2015 AMEU CONVENTION PAPER ABSTRACTS

Sibusiso Bakana, City Power

Investigation and mitigation of technical electric power losses within City Power distribution

The national grid is found to be more constrained, influenced by the growth in population and electrical usage, in addition to Eskom's load shedding scenario due to generating constraints. As the distribution network changes its normal business, energy efficiency is the dominating term and the reduction of technical losses is one of the sections that needs attention in the emerging economy of South Africa. This paper evaluates different loads (residential, commercial and industrial), utilising calculation, measurements and simulation (DigSILENT) methodologies in order to develop accurate and authentic results. These results are further analysed to develop optimum solutions, mainly around improving the power factor and voltage transformation. The paper also focuses on improving technical losses due to circulating current (I2R), thereby improving the overall energy efficiency that can further boost the operational efficiency and planning equipment of the electrical network.

Kyle Parker, Traceability Solutions

Prevention of electric power theft initiative using pelta code through KWH meter authentication and its T&T application

By ensuring that each meter has a label that has a Pelta™ code on it, inspectors are able to identify that the meter has been interfered with, and that electricity has been stolen when the label is broken or tampered with. The inspector will be able to see information relating to that meter from the database, as well as update information using a smart phone device with a Pelta reader installed.

Dennis Mokoala, Polokwane Municipality

Load shedding from a municipal perspective

Load Shedding means controlled load power rotational sharing made to avoid the total country's black out due to the fact that demand is more than supply. This is because Eskom has a little reserve generation capacity and the loss of more than 1200MW will always demand load shedding after all other reserves have been exhausted.

Even though municipalities understand the importance of load shedding, they link the following points with load shedding

1. Loss of income to Council
2. Loss of investors
3. Security risk
4. More overtime
5. Exposure of silence failures and weak points on the network
6. Fear of the country's black out
7. Community uprisings
8. Water shortages
9. Sabotage
10. Consumers with home medical needs (oxygen machines etc)
11. Increased maintenance costs
12. Utilising equipment (breakers) beyond their design capacity
13. Increased exposure of danger to switching personnel
14. Negative economic impact on businesses in community

They keep asking themselves the following questions

- Why load shedding?
- Why is it done now
- Why was it not foreseen?
- How long are we going to continue shedding load?
- When will the new power stations be operational and reduce the current load shedding risk?
- How can municipalities help Eskom to generate enough for its customers
- Can the country build power generation capacity at a faster rate than demand is increasing

This is the reason why most municipalities who can afford to do load shedding within them are doing so. They are so focused on reducing load to avoid total black out but the reality is that the following will be the impact of load shedding;

- Loss of income
- More maintenance to switch gears
- More overtime
- Loss of income
- Loss of investors
- Consumers with home medical needs (oxygen machines etc)
- Increased maintenance costs
- Utilising equipment (breakers) beyond their design capacity
- Increased exposure of danger to switching personnel
- Negative economic impact on businesses in community

Planned load shedding helps to avoid shedding critical loads like:

1. Hospitals and medical centre's
2. Water pump stations
3. Airports
4. Sewer treatment plants
5. Mortuaries

Municipal network work systems were not designed to accommodate load shedding, When shedding in such a way to avoid critical loads like water pump stations and hospitals, more switching work is done on the rings and this causes problems to municipalities as individuals sharing mini substations with critical loads are not getting shed and the consistency of municipalities are challenged. A major issue is also the ageing infrastructure that in some cases is beyond its useful life expectancy. Some critical loads like traffic lights are unavoidable. This also causes traffic congestions within municipalities. There are general influences affecting municipal customers differently and categorised as follows.

1. Influence on domestic customers
2. Influence on Industrial customers
3. Influence on commercial customers
4. Security risk
5. Travelling without traffic lights
6. Maintenance costs

Recommendations

1. Can AMEU engage DoE to request some sort of funding for municipalities who are participating in load shedding to fund their Switchgear maintenance or even replace dangerously old switchgear?
2. Can NERSA provide clear guidelines for embedded generation
3. Can Eskom improve notifying clients in time for load shedding?
4. How to identify good performing companies for Solar farm, bidirectional meters etc?

