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SAIEE SUPPORTS ENERGY EFFICIENCY AND THE ENVIRONMENT

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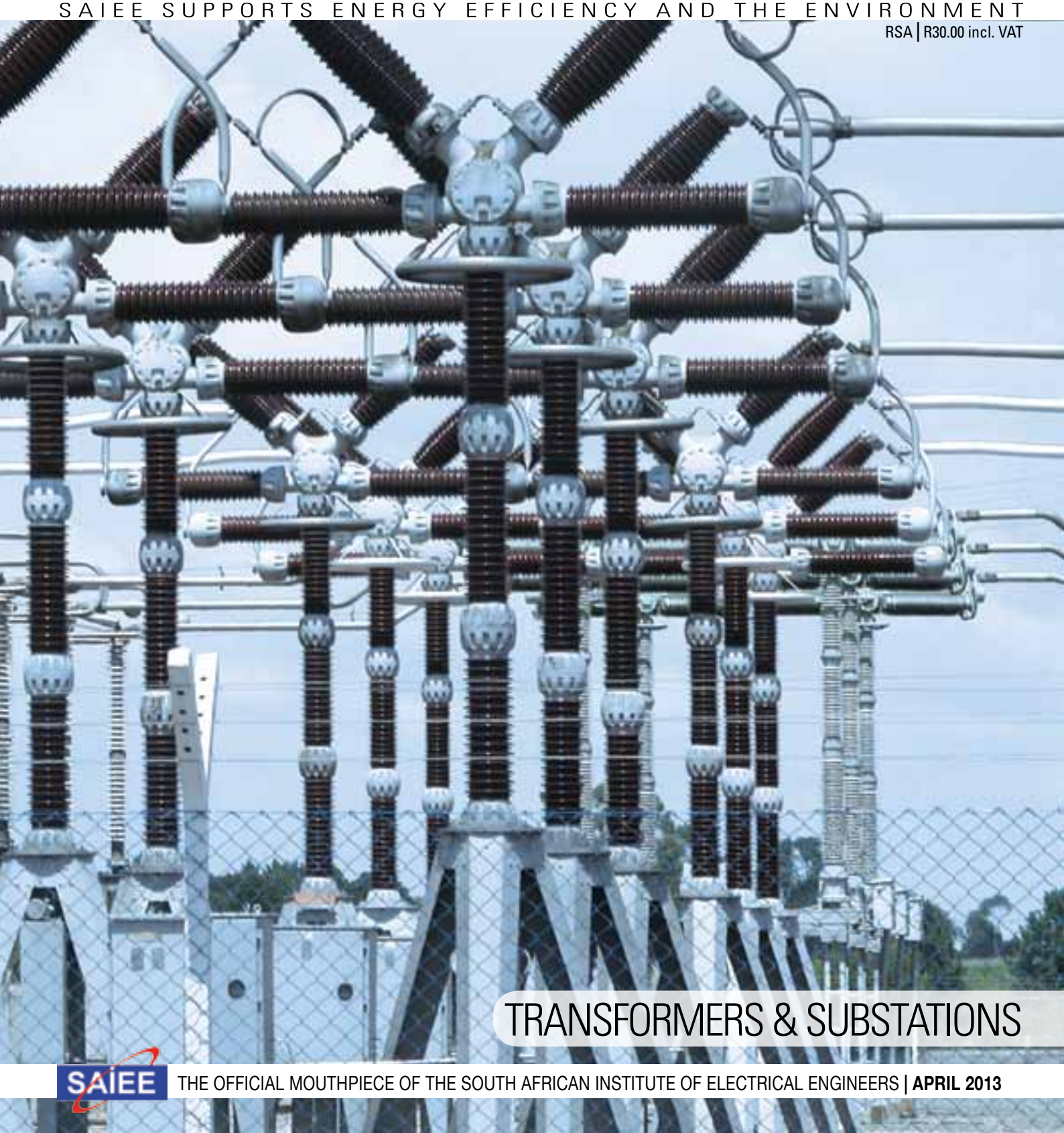

TRANSFORMERS & SUBSTATIONS

SAIEE THE OFFICIAL MOUTHPIECE OF THE SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS | **APRIL 2013**

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wattnow magazine

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5905

It is the time of year again when we inaugurate a new SAIEE president at our AGM.

Paul van Niekerk will take over the helm from the very capable hands of Mike Cary. Before I get into the welcoming of Paul van Niekerk, I would like to thank Mike Cary for all his efforts, in particular procuring articles for the **watt**now magazine. His help really came at a time when I needed to find my feet in such a prestigious institute as the SAIEE. Thank you Mike, I hope you will continue your efforts for the **watt**now magazine. Mike takes a look back on his year as president on page 7.

This brings me to the welcoming of our 2013/14 SAIEE President, Mr Paul van Niekerk. I wish you luck in your term of office as president and I'm sure your efforts will bare fruit in enhancing the visibility of the SAIEE nationwide as well as worldwide. I'm looking forward to working with you this year.

This issue of **watt**now focuses on *Transformers and Substations*, and our feature on page 22 takes a look at the utilization of power systems and the variable load flows due to decentralized power generation from renewable energy sources.

In the early 1960s Africa's population was about 300 million. 10% of the rural and 50% of the urban African households were grid-connected. Today, Africa has about 800 million people. Less than 5% of the rural and less than 40% of the urban households have access to grid electricity. Read the article "Access to Electricity" on page 32.

The correlation between energy efficiency and economic growth is one that is often overlooked even though it has great importance. Hope Mashele shares with us the pros of energy efficiency in the work place on page 40.

I find that members do not take time to relax and to enter the crossword competition, which offers an easy R1000 cash in your pocket. Please send me your opinion if you would rather see Sudoku featured in the **watt**now. Drop me an email at minx@saiee.org.za and give me your opinion – it is valuable to me.

Herewith the April issue, enjoy the read.

Earn CPD Credits

*Visit www.**watt**now.co.za to answer the questions related to these articles to earn your CPD points.*

Greetings to you all, by the time that you read this message, I would have been inaugurated as the President of the SAIEE for the 2013 term of office. I am greatly humbled by the appointment to this high office, and I wish to express by sincere appreciation to all of you for your confidence in me. I will do my best to uphold the aims and objectives of the South African Institute of Electrical Engineers.

I wish to pay tribute to my predecessor Mr Mike Cary who did a marvellous job for the Institute and set a president that will be ….'a hard act to follow'. Mike is a very good, professional Manager who did an excellent job of looking after the finances of the SAIEE. Mike has been an inspiration to me, and I believe to all office bearers, he has a calm and collected, 'no nonsense' approach to the problems that we have to confront and invariably follows up with a pragmatic implementable solution.

Mike did a lot for marketing the SAIEE, increasing membership and making the SAIEE more relevant in the Electricity Industry. Fortunately, his services will not be lost to the institute, as he has agreed to continue, and will continue making the very valuable contributions that he made during his term of office.

My theme for the year will be the *"Professionalisation of Electrical Engineers"* and is specifically aimed at getting more young people at secondary schools to enter the fascinating world of Electrical Engineering and to eventually register with the Engineering Council of South Africa (ECSA) as Professional Engineers.

The SAIEE is considering a fresh approach to the professionalisation training of graduates via the introduction of a mentoring system to assist new graduates through the process of acquiring the correct training and experience that will satisfy the stringent requirements of registering as a Professional Engineer with ECSA . The SAIEE has for many years offered a mentorship service to engineers in training, however, for various reasons, this has never proved to be very successful.

Mr John Gosling, the Chairman of the Professional Development committee has recently completed a policy document which has been approved by Council, for the SAIEE to introduce a structured mentorship service to support ECSA's system for the Registration of Engineers in Professional categories. More news regarding this initiative will follow in future issues of **watt**now.

Becoming a Professional Engineer is a great achievement in life, and is recognition of professional experience and competence as an Electrical Engineer.

Things happen very quickly at this time of the year. We have already had the Presidents 'State of the Nation address', and the Minister of Finance's budget speech for 2013 to Electrical Engineers in South Africa. The primary thrust of Government is once again the alleviation of poverty and job creation; hence the State President has reiterated his 2012 objective of large scale infrastructure development and job creation in South Africa.

It is up to us to ensure that the SAIEE remains relevant and that we assist the nation with the National Development Plan and in this process, protect the interests of Electrical Engineers. South Africa has for very many years been very proud of the Standards of Engineering taught at our universities, which can be favourably compared with the best universities around the world. It is up to us as the South African Institute of Electrical Engineers to maintain this tradition in our Country.

Paul van Niekerk Pr. Eng | SAIEE President 2013

Looking back on my year 2012-13

In March 2012 I took up the helm of HMS SAIEE. I now have pleasure in reporting on the last 12 month's voyage.

One would think that a vessel that is 103 year's old needs only to be kept on course. The SAIEE is a dynamic vessel, however, and is always looking for new challengers, and ways and means to serve its passengers (members). To illustrate this, consider the following:
In the past 10 years the membership has grown from 4952 to 5993, and thanks to a membership drive, the number increased by 598 in the past year.

The crew (our very able Director and staff), has grown from 8 to 16. Our income has grown from R846 500 to R4 960 000, and our total assets from R11,197,500 to R40,800,000 *(the current financial results will be presented by our Bursar)*.

Like all good cruise ships, we have provided entertainment and services for our passengers. A very interesting President's Invitation Lecture was presented by Professor Philip Lloyd from the Cape Peninsula University of Technology on Energy Efficiency and Renewables on the 22nd of May – thank you Philip.

We have passengers in many ports (Centres and Interest Groups). The ports are situated in Kwazulu Natal, Western Cape, Southern Cape, Eastern Cape, Mpumalanga, Vaal, East London, and Bloemfontein. These Centres and Interest Groups are providing a great service and I had the privilege of visiting each of them (except the Vaal which has recently started meeting again) to deliver my inaugural presentation – *"Energy Efficiency and Renewable Energy Resources"*.

In September the prestigious Bernard Price lecture was presented by Dr Nick Frydas from Mott Macdonald in the UK. The title of the talk was *"Integrating Renewables in the power system of tomorrow – definitely not business as usual."* The presentation took place in Cape Town, Johannesburg, Bloemfontein, Port Elizabeth, East London, and Durban. This was a very interesting and thought provoking presentation, and thanks go to Nick and Mott Macdonald.

On the 19th of October, the banquet took place, and the passengers and guests were entertained by a comedian, Mr Ndumiso Lindi. Our guests had a very enjoyable evening.

One of the services HMS SAIEE provides is support for skills development. This year, the previous administration building at its home port, Johannesburg, – Innes House was refurbished. This building is a Herbert Baker design, and during the course of the next voyage, it will be equipped with artifacts as the SAIEE's museum.

This would enable us to invite pupils to visit and to encourage them to become engineers and ultimately passengers.

We also offer bursaries to under-graduates, and this year, 8 were awarded. In addition, HMS SAIEE administers the ISH post-graduate bursary scheme.

For many years, we have offered mentoring, and are now formalizing the program, to help alleviate the skills shortage in the Country by providing greater numbers of mentors.

Finally, a few years ago we commenced with the Continuing Professional Development Programme. This service has grown dramatically, and is also being offered in our ports.

The HMS SAIEE is also a publisher. For many years we have produced the African Research Journal. Since Officer Saurab Sinah has taken over this publication, it has grown from strength to strength. In November 2011, we decided to take over the publishing of **watt**now. Officer Minx Avrabos was commissioned, and we now have a very successful publication. Thank you to Officers Saurab and Minx.

My thanks go to the Office Bearers and Council, who have successfully navigated this voyage with me. Thank you too, to Stan Bridgens and the rest of the crew, who have ensured that we have traveled in calm waters, and that events and meetings just "happened". A vote of thanks to Gerda Geyer who assisted me on my journey with all of the arrangements.

My final special thanks go to my wife Margaret, who shared my cabin, and visited many of the ports with me – thank you for your support and encouragement.

I have pleasure in handing over the helm to my First Officer, Paul van Niekerk, and am confident that he will have a successful voyage in 2013/14.

Mike Cary
Immediate Past President

WATTSHOT

Showcasing the latest gadgets & gizmo's for the urban man...

Muhle Kosmo Mach® 3 Shave Set

Breath new life into your shave regime with a premium quality nickel plated shave and grooming set. Utilising your existing (and easily replaced) Gillette, Mach 3® cartridges, you can now upgrade to a more masculine and more indulgent shaving set that is guaranteed to leave you feeling invigorated, pampered and stubble-free like never before.

Each set features the highest quality workmanship, and is certain to take your daily shaving ritual into the 21st century.
Price: R1,499 (incl.)

All-Weather Rugged Mobile Phone (with 2-Way Radio Function)

Rugged outdoor mobile phone, almost indestructible with waterproof, dustproof, and shockproof design, and with many useful features such as a built in walkie talkie, GPS, compass and much more.

With a hardened magnesium frame and 3.5mm rubberized casing that repels water, dust, blunt force, this rugged cell phone is designed for the real world and whatever the real world can dish out.

It is perfect for the internet storefront re-seller who wants to offer his customers something outstanding, quality and useful.
Price: R2,599 (incl.)

