

# Balancing the business of energy and water

*As an organisation that constantly strives to limit increases in water consumption and contribute to sustainable water use, Eskom has indicated its commitment to improving the way in which South Africa's water resources are managed. Eskom's Nandha Govender provides insight into how this is being achieved. Article by Debbie Besseling.*



With a track record of some 15 years at Eskom, Govender joined the organisation's Generation Division's Primary Energy, Water Supply Department in 1998 as a mechanical engineer. Today, he is the Acting General Manager: Operations, under the group's Commercial and Technology: Primary Energy Division, where he is responsible for integrated planning and operations of primary energy resources such as coal, water and limestone. In this role he provides general management of the coal supply, water supply, logistics operations as well as environmental and technical services; a position that he enthusiastically describes as having a new challenge every day and an opportunity to learn something new.

According to Govender, one of the major challenges for the organisation is the security of water supply to its power stations in the long term. "This is a major area of focus for us. We have existing and new power stations that last anywhere between 50 and 60 years and it is very important to ensure that water is available to sustain these power stations. Secondly, to ensure proper planning, and that water resources and infrastructure planning is done to make sure that we deliver water to the power stations for the life of the power stations. We are competing for limited resources. We as Eskom

have to go beyond our own interests. The idea, which is part of our strategy, is that in the course of doing our business, we have to find ways and means of reducing our water footprint, and managing our current water resources so that others will have access to it as well."

Eskom Holdings SOC Limited is a large consumer of fresh water, accounting for approximately 2-3% of the country's total water consumption annually. Eskom power stations run constantly, supplying in excess of 95% of South Africa's electrical energy and more than half of the electricity used on the African continent.

Govender adds: "It is expected that Eskom's water usage will increase over the next 10 years due to the return to service of older wet-cooled power stations and the introduction of new power stations. However, with the introduction of more dry-cooled stations, diversification of the energy mix and energy and water efficiency measures, Eskom's relative and absolute water consumption will improve considerably by 2030."

Eskom has several overarching environmental objectives relevant to addressing the water challenges, namely avoiding harm to the natural environment; reducing freshwater usage; eliminating liquid effluent discharges through effective water management processes and the

## ABOUT NANDHA GOVENDER

- **Professional registration:** Engineering Council of SA
- **Other memberships:** Certified Director- Institute of Directors; National Society of Black Engineers
- **Academic qualification:** Bachelor of Science (Mechanical Engineering), University of Durban Westville, 1995
- **First job:** Apprentice diesel mechanic
- **Own personal vision:** I am the light and from one light many can be lit
- **Likes:** Education in human values
- **Dislikes:** Wastage of electricity and water taps left running
- **Currently reading:** *Intuitive Listening: How Intuition Talks Through You* by Christiane Northrup and Mona Lisa Schulz.

re-use of mine-water; and minimising the impact of its activities on groundwater resources.

## ACHIEVING OBJECTIVES THROUGH INNOVATION

Eskom has achieved significant water saving objectives through

the implementation of various projects over the past two decades. One major innovation has been dry cooling. To date, 17 of the newest Eskom coal-fired power generation units (at Grootvlei, Matimba, Kendal and Majuba) have been installed with dry-cooling systems. Water consumption from these units is 15 times lower when compared to conventional wet-cooled units.

In addition, a policy decision has been made to implement dry-cooling technology at all new coal-fired power plants. Thus Medupi and Kusile will be equipped with dry-cooling technology. Figure 1 illustrates the positive impact of water usage following the introduction of dry-cooled large six pack power stations during the period of 1983 to 1993. It is anticipated that this will further improve with the commissioning of the world's largest dry-cooled power stations, Medupi and Kusile, which are currently under construction.

The second water-saving project relates to diversification of Eskom's water mix. Through the reuse of treated mine-water from its coal suppliers and treated sewage recovery the power company has managed to reduce its freshwater usage. To reduce the intake of freshwater at Tutuka and Lethabo power stations, mine-water is being sourced from nearby tied collieries, desalinated and used to augment the freshwater supply. The total volume of mine-water recovered to Tutuka and Lethabo is approximately 8 million m<sup>3</sup>/a.