Conclusion

1. Load shedding causes constraints on the existing infrastructure.
2. Let municipalities be compensated for participating in load shedding Acknowledgement

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Rob Surtees, EOH

Creating a virtual power station and avoiding stage 1 & 2 load shedding through customer participation

Eskom allows some customer classes, including Municipalities (under certain conditions) to opt for voluntary curtailment and reduce load in order to avoid forced load shedding.

Given that the generation supply shortfall very rarely exceeds 20% of demand (Stage 0 to Stage 3), and most often only a 10% reduction (Stage 1 and Stage 2) is required, this can be achieved through the implementation of a number of “Smart Utility” initiatives with minimal impact on the customer base.

Municipalities can through a collaborative effort with its customers avoid up to 90% of all load shedding events in full compliance of the national standard (NRS 048-9).

Individuals, businesses and municipalities can co-operate and collaborate to ensure a more stable and predictable supply of electricity to a municipality.

Aurelie Ferry, SA Local Government Association

Energy efficiency and renewable energy initiatives in South African Municipalities

Many energy efficiency and renewable energy projects have been implemented by municipalities. SALGA, with support from GIZ, aims to share good practices and lessons learnt. Enabling peer learning among municipalities could ignite innovation and uptake of more sustainable energy projects at local government level. SALGA and GIZ are jointly developing a database of municipal projects which should turn into an online interactive map providing information and case studies on existing sustainable energy projects. In line with the SALGA Energy Efficiency and Renewable Energy strategy, the database will focus on projects implemented by municipalities in the following subsectors:

- Energy Planning
- Energy Efficiency (own energy efficiency and energy efficiency in the residential, commercial and industrial sectors)
- Renewable Energy (including biogas, landfill gas to electricity, hydro, etc.)
- Energy Poverty (providing alternative energy to low income households
- Embedded Generation / net-metering

At van der Merwe, Aurecon SA & Adriaan van der Merwe, Cliffe Dekker Hofmeyr

Legislative imperatives – A legislative roadmap for energy challenges in South Africa

The paper provides a critical look at the legislative reform in South Africa and the main business drivers for the current energy supply structure in SA. It then benchmarks best practices for reform in other countries and draws parallels to the current SA challenges by suggestion a roadmap of legislative and business interventions to address the current power shortages. It concludes by taking a view on future legislative and business enablers for SA.

Eustace Davie, Free Market Foundation

Establishing a market for electricity at the distribution level

An efficient market for electricity at the distribution level cannot be brought about without making fundamental changes to the entire electricity, generation, transmission and distribution system. It can also not be established without creating facilities for trading in electricity, competition between generating companies and electricity retailers, with the ultimate objective of providing consumers with a choice between competing suppliers at competitive prices. In addition, for the system to function at all, the transmission grid or grids must be independent of the generators, who in turn, must have unbiased access to the grids.

In South Africa it is taken for granted that a single distributor, whether Eskom or a municipality, will have a monopoly in a specified area and that the only constraint on their prices will be exerted by the regulator. The South African municipal retailer, on the other hand, is dependent on the regulator to control the prices charged by the generation and transmission company, Eskom, which also carries out about half the retailing. The regulator, in turn, cannot possibly have access to the information necessary to set prices similar to those that would have come about in a fully competitive market for electricity.

Given the structure of the South African generation, transmission and distribution system, it is not possible to know what the price of electricity could or should be. We do not know for sure whether the price is higher or lower than it would have been in a competitive market. However, if we examine what has happened in other markets for electricity, we find that wherever open competition has been introduced into the various sectors of the business, there has been downward pressure on the price of electricity and a better deal for consumers.

Kevin Kotzen, Green Cape

Designing Sustainable and Responsible SSEG Tariffs. Sub-Theme: Electricity Pricing / Tariffs

In order to promote the SSEG industry, while at the same time protecting the municipality's electrical business, it is essential that sustainable and responsible tariffs are designed and implemented.

Customers require embedded generation tariffs that make the investment in the proposed installation worthwhile. Customers need to see significant savings on their bill - which may require a favourable feed in tariff.

