

LEDs for Photons, Physiology & Food

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Phood!

Physiology!

Energy Productivity of Lighting (aka Lighting Application Efficacy)

U.S. Department of Energy Lighting R&D Workshop • Co-sponsored by the Illuminating Engineering Society

U.S. DEPARTMENT OF
ENERGY

Office of ENERGY EFFICIENCY
& RENEWABLE ENERGY



Energy- and Information-Intensive Uses of Photons *(e.g., for Humans and Plants)*

Light $\int \frac{\partial^4(h\nu)}{dAd\Omega\partial t\partial\lambda} dAd\Omega dt d\lambda$

Information

$$\frac{Y \left(\int \frac{\partial^4(h\nu)}{dAd\Omega\partial t\partial\lambda} dAd\Omega dt d\lambda \right)}{\int \frac{\partial(eV)}{\partial t} dt}$$

**Electrons-to-Photons
Transducer/Fixture**

Energy

$$\int \frac{\partial(eV)}{\partial t} dt$$