

Standard Bank's Training Facility Energy Management System: Case Study

South Africa

The Standard Bank Global Leadership Centre

Africa's first ISO50001 certified commercial facility



The Standard Bank Global Leadership Centre

Business Case for Energy Management

Managing and reducing the corporate's energy consumption is essential to being an environmentally responsible business. The decision to develop and implement an Energy Management System is driven by material issues such as:

1. (Rising) costs of energy supply. Based on current levels of electricity consumption and assuming a 6% annual growth rate, the electricity consumption of Standard Bank South Africa is anticipated to increase to 580GWh by 2020. Using the same annual growth rate and assuming electricity rate increases of 10% per year, electricity costs are anticipated to increase to \$71-million by 2020.
2. Security of energy supply. South Africa was plagued by load shedding in 2008 and 2015. Standard Bank, as a bank, plays an important role in the South African economy and has to do it's bit to help ensuring the South African energy supply security.
3. Environmental impact and reputation. The South African power pool generates by far the most of electricity from coal based sources. Standard Bank can improve their energy efficiency to reduce electricity consumption thereby minimizing their environmental impact.

Case Study Snapshot

Industry	Commercial
Product/Service	Financial Services
Location	Johannesburg, South Africa
Energy Management System	ISO 50001
Energy Performance Improvement Period	Two
Energy Performance Improvement (%) over improvement period	10.9%
Total energy cost savings over improvement period	\$64 500
Cost to implement EnMS	\$26 014
Payback period on EnMS implementation (years)	10 months
Total Energy Savings over improvement period	3778GJ
Total CO ₂ -e emission reduction over improvement period	1039 tonnes

To reduce our energy consumption, cost and environmental footprint we consider repeatable and scalable energy efficiency programmes. Alternative energy sources aim to reduce our reliance on purchased electricity.

Standard Bank Group's strategic vision is to build the leading Africa focused financial services organization using our competitive advantages to the full. Supporting the vision, we realize that our business needs to grow sustainably within the constraint of a reliable energy supply, a commodity in scarce supply within the African continent. In line with our vision, we made a commitment to actively reduce energy consumption at all our facilities. This goal is achieved by implementing and operating an energy management system based on international accepted standards.

The Global Leadership Centre (GLC) was ear-marked as the first facility in the portfolio for implementing an ISO50001 Energy Management System (EnMS). Rated as one of the top 10 energy consumers in the portfolio, the intent of selecting this facility was to build on its training capabilities, develop energy leaders of the Bank and to expand the energy management activities to other facilities in the 1.1 million square meter portfolio. The learnings and experiences gained from implementing the energy management system at this facility will be used to train energy leaders to implement a similar system at their facilities.

Business Benefits Achieved

The GLC is a facility owned and operated by the Standard Bank of South Africa (SBSA) and is located in Morningside, Johannesburg. The facility was expanded and revamped in 2006 and has a total floor area of more than 25 674 m².

Its primary function is a hotel and training facility which hosts training and conferences for Standard Bank staff. The GLC boasts an impressive range of facilities, including an auditorium, lecture rooms, library and technology facilities, lounge and dining room.

The site also operates management systems such as an environmental management system (ISO 14001) and an occupational health and safety management system (18001) for which it has been certified.

“It’s not really a target, it’s a guide – the goals are continuously shifting, and we are continuously improving”

—Keith Cassie, Senior Manager: Engineering and Energy Management

Technical and non-technical energy management opportunities were identified and used to develop an aspirational target of 11% electricity reduction by 2020. This commitment from executive management was used to drive the creation and support of an energy team.

Non-technical interventions, focusing on the significant users of energy, were found to be quicker to implement realizing improved efficiency in a shorter time. The realization of these savings came from the inclusion of operational personnel from all areas of the facility in the energy team, education of personnel on correct energy management, communication to all areas of the facility on the importance of managing energy and regular engagements.

Primarily operational changes, changing boiler and air-conditioning set points, switching off unnecessary equipment, the facility reduced their annual electricity consumption from an IPMVP Option C determined baseline of 4 810 283kWh to metered consumption of 4 456 770kWh in 2015. That is a reduction of 7.3% without any capital expenditure. In 2016 the baseline consumption was 4 813 487kWh and actual metered consumption were 4 117 362kWh. That is a reduction of 14.4% in 2016. Full operation of a heat pump installation was seen as well as the connection of a 203kW Solar PV plant in November 2016.