Mini DV Camera

This thumb-sized cam has got to be in the running for title of the Smallest Video Camera in the World! Yet despite its dinky stature, it still packs a punch in the recording stakes!

The Mini DV Camera records both audio and video in AVI files and saves them to a micro SD card for computer playback, giving you a maximum capacity of 16GB. Considering its size, the frame rate of 30fps and resolution of 720 x 480 pixels is pretty impressive. It features a sound-activated mode, takes pictures as well as video footage and performs well under low light conditions! Price: R875 (incl.)

Handcrafted Wireless Bamboo Keyboard

Hand-carved from the finest bamboo material, this carefully crafted wireless bamboo keyboard has been designed with "the nature lover" in mind!

These bamboo keys are 100% natural bamboo for the earth friendly people looking for a fashionable computer accessory. So easy to install, simply connect this bamboo keyboard via the 2.4 GHz USB nano receiver and off you go! This durable bamboo keyboard also acts as an anti-static device with radiation control, so you can avoid any unwanted static shocks or rays from your computer.
Price: R390 (incl.)

All the products featured on pages 8 & 9 are available online at www.mantality.co.za

iWallet for iPhone 4/4S

Are your pockets out of control? Your iPhone's jumbled up with cash, cards and receipts - but you still don't want to carry around a bulky wallet?

The iWallet will restore pocket order! Snapping closed with a svelte magnet catch, the slim-line iPhone 4/4S case serves as gadget protection while conveniently organising your pocket clutter!

So now alongside your emails, text messages and music in your iPhone, you can keep your all-important pieces of plastic, cash and travel cards!
Price: R300 (incl.)

Drift HD 1080p Camera (with LCD & Remote)

The Drift HD is the new compact, durable, easy-to-use HD helmet camera which elevates the point of view camera market to a higher level with the most feature-rich, multi-functional helmet camera available to date. Drift has still integrated its signature features into the Drift HD such as the integrated LCD screen, wireless remote control, 300-degree rotating lens, 170-degree field of view, multiple mounting options, water resistant casing and professional-grade 1080p/30fps and 720p/60fps high-definition video settings.
Price: R3,250 (incl.)

BrewMaster Home Beer Brewing Kit

In the past homebrew was never quite drinkable but thanks to some brilliant Canadians inventing the Brew Master Beer Machine home brewed beer is now dangerously good and easy to make. The Beer Machine is simplicity itself to use, just add the beer mixture (made from 100% natural ingredients), and in seven to ten days you'll have 17 pints of really excellent beer.

It also comes with a unique Bottling Transfer System that equalises the pressure and allows you to bottle up your brew quickly without exposing it to any bugs. It even comes with 6 re-usable bottles to make your very own sixer. You'll need C02 Soda Chargers for dispensing and conditioning your beer, there are three of them included. You're also able to monitor the temperature and PSI of your brew - essential for drinking it at the optimum moment. Price R2,499 (incl.)

Sharp Act Knife Sharpener

It's the perfect set-up - the mysterious wooden box, the lovely volunteer from the audience, the glint of finely-honed carbon steel...and YOU! Yes, Fred has elevated the boring old knife sharpener into death-defying magic, and you are the star. It's a Sharp Act, so take a bow! Gift box packaging. Price: R150 (incl.)

Credit Card Multitool

A stainless steel multi-functioned tool, ideal for outdoor pursuit - functions include a can opener, wrench, screwdriver and saw blade.

Complete with a leather effect case, this multi-purpose gadget makes a great gift for anyone who enjoys outdoor pursuits such as camping, fishing, or cycling.

Functions include:
Can opener, Knife edge, Screwdriver Ruler (5cm), Cap opener, Four-position wrench (for various sizes of nuts and bolts), Butterfly screw wrench, Saw blade, Direction anxillary indication, Two-position wrench, Lanyard/key chain hole.
Price: R50 (incl.)

WATTSHOT

Mother's Day is celebrated on the 12th of May 2013 - herewith a few ideas....

Trendy Gardener | Price: R920

Beautiful aluminium garden tools, gardening gloves, herb scissors, cactus shaped candles, towels for hand face and body as well as Rose & Jojoba hand&body wash, hand&body cream and gorgeous bath dust to relax with after a good day's gardening!

Beautifully presented in a green wooden planter tray with your personal message attached.

Extreme Indulgence | Price: R999

An extremely indulgent pamper gift set!
When it comes to gift-giving we believe the quality of presentation is essential. We take pride in making sure each of our gift hampers is delivered in perfect condition and arrives beautifully gift wrapped with your personalised gift message.

GIFT CONTENTS:
1 x Rose & Jojoba Hand and Body Wash
1 x Rose & Jojoba Hand and Body Lotion
1 x Rose & Jojoba Skin Nourishing Bath Dust
1 x Rose Garden Room Spray
1 x Cotton Clay Heart & Oil Gift Box
1 x Bath Massage Gloves
1 x Petersham Ribbon Soap Trio
1 x White Bath Towel
1 x White Hand Towel
1 x White Face Cloth

For the sweet tooth: Hat Box Treat Box | Price: R799

Jam-packed hamper with something for everyone. Beautifully presented in a striped hat box.

GIFT CONTENTS:
1 x Wedgewood Angels Nougat Biscuits
1 x Lindt Truffles Milk (3)
1 x Two Designer Lindt Mini Slabs (35g; African)
1 x Mango Strips (100g)
1 x Mixed Nuts (100g)
1 x Cashews (100g)
1 x Giant Peanuts + Raisins (100g)
1 x Diced Pineapple 100g
1 x Dolcezze Cheese Straws
1 x Wedgewood Nougat Bon Bons
1 x Kalamata Black Olives
1 x Sugar Sticks
1 x Ferrero Rocher (16)

Tea-licious | Price: R499

A Tea-Lovers Dream - Everything you need for a perfect tea party, or just for those ever-needed moments of quiet indulgence and sweet aromas. Beautifully presented in a striped hat box.

GIFT CONTENTS:
1 x Sugar Sticks - 4 White
2 x AriZona Pomegranate Green Tea (473ml)
2 x Assorted Tea Gift Pack (8-piece)
1 x Teapot Sugar Spoon

All the products featured on page10 are available to purchase online at www.giftlady.net

Hot Pink Flowers
Price: R520

Beautiful bunch of mixed bright pink and red flowers in a glass vase.

Pearl & Gems Necklace
Price: R1165

Freshwater pearl necklace with dark gemstones will make her day.

Floral White On-the-Go Bag | Price: R239

On-the-Go Bag that can be used as a handbag, shopper, or even a beach bag. Has great strong straps that are convenient for grip and are a fashionable style

WATTSUP

Western Cape Centre Dinner & Dance

The SAIEE Western Cape Centre dinner and dance was held on Friday 15 February 2013 at the majestic Kelvin Grove Club, Newlands, Cape Town. Guests arrived after struggling through the afternoon traffic due to the cricket match between South Africa and Pakistan. The guests were welcomed by the Chairman of the WCC, Marius van Rensburg. The master of ceremonies was Phumelelo Ngxonono, who had the guests in stitches with his anecdotes. The SAIEE President, Mike Cary introduced a toast to the Western Cape Centre and thanked them for all that they are doing for the SAIEE. All the guests enjoyed a fabulous event and danced into the wee overs of the morning.

Mike Cary, SAIEE President with Marius van Rensburg, Immediate Past Chairman WCC and Phumelelo Ngxonono, Chairman WCC.

Gerda & Anton Geyer, SAIEE.

Wilfred Fritz and Andrea von Gleichenstein.

Ann & Dave Gray.

Phumelelo Ngxonono, Chairman WCC with his wife, Lusanda and Andrea von Gleichenstein with Wilfred Fritz.

Robbie & Sonja Evans, Chairman Southern Cape Centre, Lusanda and Phumelelo Ngxonono, Chairman WCC, Ronel and Marius van Rensburg, Immediate Past Chairman, WCC.

Mike Cary with Ian MacHutchon.

PlanetSolar takes the plunge again!

After over six months of maintenance and optimization, the MS Tûranor PlanetSolar is back in the water and preparing for its 2013 solar campaign! The recent improvements will expand and diversify the ship's applications, and enable it to navigate to the northernmost part of the Atlantic for the first time. A scientific expedition along the Gulf Stream, a waste collection campaign in European waters, and even educational events, this is a brand new crew that will be leading the largest solar vessel ever built on its 2013 campaign, which was officially launched on March 18 in Monaco.

The success of the first trip around the world powered exclusively by solar energy has demonstrated the maturity of the prototype's photovoltaic technology. Those two years of solar navigation were instructive for PlanetSolar and led to an initial assessment of the vessel's performance. This assessment indicated where optimizations were needed to make the ship more efficient and maneuverable. These improvements will expand and diversify the ship's applications and uses; notably, enabling it to navigate to the northernmost part of the Atlantic, near the Artic, for the first time.

The MS Tûranor PlanetSolar has sailed off for the Atlantic, where it will attempt to break its own world record speed for a transatlantic crossing that is powered only by solar energy (26 days in 2010).

From May, in collaboration with the University of Geneva, the ship will become a platform for scientific research in the framework of the "PlanetSolar DeepWater"expedition. Led by Professor Martin Beniston, climatologist and co-winner of the Nobel Peace Prize, an onboard scientific team will collect new data along the Gulf Stream. The ship will follow the ocean current from Florida to the Far North and will put into port in Miami, New York, Boston, St. John's, Reykjavik, Bergen, Oslo, and Paris.

In the summer, the MS Tûranor PlanetSolar will be called upon to clean up floating waste in European waters. In collaboration with the Waste Free Oceans Foundation, the ship will be equipped with an ingenious trawling net that can collect up to 8 tons of marine pollution. In the fall, the catamaran will continue its solar energy promotion campaign and sail to the cities of Izmir and Istanbul. These stopovers will be unique opportunities to meet with local populations and promote photovoltaic energy. Instructive events aimed at young audiences will be organized aboard the ship.

High flying approach to Line of Site analysis cuts telecoms infrastructure costs

Wayne Sander | Technical Director Aurecon

Wayne Sander, Technical Director, Environment & Advisory at Aurecon, discusses a revolutionary approach to the delivery of telecommunications infrastructure that can reduce costs by 60% in comparison to traditional methods. Emerging technologies are rapidly changing the way we communicate and conduct business, with tele-communications infrastructure becoming increasingly important. Network operators want to deliver mobile and wireless telecommunications infrastructure quickly and economically to meet ever growing user demands. Large scale national telecommunications projects can require anywhere up to 2 000 base stations, each one needing a point to point link into the wider network via a microwave transmission dish. As such, these sites must be located where 'Line of Sight' (LOS) has been verified allowing the site to transmit and receive data from the network without interference from obstructions such as trees, terrain or infrastructure.

TRADITIONAL LINE OF SIGHT METHOD

Typically, to determine the suitability of a particular location for a telecommunications tower, an elevated work platform (EWP) is hired and transported to a site to test the line of sight. The EWP is used to shoot to an existing tower, a blimp or a second elevated work platform to ascertain whether there are any obstructions.

LOOKING AHEAD

The adoption of this technology is providing real time and cost benefits over traditional LOS techniques. While work for LOS checks via EWPs still remains the most cost efficient method for projects requiring few paths, LIDAR's effectiveness and accuracy will ensure that its role in the telecommunications market will expand as strict budget and time deadlines apply. LIDAR is also utilised to capture accurate topographical and vegetation information for new road, rail and pipeline projects.

WATTSUP

SAIEE STAFF MEMBERS RETIRES

Stan Bridgens, Viv Crone, Ansie Smith & Paul van Niekerk.

Robert Benites & Sue Moseley.

Our chef, Anton Geyer.

Alice Makhado, Dudu Madondo, Delana Cader with Paul van Niekerk.

Paul hands Ansie her retirement gift.

Craig Smith & Herbert Hlanze.

Dudu Madondo, Ansie Smith, Tracey Human & Delana Cader.

Androzette Muller & Celeste Pretorius.

Stan Bridgens & Gerda Geyer.

The SAIEE has said goodbye to one of its longest serving employees, Mrs Ansie Smith. Ansie has been an employee of SAIEE for the past 16 years. Ansie forms an integral part of the Membership Department as well as Technology and Leadership. We celebrated this milestone in her career with an afternoon braai. Stan Bridgens, Business Director said a few words, which saw a few blinking away the tears. When Ansie had to say a few words, it was filled with emotion and gratitude. The newly elected SAIEE President, Paul van Niekerk and the Treasurer, Viv Crone joined the staff. Ansie has been signed on to continue her job at the SAIEE on a contractual basis.

Polymicro FBPI Optical Fibre Delivers Industry-First Panoramic Spectrograph and Sensor Analysis

Polymicro Technologies, a subsidiary of Molex Incorporated, has successfully developed a broad spectrum optical fibre with a low -OH pure silica core that demonstrates significantly reduced content of UV defects and other UV absorption centres.

Polymicro's proprietary FBPI fibre takes advantage of the benefits and mitigates the limitations of standard optical fibres. Featuring improved transmission properties over a much wider spectral range, the silica-based, broadband FBPI fibre is available in a range of densities and can be produced in core diameters from 50-600 µm.