Eskom has also increased its use of desalination plants. A desalination plant is already in place at Tutuka Power Station to utilise excess mine-water from its tied coal colliery. An additional project, to be completed at the end of the financial year, aims to manage the resultant brine with the construction of a brine pond.

Furthermore, there is a project underway for the development of a large-scale desalination plant to

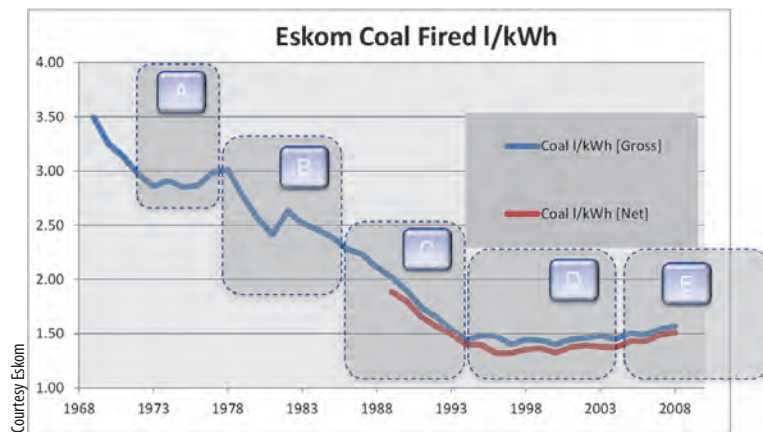


Figure 1 - Eskom's water use per unit of energy over the last 40 years.

treat and use mine-water at Kriel and Matla power stations from the tied coal collieries. The project is currently in the feasibility phase. The estimated time for the operation of the plant will be in the next three to four years. There is a temporary desalination plant in place, with plans to build a permanent plant at Lethabo Power Station for the use of mine-water from its tied coal colliery.

Sewage is also treated and re-used. Most of Eskom's coal-fired power stations (10 of the 13 stations) treat and recover sewage water for use in their operations. The total amount of sewage water reuse is approximately 5 million m<sup>3</sup>/a.

A further innovation is Eskom's implementation of a Water Accounting Framework (WAF) directive. The objective of the WAF is to facilitate sound water and effluent management by prescribing minimum requirements for the monitoring, accounting and reporting of water

use at the organisation's power stations. Stations have identified major streams, and plans are underway to install flow meters at strategic points as part of the technical plans to be implemented over a period of three years to ensure full compliance to the directive.

Eskom also sets water-use targets in terms of litres of water used per unit of electricity produced for each power station every year. The water targets are linked to the Eskom Sustainability Index. The targets are benchmarked against historical as well as designed water consumption for each type of plant.

All power stations have water use performance targets that are set and monitored on a monthly basis and reviewed each year. The target setting is based on the station design and technology, water use performance, water quality and statistical/regression analysis of each power station. Eskom achieved its best overall water use performance

Eskom accounts for up to 3% of South Africa's total water consumption.



Courtesy Eskom



Courtesy Eskom

An aerial view of Matimba Power Station, one of Eskom's dry-cooling stations.

**WHERE DOES ESKOM USE ITS WATER?**

- At the coal-fired stations, water is used to generate the steam that drives the turbines to generate electricity, and for cooling purposes
- Water is used to drive the turbines to generate electricity at its hydro power and pumped storage schemes
- Most power stations treat raw water to produce potable water for certain processes and to supply the nearby communities and coal collieries for domestic purposes
- Sea water is used for cooling purposes at Koeberg Nuclear Power Station
- Construction and commissioning activities at its new power station build sites
- Production of the demineralised water as make-up water for the steam cycle
- Hydraulic conveyance of ash to the ash dams
- Dust suppression
- Scrubbing of flue gases where flue gas desulphurisation is employed

of 1.34 l/kWh in the 2012 financial year against a target of 1.35 l/kWh.