The majority of savings was realized solely through the implementation of the EnMS aligned with ISO50001 and equates to 1 039 tonnes of CO₂ not emitted. The total accumulative cost saving was quantified at R903 683 (South African Rand) (\$64 548).

This facility is the first ISO50001 certified commercial facility in Africa. The certification was done by a local certification board, i.e. the South African Bureau of Standards (SABS) which was not accredited by the local accreditation board, i.e. South African National Accreditation Society (SANAS). The certification of this facility was used as their example by the SABS to extend their scope to certify other commercial facilities in Africa.

The learnings of the system at GLC led to the management decision of implementing the same at three additional significant energy using facilities in the portfolio. The project was also awarded the Sub-Saharan Energy Project of the Year by the American Association of Energy in 2016.

“We have been able to chart a clear way forward with our energy strategy and have developed meaningful targets for energy savings over our million plus square meter portfolio.”

—Nkosinathi Manzana, Head of Professional and Technical Services

EnMS Development and Implementation

THE E-TEAM

The development and implementation of the Energy Management System was done mainly by internal people based at the facility with support from the Energy and Engineering Team at Corporate Head Office. The resources made available included energy managers, energy engineers, lighting and HVAC specialists, and sustainability experts. The team comprised of people qualified as mechanical, electrical, or chemical engineers including technicians and PhD graduated, Association of Energy Engineers (AEE) certified Energy Managers (CEM), Energy Auditors (CEA), and Measurement and Verification Professionals (CMVP).

“This achievement wouldn’t have been possible without the hard work and dedication of the Energy Team.”

—Mongezi Nosenga, Facilities Manager.



The Core E-Team showing off the SABS certificate and AEE Award

ENERGY POLICY

An energy policy was drafted and approved by top management to demonstrate their commitment toward implementing an Energy Management System and ongoing support to achieve energy performance improvements.

ENERGY REVIEW

Implementation of the EnMS started off with an Energy Review to identify areas of significant uses. Once areas of significant energy use are identified, the areas can be assessed in detail to identify energy savings opportunities.

SCOPE AND BOUNDARIES

The scope of the EnMS is limited to all areas and equipment located on the premises of the GLC.

Electricity as well as diesel is used as energy sources at the GLC. Diesel is only used at the two backup generators and operates only when the main electricity fails

TOTAL ELECTRICITY CONSUMPTION

Knowing the total electricity consumption is important as it guides the team towards potential financial, technological, and human resource needs and allocation for the project.

Figure 2 shows the total monthly electricity consumption of the GLC. It is seen that electricity consumption is higher in the winter than in the summer months. Also, the electricity consumption is lower in December because activities are drastically reduced between middle December to middle January.

The total electricity consumed in 2014 was 4 542 000 kWh.

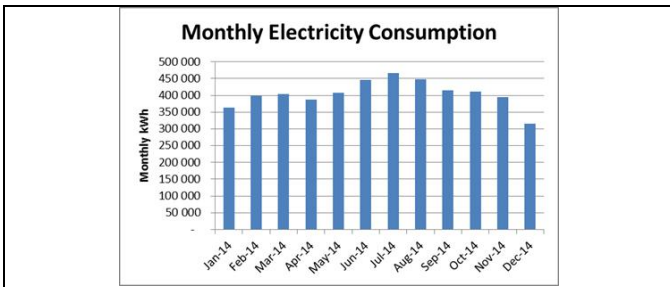


Figure 2: Electricity consumption is affected by seasonal effects

AREAS OF SIGNIFICANT ELECTRICITY CONSUMPTION

The nature of the activities at the GLC results in electricity being consumed in lighting, HVAC, IT, Domestic water heating, kitchens and laundry.

Figure 3 shows a breakdown of where electricity is consumed at the GLC. The results are from comprehensive sub-metering of all the main consumption areas.

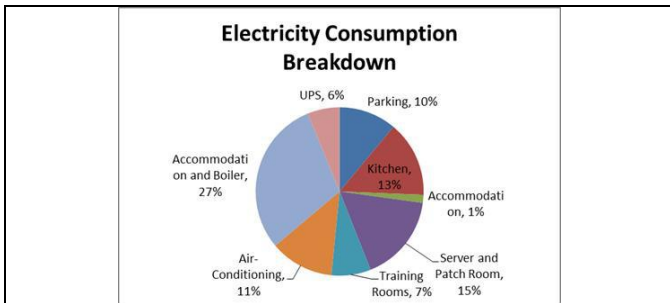


Figure 3: Significant users of electricity at the GLC are the boilers, the IT servers and the Air Conditioning

FACTORS INFLUENCING ELECTRICITY CONSUMPTION

Figure 2 shows that electricity consumption is higher in winter months than in summer months. This indicates that temperature is a driver of electricity consumption. Also seen in the figure is the lower electricity consumption in December. This indicates that occupancy is also a potential driver of electricity consumption.

