NATIONAL BUSINESS INITIATIVE

ENERGY EFFICIENCY CASE STUDIES - 2010

Regional partner of the World Business Council for Sustainable Development

CONTENTS

Foreword

Energy will be a key issue for the country's development path over the next two decades for two key reasons. First, the need to manage the relationship between supply and demand, particularly in the provision of electricity. Second, energy will be crucial due to the pressure on South Africa to support international efforts to reduce emissions of greenhouse gases. These factors have resulted in a significant challenge to which both the public and private sector will need to respond. It is for this purpose that this combination of factors has been referred to as creating the "Perfect Storm".

What has become clear is that the transition to a new energy efficient economy - one that supports the country's development objectives - will involve a number of actions and that these will have to be at scale. This will require a different set of institutional relationships, the use of new technologies and new behaviours and attitudes across all sectors.

When the voluntary Energy Efficiency Accord process was initiated in 2005, it brought focus onto an issue that had been neglected for years for a number of reasons, including the unsustainably low price of electricity.

Despite the inherent structural constraints, the work of the Accord signatories led to a number of positive achievements including:

- Stimulating a number of companies to establish their energy baselines;
- Stimulating some signatories to make significant investments in energy efficiency;
- Beginning the seed work for the measurement and verification standard, which has now been published as SATS 50010;
- Motivation for funding from the Swiss government and UNIDO, and the leveraging of funding from government for capacity building relating to energy efficiency;
- Providing a platform for engagement with government, which informed the Department of Energy's proposals to National Treasury for the allocation of funds with regards to energy efficiency-related fiscal incentives;
- Providing a platform for business to engage directly with Eskom in dealing with the challenges experienced in accessing DSM funding;
- Testing a reporting process for signatories using an energy management performance matrix and, through this process, identifying areas for improvement and further attention. For example, the need for skills development and the need to focus on energy carriers other than electricity; and
- Sharing experience and technical expertise between signatories who have supported project development and implementation.

Information sharing has shown itself in the Accord process to be a major supporter of project development, particularly through building the confidence to implement. Accord signatories have often indicated that they have gained greatly learning from the experiences, both good and bad, of others.

This case study booklet is another element of this approach. It documents how companies have taken forward their energy efficiency initiatives, what has worked, what has not and what they have actually achieved.

Each of these companies had to take the first step to commit resources to implementing projects. In sharing these stories, we hope that other companies will be inspired to take a similar first step. A step that will ultimately lead towards creating benefits for themselves, the country and the global environment.

We wish them luck and offer our continued support in their endeavours to show leadership in this crucial sector.

Valerie Geen
NBI Director: Climate and Energy

Message from Eskom's Chief Executive Officer

Climate change can no longer be viewed as a remote issue, nor a topic reserved for debate by scientists and academics. It is a very real issue with which every one of us must engage. It is estimated that South Africa's national greenhouse gas emissions amounted to 495 million tons of carbon dioxide equivalents (CO_2) in 2007 – 53% of it as a result of coal combustion. While Africa as a whole only contributes around 3% of global greenhouse gas emissions, South Africa represents a significant portion of this.

Our leaders have recognised climate change as a serious threat which could impact on our natural environment as well as the competitiveness and effectiveness of our economy. Changing weather patterns affecting the existing electricity supply infrastructure and components of our supply chain could become real obstacles to our business if we don't factor the changing natural and regulatory environment into our future planning.

The instruments which define this changing environment include international treaties such as the United Nations Framework Convention for Climate Change (UNFCCC) and the Kyoto Protocol and national policies. They also include market responses, such as investor requirements and consumer activism. Without an appropriate response, these measures would increase the operating costs and risk profiles of companies.

Apart from its potentially negative effects, climate change also presents us with an opportunity to create and realise additional value. By accessing global carbon markets, a business that can reduce its emissions of Green House Gas's can, in many cases, generate emissions reductions credits which constitute a tradable asset.

Reducing emissions doesn't necessarily mean restricting output. Rather, the drive is towards efficiency. Energy efficiency is a key concept being advanced within Eskom and with our customers. By using no more than is necessary, and by optimising consumption and eliminating waste, we not only reduce the costs of production and the cost of living, we are also reducing our individual and collective impact on their environment.

