UN environment

Accelerating the Global Adoption of

ENERGY-EFFICIENT LIGHTING

UN Environment – Global Environment Facility | United for Efficiency (U4E)

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en.lighten

U4E United for Efficiency

U4E POLICY GUIDE SERIES

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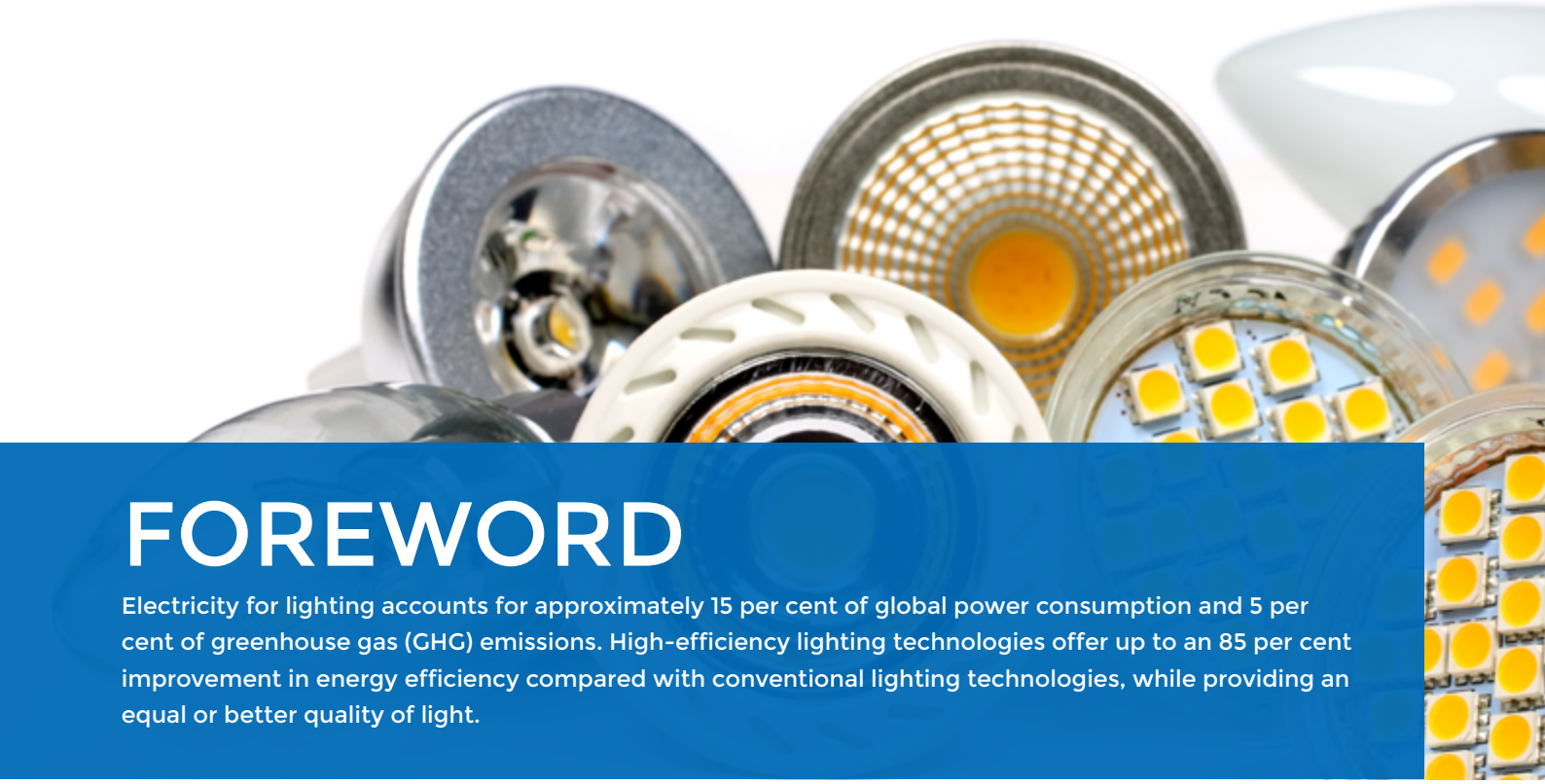

FOREWORD

Electricity for lighting accounts for approximately 15 per cent of global power consumption and 5 per cent of greenhouse gas (GHG) emissions. High-efficiency lighting technologies offer up to an 85 per cent improvement in energy efficiency compared with conventional lighting technologies, while providing an equal or better quality of light.