A multivariate regression analysis was performed to confirm that both occupancy and temperature are indeed drivers of electricity consumption at the GLC. A statistical analysis indicated the significance of the factors selected.

Factors used as input to the multivariate regression analysis included degree days and occupancy.

THE BASELINE

Determining a baseline is crucial to demonstrate the success as well as the sustained energy performance of the implemented EnMS. The baseline is defined as a prediction of what the energy consumption would have been under the same circumstances if no energy management activities have been implemented.

For the purposes of the EnMS at the GLC, Option C as per the IPMVP was used. This provides a baseline for the total facility based on 2014. The baseline equation for the GLC is:

$$kWh_{monthly} = 338.97 \times HDD + 31.03 \times BedOcc + 287399$$

Figure 4 shows a graphical comparison of the actual monthly electricity consumption for 2014 and the baseline monthly electricity consumption. Savings will be calculated by using the following equation:

$$kWh_{savings} = kWh_{baseline} - kWh_{actual}$$

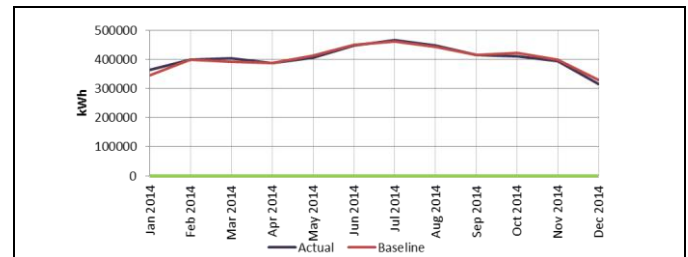


Figure 4: The baseline is a very good prediction of what the electricity consumption would have been and can be used with confidence to determine savings

IMPROVING ENERGY PERFORMANCE

Knowing how much and where electricity is consumed leads us to areas where we should focus on with detailed energy assessments. Key opportunities are discussed below.

BOILER

Various energy management opportunities have been implemented to improve energy performance including:

- Supplying domestic water at 55°C instead of 60°C.
- Switching off the boiler during extended unoccupied times.
- Insulating supply water pipes.
- Install flow restrictors.

- Heat pump installation at end 2015.

HEATING, VENTILATION, AND AIR-CONDITIONING

The HVAC system comprises of three chillers of different sizes. The Building Management System controls the chillers to meet the current thermal demand of the facility. Thus, a small chiller will operate on a cool day with the biggest chiller only in operation on a very hot day and the facility fully occupied. A problem was picked up on investigation as to why the chillers could not achieve the required temperature drop across the evaporator as expected. A strainer was found to be incorrectly installed which restricted water flow to the cooling towers resulting in insufficient heat transfer.

TRAINING AND COMMUNICATION

Communicating information regarding the effectiveness of the EnMS is done through information sharing, daily communication, meetings, surveys, awareness training / toolbox talks, internal audits, continual improvement and corrective and preventative action processes.

Training

The purpose of training is to provide knowledge and skills to individuals in order to provide a workplace that is free from the risk of injury and harm to health, environment, and improving energy performance. Therefore, the training provided, whether it is in respect of the safety, health, environment, energy or specific work skills, must meet this provision. To determine if these provisions are being met there are several areas that should be reviewed including EnPIs, Trend and root cause analysis, system audits, outcomes of assessments, new ideas from employees, minutes of meetings.

Analysis of the above will assist in determining the need for further training and possible amendments to the existing schemes.

Information Sharing

This process is used to distribute broad based information to a wide spread audience. Feedback is not required and the intention is for information only. Channels in use include newsletters, notice boards, dashboards, and campaigns.

Maintaining Performance

Daily Evening Manager on Duty (EMOD) reports are vital documents to ensure issues encountered during the evenings are communicated to the day managers. These reports are also a key communication medium from the day managers (who set set-points) to night managers to ensure set-points are controlled as documented in the EMOD reports.

TOOLS AND RESOURCES

The EnMS at the GLC were developed and integrated with the existing ISO14001 and 18001 management systems. This meant that the framework for EnMS was already in place. Other tools used were in-house developed tools such as business case tools. An online monitoring system is in place throughout the facility yielding outputs as shown in Figure 7. An Excel based tool developed by UNIDO also assisted in implementing the EnMS.