At Eskom, we've dedicated a whole new division called Integrated Demand Management (IDM), to work both internally and with energy consumers to help optimise the use of electricity. Targets have been developed for each Division for the next three years in order to achieve an internal energy saving of 1 billion kWh by 2012-2013 and these have been included in relevant compacts. Historically, Eskom was working to effect a reduction of 3000MW by March 2011 and a further 5000MW (a capacity exceeding that of one of our new coal-fired power stations) by March 2026. Due to the financial pressure on the company the planned demand target of 3000MW will now only be achieved by 2013.

Business leaders need to be aware that the time to address the challenge of climate change is now in order to take the necessary pre-emptive measures to counter costs and deal with future requirements. We can also raise public awareness about how individual actions can slow down global warming and at the same time, save money.

Brian Dames
Eskom Chief Executive

Brian Dames

Introduction

In 2003, the NBI established the Sustainable Futures Unit to promote good corporate citizenship and responsible business practices, with a specific focus on environmental concerns. The NBI is the regional partner of the World Business Council for Sustainable Development (WBCSD) in South Africa. As such, the organisation has begun to introduce global debates and increase the focus amongst local business leaders on issues such as energy, climate change and more recently, water.

The NBI facilitated the signing of the Energy Efficiency Accord in 2005 between 31 leading corporates and industry associations, along with the former Minister of Minerals and Energy at the time, Phumzile Mlambo-Ngcuka. This commitment was reinforced a year later, when more leaders joined the initiative, bringing the total number of signatories to 40. The technical committee, formed to implement the Accord, is led by business and government, with NBI as the secretariat and facilitator of the ongoing partnership. Minister Dipuo Peters recently pronounced her support to continued partnership between government and business in support of Energy Efficiency.

The NBI is also the local partner of the Carbon Disclosure Project (CDP) – the secretariat for the world's largest institutional collaboration on the business implications of climate change in South Africa. This project represents an efficient process through which many institutional investors collectively sign a single global request for disclosure of information on Greenhouse Gas emissions (GHGs). A significant contribution to South Africa's emissions profile is its reliance on coal as a source of energy and therefore energy efficiency is also one of the most important mitigation measures in response to climate change. Coupled with energy security challenges and increasing energy costs, there is a strong business imperative for energy efficiency measures. The CDP assists in fostering an integrated approach to energy and carbon management.

Many organisations are waking up to the need to reduce their carbon footprint. This comes as global carbon reduction initiatives gain momentum and customers increasingly seek to support companies in transition to a low carbon economy.

There has been a significant increase in pressure on business over the past five years to tackle issues of sustainability. This pressure is likely to increase further over the next five years, offering businesses major opportunities as well as penalties and risks for those who fail to act in response to a more resource efficient pathway.

Case Studies

ABB's Longmeadow facility – a shining example of energy efficiency

ABB's Longmeadow Head Office

ABB's Longmeadow head office, manufacturing and logistics centre has been designed with an impressive depth of research and focus on design, construction and facilities management automation, resource efficiency, recycling and ongoing minimal environmental impact. This has ensured that the site is a shining example of ABB's environmental best practice.

Occupation of the R550 million facility began in June 2009. It was built with energy efficiency in mind and features key green building elements that include solar panels, a grey water recycling system, energy-efficient lighting, and the optimisation of natural light both in the offices and the factory.

Solar heating

Longmeadow has reduced energy use, through the use of solar heating, the heat exchanger from air conditioning, the EFF1 (High Efficiency) motors, extensive use of grey water and by implementing the building automation systems developed by ABB. A north-facing solar heating system on the roof heats the water delivered to the showers. This natural, free energy source replaces the need for electrical heating and does not produce carbon emissions. Energy consumption for the building's heating system is also reduced with a heat exchange system that uses hot air from the air conditioning system to supplement the building's boilers.

Grey water

All rain water is collected from both the roofs and the hard stands into an attenuation pond which also serves as a water feature. The factory roof and hard stands alone account for some 40 000m² of catchment area should a rainstorm deliver 100mm of rain, hence a total of 4 000 litres of rain water will be diverted into two attenuation ponds which feed the indigenous gardens. The system also has a top up water feature for non-rainy days.

