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Low Emissions Development Program

CASE STUDY

Auditing for Energy Efficiency: Students Conduct Energy Audits in Polokwane

Photo Credit: SA-LED

Capricorn Technical Vocational Education and Training (TVET) college students conduct energy audits for Polokwane Municipality

South Africa has been experiencing an extended period of electricity supply constraints due to an insufficient supply to meet total demand. A key contribution, therefore, to address both local and national energy security is a broad roll-out of energy efficiency interventions within all sectors. Energy efficiency not only helps to reduce the environmental impact of energy use through reducing associated greenhouse gas emissions[1] but also leads to financial benefits and cost savings.

An objective of local government, as stated in Section 152 of the South African Constitution (Act No 108 of 1996), is "*to ensure the provision of services to communities in a sustainable manner.*"[2] Municipal

[1] Polokwane Green Goal Energy Update and Implementation Plan 2016

[2] How to include energy efficiency and renewable energy in existing infrastructure grants: Information guide for municipalities- February 2017

investment in energy efficient infrastructure is increasingly recognized as an important part of achieving this objective. To aid in achieving this objective, the Department of Mineral Resources and Energy--formerly the Department of Energy (DoE)—manages the grant funded Energy Efficiency and Demand Side Management (EEDSM) program[3] which aims to support municipalities with implementing energy efficiency interventions within their facilities. As a grant funded program, the funds originate from the national fiscus and are disbursed by the National Treasury.

The selected municipalities receive grants for the planning and implementation of energy efficient technologies ranging from public lighting—traffic, high mast, and street lighting—to energy efficiency measures in public buildings and water service infrastructure. As significant consumers of electricity, municipal buildings and facilities provide the greatest opportunity to reduce municipal electricity consumption. The water supply and wastewater treatment facilities have the highest electricity efficiency savings potential among the electricity consuming sectors.

CHALLENGE

An essential element for successful energy efficiency intervention is the availability of energy consumption data at the facility or operations level. Most municipalities, including Polokwane Local Municipality, have neither energy consumption baseline information readily available nor the capacity to conduct energy audits to obtain this information. It is therefore difficult to determine the potential savings that can be achieved, which makes it difficult to justify investment in the energy efficiency technology. A detailed energy audit carried out at the various facilities helps municipalities to identify appropriate energy efficiency measures. The DoE then funds the measures that have the best technical and economic potential through the EEDSM grant. The energy audit report therefore becomes both the foundation for the EEDSM grant as well as the key document that DoE uses to assess the energy savings and the financial viability of the project.

> The EEDSM program begins with a comprehensive baseline assessment of the energy consumption of public infrastructure within the participating municipality. The baseline assessment helps the municipality to gain a deeper understanding of the potential energy savings that could be achieved through the EEDSM program and assists in the assessment of the estimated cost to retrofit public infrastructures with energy efficient technologies.

Polokwane Municipality applied for EEDSM funding for the 2018/19 financial year to continue retrofitting their streetlights to become more energy efficient. Energy efficiency in buildings is one of the priority areas identified in South Africa's National Climate Change Response as it is considered the key actor in the efforts to reducing greenhouse gas emissions[4] at the municipal level. As Polokwane had been identified as one of the municipalities to implement the Energy Efficiency in Public Buildings and Infrastructure Programme (EEPBIP) alongside EEDSM, to bolster its application and qualify for grant funding, the DoE had requested the inclusion of other municipal buildings and facilities in the application. To prepare for EEPBIP implementation, the municipality had to develop an energy consumption baseline of its buildings. However, to set this baseline, the municipality first needed to conduct energy audits of its buildings. The municipality did not have this capacity internally, so it reached out to the USAID South Africa Low Emissions Development (SA-LED) Program for support.

[3] Opportunities in Energy Efficiency for Municipalities in South Africa: Resource Tip

[4] Building Energy Efficiency V-NAMA in South Africa (Vertically integrated Nationally Appropriate Mitigation Action)

APPROACH

Launched in 2015, the USAID-funded SA-LED Program strengthens the capacity of the public sector to plan, finance, implement and report on low emissions development projects and to accelerate the adoption of low emissions technologies.

