Internal **energy efficiency**

Eskom practices what it preaches in energy efficiency

As the supplier of 95% of South Africa's electricity, mainly from coal, Eskom decided to 'practice what it preaches' by demonstrating best-practice in energy efficiency and committing to a 15% reduction in non-essential energy consumption by 2015. Eskom has itself applied many of the recommendations it has made for reduced electricity usage with a nationwide focus on reducing and optimising energy consumption. This was driven by the need to be more responsible with a limited resource.

In the absence of a formal baseline, each division was asked what it could feasibly achieve. From these estimates a savings target of 24 GWh was set for the 2010/2011 financial year. Through the commitment of staff and technology changes, this has resulted a 26,2 GWh independently verified saving (annualised) in the 2010/2011 financial year. A further 25,5 GWh savings has been targeted and set in the Shareholder's Compact for the current financial year.

The state-owned enterprise adopted a six step approach to energy efficiency across the country. This started with an energy audit footprint and installation of metering technology; tuning up each building; upgrading lighting; making other load reductions such as water heating and office equipment; upgrading HVAC and AHU; and monitoring, verifying and maintaining savings.

An excellent example of what has been achieved is the 10-18% reduction in consumption at Eskom's largest commercial facility, Megawatt Park, which has an operational cost of over R3 million a year. From quick and obvious interventions initiated in 2007, Megawatt Park has embarked on a process of engaging specialist consultants to assist with a detailed study of the building, starting with a sound strategy, based on two pillars, namely replacing inefficient electrical products and appliances and modifying human behaviour.

Prior to November 2007, the immediate goal was to reduce power used by at least 10%. Simple interventions included as replacing lighting, installing variable speed drives in air conditioning units, and removal of hot water geysers in the Eskom section of the building.

All lighting in the building is turned off between 19:00 and 05:00; the lighting level in the parking areas has been reduced to the minimum legal requirement during the day and is turned off at night after the building lights have been turned off along with all non-essential lights; and lighting in the basement has been halved, with the removal of at least 400 fluorescent tubes.

During summer months, extraction fans are turned on at around 04:00 to draw cold outside air through the building to cool down the structure. This enables air conditioning chillers to be switched on about three hours later. The average temperature in the building has been changed to 23°C as opposed to the previous 22°C.

In winter, retained heat built up during the day is used to keep the structure warm in the morning, minimising the use of boilers. The temperature inside the building is now maintained at 22°C rather than 24°C during preceding winters.

In boardrooms and other facilities, which are only occasionally occupied, motion sensors that automatically turn lights on and off are being deployed. This takes out the 'human element' of having to remember to turn lights out.

Initiatives under way or being planned include installation of solar water heating and heat pumps for the main gym and kitchen; replacing some electrical appliances with gas appliances in the kitchen; and using energy efficient lifts, which use the principle of regeneration – a process that utilises kinetic energy during a lift's descent – as well as escalators that are activated by sensors.

Following initial 'quick win' solutions, a complete energy audit was undertaken, which included virtual modelling of the building and was intended to yield maximum energy efficiency by examining the external 'fabric' of the building and gauging its thermal properties, and redesigning lighting systems throughout as well as the air conditioning system.

In terms of the exterior, which has a substantial area of glass, a good deal of heat exchange occurs. The glass permits sunlight to shine through, thus translating into heat coming through and rendering climate control inside Megawatt Park difficult. The building was designed several decades ago with little consideration for energy efficiency. Moving the building to lower consumption therefore requires substantial interventions.

This thermal performance has a direct impact on air conditioning requirements. Chilled beam air-conditioning is being piloted. A recent innovation, the chilled beam system uses water (instead of circulating cold air) to remove heat from a room. Chilled beams are best suited to locations where the humidity can be controlled. Doing so at Megawatt Park is difficult, but there is some optimism for the project.

During November 2011, Eskom will be installing photovoltaic panels over the main visitors parking area. The system is planned to produce up to 350 kW, enough to power the lighting for up to two floors of the building.

The technologies applied at Megawatt Park have also been applied at many of Eskom's other key facilities throughout South Africa resulting in significant savings and improved working conditions. The successful implementation of energy efficient technologies and practices will continue into the future in all of Eskom's facilities nationwide.