H-shaped design

The building's H-shaped design contributes to lower energy demand for lighting by ensuring the office workstations are located in the exterior portions of the building thus receiving good natural light. The factory has also made use of natural light through the roof design.

Lighting

Each workstation is fitted with a photo-sensitive motion sensor switch. All lights are low energy consuming and all of the service areas are located in the middle where down-lighters and emergency lighting have been installed.

Low energy consumption compact fluorescent lights (CFLs) have been installed in the factory section. The power reticulation grid to the lights allows individual units within the factory to turn their lights on and off as required.

Building insulation and air conditioning

The basement is open and was designed in this manner for effective natural ventilation.

Roof design provides natural lighting

Fans have carbon dioxide detection meters that automatically turn air extraction on when the CO_2 emissions reach a pre-determined level. The fans and air conditioning plant are driven by ABB variable speed drives that use energy more efficiently and pick up speed in a slow controlled manner which eliminates high power demand bursts at start-up.

Temperatures in the basement in winter can plummet to 5°C. Each of the office floors above therefore has a 200mm thick concrete slab that is insulated with a 100mm deep Styrofoam layer – as are the side walls and the roof.

ABB Building Management System (BMS)

The ABB Building Management System (BMS) is programmed to automate, control and manage all of the energy demands in the building. The BMS provides a wide range of control functions, including fire control, security, power monitoring and air conditioning control.

Driver's provide infinite control over the speed of motors driving pumps and fans, maximising the building's environment by matching the temperature and humidity to the demands of the prevailing weather and the number of occupants.

Waste handling

ABB SA generates a lot of waste due to the size of the organisation; a waste management plan was therefore devised and implemented. All waste is sorted into its relevant piles for recycling, namely, paper; metal; glass and plastic. The wet waste from the canteen is taken to a worm farm where earthworms process it into compost for the Longmeadow gardens.

Cleaning contractors

ABB has entered into a green cleaning contract with a company that prides itself in the use of environmentally friendly cleaning products.

The Longmeadow building attains the highest green building standards.

ABB's Longmeadow green office building and factory was the venue for Automation and Power World Africa on 11 and 12 November 2009 – the company's largest customer event in Africa. The new facility was officially opened by ABB Group CEO Joe Hogan as part of the proceedings.

ABB South Africa has also won a top energy efficiency performer award in the industrial category of the *eta* Awards sponsored by energy utility Eskom for its Longmeadow building.

Mix of low energy and natural lighting

AfriSam drives down the energy cost of cement

Eco Building Cement

AfriSam has been at the forefront of energy efficiency initiatives for many years – an effort recognised at the *eta* Awards 2008, when AfriSam was named 'Top Energy Efficiency Accord Performer' in the industrial category. Using 2000 as its base year, AfriSam has reduced its specific electrical energy consumption by 25% and its specific thermal energy consumption by 40%.

Numerous projects were undertaken across all of AfriSam's operations including: behavioural, educational and staff advocacy initiatives on the one hand; and systematic technology changes to state of the art energy efficient equipment, on the other.

AfriSam has implemented an energy management programme at each of its plants as well as employed a trained team of process engineers in order to get the best energy efficiencies out of each plant component.

Electric motor audits were performed across all plant equipment to ensure that the motors were not oversized, and the motor sizing requirements were recalculated based on actual production load requirements to make sure that motors matched their load requirements and ran at optimal efficiency. Old Direct Current (DC) motors with damper controls are being replaced by energy efficient Alternating Current (AC) motors with Variable Speed Drives (VSDs) and all small motors (generally less than 90kW) are being replaced by energy efficient motors.

Load shifting programmes were put in place with improved maintenance techniques – so AfriSam is now able to plan load shifting of the large units (the primary crushers and mills) if stock levels in buffer storage are high.

Cement extenders – lowering the energy intensity of cement

In 2002, AfriSam initiated Project Green Cement, this focused on changing the composition of cement through the use of 'low-energy' extenders. These are substitutes which decrease the amount of energy-intensive clinker dominating the composition of traditional cement. The main drive of this project is the optimisation of cement production by using mineral extenders that have either no or limited additional energy requirements by using by-products such as slagment from the steel industry and fly ash from coal power stations.