The municipality needs to protect revenue generated from the sale of electricity. It is already understood that the financial impact is noteworthy, given that the customers who are in the best financial position to install these systems are often the highest electricity consumers - paying the most for electricity.

This paper will investigate tariff ideas and questions that need to be explored as the municipality seeks to promote correct customer SSEG decision making, while at the same time protecting municipal revenue. This will be achieved by looking at topics such as: self-consumption vs exports, value of feed in tariff (vs Eskom), total energy costs, time of use vs flat charges, value of energy, municipal buffers/subsidies (how much the municipality can afford). The paper will also make use of International and local cases as examples.

Nhlanhla Ngidi, SA Local Government Association

Grid integration of renewable energy in municipal networks – The grid code recommendations

At least 70% of round 3 preferred bidders within the DoE Renewable Energy Independent Power Producers Procurement Programme is going to be connecting to the Municipal grids and networks.

The South African Renewable Energy Grid Code requests that all the IPPs are subject to being tested for compliance to the Grid Code before they are connected to the Networks in order to maintain the stability and safe operation of the networks. In the previous two/three years, the Eskom connected IPPs, have been integrated into the grid using procedures that emanates from the Grid Code requirements. These processes have yielded successes in integrating the renewables and also have experienced some challenges and lessons. The objective of the paper is to make the municipalities aware of this process, adopt it and start preparing themselves with the proper training and capacitation to be able to have seamless integration of renewables into their networks.

Kenneth Gaynor, Cummins Power Generation

From waste to energy, from problem to opportunity

Looking at ways to turn a City's burden into a significant environmental benefit and cost savings opportunity by creating bio–gas from Municipal solid waste, landfill sites and waste water treatment Plants.

These benefits are related to health issues, reduced costs of waste disposal and treatment, environmental advantages and the generation of low cost electricity for municipal consumption or export to the grid.

Dr GL van Harmelen, Enerweb EOH and ECB – Namibia

Energy, demand and revenue impacts of rooftop PV in Namibian distributors

A bottom up, hourly based PV impact model was established for the Electricity Control Board of Namibia, informing their net metering rules. A unique hourly load disaggregation algorithm was developed, allowing hourly impacts on energy, demand and revenue requirement to be quantified in detail per redistributor (RED). Each RED received a full impact model analysis using their own specific load characteristics and own specific tariff structures. This allowed the unique cost of service per RED to be applied with the respective RED revenue requirements being calculated for each RED, depending on the levels of PV penetration (in the commercial, industrial and residential sectors). This paper will describe the unqiue modelling process, show how this was applied per RED, and will give sample results on energy, demand and future revenue requirement impacts for the different REDs in Namibia.

Clinton Carter-Brown, Department of Energy IPP office

Independent Power Producer procurement – Improving integration and municipal distributors

The IPP Office is procuring electricity from IPPs in alignment with the associated ministerial determinations and new generation regulations. This procurement commenced with the now internationally recognised large scale renewable energy programme, and has been expanded to include Coal, Gas and Co-generation. The initial programmes have by their nature targeted generation plants located in the Eskom areas of supply. The expansion of the programmes to include smaller and embedded generation will see increased interest in the connection of IPPs to municipal distributors.

The paper will provide a summary of the IPP programmes to date, the achievements, and most importantly an overview of the new and possible programmes that are expected to have an impact on the municipal distributors, such as the co-generation programme. It is hence an opportunity to inform the AMEU membership of these developments, and open communication.

Rodney Swartz, Siemans AG

Microgrid shelter: ensuring off grid stable and reliable load supply in remote locations

Microgrids are interesting alternatives wherever a stand-alone grid is feasible or even necessary for reasons of infrastructure, security of supply or geography.

Especially in remote locations where human maintenance activities are limited and have high cost impacts, one of the current technological challenges is to have very flexible infrastructures both in terms of operations and logistics. Here it is fundamental to have an off-grid system which guarantees energy production/storage and which can be monitored from remote. This is where Siemens' prototype Microgrid Shelter comes into play.