Because of this potential, the United Nations Secretary-General's Sustainable Energy for All (SEforALL) initiative identifies energy-efficient lighting as a "High Impact Opportunity". It can reduce countries' GHG emissions, generate significant economic benefits, enhance energy security, and improve people's wellbeing.

To leverage this opportunity a lighting initiative, en.lighten, was established in 2010. en.lighten aimed to accelerate a global market transformation to energy-efficient lighting technologies, as well as to develop strategies to transition to energy-efficient lamps. It was a public-private partnership (PPP) between the UN Environment, OSRAM and Philips Lighting, supported by the Global Environment Facility (GEF). As part of the partnership, the National Lighting Test Centre of China established the Global Efficient Lighting Centre (GELC), and the Australian Government supported developing countries in Southeast Asia and the Pacific.

Building on the success of the en.lighten initiative, UN Environment and the GEF launched a new United for Efficiency (U4E) initiative in 2015. The initiative supports countries in their transition to the use of energy-efficient lighting, appliances and equipment. en.lighten now represents the lighting chapter under U4E. It focuses on developing countries and emerging economies, which are seeing the largest growth in energy-consuming products. U4E works under the umbrella of the SEforALL initiative, as the leading "Energy Efficiency Accelerator" for Lighting and Appliances and Equipment.

This report is published as part of U4E and focuses on lighting. The report guides policymakers on how to promote energy-efficient lighting in their respective national markets. It is based on the integrated policy approach, which has been used around the world to bring about sustainable and cost-effective market transformation.

This report was developed in a holistic process with participation from over 20 organisations. This included international organisations, environmental groups, international lighting manufacturers, government officials, and academic institutions. Our experience is that the sort of credible guidance

resulting from a balanced expert group is very effective in reducing uncertainty, and measurably helps countries adopt energy policies that make economic sense and help reduce carbon emissions.

The earlier work of en.lighten complements this report. This includes reports such as Achieving the Global Transition to Energy Efficient Lighting Toolkit, Developing Minimum Energy Performance Standards for Lighting Products: Guidance Note for Policymakers, and a series of six reports aimed to improve the monitoring, verification, and enforcement (MVE) of lighting products that can lead to other energy efficiency measures including legislation and administrative processes. This new report also provides an update in policy recommendations to adjust for the market shift to light emitting diodes (LEDs), which offer significantly greater electricity and financial saving.

The report is part of a series of U4E reports on five product groups. The other reports in the series cover room air conditioners, residential refrigerators, electric motors, and distribution transformers. An additional overarching report, "Policy Fundamentals Guide," provides crosscutting, general guidance critical to the establishment of a successful energy efficiency programme.

It is our hope that decision-makers will use the information in this report to select the right policies for the coming decades.

U4E United for Efficiency

THIS REPORT FOCUSES ON
ENERGY-EFFICIENT LIGHTING

OTHER GUIDES IN THIS SERIES INCLUDE:

AND AN OVERARCHING FUNDAMENTAL GUIDE:

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This report was developed in a holistic process with participation from over 20 organisations.

EXECUTIVE SUMMARY

Lighting is widely used in everyday life. It is a significant factor contributing to our quality of life and productivity of our workforces. Artificial illumination extends the productive day, enabling people to work in homes, offices, buildings and factories.

Lighting equipment, however, consumes resources. It does so in the manufacturing phase and, more importantly, when installed and operating (i.e. producing light). As our economies grow and populations expand, the global demand for lighting will increase.

Policy measures that transform markets toward higher energy efficiency are needed. Lighting is one of the most cost-effective products for setting such measures. This is partly because in some markets the incumbent products include technology such as incandescent lamps, which are based on a 125 year-old technology and are replaceable with widely available products that can cut power use by 80 – 90 per cent. Globally, according to a UN Environment lighting market model including over 150 country lighting assessments, there are still seven billion incandescent lamps in use in 2016.