An APC product change from CEM II (Cement type) to CEM V standards with improved workability, durability and flexibility was possible because of the favourable location of the Roodepoort and Brakpan factories. These plants are situated closer to the market and to sources of extenders like slagment and fly ash. This advantage is further supported by state of the art blending plants which can provide the customer with a special blend of cements from three types of extenders.

The energy saving - both electrical and thermal - is optimal because the extenders need only be added in the final milling process and do not have to go through the raw milling or the thermal process in the kiln. The extenders therefore consume 60% less electrical and thermal energy used in the cement production process, that is, 30% less for raw milling and 30% less in the kiln.

Capital intensive energy efficiency projects

It has been shown that bucket elevators draw on average 0,41kWh/t of material, while air lifts draw 1,10kWh/t of raw material (World Cement, 2004). The 2003-2004 upgrade of the Duffield 3 raw meal elevator and the subsequent 2006 upgrade of the Duffield 2 elevator from air lifts to bucket elevators therefore resulted in a 62% reduction of electrical energy use.

Awareness creation of the Eco Building Cement

AfriSam has found that vertical roller mills (VRMs) use 24% less electricity than ball mills, while VRMs are typically 20% more expensive than ball mills – this was gauged from experience and results from similar mills installed around the world. Each ton of cement milled will therefore result in a remarkable and provable saving in energy consumption.

It is projected that the new VRM at AfriSam's Roodepoort plant will save more than 6 000 000kWh per year while milling a comparative volume of cement as a ball mill. An additional blending plant was installed at Roodepoort as an additional component of the Roodepoort VRM project. This plant affords AfriSam the opportunity to decrease the clinker factor, which will result in further energy efficiency improvements and a further decrease in CO_2 emissions.

The upgrade of Ulco's raw mill separator includes the installation of a high efficiency separator on the raw mill and replacing the electro-filter fan with a high efficiency unit. A technical study shows that the potential savings of electrical energy consumed by the raw mill will be 10%.

Energy efficiency improvements and AfriSam's CO_2 footprint

AfriSam has prevented direct CO_2 emissions of 6,3 million tons from 2000-2008 by improving the specific thermal and calcination processes from 2000 levels. CO_2 savings also accrue due to electricity savings. It is impressive to note that since 2000, AfriSam's 715 000MWh of electricity savings is equivalent to 860 000 tons of CO_2 being removed from the air at Eskom Power Stations.

Anglo Platinum's new lighting technologies improve energy efficiency at mines

Energy efficiency industrial compact fluorescent lamp

One of the country's top producers of platinum, Anglo Platinum signed the Energy Efficiency Accord in 2005. This, in turn, created a significant challenge in terms of meeting the Accord's requirements. Energy efficient lighting was identified as the first of the "low hanging fruit" which would, apart from saving energy, also contribute towards a culture of energy efficient behaviour. With the mining industry using electricity to power everything from plant to underground pneumatic tools, reducing energy costs and increasing efficiency are matters of great concern.

Whilst Anglo Platinum uses about 1000MW of power, about 20MW was estimated to be used for lighting. The bulk of this was in Anglo Platinum's underground mines where 60 watt and 100 watt incandescent lamps spaced at 5 to 6 metre intervals was the norm, plus normal switch-start fluorescent lamps, either in 5 foot or 8 foot configuration in the areas where more light was required (such as at the stations, pumping areas, workshops, etc.)

Anglo Platinum engaged the services of Voltex Mine Lighting, one of its contract suppliers, to devise innovative ways to save power used for industrial lighting. A design review was held, and the requirements for a mine lamp to replace the incandescent lamps were agreed upon. Amongst others, these were a lamp life of at least two years, a minimum lighting level of 5 lux, vandal proof and low cost.

The light developed by Voltex was a 13 watt industrial compact fluorescent lamp that has a four-pin fitting that differentiates it from those found on CFL's intended for domestic use. This was tested and certified for compliance to SANS and IEC standards. The lamp had a guaranteed life of 15 000 hours under switching conditions. It was fitted in a housing with a standard E27 Edison screw fitting and an industrial quality electronic ballast with a design life of 50 000 hours. The Edison screw used a special key for insertion and removal from the supply connection, thus making it theft-proof. A special prismatic diffuser rounded off an elegant design which conformed to all the design requirements.

