



## Efficient Lighting Programme involving the rollout of Compact Fluorescent Lights (CFL)

### Eskom's large scale exchange of CFLs in the residential sector

Eskom drives large scale mass roll-outs of Energy Efficiency Demand Side Management (EEDSM) programmes, which focus on identifying and promoting more efficient ways to use electricity, through the implementation of technology enhancements and behaviour change.

The majority of savings in the residential sector have been achieved through the implementation of large-scale mass rollouts replacing incandescent light bulbs with compact fluorescent lamps (CFLs) and, up until the end of the 2010/2011 financial year, over 47 million CFLs had been installed in the residential sector nationwide, bringing about demand savings of 1,958 MW and creating over 30,000 temporary jobs nationally.

### Benefits

#### Economic benefits:

The Eskom CFL Projects will contribute significantly to South Africa's national economic development through encouraging the more efficient use of electricity by residential energy consumers. Energy savings at both individual homes and national levels make important contributions to South Africa's economic efficiency and sustainability, particularly in the

context of the rising demand for electricity currently occurring in South Africa. Residential electricity demand is approximately 35% of national generation capacity, and as such any efficiency gains made in this sector will have significant benefits for the national economy.

The Demand Side Management (DSM) programme administered by Eskom, has recognized the contribution that lighting can make to achieve the national energy efficiency objectives. The South African Government has recognized the specific need for energy efficiency in the residential sector since at least 2005, with the publication of the National Energy Efficiency Strategy (NNS) 2005. The strategy links energy sector development with national socio-economic development plans, and sets a target for improved energy efficiency in South Africa residential sector of 10% by 2015. Improving energy efficiency reduces the need to build more electricity generation capacity. This is particularly important given the high cost associated with energy infrastructure, as well as the fact that building such fossil fuel infrastructure 'locks-in' future greenhouse gas emissions in the South African economy.

Further, the sale of certified emission reductions (CERs) and verified emission reductions (VERs) in the international carbon market by the project proponents will have a positive foreign exchange impact for South Africa.



### Contribution to social development:

As well as supporting national energy efficiency policies and delivering macro-economic benefits through reduced energy infrastructure costs, the Eskom CFL projects deliver significant socio-economic benefits for participants through job creation and delivering energy savings to households.

In order to deliver the CFL Projects, Eskom has engaged (directly and through partnerships) a large workforce over the short to medium term, to install and distribute the lighting products, as well as manage M&V tasks associated with the projects. This has positive social impacts in terms of employment through the creation of a number of semi-skilled jobs in Energy Services Companies (ESCOs) and skilled jobs in local Universities. For example, since 2006, Eskom has installed more than 47 million CFLs nationally which has resulted in the creation of more than 30 000 temporary jobs nationally.

In addition to job creation, the free issued CFLs installed deliver participating households cost savings on their electricity bills. A 60W ICL exchanged for a 15W CFL will deliver approximately R40 per year in cost savings (based on electricity price of R0.71/ kWh). A household exchanging six CFLs will generate annual cost savings in the order to R250. This is a material saving for low and middle-income households, and when delivered at the scale contemplated under the CFL Projects will mean significant gains for the residential sector with flow on benefit across society.

As well as the direct financial benefit to households in terms of savings on their electricity bills each year, the CFL Projects also generate a range of less tangible social outcomes in education and awareness. This raised awareness creates an opportunity for collective action on climate change, enhancing a sense of community, and empowering individual households.



### Contribution to Environmental Sustainability:

The introduction of energy efficient lighting in households will reduce the consumption, and hence generation of electricity. In addition to reducing GHGs, the CFL Projects will therefore reduce emissions produced during the burning of fossil fuels to produce electricity. The high dependence on coal and conventional thermal power stations in the electricity generation sector of South Africa means that energy efficiency interventions have a significant positive impact on the sustainability of fossil fuel reserves.

The energy savings are associated with additional environmental benefits that include less natural resource consumption and fewer greenhouse gas (including carbon) emissions. These potential benefits are indicated in the table below indicating environmental savings per kWh of electricity. It is estimated that in 2011 electricity generation in South Africa led to the emission of 1.81Mt SO<sub>2</sub>, 2,906 tN<sub>2</sub>O, 977 ktNO<sub>x</sub> and 75,840 tonnes of particulates. For every 1 million CFLs distributed electricity consumption is reduced by up to 60 GWh/year making a significant contribution to a reduction in these emissions.

