



The Environmental and Health Effects of Lighting

A Lighting Council New Zealand Position Statement

In recent times there has been a range of media articles and reports asserting that LED lighting may cause detrimental effects in humans, animals and the night sky. The broad implication is that LED technology and blue-rich white light is a negative force that is undermining the delivery of healthy outcomes.

There is much misinformation and out-of-context assumptions in circulation. Some commentaries are based on the premise that LED white light is only a damaging element and to be avoided, and little regard is paid to the very many desirable and positive contributions of well-designed LED white light applications. Overseas case studies, reports and research findings are often referenced in a NZ context, but without expert advice to meaningfully interpret for local design standards and conditions there is much opportunity for misinterpretation and to draw inappropriate conclusions.

In terms of balanced societal outcomes, LED is the solution, not the problem.

Well-designed LED lighting schemes can deliver virtually any required light colour and spectral outcomes that the market desires and values. Almost all new lighting supplied in NZ is now LED and there is a huge range of product and performance options available that are delivering major financial, energy and environmental benefits to owners and users.

There is much new focus in the community on the nature and effects of blue-rich white light from LED lighting, but this form of light is not a new phenomenon. The spectral characteristics of legacy white light sources such as compact fluorescent, linear fluorescent, mercury vapour and metal halide are similar to those of white LED. Thus, the currently perceived issues are by no means the sole province of LED lighting, and any unintended consequences that may have occurred in preceding decades have not been high profile.

A vital consideration in the unintended consequences debate is the "dose" (or exposure) of light delivered, i.e. the light intensity, duration and repetition. These are critical variables that determine whether any unintended consequences (human, ecological or environmental) are likely to be significant or otherwise.

For indoor residential lighting there are many warm white 3000K and 2700K LED options both as retro-fit replacement lamps (bulbs) and as luminaires (light fittings). Homeowners in NZ are well-served for advice and supply by specialist lighting retailers and DIY outlets. For indoor commercial lighting neutral white 4000K is the usual daytime operation choice (e.g. offices, libraries, etc), and for evening operation (e.g. restaurants, hotels, etc) 2700K and 3000K are common. These colour selections fit well with the debate on human circadian cycles and low-impact options.

For outdoor commercial and public space lighting AS/NZS lighting design standards play a pivotal role in defining fit-for-purpose lighting outcomes, and the requirements for NZ conditions are very different to those of other countries. AS/NZS standardised light levels are very much lower than those used in the US, EU and the UK. The NZ applicable design and application standards for public

outdoor lighting are AS/NZS 1158 series (road and public lighting) and AS/NZS 4282 (obtrusive outdoor lighting). AS/NZS 1158 recommends colour temperatures of no greater than 4000K (neutral white), based on road safety requirements for optimum driver visual conditions and hence faster reaction times. As the principal reason for public lighting at night is pedestrian and driver safety, this element is of prime importance. However, it is becoming evident that consumer preferences for warmer colour temperatures is seeing NZ councils more frequently selecting 3000K options. The NZ lighting industry is fully in accord with such choices and can economically provide such solutions.

A clear benefit of the use of LED luminaires is that precise light optical control and multiple choices of light distribution are possible, a vast improvement over legacy technologies. This allows lighting designers much greater flexibility for minimisation of obtrusive or unwanted effects. In addition, the facility for precise fingertip adjustment via control systems provides the ability to minimise over-lighting or operation when not necessary. Many New Zealand councils are now deploying world-class control systems (in particular, Auckland Transport, Wellington City Council and Christchurch City Council) greatly reducing any unwanted lighting impacts at night, in a way that was never possible with non-LED technology.

Unfortunately, there is currently no research available that practically assesses and compares the resultant net impacts of the combined effects of good LED design and technology. Simplistic before/after comparisons of lab-measured light spectra at source are misleading as they don't take into account the constructive effects of astute lighting design, NZ's low standardised light levels, upward light shielding, better luminaire optical control, and off-peak dimming and switching, all of which have material and positive impacts on environmental and health outcomes.

The professional organisation for lighting designers in NZ is the Illuminating Engineering Society of Australia and NZ (IESANZ). Lighting design consultant members of IESANZ should be engaged on significant projects to provide advice on the fundamentals of good lighting design for both indoor and outdoor application.

As suppliers and solution providers, Lighting Council New Zealand members strongly acknowledge the need for sound environmental and social stewardship and strive to innovate to provide ever improving options for the NZ lighting market

There are many practical reference documents on light colour, spectra and lighting effects available from commercially independent organisations. Some are:

- Illuminating Engineering Society of North America (IESNA) – USA
- Institution of Lighting Professionals (ILP) – UK
- International Commission on Illumination (CIE) – Switzerland
- US Department of Energy (US-DoE) - USA
- Illuminating Engineering Society of Australia and NZ (IESANZ) - AU and NZ
- Institute of Public Works Engineering Australasia (IPWEA) – AU and NZ

This Position Statement is provided to assist with accessible information about the characteristics and role of LED lighting in NZ conditions. See LCNZ website for a separate sheet with a comprehensive list of references and resources. www.lightingcouncil.org.nz

Lighting Council New Zealand is the industry association representing twenty-eight lighting equipment importing and manufacturing companies in New Zealand. LCNZ was formed in 2003 in order to provide an informed and cohesive industry voice to inform and educate on lighting issues and to help navigate productively through the increasing complexity of lighting technology, standards and regulation.