"Optimised for panoramic spectroscopy and sensor analysis our new broad spectrum FBPI fibre represents an industry first," states Robert Dauphinais, business development manager, Polymicro Technologies. *"FBPI fibre delivers superior performance coupled with resistance to radiation and exposure that can lead to fibre degradation and shorten product life."*

In the near-infrared (NIR) wavelength region to beyond 2100nm, Polymicro FBPI fibre attenuation is equivalent to standard NIR fibres having a low -OH silica core and F-doped cladding. Comparable to solarisation properties of standard UV optimised high -OH fibres with high radiation resistance, FBPI fibre features ultra-violet (UV) transmission down to 200nm.

Many spectroscopic applications require high performance optical fibres that transmit light over a broad spectrum and demonstrate minimal focal ratio degradation.

Unlike standard optical fibres, which are limited by transmission spectral range, Polymicro FBPI optical fibre transmits a wider range of wavelengths with relative uniformity across the wavelength range.

"FBPI fibre handles both UV and NIR in a broader spectrum of wavelengths than any other optical fibre on the market today. This is particularly advantageous in expanding the spectroscopic measurement range and sensitivity of a device," adds Dauphinais. FBPI broadband optical fibre is designed for a range of high performance spectroscopy applications.

Jaco Cronje has been appointed as a Director of EES.

EES is an ISO 9000 professional engineering management company. It provides engineering solutions to infrastructure, industrial and built environment applications, and specialises in the integration of multiple system infrastructure. This is achieved by means of data centre and smart connected real estate design in the global environment. Its investment in technology allows it to work remotely irrespective of locality and in collaboration with its clients, contractors and technology providers.

WATTSUP

Continent's eyes on African Utility Week as Eskom's Brian Dames confirms welcome address

Eskom Chief Executive Brian will once again deliver the keynote address during this year's opening session of African Utility Week in Cape Town on 14 May. Some 5000 power professionals from all over the continent meet at this event every year at what is the largest utility gathering of its kind in Africa.

African Utility Week's programme director Claire Volkwyn says: *"As the leading African power utility, Eskom's presence is a sign of their continued support as host utility of the event, their commitment to the growth and expansion of the industry and opportunity to grow a shared vision of what the power sector in Africa can look like if we work together."*

She says there are always high expectations when Brain Dames addresses this industry event because *"as the largest power utility in Africa, and one of the largest in the world, Eskom's strategy for the next 12 – 18 months will inform a lot of decisions, not only for industrial, commercial or domestic consumers within South Africa, but also for other utilities which are either dependent on Eskom for power, or have plans to develop a strategic relationship with Eskom."*

"In the 13 years of African Utility Week's existence, we have been part of and at the root of many valuable joint projects between utilities and services providers across Africa", says Claire Volkwyn who adds that the Eskom CE has in the past often emphasised the need for collaboration in order to foster growth in Africa's power sector.

She continues: *"This message has been strengthened by the recent announcement that Eskom has finalised a draft African strategy with a view as they put it: 'to taking equity as well as operational positions in generation and transmission projects in the rest of the continent, with its primary focus being opportunities in Southern Africa'. Particularly high on the list of priorities in this strategy is hydropower and transmission projects within SADC. As the only true pan-African event, we are perfectly placed to facilitate this ongoing vision."*

The African Utility Week programme will address many of the ongoing challenges that utilities on the continent grapple with. The programme director explains: *"The day to day challenges of African utilities include getting the generation mix right so that they have the optimal balance of 'least cost' options, but also the maximum energy security that they can ensure. The importance of metering cannot ever be underestimated, and we are going to be addressing the importance of correct installations, revenue management and pros and cons of smart metering."*

Claire Volkwyn adds: *"Also as we move to an environment where renewable energy is becoming more and more a mainstream energy choice, decisions and plans need to be put in place about how this technology is going to be integrated into the utility environment."*

DistribuTECH Africa Conference to Co-Locate with POWER-GEN Africa 2014

PennWell International announced that it has made the strategic decision to co-locate the POWER-GEN Africa and DistribuTECH Africa exhibitions and conferences. The combined event will take place from 17 – 19 March, 2014 at the Cape Town International Convention Centre.

By hosting these events concurrently, these two globally renowned energy event brands will present one end-to-end platform designed to address the needs of Africa's energy sector throughout the electricity delivery process, from the generation of electricity in the power station, to its efficient distribution and delivery to the end-user/consumer.

Says Nigel Blackaby, Event Director of POWER-GEN Africa and DistribuTECH Africa and Director of Conferences at PennWell International, *"The decision to co-locate these events was arrived at after consultation with and feedback from the market. It's clear that given Africa's unique challenges and that so many of its utilities are integrated end-to-end energy providers, its stakeholders would be better served by a single event that addresses the entire power generation and delivery chain."*

The effect of hosting these two major global brands under a single roof will offer participating utilities and other stakeholders a much bigger and more comprehensive value proposition.

More than 2100 attendees from 63 countries and six continents attended the inaugural POWER-GEN Africa 2012. The 2014 event is expected to attract larger numbers of the same high-level decision-makers, to explore the theme Solutions for Africa's Energy Future across the conference's three Strategic, Technology and Renewable Energy tracks.

ACTOM Electrical Machines completes multi-million rand LV motors contracts for Medupi and Kusile's air-cooled condensers

Two members of ACTOM Electrical Machines' factory staff are seen here doing finishing touches to one among a large batch of 250 kW squirrel cage induction motors awaiting delivery to SPX for installation in air-cooled condensers for Kusile power station.

ACTOM Electrical Machines, South Africa's leading designers, manufacturers and suppliers of electric motors, has completed manufacture of all the customised low voltage motors required for the air-cooled condenser (ACC) units at Eskom's new Medupi and Kusile coal-fired power stations.

The company was awarded the ACC units LV motors contract for Kusile power station near Delmas in Mpumalanga in August 2009 by Johannesburg-based SPX (DB Thermal), the ACC subcontractor to Alstom Power, the main contractor for the turbines of the new power station. This followed the award in November 2008 of the ACC units LV motors contract for Medupi power station near Lephalale in Limpopo Province by GEA Aircooled System, the ACC subcontractor to Alstom Power in that instance.

The Medupi and Kusile ACC motors contracts together are worth close to R100-million.

The contract, for design, manufacture and supply of a total of 384 x 250 kW 4-pole squirrel cage induction motors, along with soft-starters, for the ACC units at Kusile was completed well ahead of schedule, while the Medupi contract, comprising a total of 384 x 225 kW 4-pole squirrel cage induction motors, has been completed on schedule.

Said Tony Teixeira, ACTOM Electrical Machines' General Manager: *"In tackling the Kusile contract we benefitted greatly from the experience we gained on the Medupi contract, but it involved some unique challenges of its own."*

The earlier contract involved designing and developing motors that incorporated additional equipment without compromising their efficiency.

To ensure that this was achieved the company first produced a prototype motor, which it test ran to ensure that the contract's stringent performance specifications were met before it went ahead with production of the final product.

"The motors for Kusile follow the same design concept as developed for Medupi's ACC units. However the soft-starters required for the Kusile motors necessitated a similar preliminary test exercise, for which we developed a simulation process to test the soft starter-motor-load combination to ensure that it worked at optimum efficiency," Teixeira explained.

"We designed and assembled a special item of equipment to simulate the actual site conditions. These prototype tests were witnessed and approved by SPX, Alstom and Eskom."

ACTOM Air Pollution Control on track with emissions control contract for Xstrata's Lion Ferrochrome smelter expansion project

At the end of February 2013 ACTOM Air Pollution Control was halfway with erection of the first of three bag houses in its current contract for the control of emissions from the new rotary dryer and two new kilns that form part of the Phase 2 smelter expansion project at Xstrata's Lion Ferrochrome complex near Steelpoort in Mpumalanga.

The reputable Johannesburg-based company was awarded the multimillion rand contract – the largest it has won in its 44-year history – in late-2011 for completion in late-2013. *"The total package manufacturing is 85% complete, close to 50% of all equipment and other materials have been delivered to site and the main components of the rotary dryer bag house have been erected, with the remainder due to be installed by the end of March. We have also started erecting the bag house for Kiln C,"* commented Gerard Pretorius, ACTOM Air Pollution Control's Marketing & Sales Manager.

The rotary dryer bag house for the Lion Ferrochrome expansion project as seen in February 2013 while in the process of being erected, showing the bag house casings and dust collection hoppers mounted on the support structure.

WATTSUP

New EnI MD upbeat about growing market share in Africa

As part of the Zest WEG Group, EnI Electrical is able to offer a packaged supply solution that significantly reduces the risks and costs for engineering houses in the mining sector. According to Trevor Naude, newly appointed managing director of this Zest WEG Group company, this solution will continue to be a key strength that attracts increasing market share.

Established in 1984 by brothers Richard and Robert Miller, EnI Electrical has made vigorous progress to the current day, with the company experiencing a total percentage growth of nearly 400% over the last three years.

"The Miller brothers' vision was to create a legacy — a company that would provide a full service electrical and instrumentation offering across the board, at the same time being a business that would remain passionate about people and customer care," Naude says. *"This has always been the foundation ethos of the company."*

Zest Electric Motors acquired a majority shareholding in EnI Electrical in 2008, drawing the thriving electrical and instrumentation company along with it into the Zest WEG Group when WEG Brazil acquired Zest in 2010. *"Our far-reaching vision for EnI Electrical has become a reality over the years and today we have a firm foothold on the African continent, with a strong track record of numerous large projects successfully completed,"* Richard Miller, outgoing managing director of EnI Electrical, says.

Naude says that customers beyond South Africa's borders are now supported by EnI Electrical Ghana, EnI Electrical Zambia and EnI Electrical Mozambique and the company is currently in the process of establishing anther two fully fledged companies in Tanzania and in the Democratic Republic of Congo (DRC).

"Africa contributes a major portion to the business and the region will remain our focus. It's essential that we maintain a local representation in each country, allowing us to leverage off local knowledge and relationships and ensure that we provide the most appropriate service and support in each region," Naude continues.

"In the coming years our company will continue to be focused on electrical construction and we intend to increase our market share even further. At the moment, the biggest projects are happening beyond South Africa's borders and we're making sure that we not only support our existing customers, but are ideally positioned to take part in the future growth anticipated in the African mining sector."

Notable projects successfully completed during 2012 include the Beira Coal Terminal in Mozambique, Konkola North Copper Project in Zambia, Nantou Mining in Burkina Faso, Samancor Meyerton furnace upgrade, Goldfields South Deep Expansion, Xstrata's Tswelopele sinter and pelletising plant in Rustenburg, Petra Diamonds' Cullinan DMS plant and two gold mine expansions for Barrick Gold in Tanzania. EnI Electrical has also completed projects in Uganda, Ghana, Zimbabwe, Mali, Namibia and the DRC.

Trevor Naude has been appointed as the managing director of EnI Electrical.

EnI Electrical cable pulling team in Zambia.

Cable racking done by EnI Electrical in Zambia.

Career's Day in Bergville

The School of Electrical and Information Engineering has, over the past couple of years, assisted in community projects in Bergville, KwaZulu-Natal. This year, an invitation was received from the BCB (Bergville Community Builders) to participate in the Bergville Career's Day. This year is also the 10th anniversary of the BCB. The Bergville Community Builders comprises of successful members of the Bergville community who feel the necessity for education in their respective industries. Their aim is to expose their community school learners to future careers afforded to them by a solid educational base. This event was aimed at learners from grade 11 and 12 from the Okhahlamba district high schools and its surrounding areas.

The event took place on Saturday the 9th of February 2013 at the Amangwe High School. A total of 31 high schools were invited to the event. Participants from around the country were present, ranging from companies such as Eskom through to Universities (UNISA, UKZN, University of the Witwatersrand and others) to organisations such as the South African Weather Service and KZN Wildlife.

The day kicked off with motivational speeches given by the principal of Amangwe High School, Mr B.O. Dube. Mr Thami Mgwenya from the KZN Department of Education and the Mayor of the Okhahlamba region, Mr Thulani Sibeko were amongst the esteemed guests. They all stressed the importance of education and that students should take advantage of the event to learn as much as they can about available careers.

Towards the end of the morning's proceedings, awards were presented to schools that performed well in the 2012 matric exams. The awards were sponsored by Siemens, the SAIEE and the BCB. The following prizes were presented:

- ***Highest number of Bachelor passes in 2012***
  The winner was Meadowsweet High School;
- ***School with most improved results between 2011-2012***
  The winner was uKhali High School;
- ***Okhahlamba ward with highest number of average pass rate***
  The winner was W Magwaneni Ward;
- ***The learner with the best matriculation results in the disctrict in 2012.***
  The winner was Mbongeni Nkosi from Amangwe High School. He won a bursary to study Electrical Engineering at the University of the Witwatersrand, Johannesburg. The learner could not attend the prize giving as he was already at Wits University.

After the speeches and prizegiving, the learners split up and visited all the different career presentations. Topics covered included:

- Science
- Engineering
- Banking, Financial management and Accounting
- Economics and Marketing
- Humanities
- Health Care
- Legal careers
- Nature Conservation and Natural Sciences

On the whole, it was very enjoyable interacting with the learners from the Bergville community. They showed a great enthusiasm to learn and brought lots of energy to the event. It is incredible how much they have achieved with such limited resources. One only hopes that there will be constant improvement in the learners' performance. A great 'thanks' is due to the BCB for giving back to the community by organising these events.