The system developed is built up by different elements all included in a twenty foot compact shelter: a Sodium Nickel Chloride (NaNiCl2) technology storage; small renewable plants (photovoltaics and wind turbine); diesel generator and a control center. The basic approach of Siemens Microgrid Shelter is to maximise power production coming from renewables stored or supplied by electrochemical storage systems, ensuring off-grid stable and reliable load supply. Diesel generator guarantees black start functionality and power generation in emergency conditions, while control center monitors the whole system performances.

Thanks to its modularity, the system can be easily customised according to specific requirements related to units sizes and energy mix, representing a reliable, environmentally friendly and cost-effective microgrid system.

Brian Sibiya, eThekwini Electricity

eThekwini electricity's transformer life management programme

To successfully convert data into valuable business intelligence is the key in managing the life of what is often the most critical and high valued asset to every electrical utility, the Power Transformer. With a fleet comprising approximately 300 transformers ranging from 275 kV to 11 kV feeding directly key customers as well as a distribution network of customers, eThekwini Electricity HV Substation's branch has established a system that not only provides realistic risk and consequences of transformer failure at a very early stage but also identifies units that require repairs, refurbishment or replacement. Asset information as per Section 4.3 of PAS55 pinpointing critical assets as well as Section 4.5 of PAS55 where the value of each asset is obtained are additional features of this system.

Phetole Moagi, University of Johannesburg

The consequences of misalignment between financial, performance auditing and engineering management

The Electrification of Informal Settlements: - City of Johannesburg (CoJ)

It includes lessons learned and new model to resolve informal settlements electricity backlogs.

The purpose of the report is to provide an outline of projects for the electrification of 161 informal settlements in CoJ, from a total number of 181. It will further share an insight and lessons learned during the electrification of Narens Farm (Lenasia) and Setjwetla (Alexandra) informal settlements. The new proposed CoJ's approach is a hybrid electrification model, which include the connection of photovoltaic (PV) to conventional electrical grid (grid tied). The model was developed in-light of the current electricity capacity constraints in SA. It also includes the provision of 6kg gas cylinders for cooking with an insulated shack.

Access to electricity will have a substantial positive impact on the quality of life of the recipient communities. The programme improves revenue collection; reduce electrical and nonelectrical losses, carbon footprint, security of electricity supply etc. Electricity utilities, commercial and industrial customers were hoping that the Breaking New Ground (BNG) Policy would eradicate informal settlements in 2014. Informal settlements are still here; BNG was introduced to speed up the housing service delivery issues and honour the supreme law of the country. Section 26 (2) of the Constitution, identifies the rights to basic needs and the provision are found in the Bill of Rights, entrenches the right of each citizen to adequate housing, healthcare, food, water, social security and education. NUSP (Government Outcome 8): sustainable human settlements and improved delivery quality of life. Informal settlement upgrading includes National Priority Programmes such as NUSP.

Intergraded National Electrification Programme (INEP): The programme together with the CoJ approach will contribute in achieving Universal Access to electricity. Energy White Paper, cognisance is taken of the fact that many people in informal settlements are living below the poverty line and have limited ability to pay for goods and services. The report will further discuss a few CoJ approaches to addressing poverty, inequality and unemployment through the programme called Jozi@work and Expanded Social packages respectively.

City Power (MoE) focussed on revenue recovery projects: informal settlements included_ Illegal connections affecting the surrounding areas, causes overload, interruptions, revenue losses, unaccounted electricity usage, electrical losses and compliance to NRS 047, NRS 048 and NRS 034. Section 101 is also affected; complaints and petitions are also received from the affected areas.