MEASURING ENERGY IMPROVEMENT

Energy Performance Indicators

Energy Performance Indicators (EnPI) are used to demonstrate, quantify, and show sustained electricity consumption savings. Two important EnPIs for the GLC are:

1. Baseline versus Actual. This EnPI is shown in Figure 5. It is seen in the graph that the actual electricity consumption is below the baseline electricity consumption for most of 2015.
2. Cumulative Sum of all the Difference between the Baseline and the Actual (CUSUM). This EnPI is shown in Figure 6. The CUSUM graph shows that since the 2014 baseline, electricity consumption was reduced by more than 1 000 000 kWh at the end of December 2016.

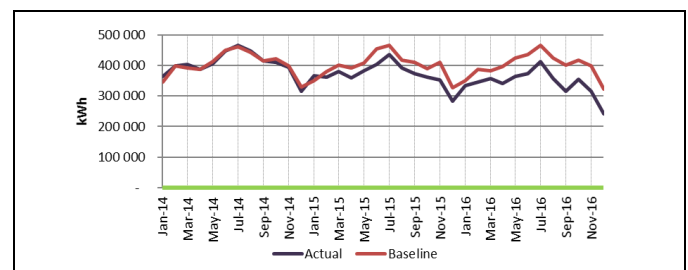


Figure 5: Actual electricity consumption is below baseline electricity consumption for 2015 and 2016

“Energy Performance Indicators, such as the CUSUM-graph, are excellent tools to gauge facility energy performance improvements in one blink”

—Braam Dalgleish, Energy Manager

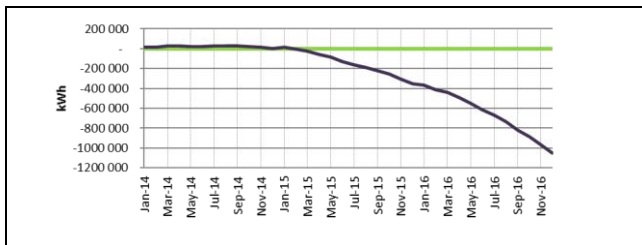


Figure 6: The CUSUM graph shows that electricity consumption was lowered by more than 1,000,000kWh since beginning 2015

Dashboards

Dashboards are valuable tools utilized to ensure the facility is efficiently operated from an energy point of view. These dashboards include high level real time energy performance assessment tools that are easy to use and shows energy intensity (Figure 7), electricity consumption, and maximum demand.

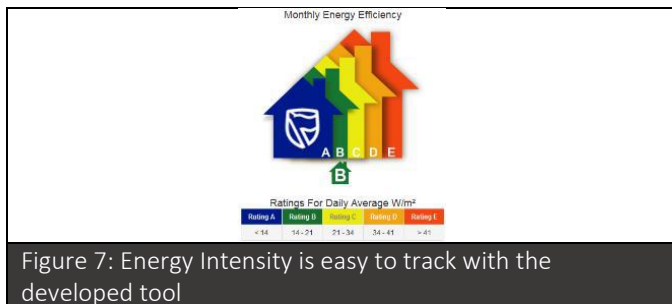


Figure 7: Energy Intensity is easy to track with the developed tool

Lessons Learned

The following key lessons were taken from the implementation of the energy management system at the GLC:

- Management and operational teams support is essential. Without support from other teams, including management teams, the management system is destined for failure.
- Significant savings can be achieved through operational and maintenance awareness (No or low capex required). Changing boiler and air-conditioning set points, switching off unnecessary equipment, reduced electricity consumption by 353 513 kWh in less than ten months and without any capital expenditure.
- Readily available data and information are vital for successful energy management as it aids in decision making and also monitoring and tracking of impacts.
- Teams with the relevant expertise were involved in different stages of implementation and execution of the management system. People with appropriate skills and expertise were used for procedures development, project identification, evaluation of financial and technical viability of projects, project management, implementation, and verification of savings.

The learnings of the system at GLC led to the management decision of implementing the same management system at three additional significant energy using facilities in the portfolio.

Through the Energy Management Working Group (EMWG), government officials worldwide share best practices and leverage their collective knowledge and experience to create high-impact national programs that accelerate the use of energy management systems in industry and commercial buildings. The EMWG was launched in 2010 by the Clean Energy Ministerial (CEM) and International Partnership for Energy Efficiency Cooperation (IPEEC).

For more information, please visit www.cleanenergyministerial.org/energymanagement.