Cost of illegal activities on utilities networks more than "just money"

On the last day of January this year, two trains collided outside of Pretoria, the administrative heart of South Africa.

Two people were fatally injured, 19 critically and about 300 – many of whom school children – suffered minor injuries. Passenger Rail Agency of South Africa CEO Mosengwa Mofi said at the time that the most likely cause was the theft of two 25m cables, which disrupted the automated signalling system.

The damage caused by the January crash to the trains and infrastructure was estimated to be R22 million. This excludes the cost of lost productivity due to huge delays in train arrivals resulting in workers arriving late for work.

However, the damage should not just be calculated in terms of money. Physical and psychological injuries to the passengers are unknown. This is just one example of how cable theft impacts the economy, infrastructure and society.

BILLIONS OF LOSSES EVERY YEAR

It is estimated that cable theft alone in South Africa annually amounts to a loss of R5-billion per annum. This kind of theft also impacts on the telecommunications system, resulting in a loss of telephonic, internet and other forms of telecommunications connectivity. In its 2010/11 financial report, the national telecommunications provider, Telkom, reported losses due to cable theft of between R165.4 and R183.5 million.

"In certain areas, when cables are stolen four or five times, Telkom refuses to re-install cables – it simply becomes too expensive. Not only does this cut people off from communication with their families and friends, but it can also impact negatively on business and trade," says Rens Bindeman, Technical Advisor of the Southern African Revenue Protection Association and an expert on the combating of revenue losses. "Utilities are constantly looking for alternatives to copper cables to diminish the risk of theft."

And while it is clear that cable theft poses serious challenges to the South African economy, non-technical losses also occur in other spheres. *"The power distribution network is extremely vulnerable in term of illegal connections, meter tampering, theft of transformers and other illegal activities,"* says Bindeman.

Transformers at substations are frequently tapped into to drain the oil in many African countries. This leads to the overheating of the transformer, which in turn leads to power outages and even explosions. According to Rens Bindeman, the total annual losses for South Africa could be as high as R10 billion. Eskom, the country's national utility's official annual figure for losses is estimated at around R4.4 billion. As with cable theft, this loss of income by power utilities impacts negatively on the economy, infrastructure and society.

IMPACT ON SOCIETY

An example of how illegal activities in the power distribution field affect the ordinary person: In September 2012 an illegal settlement bordering a school in Kayamandi, a township just outside of Stellenbosch was illegally connected to the power grid. It lead to an overload and the school was left without power and lessons were severely disrupted – something that the problem-ridden education system in the country can ill afford.

The South African media also frequently reports on deaths caused when children and adults come into contact with exposed live electrical wires, which are left on the ground when illegal connections are made. Unfortunately communities often react with great anger when officials arrive to take action, even physically attacking these officials - as happened in 2011 in Tzaneen when Telkom workers were set upon by angry residents. Eskom spokesperson Hillary Joffe said at the time that illegal connections to the electricity grid destabilised the distribution networks leading to over-loading and wide-spread power outages.

When Eskom loses revenue through illegal activities, it looks for ways to recoup its losses. Most often this means that the already overburdened consumer has to pay even more for this service.

AFRICAN UTILITY WEEK

Because of the devastating effects of non-technical losses to utilities, a number of speakers at the upcoming African Utility Week in Cape Town from 14-15 May, will discuss these issues in various conference tracks including Metering, Clean Power, Water, Large Power Users, Investment and Finance, T&D/Smart Grids and Generation.

"Globally utilities lose USD25 billion annually due to illegal activities," says Claire Volkwyn, programme director of African Utility Week. "These huge losses mean that less money is available to render other necessary services. In South Africa the lost income could have been used to speed up electrification processes and the roll out of communication networks in areas where there is need. We all suffer when losses, due to illegal activities, occur."

African Utility Week brings together the entire ecosystem for the African water and power sector, from high level government representatives, utilities and municipalities, regulators and power pools to consultants, vendors, service providers and energy intensive power users for the purpose of sharing and determining the future development of Africa's power industry. WN

Earn CPD Credits

Intelligent Transformer Substations in Modern Medium Voltage networks as Part of "Smart Grid"

BY | HELMUT SPÄCK | BERND SCHÜPFERLING | JÜRGEN RIEMENSCHNEIDER | MEINOLF SCHELTE
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Higher utilization of the power systems, variable load flows due to decentralized power generation from renewable energy sources and a growing need for information of the regulating authorities place higher demands on fault detection and acquisition of system operating data.

Furthermore, remote indication and remote control can considerably reduce supply interruption times as well as system breakdown costs, and provide rapid adjustment to varying load conditions.

Therefore, the requirements for the intelligence of transformer substations will increase in the future. But where are the limits of useful and cost-efficient utilization? They are somewhere between a merely passive substation and the complete automation.

With a gas-insulated medium-voltage switchgear, a renowned international mannufacturer offers the basis for application in an intelligent transformer substation. It is optionally equipped with motorised operating mechanism; short-circuit indicators and voltage detecting systems, as well as a variety of other sensors.

Plug connected to a Remote Terminal Unit (RTU) in a separated wall-mounting cabinet, the switchgear fulfills all preconditions for integration in an intelligent network infrastructure.

This article provides an overview on different intelligence levels, possible kinds of communication to the telecontrol system as well as necessary components and requirements of future intelligent transformer substations.

Modern life needs electrical energy: at any place, any time requiring high quality. Increasing demand for electricity – especially in developing countries – and the concerns about global warming are the motors to push renewable energy sources in many countries. In addition, high efforts are made to reduce power losses wherever possible.

Renewables like wind power or photovoltaics are sponsored in many countries by law, like the law for renewable energies EEG ("Erneuerbare-Energien-Gesetz"[1, 2]) in Germany. The increase of renewables changes the structure of the networks. On the other hand, the number and time of outages are the basis for the "grid fees", its upper limits, or penalties in some countries.

In the past there was only one principle: power generation follows load. So, there was only one direction of energy flow: from the power plant to the consumer. Today, a lot has changed. Renewable energies are generated in a decentralized way according to suitable locations.

Energy is usually fed into the network at the medium-voltage or low-voltage level; in some cases, even directly into the high-voltage network.

An essential feature of renewables like wind power and photovoltaics is the stochastic availability. This has a great influence on network the control into existing distribution system.

Besides there are other effects such as:

- Changed direction of energy flow
- Changed cable load
- Higher short-circuit currents
- More difficulties with power quality
- Additional demand for balancing energy
- Changed requirements on the protection concept

In the future, power consumption will follow generation rather than vice versa.

Prime examples are electric cars that can be charged or operated at night drawing on cheap wind power.

This means a change towards a paradigm shift: leaving uni-directional energy and communication flows behind for bi-directional power flows[3]. Therefore, new intelligent and flexible solutions have to be identified and developed.

One module of the future smart grid is the intelligent transformer substation enabling automatic and fast fault clearance, thus contributing to active load management in secon- dary distribution systems.

SECONDARY DISTRIBUTION SYSTEM DESIGN WITH DECENTRALIZED POWER SUPPLY

Figure 1 shows an overview diagram for a typical medium-voltage system for the secondary distribution level in Central Europe, including decentralized power supply on the medium-voltage and low-voltage side.

Intelligent Transformer Substations in Modern Medium Voltage networks as Part of "Smart Grid"

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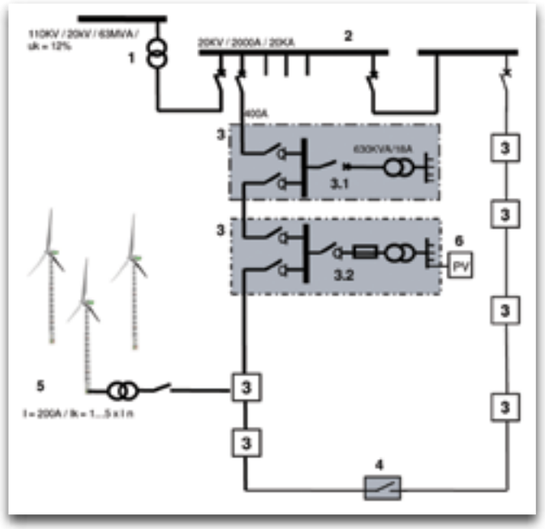

Figure 1: Secondary Distribution System Design with Decentralized Power Supply

Legend:

1 Power transformer;
2 Circuit-breaker switchgear of the primary distribution level;
3 Secondary transformer substation with Ring Main Unit (RMU)
  3.1 RMU with circuit-breaker;
  3.2 RMU with switch-fuse combination;
4 Secondary transformer substation with RMU, with open sectionalizer;
5 Decentralized power supply, wind power;
6 Decentralized power supply, photovoltaics.

The key data for the circuit-breaker switchgear of the primary distribution level and for the distribution system basically result from the data of the power transformer. Today, circuit-breaker switchgear of the primary distribution level are fully automated and integrated in the substation automation system.

At the secondary medium-voltage level, cable systems with compact HV/LV-transformer substations are mostly used, as shown in Figure 2. Presently, secondary transformer substations are not included in the "substation automation system" in most of the cases, and can therefore not be monitored or telecontrolled. The secondary distribution system is mostly operated as an open ring, i.e. with an open sectionalizer in one transformer substation. Apart from the RMU with switch-fuse combination (IEC 62271-105) or circuit-breaker, the transformer substations are equipped with the distribution transformer and the low-voltage switchgear with fuse blocks or low-voltage circuit-breakers.

Figure 2: Typical HV/LV-Transformer Substation

Legend:

1 Ring-Main Unit
2 Distribution transformer
3 LV equipment

Statistics from power supply companies referring to supply interruptions at the end customer show that e.g. in Germany about 80% of the interruptions are caused by failures in the medium-voltage system. The System Average Interruption Duration Index (SAIDI) describes the total time of all interruptions for customers, divided by the number of customers. Typical values for a German municipal utility are 10 minutes of annual outage per customer. In other regions of the world the outage times reaches from hours to days. The utilities' customers require maximum availability of the electrical power supply.

MANUAL FAULT LOCALIZATION - CURRENT STATUS

As secondary transformer substations are usually not equipped with communication links to the network control centers, monitoring of faults as well as remote control are not possible. This can cause long supply interruptions, thus restricting the reliability and security of supply to a large extent. Fault detection is also impaired by the long distances to the secondary transformer substations, which leads to even longer outage times.

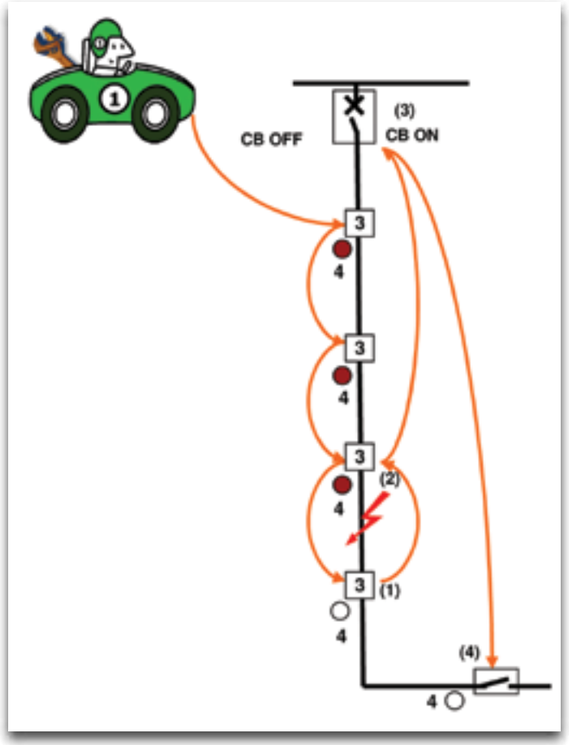

Figure 3: Manual Fault Detection

Legend:

[3] Transformer Substation
4 Short Circuit / Earth Fault Indicator
● tripped
○ not tripped

The procedure for fault clearance according to figure 3 is normally done in the following way:

- When a fault occurs in the distribution system, the upstream circuit-breaker (CB) in the transformer substation trips (CB OFF), so that all substations up to the open sectionalizer are not supplied.
- An intensive and time consuming fault detection process starts by driving to the individual secondary transformer substations and reading the short circuit or earth-fault indicators. The ring is opened at the substation where the short-circuit or earth-fault indicator has not responded (1). After returning to the previous substation, the ring is also opened there (2), so that the fault is isolated and can be cleared later.
- Now the tripped upstream circuit-breaker can be closed again ((3) – CB ON).
- Finally the sectionalizer will be closed (4).

After this procedure the complete ring is supplied again, and the faulty section in the ring can be repaired.

The described procedure for fault clearance requires a lot of time and a large number of personnel. A highly qualified service expert has to drive to many substations to identify the fault prior to supplying all customers with power again. This produces financial losses for utilities by not supplying energy to households and companies.

Therefore, there is great need for intelligent and automated solutions.

