

# Executive Summary – Cost Benefit Analysis of Technology Neutral Regulations to Introduce Energy Performance Standards for General Service Lamps in South Africa

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Roughly 80 million general service lamps (GSL) are sold in South African each year; and the total estimated installed stock is approximately 170 million. Most importantly, while a single electric lamp does not consume a large quantity of electricity, the average household has about 15 lamps – which collectively accounts for a significant amount of electricity use during peak consumption periods, when the electricity grid is most vulnerable. Thus, a transition to higher efficiency GSL's which produce the same light while using much less electricity provides an opportunity to both reduce strain on the national grid and save on the electric bills of households. More efficient GSLs will make lighting more affordable and accessible to South Africans, extending the universal usage of lighting and ensuring all consumers will benefit.

## **Objective of MEPS and problem statement**

Minimum Energy Performance Standards (MEPS) aim to improve the efficiency of GSLs; and conducting a Cost Benefit Analysis (CBA) study is a mandatory requirement before regulatory legislation is enacted. Conducting the CBA, several regulatory and market failures inhibiting the uptake of efficient GSLs were identified:

- South Africa's lighting regulation has not kept pace with the rapid technological advancements that have taken place in recent years; and is therefore no longer able to remove the least efficient, lowest quality and potentially hazardous GSLs from the market. And while older lighting technologies, compact fluorescent lamps (CFLs) and incandescent lamps (ICLs) are regulated separately, there are no safety or performance standards for Light Emitting Diode (LED) lamps.
- Consumers are making poor economic choices. Here our analysis shows that consumers are purchasing some of the most expensive and least efficient GSLs, by opting for a lower upfront cost based on familiar (inefficient) technologies, and not considering the full life cycle cost of lighting. By example, in the highest-selling brightness category, a 70W BC Eco Halogen lamp accounted for 52% of sales - costing R20 - but it is one of the most expensive to operate, at ~R1 500 in electricity and replacement lamp costs over a typical 5-year (7 000-hour) period. The same company's LED lamp with the same light output will cost R35 to purchase, will not need to be replaced because of its long lifetime, and will only cost R178 to use in electricity bills over the same five-year period. Thus, R1 520 for halogen versus R213 for LED – halogen is over 7 times more expensive than LED on a lifecycle cost basis.

- Barriers hindering a transition to LED technology persist. Retail sales for the same period show that CFLs dominate at 52%, followed by halogen at 26%. Here, consumers are more familiar and comfortable with halogen lamps, which look like traditional incandescent bulbs, while continuing to associate CFL's with energy-saving, after Eskom's nationwide demand side management program which distributed over 70 million CFLs up to 2016. Also, an added concern is market-spoiling, where if consumers have a poor experience with low quality LED lamps, it may result in them reverting to the familiar (inefficient) technologies. Laboratory tests conducted on 10 popular LED lamps sold in stores, found that three did not meet the efficacy or energy-efficiency specifications stated on their packaging.
- Finally, CFLs pose environmental and health risks when incorrectly disposed or accidentally broken, due to their mercury content. Mercury is a heavy metal that will contaminate landfills and is a neurotoxin in humans. The UN is working to phase out mercury use globally under the Minamata Convention, which [South Africa ratified](#) on 29 April 2019.

### **Approach to the study**

The assessment was conducted following a CBA framework, which is an internationally accepted methodology for the economic evaluation of the potential impacts of new regulations. CBA is a comparative approach; and the impacts of the proposed regulation that will establish MEPS for lighting have been defined as the 'policy option' scenario. This is then modelled against the baseline or 'business-as-usual' (BAU) to quantify the impact of the draft policy measure. In addition to economic modelling to assess the potential impact of MEPS, the CBA uses inputs from a market analysis, stakeholder consultations and laboratory testing of lamps sold in the market.

### **Proposed regulation**

The draft Compulsory Specification for General Service Lamps (VC 90XX) covers the safety requirements, energy efficiency and functional performance for general lighting, including both directional and non-directional lamps, and all shapes and finishes. The key technical requirements in VC 90XX fall within four main categories: energy-efficiency (efficacy); functional performance; product safety; and product information (labelling).