Aubrey Mochela, City Power

Tangible benefits of smart metering technology

Utilities consider smart metering technology for various business reasons. City Power's challenges included meter reading, revenue recovery, accurate billing and reduction of non-technical losses. This report presents City Power's experience in rolling out smart metering technology on a large scale. City Power recently embarked on an ambitious programme to implement smart metering infrastructure across its Large Power User and Domestic Customer base in a bid to enhance the revenue recovery shortfall and billing accuracy. This strategic project has incorporated a novel approach which recognises the value of customer awareness campaigns, contractor performance indicators, revenue protection technology, safeguarding future revenue streams, public safety, and centralised deployment by a command centre. This approach brings to visibility contractor productivity outputs on a daily basis, which substantially improves efficiency. City Power has seen steady improvement in meter reading performance, particularly in the Large Power User segment which accounts for 60% of its revenue base. Opportunities to recover revenue are being maximised on installations which have been normalised. In addition, City Power is using the capability of the smart metering technology to limit the impact of load shedding in the City of Johannesburg. The load limiting capability of the meters allows the utility to control the maximum current available for each household, while the customer is kept informed through text messaging capability. As a result, City Power is able to provide real-time status of the actual load reduction achieved to Eskom. The paper intends to share the key benefits to be derived both for the utility and the end customer, as well as share key learnings and pitfalls that are to be avoided when embarking on a massive smart metering programme. Current progress made and future milestones to be achieved will also be shared.

Tony Duarte, ABB South Africa

The business case of Smart Grids

The lack of reliable power generation has been a problem in South Africa during the last several years. Economic growth and the need for additional power have worsened the situation and made several situations, such as load shedding, increasingly common.

The business case for smart grids creates new opportunities.

To realise the benefits of smart grid we need a radical overhaul of the sector to create an enabling framework that allows new technologies to provide reliable and cost effective solutions.

Smart grids have the ability to integrate electricity from alternative sources such as solar and wind, smart grids can, in coordination with the utility, provide the extra boost of electricity required to satisfy increasing demand, especially at peak hours.

A smart grid has the ability to operate in situations that require fast response. This results in optimal production of electricity, and the addition of storage creates a natural integration of decentralised producers – in particular from renewable energy sources- to reduce consumer costs, and increase security of supply.

The smart grid could be at the city level, integrated into a national grid, or at the plant level, integrated into the urban grid.

In either case, ABB has the solution.

Christo Nicholls, Edison Power Group

The real smartness of a smart meter solution

Addressing the various benefits associated with a smart metering solution outside the traditional billing ONLY benefit domain, e.g. Data benefits , capacity management, etc

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Revona Botha, Robus Engineering Training Services

Building capacity to promote professionalism and promote a balanced economic infrastructure development

1. Bridging the gap between Education & Industry

2. Creating an Enabling Environment for Economic Development and Growth across the Asset Creation Value Chain

2.1 Career Development

2.2. Contractor Development

2.3. Optimise - Recognition of Prior Learning (RPL)

3. Effective Support & Aid for Socio Economic Development

4. Industrialisation (Rooted in Training & Development)

Daniel Kasper, Beka Schreder

Visual improvement and high energy saving high mast installations in municipal environments

South Africa's energy crises is effecting all parts of the country. As LED streetlighting already creates a very good alternative to conventional streetlighting, LED high mast lighting in municipal areas was not able to offer an economical viable solution until now. The initial investment cost was too high and most LED luminaires were not able to replace conventional luminaires adequately.

With new LED technology available, constant cost reduction and highly efficient thermal dissipation techniques, it is now possible to offer LED lighting solution which can create substantial savings in maintenance costs and energy.

I will demonstrate by means of recently installed LED installations in various municipal areas, as to what benefits standard LED high mast lights can offer and if combined with remote management control even further cost savings can be achieved.

Phetole Moagi, City Power

The electrification of informal settlements: City of Johannesburg (CoJ) Universal access

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Access to electricity will have a substantial positive impact on the quality of life of the recipient communities. The programme improves revenue collection; reduce electrical and nonelectrical losses, carbon footprint, security of electricity supply etc. Electricity utilities were hoping that BNG Policy will definitely eradicate informal settlements in 2014. BNG was introduced to speed up the housing service delivery issues and honour the supreme law of the country. Section 26 (2) of the Constitution, identifies the rights to basic needs and the provision are found in the Bill of Rights, entrenches the right of each citizen to adequate housing, healthcare, food, water, social security and education. NUSP (Government Outcome 8): sustainable human settlements and improved delivery quality of life. Informal settlement upgrading includes National Priority Programmes such as NUSP.