INTELLIGENT TRANSFORMER SUBSTATIONS

The topic *"Intelligent Transformer Substations"* is intensively discussed on many technical conferences and expert circles at the moment. There are three different levels of an intelligent transformer substation:

- Level 1: Monitoring
  → higher availability by faster fault localisation
- Level 2: Monitoring + remote control
  → minimizes breakdown times by fast fault clearance
- Level 3: Monitoring + remote control + load flow control → minimizes losses
  → manages decentralized power supplies

Figure 4: The Three Different Levels of an Intelligent Transformer Substation[4]

Intelligent Transformer Substations in Modern Medium Voltage networks as Part of "Smart Grid"

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INTELLIGENT TRANSFORMER SUBSTATIONS – RTU – COMMUNICATIONS – NETWORK CONTROL CENTER

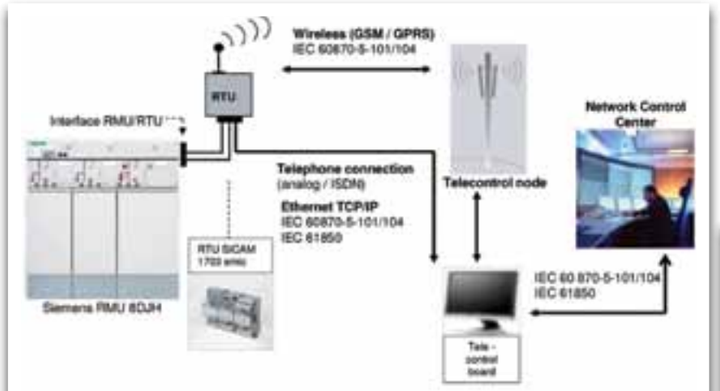

Figure 5: Substations – RTU – Communications - Control Level

Figure 5 shows the basic structure of an intelligent transformer substation with communication link via the Remote Terminal Unit (RTU) to the telecontrol node or the network control center.

RING-MAIN UNIT (RMU) / TRANSFORMER SUBSTATION WITH SENSORS AND ACTORS

RMU with sensors and actors are the basis of an intelligent transformer substation. Depending on the objective, different components are used for monitoring and control according to figure 6:

- The voltage detecting system (1) shows whether the outgoing feeders are live or not;
- Short-circuit/earth-fault indicators (2) signal a short-circuit or earth-fault in accordance with the adjusted operating threshold.
- Depending on the network structure and the direction of the energy flow, it may be necessary to use devices with detection of direction which require an adequate voltage information;
- Overcurrent-time protection systems with auxiliary contacts are used for transformer protection;
- Auxiliary switches (4) are available, e.g. for position indications, interlocks, releases, gas pressure;
- Stored-energy operating mechanisms with solenoids (5) and motor operating mechanisms (6) are available for remote closing and opening;
- Voltage and current sensors (8/9) transmit the voltage and current signal for the purpose of load flow control. The signals are derived from conventional voltage or current transformers or from modern sensors.

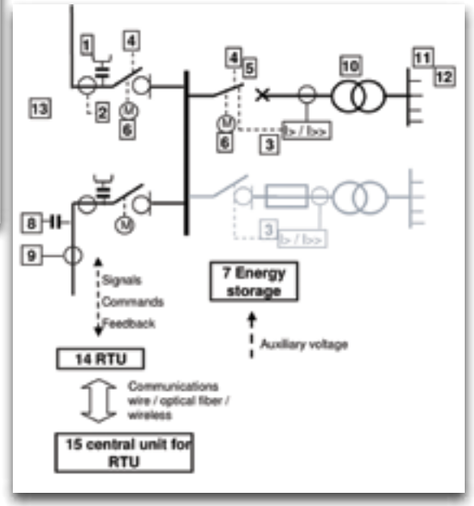

Figure 6: Components for Monitoring and Control

Legend:

1 Voltage detecting system
2 Short-circuit/earth-fault indicator with operating threshold
3 Overcurrent-time protection for distribution transformer
4 Auxiliary switches
5 Stored-energy mechanisms / solenoids
6 Motor operating mechanisms
7 UPS (Uninterruptable Power Supply) energy store
8/9 Voltage/current monitoring
10 Transformer monitoring
11/12 Monitoring of low-voltage distribution + possibly customer connection
13 Monitoring of substation
14 RTU (Remote Terminal Unit)
15 Central unit / control level

The new gas-insulated medium-voltage switchgear type 8DJH [5] provides all functions for applications in intelligent substations and fulfils all preconditions for integration in an intelligent network infrastructure.

Later retrofitting of components for remote control can be performed easily and very quickly.

Additional sensors/information according to figure 6 are available in the transformer substation for:

- Transformer monitoring (10) with sensors for temperature, pressure and oil level
- Monitoring of the low-voltage distribution in the transformer substation (11)
- If required, data from the customer's side can also be integrated (12)
- Monitoring of the substation itself like door lock or temperature (13), e.g. for object supervision

REMOTE TERMINAL UNIT (RTU)

There are two main tasks of the remote terminal unit (14): on the one hand providing the signals and measured values or information from the transformer substation for communication to the telecontrol node or network control center. On the other hand the RTU transfers the necessary commands to the actors and monitors the execution thereof.

Figure 7 shows a real installation of the 8DJH RMU with a complete RTU box, delivered to a German utility.

Legend:

1. RMU 8DJH
2. Plug connection interface
3. TRU SICAM TM 1 703
4. Modem for wireless communication
5. UPS with power supply units + battery

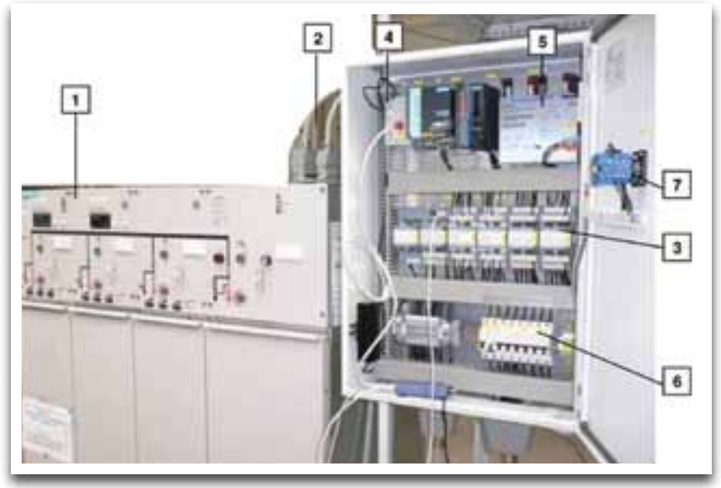

Figure 7: RMU 8DJH with RTU for Remote Control

6. Mini Circuit Breaker (m.c.b.)
7. Local Remote switch

A plug connection interface between RMU and RTU box is required by many customers for several reasons:

- Easy installation of the RTU box in substations;
- Use of the same RTU box for new and old substations;
- Easy exchange in case of new sophisticated technology or in case of failure.

The RTU box is designed and manufactured by the switchgear manufacturer or by the utilities. The main components of the RTU box shown in figure 7 are normally:

- Basic RTU module with extension modules if necessary;
- Communication module;
- Energy store (battery or capacitor);
- LV equipment like m.c.b. and local-remote switch

Modern RTUs can be modularly extended. They feature several communication interfaces, and are designed and tested for the rough environmental conditions of a transformer substation.

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ENERGY STORE

The components of an intelligent transformer substation require a reliable auxiliary voltage supply. If the auxiliary voltage fails, an energy store supplies the components for time periods reaching from few minutes to two hours.

The size of the energy store mainly results from the power demand to maintain the RTU function and the communication modules. In contrast to this, the energy consumption for motor-operated CLOSING and OPENING of an 8DJH disconnector operating mechanism is very low.

Conventional batteries and capacitor stores with double layer capacitors (ultracaps) or a combination thereof are mainly used as energy stores. Special batteries are also available for extreme environmental conditions.

COMMUNICATION – CONTROL LEVEL

As shown in Figure 5, communication from the RTU / transformer substation can take place in different ways, via wire (e.g. Ethernet TCP/IP), optical fibre, or wireless (e.g. GSM/GPRS) to the network control center. There the information is processed, and control commands are communicated back to the RTU's, if required. In the future, communication via WiMAX or BBPL (Broad Band Power Line) will become more important.

The communication protocols follow the standards of IEC 60870 - 5 - 101 and – 104. With a WiMAX or BBPL communication infrastructure, communication standards as per IEC 61850 could also be used in the future.

The utilization of these protocols ensure interoperability between devices from different manufacturers. The following points, which are also important for selecting the communication medium, are discussed in expert circles:

- Availability and reliability of the communication channels; Redundancy required?
- Management of the data flood;
- Data security/encryption - Protection against hacker attacks;
- Costs for investment and running operating costs;
- Risk by "ageing of technology" that is used due to fast IT evolution.

OTHER TOPICS IN DISCUSSION CONCERNING LOAD FLOW CONTROL

Reducing network losses, increasing the capacity for energy transport and increasing the network stability are the goals. Topics in discussion are:

- Compensation of reactive power and harmonics by the invertors of wind power and photovoltaics.
- Which balancing mechanisms are optimal to minimize losses and stabilize the network?
- Are distribution transformers with automatically controlled tap changers required?
- How can distribution transformers be controlled during peak loads and monitored in the overload range?
- Can these measures contribute to postpone/avoid network extensions?

INTELLIGENT 3-POINTS-AUTOMATION

Cost-benefit estimations urge many power supply companies to compromise and not to automate the complete distribution system, but only to operate selected important transformer substations in a 3-points-automation, as exemplarily shown in figure 8. Automation can also be retrofitted and adapted to switchgear from different manufacturers.

Legend:

3 Transformer Substation
not-automated
automated

FAULT CLEARANCE WITH 3-POINTS-AUTOMATION

The procedure for fault clearance in a system with 3-point-automation is as following:

- A fault in the distribution system trips the upstream circuitbreaker in the transformer substation; thus, all substations up to the open sectionalizer are not supplied.
- Fault location by signaling the shortcircuit indicators of the automated substations to the network control center.
- In the automated transformer substation, the switching device of the ring is opened by the network control center in the direction of the fault.
- Depending on the location of the fault, either the tripped circuitbreaker in the transformer substation or the switching device at the open isolating point can be closed, so that all important customers are supplied again within a very short time.

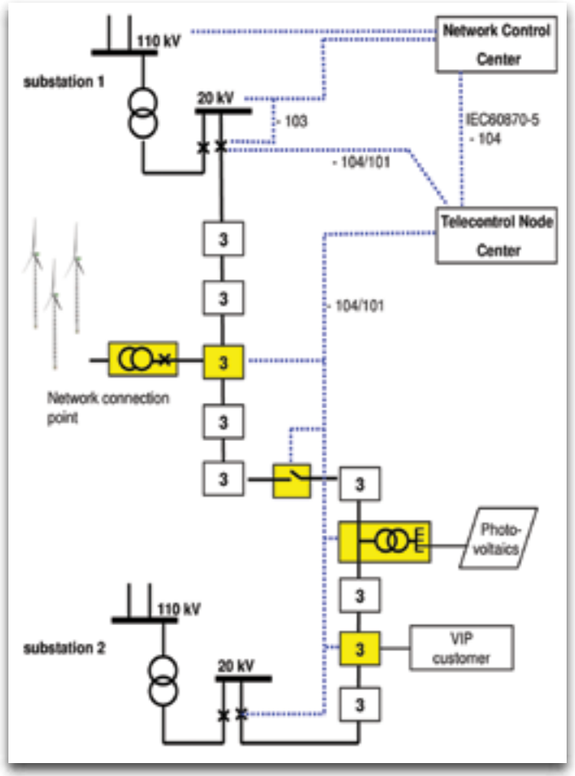

Figure 8: 3-Points-Automation Principle

- Finally the service expert has to drive straight to the ring section with the fault. There he performs the necessary switching operations to ensure that all customers are supplied again and the faulty section in the ring can be repaired.

Legend:

3 Transformer Substation
4 Short Circuit / Earth Fault Indicator
tripped
not tripped
automated

The advantages of this system already utilized by some power supply companies in Germany are much shorter outage times, as well as less expenses for technical personnel for fault detection. Very important customers can be resupplied within minutes.

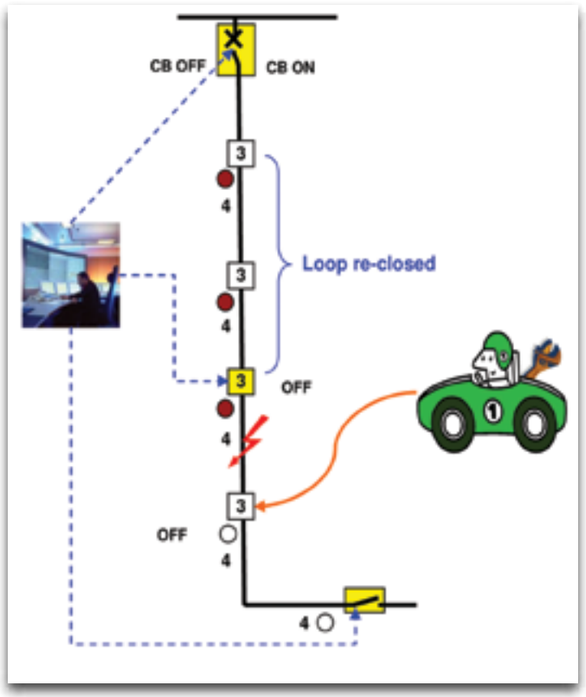

Figure 9: 3-Points-Automation Fault-clearance Procedure

CONCLUSION

Increasing demand for reliable electricity and achieving the climate protection targets lead to promote the renewable energies with points of infeed in the medium-voltage and low-voltage systems. Maintaining the necessary power quality and network stability requires an active distribution system with intelligent transformer substations.