The SA-LED Program signed a Memorandum of Understanding (MoU) with Polokwane Local Municipality in 2017 to support their capacity building efforts and provide technical assistance where requested. In the South African context, having an MoU is very important, as the agreement outlines the terms and conditions governing the roles, responsibilities, and obligations of the respective parties to ensure that work is completed. The agreement further helps to institute an accountability mechanism for both the municipality and the Program. Through the MoU, SA-LED's role was to provide technical assistance to the municipality, which aimed at helping to conduct baseline energy consumption audits on the identified municipal buildings and facilities. SA-LED engaged the municipality in partnering with the local Capricorn Technical Vocational Education and Training (TVET) College to engage its students to train them in conducting energy audits as part of a broader skills development program initiative. The trained students would then provide support to the municipality during the planned audits. This model, which has also been used with University of KwaZulu Natal (KZN) students, has proved to be a practical, low-cost measure as compared to simply appointing private sector consultants. This approach allowed SA-LED to accomplish more with less resources and it also paved the way for the municipality to maintain a local pool of trained 'auditors' to participate in future audits following the completion of SA-LED's technical assistance.

TRAINING POLOKWANE MUNICIPALITY OFFICIALS AND TVET COLLEGE STUDENTS AND LECTURERS

The training aimed to develop the following skills:

1. Identifying different lighting types
2. Classifying lights
3. Determining operating hours and project feasibility
4. Using excel and excel workbook sharing
5. Demonstrating the need for accurate data capturing
6. Designing an audit and data capturing sheet

As part of SA-LED's working relationship with the TVET college, SA-LED engaged 20 electrical engineering students who were completing their final year of the program on a short-term internship to participate in the energy auditing exercise. Before the students conducted the audits, SA-LED provided the students with a one-day in-service training on basic energy auditing, which focused on how to conduct the audit and provided a template from which the Capricorn TVET staff could develop a more comprehensive audit course. The training provided basic background information that the college course did not fully cover. To help build the capacity of lecturers in conducting the energy audits and ensure sustainability of this training going forward, SA-LED extended an invitation to the TVET's lecturers to join in on the training and auditing process. A total of six lecturers from the Electrical Department and four Polokwane municipal officials participated in the training.

CONDUCTING ENERGY AUDITS ON MUNICIPAL BUILDINGS

Following the training, SA-LED then engaged the 20 students and two lecturers to conduct the energy audits under the SA-LED's supervision for the identified municipal buildings when schools were closed. The lecturers were assigned the task of supervising and coordinating the students during the training and auditing process. The students were organized in two groups, where the first group of 10 students conducted energy audits for 25 selected buildings and captured information into an excel spreadsheet. For verification purposes, the second group of 10 students re-audited the same buildings to ensure collection of accurate data.

Three students from the first group were identified to join the second group during the audits as mentors. Before the second group's audits, the group was broken down into three sub-groups, each led by a mentor to share their experiences and lessons from conducting the first audits and to explain the process. These sub-groups then conducted energy audits in assigned buildings.

Photo Credit: SA-LED
A mentor leads a group discussion

Photo Credit: SA-LED
Students conduct the energy audits

RESULTS

By the end of the audits, a total of 25 municipal-owned buildings of various sizes and service operations were audited. The data collected through the audits was then used to complete the DoE EEDSM application templates—the Extended Baseline, Business Plan, and Financial Analysis—which were then submitted together with the narrative report for the Request for Proposal. With the $533,300 (R 8,000,000) received from DoE, the municipality was able to continue to replace the high-pressure sodium lamps with newer light emitting diodes (LED) technology. Further, part of the funds will be used to purchase and install smart meters to establish a baseline for the municipal-owned facilities to enable continued monitoring of energy consumption. The energy consumption data collected by SA-LED is going to be used to start constructing the municipality's energy management system. With the current available data, the municipality has identified 13 facilities (eight libraries and five sports complexes) in which to install smart meters to begin recording their data and monitoring energy consumption. The energy audits recommendation was for the municipality to replace 134 400-watt high pressure sodium floodlights at the stadium and cricket grounds with 120-watt LED floodlights. This will result in energy savings of 28,728 kWh/a (45%) which translates to a financial saving of $1,700 (R25,500) per year.

Additionally, the 20 students who had conducted the audits were not only trained on the basics of energy auditing but were also provided with practical, hands-on experience, which helped them see how energy auditing works firsthand. 10 of the students later went on to conduct electricity meter audits for 6,000 houses in Thaba Chweu Local Municipality in Mpumalanga.

Therefore, through the energy audits, the Polokwane Municipality was able to tap into local resources by engaging students and the local TVET and identify key potential areas for energy efficiencies and translate these efficiencies into cost savings.

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