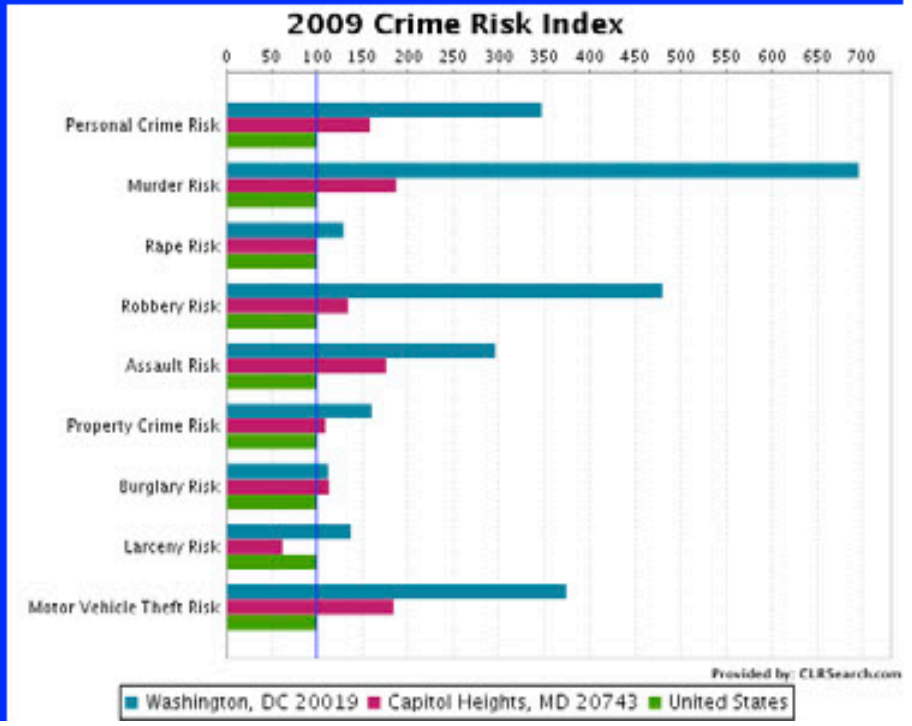
• Analysis of 40 studies in 1977 showed mixed results; crime increased with light in some, decreased or remained the same in others. Lighting appears to be only one of many factors in crime rates.

• Lighting can illuminate victims to the benefit of criminals.

http://www.icjia.state.il.us/public/pdf/ResearchReports/Chicago%20Alley%20Lighting%20Project.pdf

Does more light mean less crime?

Crime rates are higher in the brightly lit area in DC, zip 20019 than the adjacent, darker Maryland zip of 20743. The DC zip has a much higher percentage with incomes under $10,000, but otherwise, demographics are similar. We are not aware of any solid evidence that excessive lighting reduces crime.



OPEN ACCESS

The effect of reduced street lighting on road casualties and crime in England and Wales: controlled interrupted time series analysis

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▸ Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/jech-2015-206012).

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Received 6 May 2015
Revised 2 June 2015
Accepted 3 June 2015
Published Online First 29 July 2015

ABSTRACT

Background Many local authorities in England and Wales have reduced street lighting at night to save money and reduce carbon emissions. There is no evidence to date on whether these reductions impact on public health. We quantified the effect of 4 street lighting adaptation strategies (switch off, part-night lighting, dimming and white light) on casualties and crime in England and Wales.

Methods Observational study based on analysis of geographically coded police data on road traffic collisions and crime in 62 local authorities. Conditional Poisson models were used to analyse longitudinal changes in the counts of night-time collisions occurring on affected roads during 2000–2013, and crime within census Middle Super Output Areas during 2010–2013. Effect estimates were adjusted for regional temporal trends in casualties and crime.

Results There was no evidence that any street lighting adaptation strategy was associated with a change in collisions at night. There was significant statistical heterogeneity in the effects on crime estimated at police force level. Overall, there was no evidence for an association between the aggregate count of crime and switch off (RR 0.11; 95% CI 0.01 to 2.75) or part-night lighting (RR 0.96; 95% CI 0.86 to 1.06). There was weak evidence for a reduction in the aggregate count of crime and dimming (RR 0.84; 95% CI 0.70 to 1.02) and white light (RR 0.89; 95% CI 0.77 to 1.03).

Conclusions This study found little evidence of harmful effects of switch off, part-night lighting, dimming, or changes to white light/LEDs on road collisions or crime in England and Wales.

ultimately make their own assessment of the most appropriate lighting regime on each road for which they have responsibility. Three street light adaptation strategies reduce the amount of light: switching lights off permanently ('switch off'), reducing the number of hours that lamps are switched on at night ('part-night' lighting), and reducing the power or output of lamps ('dimming'). A fourth strategy is to replace traditional sodium lamps (orange/yellow light) with more energy efficient lamps or LEDs ('white light').

Each of these strategies has prompted public and media concerns about the negative effects that focus on risks of night-time road traffic collisions, crime, and fear of crime.[3] Road collisions have received particular attention, with a number of coroners concluding that reduced street lighting contributed to road deaths sparking inquests.[4] However, health and well-being benefits from reduced light pollution (eg, improved sleep and being able to see the night sky) have also been noted.[5 6] There are also putative benefits from reductions in artificial light at night, which have been linked to a range of health outcomes affected by disruptions to the circadian rhythms.[7–9]

Public concern that street lighting is necessary for road safety and crime prevention is, in part, supported by the literature: systematic reviews have identified some evidence for improved road safety[10] and an overall reduction in crime[11] with increased street lighting. However, with respect to crime, studies show that reductions in victimisation are observed during both hours of daylight and darkness,[11] calling into question the mechanism