Possible measures reach from pure monitoring via remote control up to targeted load flow control, and are different in the companies or countries. There is everything from "zero level" up to complete remote control of the transformer substations.

Incentive systems to minimize outage times, and necessary measures to secure the voltage quality are the drivers. Presently, the fault detection with monitoring and remote control with shifting of the open isolating point with the sectionalizer are still in the foreground. Utilization of inverters from the wind power

Intelligent Transformer Substations in Modern Medium Voltage networks as Part of "Smart Grid"

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and photovoltaic systems to ensure and improve the power quality will increase in the future.

More-over, distribution transformers with tap changers will be used at critical points in the secondary distribution system. In addition to this there are possibilities for minimization of losses in the grid and monitored utilization of the operational equipment even in the overload range.

The advantages resulting from remote control and active load management are:

- Faster fault localization
- Shorter interruption times
- Measuring/signaling of operational data - Reduced network losses
- Possibility of compensation of reactive power / harmonics
- Monitored transformer operation during overload
- Higher transmission power; thus: postponement of network extensions
- Remote object supervision

The answer to the question "Intelligent transformer substa- tion: a need or luxury?" is: Intelligent substations and an intelligent distribution network are a must in order to meet the requirements of the future.

The objective is to continue developing intelligent solutions for the management of secondary distribution systems, thus contributing to reliable and efficient power supply. wn

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ABBREVIATIONS AND ACRONYMS

BBPL Broad Band Power Line
CB Circuit Breaker
EEG Erneuerbare Energien Gesetz (Law on renewable Energy)
HV High Voltage
LV Low voltage
m.c.b. Mini Circuit Breaker
RMU Ring-Main Unit
RTU Remote Terminal Unit
SAIDI Systems Average Interruption Duration Index
UPS Uninterruptable Power Supply
WiMAX Worldwide Inter-operability Microwave Access

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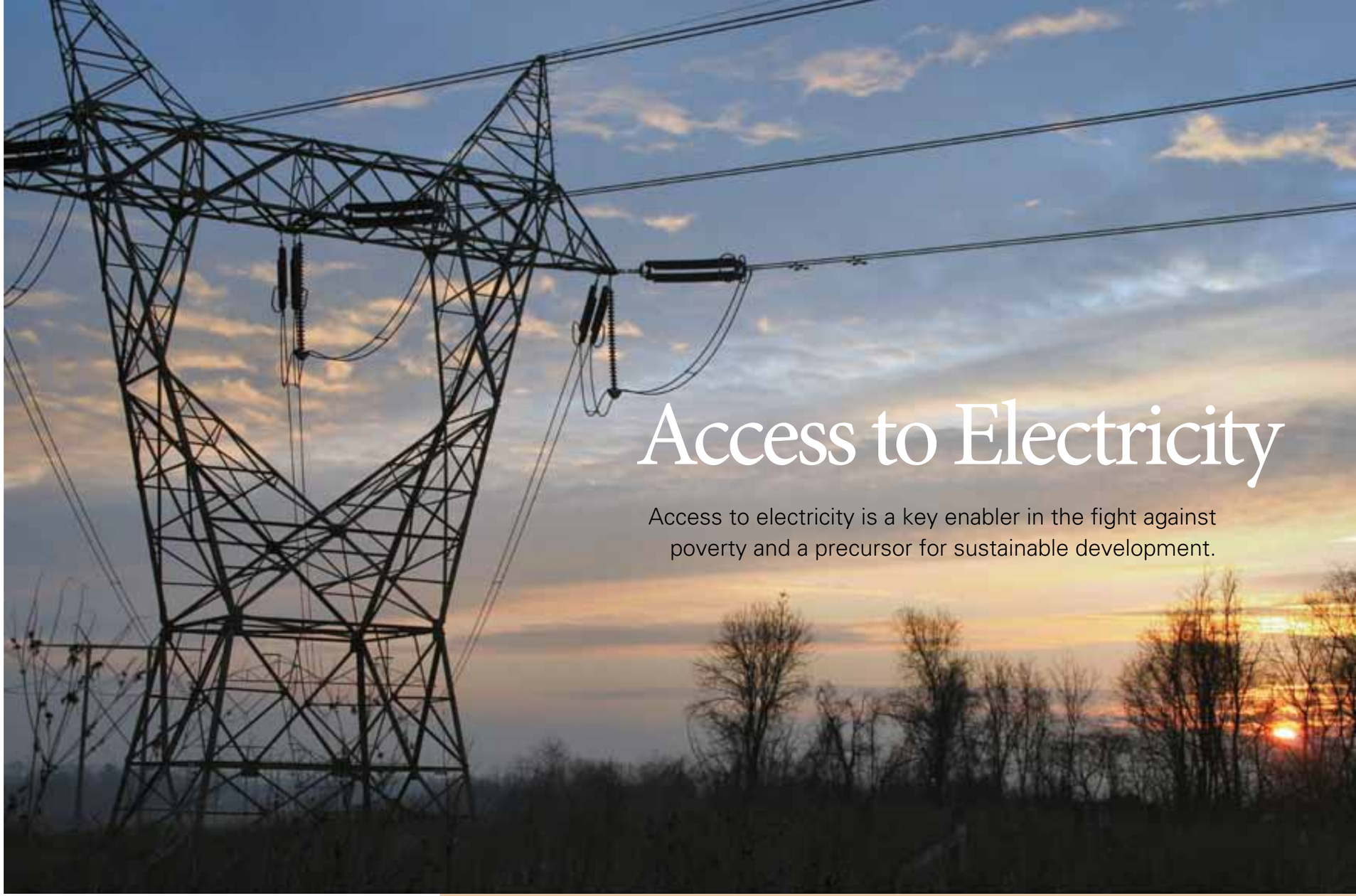

Access to Electricity

Access to electricity is a key enabler in the fight against poverty and a precursor for sustainable development.

An international power giant focuses its contribution to common efforts on its Access to Electricity initiative. This is a multi-dimensional program where they work with partners from other industries, governments, non-governmental organizations, development aid and financial institutions, to bring the benefits of electricity to those in need of it. They aim at improving their ability to respond to the needs of developing regions and to explore new ways to make use of their technical and commercial expertise to contribute to real economic and social development.

Access to Electricity is their response to the UN Global Compact's invitation to its corporate signatories to make efforts for economic growth in the world's least developed countries.

Electricity is a major contributor in meeting global goals for economic development, poverty alleviation and social development.

Traditionally, women and children in developing countries spend many hours every day to collect wood for heating and cooking time that could have been used for productive work or education. In many areas it gets dark early and electricity makes the hours after dark available for learning for women and children and gives more time for doing homework.

Electricity helps small enterprises to start up and grow and thereby to improve living conditions, increase incomes and ultimately to break the cycle of poverty by creating enhanced opportunities for education, employment and improved livelihoods. The development of small business initiatives producing goods and services has been identified as a key component

LOW COVERAGE OF ELECTRICITY GRIDS IN AFRICA

In the early 1960s Africa's population was about 300 million. 10% of the rural and 50% of the urban African households were grid-connected.

Today, Africa has about 800 million people. Less than 5% of the rural and less than 40% of the urban households have access to grid electricity.

Access to Electricity

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in job generation, income growth and cash generation in rural communities.

The energy cost for people in remote and rural areas in developing countries amounts to approximately $1 to $3 per month. Sometimes as much as up to 20-30% of the disposable income is used for energy, essentially for charcoal, kerosene and dry batteries. In areas where electricity replaces other commercial fuels, households' energy costs fall rather than rise. In developed countries people spend approximately 2-3% of their income on electricity.

Socio-economic studies among rural households and especially rural enterprises show a willingness to pay for access to electricity, if only reasonably reliable and 24h services were available.

Recent estimates indicate that poor households once electrified, would initially consume about 30-200 W during 5 hours per day, corresponding to 55–360 kWh per year.

THE DILEMMA OF RURAL ELECTRIFICATION

Rural electrification has been a dilemma to many governments. It is a complex process that deals with energy policy, technological, economical and institutional aspects. Rural electricity schemes are usually more costly to implement than urban or peri-urban schemes.

The conventional model with centralized utilities, large-scale power plants and transmission systems, has largely failed to reach the rural poor. In many countries national monopoly utilities are unable to expand services due to limited economic resources.

In the past most subsidized rural and remote electrification schemes have been run by high-cost, centralized public utilities charging tariffs that do not cover costs.

Misdirected subsidy policies, political interference and the distortion of commercial incentives worsen an already difficult situation. In many cases, this is combined with a policy environment and institutional structure that are not conducive to private investment in decentralized rural settings. Thus, despite a growing demand, the supply response is lacking and the electrification rates remain extremely low in many developing countries.

The technical standards issued by authorities in developing countries are quite often very similar to those in European or other developed countries and not adjusted to the local conditions, which lead to unnecessarily high electrification costs.

Rural power demand is initially very low: e.g. less than 200W for rural households, 2-4 kW for many small and medium sized enterprises and shops, 3-5 kW for health clinics and schools, 5-20 kW for a maize-mill, water irrigation system and so on.

The cost per connection needs to be lowered significantly over the coming years in order to enable a rapid scale-up of access to electricity in rural and remote areas. This includes developing new technical standards. It also includes the adaptation of proven technologies and the development of new low-cost technologies for transmission and distribution networks, house wiring, customer connections, metering and billing.

Procurement regulations of goods and services could be made more flexible to stimulate innovation. The existing practice normally calls for bids that are based on a given detailed specification of the prescribed tech- nical solution; in contrast to a specification of the desired functionality, leaving the technical realization to be worked out in competition by the actors on the market. Procurement regulations based on detailed technical specifications therefore tend to conserve technology. Complementing traditional specifications with functional requirements could stimulate innovation and the development of new, low-cost solutions.

Most often price is the sole criterion when evaluating tenders. This is not a satisfying practice, since other factors may be more important for the sustainable success of a project, and gain the end-customers more. Even though it is recognized in procurement regulations that other criteria are important, and a more multifaceted evaluation is allowed, it is rarely applied in practice.

Examples of such criteria are payment terms, construction or delivery periods, technical performance, technical expertise and capability of the tenderer, technical compatibility with other equipment, local presence, availability of service and spare parts, operation and maintenance costs, etc.

CURRENT TRENDS

Over the next three decades, the investment needed in new electricity generating capacity in developing countries is projected to reach 2.1 trillion US$, of which 40% in China, 15% in South Asia, 10% in Africa and 5% in the Middle East.[1]

Domestic funding in the countries, foreign development aid and private capital should cover these investments. Even if private investments in electricity infrastructure increased in the 1990s there has been a decline in recent years. In addition, private investments are small in the least developed countries and do not reach the rural poor regions.

Clearly, the international donor community still has an important role to play in the development of electric power infrastructure. We note with satisfaction that this recently has been recognized e.g. by the World Bank Group.

Electricity sector reforms in the developing world, may lead to the break up of public monopolies and privatization of generation, transmission and distribution. This may provide opportunities for alternative ways to electrify poor rural areas.

Several countries are now implementing or developing rural electrification schemes using elements of so-called output-based contracting. Subsidies are provided as capital grants for extending or creating an isolated grid or for installing small generators. Subsidies can be provided for connecting consumers, or for rehabilitating networks. The focus on outputs gives operators the flexibility and the incentive to innovate and to respond to consumer preferences.

In general, it is better to subsidize investments and not consumption or operation of power systems, since consumption and operation subsidies tend to erode operational efficiency and require long term funding commitments. The subsidies should be de- signed to encourage cost-efficiency, commercial drivers and a customer focus.

IMPLEMENTING RURAL TRANSFORMATION

A demand driven bottom-up approach to rural electrification poses a promising alternative route to reach the rural poor, focusing on improved income generation through the productive use of affordable electricity.

The electrification scheme should be based on a socio-economic analysis of what revenues can be generated from the new grid and what capital and maintenance costs the operator can bear on a sustained basis, including subsidies and development assistance.

The power may be supplied from the regular grid or in deep rural settings a stand-alone mini-grid. The approach should be least-cost and the power system should be designed to meet actual needs and allow for easy expansion with increasing demand.

With an emphasis on affordability and a strong discipline in payment of bills, the foundation can be laid for a sustainable system that could grow organically.

Electrification efforts need to be well planned with a long-term planning horizon. Grid expansion will continue to play an important role, and we may foresee the aggregation of expanding stand-alone networks and eventually their integration into the national grid.

However, rural electrification should be part of broader programs for economic and social development in poor communities.

A synergetic approach to other sectors is more likely to achieve a sustainable rural transformation. In many cases, the synergies with electrification are obvious:

- Water
- Agriculture
- Small & medium sized enterprises
- Information and telecommunication
- Roads and transport
- Health and education

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Excerpt from ABB's, Access to Electricity, White Paper. For more information, contact Anders Nordström, Project Manager, ABB Sweden.