A project pilot study was initially undertaken at the group's Amandebult Mine, situated near Thabazimbi in the Limpopo Province, which is a major producer of Merensky and UG2 ore used in the downstream refining into Platinum. A total of 32 403 incandescent lamps and 4 200 fluorescent lamps were replaced from March 2006 to November 2006.

A total of 2,33MW hours was saved (measured and verified by an independent external authority). Based on the success achieved, the project was extended to all the other mines in the Anglo Platinum group. In total, 184 619 lamps were replaced at the group's Union Mine, Modikwa Mine, Lebowa Mine, Bafokeng Rasimone Platinum mine and all the Anglo Platinum Mines in Rustenburg. The project was finally completed in April 2009, and a total verified saving of 9,755MW hours was achieved.

Unmeasured, but just as important, was the fact that pure energy efficiency gains are also supported by technical and health-related advantages such as the reduced risk in replacing far fewer lamps than before. Other benefits have included reduced spending on breakages and shrinkages which are caused primarily by theft of lights, maintenance costs, and better handling of major voltage fluctuations.

Besides reducing electricity costs and energy consumption, the lamps surprised all with their long life span. Whereas the previously used incandescent lamps had to be replaced eight times a year (the average lifespan of incandescent globes can vary between 800 and 1 000 hours), the compact fluorescent lamps have a guaranteed design lifespan of 18 000 hours under non-switching conditions (15 000 hours plus 20% due to it burning continuously). Practical experience at Amandebult has indicated a lamp life of at least 40 000 hours after 4,5 years of operational use, with a very low failure rate to date. This is significantly exceeding the payback time of just longer than 2 years on the original business case. While the benefit of the longer lamp life is obvious, there are numerous other benefits to the mine.

Other operational advantages include assembly from materials that are non-flammable and non-toxic. While the CFL contains minute quantities of mercury, it is substantially less than the total mercury resulting from the use of incandescent lamps. It has other benefits in a mining environment, such as being able to operate effectively at 110 or 230 volts. The fact that they can easily be replaced by unskilled labourers is also a major plus.

The success of the Voltex Mine Light has resulted in it being used in many more of South Africa's largest mines.

Whilst this project has paved the way for other energy efficiency projects within Anglo Platinum, lighting is continually being assessed for its further potential in energy savings. New technology such as LED lighting is being considered, as well as motion sensors to improve the contribution of lighting towards energy efficiency even further.

FirstRand's energy management programme lights the way

Of its 900 buildings, FirstRand has targeted an 11% reduction in electricity use per building by 2011. In order to achieve this target, FirstRand established an Energy Dashboard for its larger buildings and a number of business units. The Dashboard tracks current consumption against a previously measured baseline, and the KWh savings against the 11% target.

The company found that an analysis of its building's energy consumption revealed that up to 45% of consumption was used on air conditioning, 28% on lighting and 20% on office equipment. To date, the company has replaced 26 159 incandescent light bulbs with new energy efficient bulbs, installed 2 342 lighting motion sensors and 9 493 electronic control gears.

At its Four Merchant Place site alone, the company has installed variable air conditioning speed drives and amplified its minimum air conditioning setting up by 2 degrees. So from a previous setting of 19°C, the air conditioning has been turned up to 21°C resulting in an air conditioning power requirement reduction of 50kW.

Completed projects have delivered a massive R7,5 million in year on year savings to date with planned energy saving initiatives having been calculated to deliver a further R8,1 million in savings going forward.

First National Bank (FNB) are currently switching off 10 000 Linux computers in the branches from 22h00-06h00, this will be extended from 20h00-06h00 post FIFA World Cup. The roll-out of the Windows energy saving software has been piloted at Outsurance and FNB. FirstRand is completing one final pilot before rolling this solution out across the entire FirstRand Group.

The FirstRand Group which comprised FNB, Rand Merchant Bank, Outsurance, Momentum and Wesbank, has created an Energy Forum that meets on a quarterly basis to oversee and implement its energy savings programme.