Table 2: Environmental Implications of using or saving one kilowatt-hour of electricity<sup>2</sup>

Parameter	Savings per 1 kWh
Coal use	0.53 kilograms
Water use	1.40 litres
Ash produced	155 grams
Particulate emissions	0.33 grams
CO <sub>2</sub> emissions	0.99 kilograms
SO <sub>2</sub> emissions	7.75 grams
NO <sub>x</sub> emissions	4.18 grams

<sup>2</sup> Eskom Annual Report 2011, page 327

## Procurement process

Eskom only procures lamps which comply with the most stringent specifications, including a life of 6 000 to 15 000 hours or longer than five years, Restriction of Hazardous Substances (RoHs) and Efficient Lighting Initiative (ELI) compliant.

Eskom follows a rigorous commercial process for all procurement. CFLs are procured through open tender. The final selection is subject to criteria which include availability, competitive pricing and particularly, compliance with the minimum specifications. Most recently lamps were sourced from Osram, Philips and Eurolux.

At present no CFLs are manufactured locally so all lamps are imported, predominantly from China. There is a huge demand for CFLs worldwide, but Eskom managed to procure all the lamps required for the rollout. Typical delivery lead times are six weeks, but the bulk of the lamps are already in South Africa.

## Exchange process

An average of six to eight 60W and 100W incandescent globes were exchanged per household for 14 or 15W CFLs and 18 or 20W CFLs, respectively. Exchange points were managed in parallel with every roll out and if lamps failed during the roll out, it could be returned to an exchange point for replacement. All lamps were labelled with an Eskom logo and clearly marked "not for sale".

## Legislation

To sustain energy efficiency until there is again sufficient generation capacity, a CFL replacement strategy has been developed and is being implemented. This could see a further 20 – 40 million lamps distributed across South Africa in coming years, however, should legislation be introduced to ban incandescent lamps as announced by the Department of Energy, the requirement for a replacement strategy will fall away.



## Safe Disposal

Mercury is a bio accumulative neurotoxin which means that prolonged or repeat exposure can be very dangerous. However, it is an essential element in CFLs, sealed within the lamp, and contributes to the efficiency of their operation. Manufacturers are continually working on reducing the mercury content. Although there are no mercury-free CFLs available, Eskom keeps abreast of developments in this field. A CFL operated normally emits no mercury and hence presents no hazard.

The cumulative impact of millions of CFLs does become a significant issue and could present a potential risk to the environment. Concerns regarding responsible disposal of CFLs are valid and lies in concentrations of mercury accumulating in landfills over time. Expended CFLs should therefore be disposed of properly, in the same manner as other household hazardous waste products like paint, batteries and non-digital thermostats. Failed CFLs should not be discarded in the general household waste stream. A dedicated disposal and mechanism is being developed in partnership with national, provincial and local government.

In the absence of legislative requirements specific to homeowners and with limited availability of suitable facilities, environmentally conscious consumers have few options. Eskom, in partnership with the City of Cape Town and Provincial Government, the lighting industry, waste industry and several other industry stakeholders, is investigating appropriate mechanisms for the diversion of failed CFLs as hazardous waste from the general household waste stream.

The preferred disposal strategy for failed CFLs is separation of CFLs from the general waste stream at point of generation (households) collection through designated points (retail, lighting industry), safe disposals at hazardous waste disposal facilities (provided by municipalities).

## Private sector participation

An exciting development was the spontaneous participation by retailers in offering and facilitating a CFL take back and disposal initiative during the second quarter of 2008. Woolworths, a leading retailer in South Africa, formally announced a planned CFL take back offering in March in collaboration with NOVA Lighting, rolling out suitably designed bins to forty-six stores nationwide.

Pick 'n Pay developed and rolled out a similar take back service in collaboration with Philips Lighting, extending the service offering to include spent batteries.

## Marketing and Communications

The CFL rollout was promoted via community papers and radio stations; with field distributors delivering 'knock and drop' leaflets to houses within the selected wards to alert residents that visit by the installers were imminent. Educational pamphlets on CFLs were also distributed a week or so prior to the exchange.

## Lessons Learned

CFL projects are rolled out in partnership with municipalities and local stakeholders (eg ward councillors and community leaders). Customer communication is undertaken together with relevant municipalities to ensure buy-in and ownership of the product and the future replacements of the failed CFLs. In most cases, Ward Councillors become instrumental in the nomination of the installers to be employed.



BEE Energy Services Companies (ESCOs), particularly BWO, are trained and implement the CFL door to door exchanges. These companies commissioned unemployed members of the community during the project implementation, which resulted in the creation of an estimated 30 000 temporary jobs. The employed individuals were trained and made aware of the energy saving benefits associated with CFLs.