FACTS:

- 1.6 billion people have no access to electricity.
- 50% in South Asia (35% in India alone)
- 32% in sub-Sahara Africa
- 14% in East Asia (not including China)
- In absence of new policies 1.4 billion will still lack electricity 2030.
- 99% of people without electricity live in developing countries.
- Four out of five without electricity live in rural areas.

Access to electricity and other modern energy sources is a necessary, but not sufficient, requirement for economic and social development.

Source: IEA World Energy Outlook 2002

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No Harmony in Harmonics

Common causes, implications and resolutions for problematic harmonic distortion in your electrical system

BY | JONATHAN RODRIGUEZ & GAVIN SALDANHA

Harmonic currents generated by non-linear electronic loads increase power system heat losses and power bills for end users. These harmonic-related losses reduce system efficiency, cause apparatus overheating, and increase power and air conditioning costs. As the number of harmonics-producing loads has increased over the years, it has become increasingly necessary to address their influence when making any additions or changes to an installation.

Harmonic currents can have a significant impact on electrical distribution systems and the facilities they feed. It is important to consider their impact when planning additions or changes to a system. In addition, identifying the size and location of non-linear loads should be an important part of any maintenance, troubleshooting and repair program.

THE TROUBLE WITH HARMONICS IN MODERN POWER SYSTEMS

Harmonics are a distortion of the normal electrical current waveform, generally transmitted by nonlinear loads. Switch-mode power supplies (SMPS), variable speed motors and drives, photocopiers, personal computers, laser printers, fax machines, battery chargers and UPSs are examples of nonlinear loads. Single-phase non-linear loads are prevalent in modern office buildings, while three-phase, non-linear loads are widespread in factories and industrial plants.

A large portion of the non-linear electrical load on most electrical distribution systems comes from SMPS equipment. For example, all computer systems use SMPS that convert utility AC voltage to regulated low-voltage DC for internal electronics. These non-linear power supplies draw current in high-amplitude short pulses that create significant distortion in the electrical current and voltage wave shape - harmonic distortion, measured as total harmonic distortion (THD).

The distortion travels back into the power source and can affect other equipment connected to the same source.

Most power systems can accommodate a certain level of harmonic currents but will experience problems when harmonics become a significant component of the overall load.

As these higher frequency harmonic currents flow through the power system, they can cause communication errors, overheating and hardware damage, such as:

- Overheating of electrical distribution equipment, cables, transformers, standby generators, etc.
- High voltages and circulating currents caused by harmonic resonance
- High neutral currents that generate heat and waste energy
- Equipment malfunctions due to excessive voltage distortion
- Increased internal energy losses in connected equipment, causing component failure and shortened life span
- False tripping of branch circuit breakers
- Metering errors
- Fires in wiring and distribution systems
- Generator failures
- High crest factors and related problems
- Lower system power factor, resulting in less usable power (kW vs. kVA) and penalties on monthly utility bills

No Harmony in Harmonics

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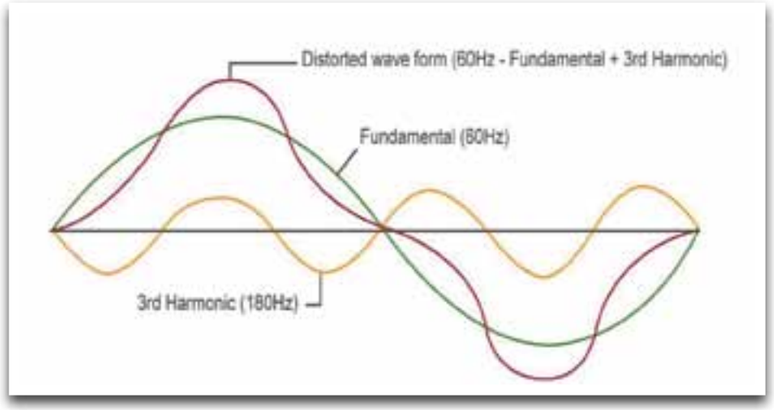

Figure 1: Harmonic distortion of the electrical current waveform

A TECHNICAL VIEW OF HARMONICS

Harmonics are currents or voltages with frequencies that are integer multiples of the fundamental power frequency. If the fundamental power frequency is 60 Hz, then the 2nd harmonic is 120 Hz, the 3rd is 180 Hz, etc. (see Figure 1). When harmonic frequencies are prevalent, electrical power panels and transformers become mechanically resonant to the magnetic fields generated by higher frequency harmonics. When this happens, the power panel or transformer vibrates and emits a buzzing sound for the different harmonic frequencies. Harmonic frequencies from the 3rd to the 25th are the most common range of frequencies measured in electrical distribution systems.

All periodic waves can be generated with sine waves of various frequencies. The Fourier theorem breaks down a periodic wave into its component frequencies.

The total harmonic distortion (THD) of a signal is a measurement of the harmonic distortion present and is defined as the ratio of the sum of the powers of all harmonic components to the power of the fundamental. It provides an indication of the degree to which a voltage or current signal is distorted (see Figure 3).

TOTAL HARMONIC DISTORTION SOLUTIONS TO COMPENSATE FOR AND REDUCE HARMONICS

While standards to limit the generation of harmonic currents are under consideration, harmonic control today relies primarily on remedial techniques. There are several approaches that can be taken to compensate for or reduce harmonics in the power system, with varying degrees of effectiveness and efficiency.

OVERSIZE THE NEUTRAL WIRING

In modern facilities, the neutral wiring should always be specified to be the same capacity as the power wiring, or larger - even though electrical codes may permit under-sizing the neutral wire. An appropriate design to support a load of many personal computers, such as a call center, would specify the neutral wiring to exceed the phase wire capacity by a factor of 1.73. Particular attention should be paid to wiring in office cubicles. Note that this approach protects the building wiring, but it does not help protect the transformers.

USE SEPARATE NEUTRAL CONDUCTORS

On three-phase branch circuits, instead of installing a multi-wire branch circuit sharing a neutral conductor, run separate neutral conductors for each phase conductor. This increases the capacity and ability of the branch circuits to handle harmonic loads. This approach successfully eliminates the addition of the harmonic currents on the branch circuit neutrals, but the panelboard neutral bus and feeder neutral conductor must still be considered.

Use DC power supplies, which are not affected by harmonics.

In the typical data center, the power distribution system converts 480-volt AC utility power through a transformer that steps it down to 208-volt AC power that feeds racks of servers. One or more power supplies within each server convert this AC input into DC voltage appropriate for the unit's internal components.

These internal power supplies are not energy efficient, and they generate substantial heat, which puts a costly burden on the room's air conditioning system. Heat dissipation also limits the number of servers that can be housed in a data center. It could be worthwhile to eliminate this step by switching to DC power.

According to an article in Energy and Power Management magazine, *"Computers and servers equipped with DC power supplies instead of AC power supplies produce 20 to 40 percent less heat, reduce power consumption by up to 30 percent, increase server reliability, offer flexibility to installations, and experience decreased maintenance requirements."*

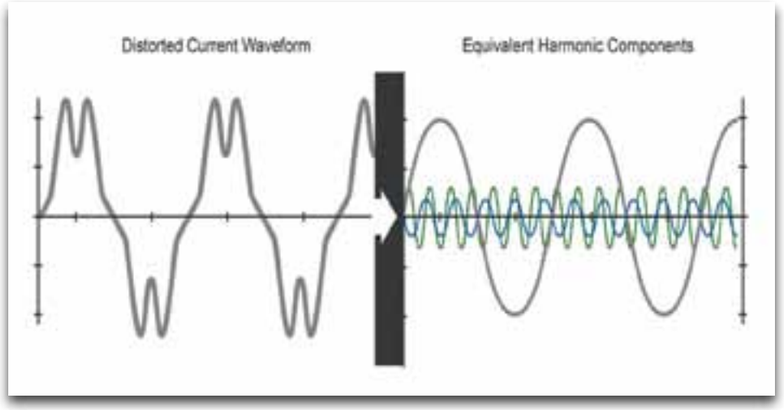

Figure 2: Distorted waveform composed of fundamental, 5th and 7th harmonics

That sounds good, but when cost, compatibility, reliability and efficiency are considered together, the move from AC to DC power is not justified for most data centers. AC power - even though it is slightly less efficient - is universally acceptable to existing equipment.

Furthermore, there are no Underwriter's Laboratory (UL) safety standards for high-voltage DC in data centers yet, while standards for AC systems are mature. That means the safety risks could outweigh the potential gain with DC power, for now.

USE K-RATED TRANSFORMERS IN POWER DISTRIBUTION COMPONENTS

A standard transformer is not designed for high harmonic currents produced by non-linear loads. It will overheat and fail prematurely when connected to these loads.

When harmonics started being introduced into electrical systems at levels that showed detrimental effects (circa 1980), the industry responded by developing the K-rated transformer. K-rated transformers are not used to eliminate harmonics but to handle the heat generated by harmonic currents.

K-factor ratings range between 1 and 50. A standard transformer designed for linear loads is said to have a K-factor of 1. The higher the K-factor, the more heat from harmonic currents the transformer is able to withstand. Making the right selection of K-factor is very important, because it affects cost, efficiency and safety.

Transformers with higher K factors are typically larger than those with lower K factors, so the optimal K factor should be chosen based on the harmonic profile of the data center to optimize the tradeoff between size, efficiency and heat tolerance. The table shows appropriate K-factor ratings to use for different percentages of non-linear current in the electrical system.

Power distribution units (PDUs) with a K-13 rated transformer (and oversized neutral) are readily available to efficiently handle harmonic currents. Units with K20 transformers are common but are typically overkill for most modern data centers.

USE A HARMONIC-MITIGATING TRANSFORMER

The K-rated, dry-type transformer is widely used in electrical environments - either in a PDU or as a standalone unit. But there have been more recent advances in transformer design that offer even better performance in reducing voltage distortion and power losses due to current harmonics.

A harmonic-mitigating transformer (HMT) is designed to handle the non-linear loads of today's electrical infrastructures. This transformer uses electromagnetic mitigation to deal specifically with the triplen (3rd, 9th, 15th,...) harmonics.

Secondary windings of the transformer are arranged to cancel zero sequence fluxes and eliminate primary winding circulating currents. This transformer also addresses the 5th and 7th harmonics by using phase shifting.

Using these two electromagnetic techniques, an HMT allows loads to operate the way their manufacturers designed them, while minimizing the impact of the harmonics to energy losses and distortion.

Most HMTs exceed NEMA TP-1 efficiency standards, even when tested with 100-percent non-linear loads. Wherever a K-rated transformer is specified, an equivalent HMT is a direct substitute.

KEY ADVANTAGES OF USING HMTS

- Prevents voltage flat-topping caused by non-linear loads
- Reduces upstream harmonic currents
- Eliminates transformer overheating and high operating temperatures

No Harmony in Harmonics

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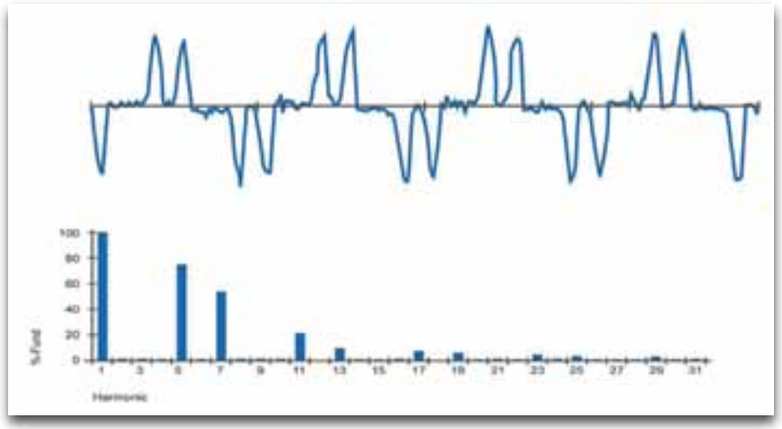

Figure 3: Total harmonic distortion

- Eliminates primary winding circulating current
- Saves energy by reducing harmonic losses
- Maintains high energy efficiency even under severe non-loading conditions
- Treats power quality harmonic issues that K-rated transformers do not address
- Suitable for high K-factor loads without increasing in-rush current
- Improves power factor

OTHER HARMONIC-MITIGATING TECHNIQUES

An HMT is a great choice for a transformer when initially designing the data center. However, if harmonics are an issue in an existing data center, a zigzag autotransformer can be used to limit the effects due to triplen, 5th and 7th harmonics.

A zigzag autotransformer is a neutral forming transformer that has primary windings but no secondary windings. There are two primary windings for each core, which are wound in opposite directions to provide high impedance to normal phase currents. When placed close to the load, the zigzag autotransformer can trap triplen harmonics. This autotransformer will need to be sized large enough to only handle the harmonics. The triplen harmonics will then be limited to the autotransformer and the load, thus preventing the upstream distribution equipment from seeing the harmonics. However, the autotransformer cannot be used to modify the voltage to a level different from the source.