According to FirstRand's Energy Manager William Cass, the work that has been done to date is not difficult to implement but just good business sense. With the enthusiastic backing of FirstRand senior management, it is set to be an ongoing success story that other companies in South Africa can learn and benefit from.

Cass says that other organisations can implement the same energy efficient measures that the FirstRand Group has already implemented. In the interest of the country's development through the sustainable use of energy, Cass is willing to share the Group's energy saving business models with interested parties.

The Woolworths good business journey

Woolworths Midrand Distribution Centre.

This strategy involves a multifaceted plan that incorporates a series of challenging targets and commitments, centred on four key priorities: accelerating transformation, driving social development, enhancing environmental focus, and addressing climate change.

To this end Woolworths is committed to reducing the organisation's relative carbon footprint by 30% by 2012. This will be achieved in part through far-reaching energy efficiencies. The company has already indicated this commitment, being the first retailer to participate in the Voluntary Energy Efficiency Accord.

Woolworths signed the Energy Efficiency Accord in August 2006 and is committed to working with key stakeholders to update, and where necessary, establish energy management guidelines for the retail sector, based on best international practice. The organisation is now using energy far more efficiently than it did in 2004. Woolworths' relative electricity usage now stands at 268,9 kilowatt hours per square metre of trading space, per day. This is a 12% decrease from relative electricity usage in 2004 – the baseline year.

The major innovations driving this saving include remote monitoring of lighting and air conditioning, automated energy systems, installation of energy efficient lighting and refrigeration plants and waste heat recycling. Woolworths has targeted a 30% reduction in both relative energy and carbon emissions by 2012.

In recognition of these initiatives, Woolworths received the National Business Initiative (NBI) special award for top performance in energy efficiency in November 2008 as part of the *eta* Awards. The eta (the Greek symbol for efficiency) Awards are convened annually by Eskom and the Department of Energy. The award has been used to raise awareness about energy conservation, to ensure that South Africa's economic growth is supported by the availability of energy sources.

On 19 November 2008, Woolworths was also recognised for its "outstanding" climate change-related disclosure practices, heading the JSE's Top 100 Carbon Disclosure Leadership Index in the low-carbon sector.

The assessment was based on the quality of information disclosed by companies in response to the Carbon Disclosure Project (CDP). The initiative also seeks to highlight the importance of monitoring and addressing carbon output in the private sector.

In 2009 Woolworths was ranked 2nd overall among South African companies participating in the 2009 Carbon Disclosure Project. The company was also named winner of the retail sector category at the inaugural Climate Change Leadership Awards in March 2010. These awards recognise, reward and celebrate South African businesses; community-based organisations; or individuals who are leaders in climate change issues and who are taking the lead through positive voluntary action, by implementing a range of activities related to combating global warming.

Woolworths' energy saving efforts include:

Lighting and air conditioning systems

All light fittings in Western and Eastern Cape stores have been changed to energy efficient fittings. Woolworths is currently rolling this programme out in KwaZulu-Natal and Gauteng; Woolworths only uses electronic ballasts, in place of magnetic chokes in stores, depots and offices, resulting

in a 15% saving in lighting costs. The electrical profiles of selected stores, depots and offices are monitored remotely to ensure that lighting and air conditioning units are managed in the most efficient way.

Automated light switching equipment has been installed in the top 40 stores to ensure that lights do not remain on after hours. Woolworths has conducted awareness programmes, campaigns and presentations at stores for the last 25 years to educate staff about efficient use of energy. The company was also amongst the first retailers to sell energy efficient light bulbs in South Africa and no longer stocks incandescent light bulbs.

Refrigeration

None of Woolworths stand-alone food stores have air conditioning, except in KwaZulu-Natal where the air conditioning is required to control humidity. Energy efficient refrigeration plants installed in stores and depots over recent years have reduced the power consumed by refrigeration by up to 40%. Frozen foods are displayed in closed refrigeration cabinets - this has been the practice for over a decade, reducing energy usage in the freezers.