As a strategic water user Eskom is committed to being proactive in establishing water management procedures and initiatives to protect water resources and promote conservation and judicious use of water in support of the national policy. A Memorandum of Understanding (MoU) has been signed between Eskom and the Department of Water Affairs to promote, encourage and support good water management practices in areas of Water Conservation and Water Demand Management (WCWDM) within the power generation sector.

**WORLD WATER WEEK IN STOCKHOLM**

Towards the end of last year, Govender attended World Water Week in Stockholm, Sweden, where he gave a presentation on the South African Strategic Water Partners Network (SWPN-SA), focusing on a case study entitled 'Partnership on Effluent and Wastewater Treatment'. This highlighted one of the key focus areas of the SWPN-SA,

whose overall objective is to reduce the 17% water resources demand gap by 2030, as well as in severely stressed catchments whose water balance is in deficit.

The SWPN-SA has formed three working groups which focus on the following:

- Working group on Water Efficiency and Leakage Reduction: Focus on water use efficiency, reducing water losses and water wastage in the Municipal Sector. Group led by Nestle (South Africa) and Sasol;
- Working group on Agriculture and Supply Chain water: Focus on Agricultural Supply Chain and irrigated agriculture, led by Coca Cola (South Africa);
- Working group on Effluent and Waste Water Management: Huge potential for increasing reuse of waste water at the coast as well as in inland systems. Focus on mine-water and municipal effluent treatment, led by Eskom and Johannesburg Water.

The SWPN-SA is a water management partnership between government, the private sector and civil society.

**GREATEST MILESTONE OF CAREER**

Govender relates the greatest milestone of his career: "I was appointed to the Governing Board of the first catchment management agency (CMA) to be established in the country. I was part of a group of governing board members who represented a wide stakeholder and user base. I was representing the Industry, Power Generation and Mining seat on the Board. The experience itself, of creating a new institution, was a huge learning experience, in terms of being able to contribute my wisdom, expertise and knowledge that I had acquired from the water sector and also from being in the employ of Eskom," says Govender. □



## Looking back: A 100 years after Lewis walks the Orange



On 12 December it was exactly 101 years since Dr Alfred Dale Lewis, former Director of the Irrigation Department (as the Department of Water Affairs was known in 1912) completed his epic journey along the lower end of the Orange River.

This was not just a casual stroll. The water engineer's aim was to explore the lower reaches of South Africa's largest rivers for the possibilities of irrigation. Decades later Dr Lewis' vision would be fulfilled when the Gariiep and Vanderkloof dams, along with the Orange-Fish Tunnel were constructed.

"There can hardly be a true South African and certainly no irrigation engineer, with a soul so dead that he can contemplate our greatest river tearing down to the ocean through a vast area of country which is thirsty for water, without feeling that some great effort should be made to design

and carry out irrigation works for the Orange River which would rival those famous works of other great rivers in the world," Dr Lewis wrote in 2012.

His journey started on 24 November 2012. He first travelled by horse-drawn cart from Kenhardt to Pella mission station. It was one of the hottest years on record and the country was suffering from a great drought. By the time Lewis reached Pella on 27 November two of his horses had died.

From this point onwards it turned out to be impossible to follow the river even on horseback, so Lewis decided to complete the journey – a distance of over 400 km – on foot. For 16 days he travelled alone beside the river, over rough terrain, carrying all his gear. Temperatures reached 41°C in the shade in some places.

He sometimes managed to procure the services of carriers from

Khoi villages dotted along the landscape to help him with his load (in his final report Lewis writes how he had to 'bribe' these men with tea and tobacco). When his food ran out he procured goats for slaughter from the passing villages.

Through all of this he kept his sense of humour. Managing to procure a riding ox for a while, Lewis writes how comfortable it is to ride "the only body part tiring being the arm from slogging." He reached the Orange River Mouth on 12 December, and the detailed report he prepared shortly thereafter served as the main information source for planning for many years.

*Source: In the Footsteps of Giants – Exploring the history of South Africa's large dams*

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Ralf Broemer

*AD Lewis' journey along the lower Orange River.*