The main energy performance requirement of the draft technology-neutral MEPS is a minimum efficacy of 90 lm/W (Tier 1) and then 105 lm/W (Tier 2). The draft VC90XX initially proposed a lower minimum efficacy of 80 lm/W for Tier 1, followed by 95 lm/W for Tier 2. However, at the stakeholder consultation meeting held at NRCS on 25 July 2019, it was collectively agreed by the majority of stakeholders that 90 lm/W for Tier 1 was more appropriate as the market has consistently achieved performance improvements of 5 lm/W a year. In addition, to help ensure continued consumer choice and availability, a power allowance was adopted for lamps below 400 lumens<sup>1</sup>. The CBA and economic impact assessment in this report were based on the original set of minimum efficacy requirements (i.e., 80 lm/W and 95 lm/W). While these levels are more lenient than what has been included in the final draft, they would still result in the removal of halogen and CFL lamps from the market (N.B., general service incandescent lamps are already banned), which is the principle driver of energy and economic savings. It is our assessment that the implication of the slightly higher efficacy requirements in VC90XX will increase the net economic benefits relative to what is presented in this report.

### **Results of the economic modelling**

The results of the CBA study show that introducing MEPS for GSL's is expected to yield significant positive net economic benefits to the South African economy. Under the central assumptions, the net economic benefit is expected to amount to R11.7 billion over the 15-year period; with a benefit-cost ratio of 27.4 to one – meaning that the present value of the benefits is more than 27 times the present value of the costs of introducing and enforcing the regulation.

Electricity cost savings that accrue to South African households once MEPS are introduced, account for most of the R11.7bn benefit realised – with the realised electricity cost savings increasing further in 2023, when the more stringent requirements for minimum efficacy (lm/W) take effect.

In assessing the key risks to the economic case for the introduction of MEPS, these are posed by a potential delay in the implementation of the regulation and very low levels of compliance (33%) – a combination of industry non-adherence, compounded by limited or intermittent enforcement by the Regulator. The modelling of a three-year delay demonstrates that the total net benefit associated with MEPS is reduced to R1.9 billion from R11.6 billion. This finding clearly demonstrates the importance of scaling up the South African government's enforcement of this regulation, as it would add nearly 10 billion Rand to the economy.

There is a strong case for implementing MEPS as soon as possible, to maximise the potential economic benefit associated with rapidly switching to energy-efficient lighting.

### **Key insights and issues raised during the stakeholder consultation process**

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<sup>1</sup> DoE/UNDP/NRCS (2019) "Item 8.1 Draft VC 9108, Functional performance" Minutes of the Standards and Labelling: Stakeholder workshop on VC9108 and VC 9110. 25 July 2019. Bambanani Committee Room, SABS, 1 Dr Lategan Drive, Pretoria.

Over 35 stakeholders, representing five main stakeholder groups (public sector, core technical group, large suppliers, local manufacturers, and others) were interviewed. Overall, stakeholder sentiment towards the proposed MEPS regulation for lighting was positive. Six of the eight stakeholders who completed the questionnaire expect the proposed regulation to have a positive net benefit on the South African economy. These included lighting industry association IESSA, large lighting suppliers Aurora, Signify, Ellies and Eurolux, and international non-profit CLASP. These six stakeholders also believe the regulation will improve the overall quality and safety of lamps sold to the residential market in South Africa. LEDVANCE was more sceptical than the other large suppliers about the potential impact of the regulation, because they felt that given the low levels of enforcement by the responsible government agencies to date, it was difficult to see how this would improve going forward. IESSA, an industry body, concurred with LEDVANCE.

Generally, industry raised several concerns regarding Government's ability to undertake effective MVE. Key amongst these were: 1) enforcement agencies have insufficient resources to introduce and enforce the proposed MEPS regulation; 2) to date these agencies have undertaken very limited market surveillance; 3) reports of non-compliance submitted to the relevant authorities have not been investigated; 4) border control is weak; 5) the Act<sup>2</sup> does not allow penalties to be levied on non-compliant suppliers; and, 6) there is insufficient capacity in South Africa to test LED lamp performance against the specifications.

Finally; the CBA report puts forward recommendations on how to improve MVE. These include: 1) the streamlining and automation of the pre-certification process; 2) improving the human resource capacity of control officers to increase their effectiveness - including communication and awareness; 3) setting a clear strategy for compliance and monitoring - with specific goals and targets, and timely and transparent reporting on the results; and 4) considering whether it is feasible to introduce self-declaration for certain categories of products, where the risks associated with non-compliance are relatively low

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<sup>2</sup> The National Regulator for Compulsory Specifications Act, Act no. 5 of 2008 (NRCS Act)