Waste heat, recycled from the refrigeration system, is pumped back into the food market ("free heating") helping to maintain comfortable trading conditions. Woolworths is the first South African retailer to reduce its ecological footprint by piloting a refrigeration system driven by carbon dioxide (CO_2). Unlike conventional refrigerants, the use of CO_2 helps to mitigate against the contribution to climate change. Furthermore, early indications are that the new refrigeration system also uses less energy. The new cooling system was recently installed at Woolworths Grey Owl store in Midrand, with a view to making this a standard in all new store installations.

Building design

The company considers the following energy saving measures when considering new real estate opportunities: Natural ventilation, including office windows that can open and cross ventilation; the use of natural light; energy efficient lighting and the use of a Building Management System for light switching; solar water heating; and re-use of heat generated by plant and machinery to heat buildings in cold periods of the year.

An illustration of Woolworths' commitment to sustainability at every level of the business is the Woolworths Midrand distribution centre, one of the largest single structures in the southern hemisphere. Every aspect of the design and construction of the 78 000m² facility has been subject to scrutiny from a social and environmental perspective, ensuring that the organisation minimises the impact on the surrounding environment and communities. In an effort to reduce the use of electricity at the centre, a number of measures are utilised.

These include:

- The use of natural light in the building;
- Intelligent light fittings in offices, capable of dimming to adjust to ambient natural light and switching off when people leave the space;
- The use of recycled heat. This is heat recovered from the refrigeration plant, which is used in the under floor heating system;
- Solar thermal hot water production for ablution facilities;
- The use of elevated flood lights, which results in a significant reduction in the number of luminaries required; and
- Using evaporative cooling technologies for the refrigeration plants, resulting in great energy savings.

Xstrata – Merafe Venture investing in energy efficiency

Lion Ferrochrome Plant in Limpopo

An international mining group, Xstrata is committed to achieving energy efficiency at all its operations. This is an approach that is typified by the award-winning programmes it has undertaken at its venture with Merafe in South Africa, where it has achieved a significant saving of more than 12% per tonne of alloy produced.

This commitment has involved investing more than R2,4 billion in the development of energy efficient furnaces at its Lion Ferrochrome plant in Limpopo and the Bokamoso pelletising plant in the North West Province. The technology employed at Lion Ferrochrome produces energy savings of approximately 429 000MWh (Megawatt Hours) a year, when similar volumes are produced with more conventional technology.

This particular technology uses ore, in the form of pellets, which has been partially reduced to the required metal product in a kiln, and is then fed hot into the submerged arc furnaces. The energy savings are obtained by not allowing the pelletised ore to cool down once it has been sintered at the very high temperatures in the kiln.

Other technologies used in ferrochrome smelters can at best pre-heat the raw materials with a gas burner before entering the furnace. The pre-heating temperatures achieved using these methods are only a fraction of those reached in the Lion Ferrochrome plant. Project Lion, which began in 2004 and started production in September 2006, is more than 25% more energy efficient than the older conventional smelters.

Backing these achievements, significant energy efficiency savings are being recorded in improved furnace charge preparation technologies for Xstrata's semi-closed (conventional) furnaces. These have led directly to the establishment of the Bokamoso pelletising and sintering plant at the Wonderkop smelter operation.

At the Bokamoso plant, energy savings are achieved by agglomerating and sintering the ore. Small ore particles are processed into pellets of 10mm to 15mm in diameter and heated above 1 300°C. This breaks up some of the mineral structure through partial reduction and re-oxidation. By using these pellets rather than normal ores, better permeability of the gaseous product from the chemical reactions in the furnace are obtained. These in turn contribute to much better furnace stabilities.

Agglomerating fine ore into pellets also increases the retention time of the ore during the semi-continuous smelting process. The ore is therefore processed more completely into the final product and less heated material, and thus energy, is wasted on the slag (waste product).
The operational performance of the Bokamoso plant, which has exceeded its design capacity, has resulted in actual energy savings substantially exceeding targets of 6% at the Wonderkop and Rustenburg smelters. The significant energy savings being realised by the Xstrata Merafe venture also have the indirect effect of reducing greenhouse gas emissions.