Lighting technology spans great ranges of performance. There are inefficient products burning

Energy-efficient lighting is usually the lowest life-cycle cost option.

fuel or heat metal (i.e. tungsten filament lamps) and highly efficient designs producing light from gas discharge lamps or semiconductor junctions. Governments can establish cost-effective policy measures that remove the least efficient products from the market and accelerate the adoption of the highest efficiency models.

There are multiple advantages of energy-efficient lighting for governments. Energy-efficient lighting is usually the lowest life-cycle cost option. It can be used to stimulate efficiency in the market across other products and to promote accelerated adoption of more efficient technology. It reduces peak loading, lowers customer bills and reduces mercury and the volume of material being sent to the landfill.

Payback time of energy-efficient lighting varies depending on equipment and energy costs. It ranges from less than one year (for direct retrofit of a light source) to two to three years for a complete lighting system overhaul. The latter requires higher investments but will render higher annual savings in return.

We currently consume 2,900 TWh of electricity per year for lighting. This is equivalent to five times the total national consumption of Germany. Over the next two decades lighting services are projected to rise by approximately 50 per cent relative to current levels of demand.

By 2030, these policy measures would reduce electricity demand for lighting to 2,160 TWh per year, saving up to 640 TWh of electricity, according to the UN Environment model. This slight savings in step with such a large increase in lighting service is due to a widespread shift from conventional lighting technologies like incandescent, halogen and fluorescent lamps to lighting products based on light-emitting diodes (LEDs).

This period of technology transition from old to new products is an opportunity to governments. They can introduce cost-effective policy measures across all lighting applications yielding substantial savings and accelerating the adoption of LED-based lighting. By 2030, governments could save up to 640 TWh of electricity, according to the UN Environment model. This is up to 23 per cent of the projected (no new policy) demand. In terms of CO_2 emissions, governments could avoid upwards of 390 million metric tonnes annually. Taken on a cumulative basis, between 2015 and 2030 the CO_2 savings would be up to 3.3 gigatonnes of avoided CO_2.

The guidance provided in this document is meant to be flexible, rather than prescriptive. It can be applied to a diverse range of lighting applications, including indoor lighting in public, commercial and residential buildings and outdoor lighting as in the case of urban and rural street lights and parking lots. The scope of this document encompasses all light sources, including incandescent, halogen, compact fluorescent, linear fluorescent, high-intensity discharge, and solid-state lighting.

UN Environment encourages countries to follow a five-stage integrated policy approach for transforming their respective markets towards higher energy efficiency:

- **Standards and Regulations (MEPS[1])** – cover a collection of related requirements defining which products can be sold and those that should be blocked from the market. Standards and regulations form the foundation from which to ensure the success of any efficient lighting transition strategy.
- **Supporting Policies** – are necessary to ensure the smooth implementation of standards and regulations, and to achieve a broad public acceptance. Supporting

policies include labelling schemes and other market-based instruments, often initiated and promoted by regulatory incentives, and information and communication campaigns that inform end users in order to change or modify their behaviour.

- **Finance and Financial Delivery Mechanisms** – addressing high first-cost challenges with efficient light sources, looking at economic instruments and fiscal instruments and incentives, such rational electricity prices and tax breaks. Also consider financing incentive mechanisms that help address the initial incremental costs such as through dedicated funds, electric utility on-bill financing, and pay-as-you-save schemes based on shared savings transactions through Energy Service Companies.
- **Monitoring, Verification and Enforcement (MVE)** (MEPS). Enhancing the capacity of various countries and the sharing of information and skills between countries and across regions provides an effective means through which to promote best practice, quickly and thoroughly.
- **Environmentally Sound Management of Lighting Products** – mercury and other hazardous substance content standards should be established in line with global best practice in order to minimize any environmental or health impact. Special attention should be given to the development of a legal framework for environmentally sound, end-of-life activities.

In order to support governments in promoting energy efficiency and removing obsolete and energy intensive lighting technologies from their markets, United for Efficiency has developed a step-by-step guide called "Fundamental Policy Guide: The Fundamental Policy Guide is cross-cutting for all United for Efficiency priority products including lighting, residential refrigerators, air conditioners, distribution transformers and electric motors.

For more information on the approach see Chapter 8 for a brief overview or the U4E Fundamental Policy Guide for complete description.

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