Put into context, if the Xstrata Merafe venture had not instituted these savings, Eskom – by supplying the electricity needed - would have produced an additional 811 000 tonnes of CO_2 and 7 000 tonnes of SO_2. This is because Eskom itself produces around 93% of its total electricity supply from thermal, coal-fired power stations. South Africa faces a number of key energy challenges in the short, medium and long term. These include energy security, whether it is with regards to electricity or liquid fuels, and the need to move towards a low-carbon economy. Addressing these issues will require significant new investments in energy infrastructure and the development of innovative approaches to energy management. Energy efficiency will play a key role in this process and transition. It will also play a major role in achieving our initial energy objectives and will give South Africa the space to plan properly for, as well as implement the major changes envisaged in our energy economy.

This work will require a lot of persistence and inspiration, and this booklet is intended to motivate companies to take forward their energy efficiency initiatives. The examples detailed reveal what opportunities exist and what has been and can be achieved. The next part of this process is to develop the scale of activity needed to underpin our ability to achieve energy security, while moving the economy from its reliance on fossil fuels and their associated emissions. This is one of the country's great challenges over the next 40 years and our approach to energy efficiency will contribute to the success of the country to achieve economic growth and competitiveness.

Bokomoso Plant

Conclusion

South Africa faces a number of key energy challenges in the short, medium and long term. These include energy security, whether it is with regards to electricity or liquid fuels, and the need to move towards a low-carbon economy. Addressing these issues will require significant new investments in energy infrastructure and the development of innovative approaches to energy management. Energy efficiency will play a key role in this process and transition. It will also play a major role in achieving our initial energy objectives and will give South Africa the space to plan properly for, as well as implement the major changes envisaged in our energy economy.

This work will require a lot of persistence and inspiration, and this booklet is intended to motivate companies to take forward their energy efficiency initiatives. The examples detailed reveal what opportunities exist and what has been and can be achieved. The next part of this process is to develop the scale of activity needed to underpin our ability to achieve energy security, while moving the economy from its reliance on fossil fuels and their associated emissions. This is one of the country's great challenges over the next 40 years and our approach to energy efficiency will contribute to the success of the country to achieve economic growth and competitiveness.

South Africa has been identified as a climate change hot spot and one that will be most adversely affected by climate change. As a result, companies need to understand where their carbon emissions are coming from, by performing a baseline assessment or gap analysis and by benchmarking themselves against other companies in their sector both locally and globally. Without measurement, companies will have no idea how big their carbon footprint is and how they can reduce it. Since energy is a significant contributor to CO_2 due to its reliance on coal, energy efficiency in terms of all energy sources, especially electricity, it is a primary starting point - not only in response to Climate Change but also in response to increasing electricity pricing and security of supply, as greater demands come with economic development.

For many general service companies, anywhere between 25% and 60% of their GHG emissions are travel-related. Business travel, by both road and air, can be a major contributor to a company's carbon footprint, as can electricity consumption and paper usage.

Once companies have measured their carbon footprints, they need to put strategies in place to reduce them. There are numerous questions to be asked, such as, does one cut the amount of travel, or move travel to more energy efficient suppliers? If they are more energy efficient, what methodology can one use to prove it? How can carbon emission reduction benefit shareholders? Which carbon offset programme is the best for your company?

In addition, South African businesses are under enormous pressure, especially since legislation and regulations require them to address the challenges of sustainability. Along with the current economic slowdown, large numbers of companies are being forced to rethink their business practices and take corrective action.

Sustainability should be a strategic point on everyone's agenda, driving how businesses respond to increasing pressures, while at the same time presenting opportunities for companies to manage risk, promote their brand and increase efficiency.

About the NBI

The National Business Initiative (NBI) is a voluntary group of leading national and multi-national companies, working together towards sustainable growth and development in South Africa through partnerships, practical programmes and policy engagement.

Since its establishment in 1995, the NBI has been an advocate for the collective role of business in support of a stable democracy, growing economy and healthy natural environment. As one of close to 60 global regional partners to the World Business Council for Sustainable Development (WBCSD), the NBI provides a platform for business leadership and a vision of how companies can contribute to a sustainable future.

The NBI's impact ranges from strategic evidence based public policy intervention to demonstrating the business case for action; from practical projects at the micro-level to high powered partnerships that address issues and constraints at the macro-economic level. Our strategic focus is:

- Business in Society
- Human Capital
- Climate and Energy
- Economic Linkages

www.nbi.org.za

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