The triplen, 5th and 7th harmonics can be eliminated by using the autotransformer described above in parallel with a second feeder. This feeder would normally be supplied by a different source. The autotransformer, along with the second, phase-shifted source, will combine together to capture the triplen, 5th, and 7th harmonics. This application is much trickier, because the two sources need to carry a balanced load to efficiently capture the 5th and 7th harmonics.

Both of these applications are effective in eliminating harmful harmonics. However, installing a single harmonic-mitigating transformer is the most cost-effective means to prevent harmful harmonics from affecting distribution equipment.

SUMMARY

Harmonic currents can have a significant impact on electrical distribution systems and the facilities they feed. It is important to consider the impact of harmonics when contemplating additions or changes to a system. In addition, identifying the size and location of non-linear loads should be an important part of any maintenance, troubleshooting and repair program. wn

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Article courtesy of Eaton - www.eaton.com

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Watt? No. Think lumen!

FINDING THE RIGHT LIGHT IS NOT SO CLEAR

Domestic consumers, faced with the gradual phasing out of the incandescent light bulb that has lit their environment for well over a century, have some difficulty finding new energy-efficient bulbs that reproduce the same light and feeling. Their confusion is compounded by the wealth of information now given on lamp packaging.

These days, finding the right bulb means looking at many different parameters.

WATT IS IT ALL ABOUT?

For decades, choosing a new or replacement light bulb has been easy: consumers would look at the wattage (the amount of energy required to light the bulb), and decide on the product that best met their need. Everyone knew what light would be given by a 60 or 100 watt bulb.

The mandatory replacement of incandescent bulbs by energy-efficient products, initially CFLs (compact fluorescent lamps), introduced confusion for consumers as, to begin with, producers often only gave the watt equivalent of the new bulbs. Furthermore, other factors such as colour temperature and colour rendering (which relates to the way objects appear under a given light source), added to the complexity involved in selecting the right bulb.

The situation is no clearer now that LED-based lamps are becoming more popular and increasing in efficiency all the time.

SHEDDING LIGHT ON WATTS AND LUMENS

Watts and lumens are different units of measurement: watts indicate the power needed to light the bulb and lumens the amount of visible light emitted by a source. The value of the bulbs required may differ according to the lighting effect desired. The table (Fig 1) gives average ratings for incandescent, CFL and LED bulbs. Consumers should compare the different values and types of bulbs and their intended use before making a choice.

PERCEPTION MATTERS

Consumers frequently complain that the new energy-efficient bulbs do not give the same "amount" of light as their incandescent equivalent. Actually it is not so much the amount of light emitted that differs, but that other factors affect users' perception of light. People are accustomed to the light supplied by incandescent bulbs in homes and a switch to the new bulbs requires some adjustment. One important element is the colour temperature.

Lamps radiate colours of different "temperature". This is given in terms of the Kelvin (K), a unit of measurement for temperature defined by IEC President Lord Kelvin, and named after him. In the colour temperature scale, the higher the temperature, the whiter the light. Light colours are divided into three or four groups that cover the following ranges:

- Warm/soft white is usually perceived as homely and comfortable; it corresponds to colour temperatures under 3 300 K, and appears yellowish to reddish;

Watt? No. Think lumen!

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- Bright white, over 3 300 to 4 000 K;
- Cool white, 4 000 to 5 000 K. Bright and cool white are more suitable for working environments;
- Daylight white light corresponds to temperatures over 5 000 K and appears bluish.

Incandescent bulbs fall into the first category; fluorescent tubes, CFLs, and LED lamps can be found in different colour temperatures ranging from warm to cool white. Another important factor in evaluating lamps is colour rendering, the ability of a light source to reproduce faithfully the colours of various objects under a reference light.

The CRI (colour rendering index), also often described as colour "accuracy" on packaging, is the quantitative measure of that ability, with 100 representing the best possible accuracy. Incandescent bulbs have a CRI of 95-100, that of CFL and LED lights is lower: 80-85 and 80-90 respectively.

All these characteristics are important as they determine the kind of lamps suitable for a set environment. For instance, the wrong kind of light in a shop may make food look unappetising.

Many factors other than lumens, colour temperature and CRI influence our perception of light in different environments and make comparisons between different types of lamp difficult.

Consumers will need time and some research to find the bulbs that correspond to their environment, needs and taste. Proper labelling should help ease the task.

That being said, the efficacy (lumens per watt) of LED modules keep improving and is expected to reach 160 lm/w in the next two years and forecats to increase gradually to reach 180-220 lm/w eventually, requiring adjustements to the equivalence table in the future. wn

Article source: IEC e-tech.

TYPICAL PRODUCT	LUMENS	EFFICACY (lumens per watt)
3 watt CFL	125	41
3,5 watt LED	150	43
15 watt krypton	185	12
25 watt incandescent	210	8
AMBIENT LIGHTING		
9 watt CFL	400	44
8 watt LED	450	56
40 watt incandescent	460	12
10 watt CFL	500	50
GENERAL ROOM LIGHTING		
12,5 watt LED	800	64
60 watt incandescent	890	15
15 watt CFL	900	60
12,5 watt LED downlight	1 000	80
75 watt incandescent	1 180	16
20 watt CFL	1 200	60
SUITABLE FOR READING		
100 watt incandescent	1 750	17
29 watt CFL	1 750	60

Many factors other than lumens, colour temperature and CRI influence our perception of light in different environments and make comparisons between different types of lamp difficult.

Fig 1
Source: EFI (Energy Federation Incorporated), USA

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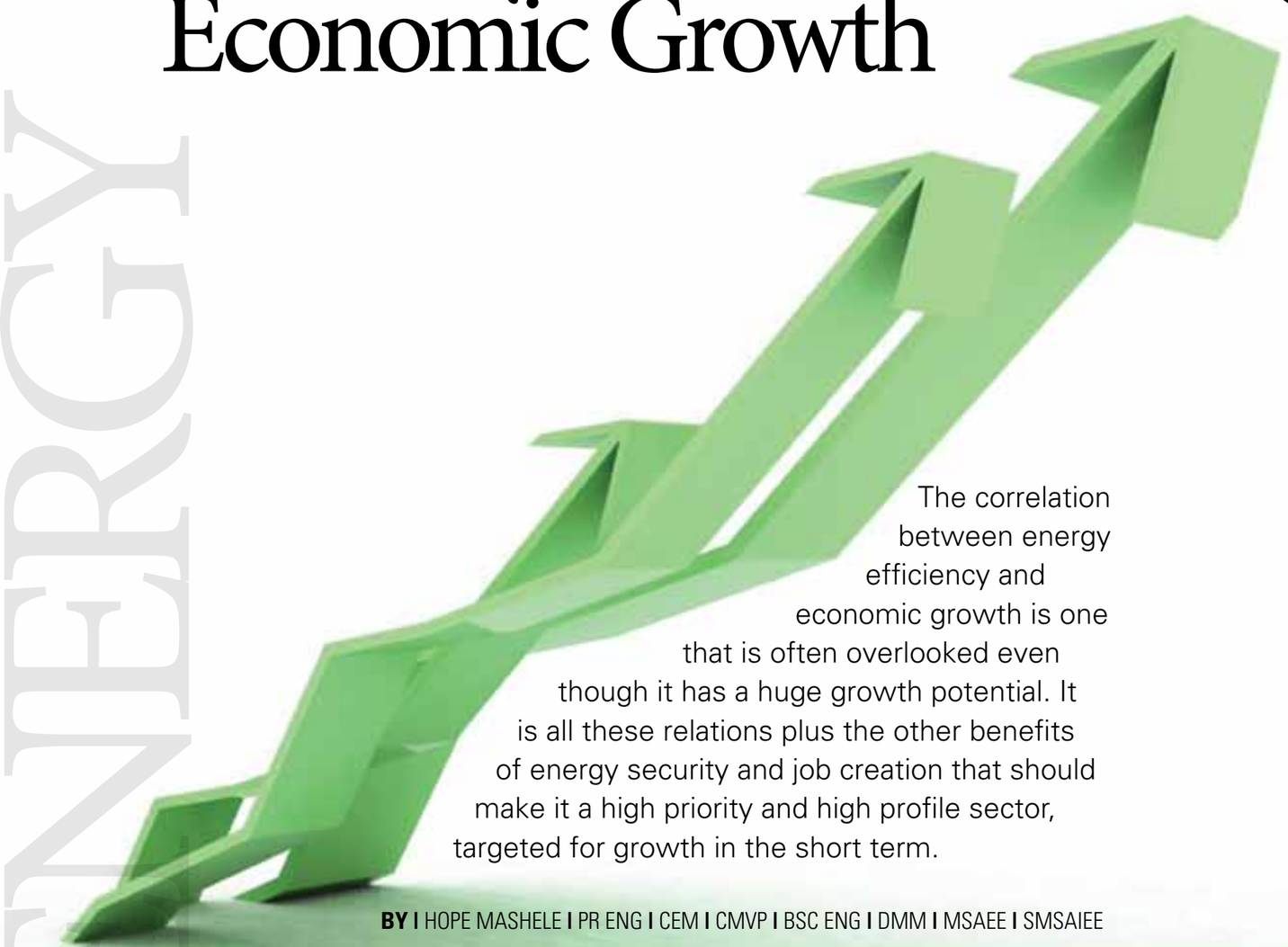
Energy Efficiency leads to Energy Security, Jobs and Economic Growth



The correlation between energy efficiency and economic growth is one that is often overlooked even though it has a huge growth potential. It is all these relations plus the other benefits of energy security and job creation that should make it a high priority and high profile sector, targeted for growth in the short term.

BY | HOPE MASHELE | PR ENG | CEM | CMVP | BSC ENG | DMM | MSAEE | SMSAIEE

The time has come for corporates to embrace the low carbon economy as part of the business sustainability strategy.

Eskom has been approved ZAR5bill for integrated demand management. This is great news for the sector as it means the sector is valued at a minimum of at least ZAR10bill for the next 5 years from the Eskom side.

This fund is supported by other funding such as the "Green Fund" which Minister Pravin Gordhan has increased to ZAR1.1billion. Other energy efficiency funds such as the AFD funding through major bank such as ABSA and Nedbank are also available, increasing the pie even more.

What this means for South Africa is that at least 250 000 jobs can be created by the sector in the next five years or so. Unemployed graduates can then have opportunities to acquire skills in engineering and project management.

Many artisans can also be employed if the companies in energy efficiency are compelled to employ a minimum amount of artisans when they use the Eskom rebate and the Green Fund. This, along with the youth subsidies will encourage more jobs in the sector and associated sectors.

Energy efficiency reduces energy wastage, which is crucial in the current times for South Africa of tight generating capacity. Using just the Eskom rebates, savings of at least 5GW in electricity demand and in costs can be achieved.

The contribution of Energy efficiency initiatives towards the country's energy security also cannot be undermined. That has been a major contributor in that no load shedding has occurred.

Power stations have to undergo maintenance and have to be shut down during this period. When this happens, Eskom needs enough capacity to shut down the power stations but still provide energy to the country. Load shedding leads to loss of confidence by international investors in economic growth and Eskom

A country without energy cannot develop economically and socially. The logic is simple: *"Companies not operating due to no electrical power makes no profits."*

Foreign direct investment cannot flow into a country without growth and energy security. We have seen how the port developments have been hindered by energy security as investors turn their backs on the country investing in smelters and energy hungry developments. With Energy security, the country can then create more jobs and increase development as a whole.

A new mind-set must occupy the talk and focus in every company and board-room. Energy efficiency is a component of process and operations optimisation, but has not been fully accepted by the majority of South African industry. We have enjoyed a long period of cheap electricity and corporate South Africa is a little spoilt.

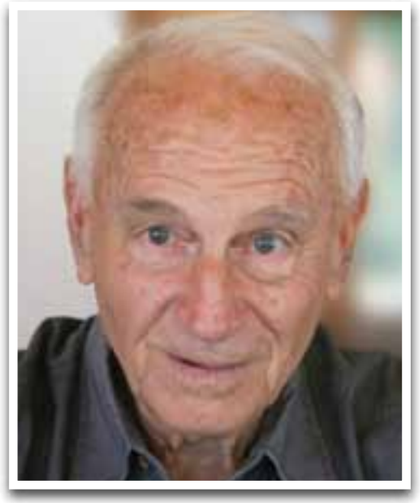
Major transformation is required for optimised operations even though the benefits are considerable and tangible. The time has come for corporates to embrace the low carbon economy as part of the business sustainability strategy. Companies not catching a wake up call, risk not being profitable in the medium and long term.

When companies save money using optimisation and energy efficiency, inflation is eased as consumer prices dont climb steeply and quickly. Economically, this means growth.

South Africa faces huge challenges is terms of the social and economic development of the majority of the population. The Global economic slowdown has done little to promote that focus, but that does not diminish the need.

Growth is needed so that the country can have the ability to further develop rural industry and foster more economic activity, which cannot occur without access to electricity or energy. wn

OBITUARY



F.L.U. Daniel

19 December 1927 - 2 December 2012

BY I MAX CLARKE I FSAIEE

It is with regret that we report the death of a long standing member of the SAIEE, Frederick Leonard Upton Daniel. He was a Fellow of the SAIEE and an active member of the Western Cape Centre, of which he was a Past Chairman and Honorary Treasurer, where he assisted with various activities until a few months before his death. He was a registered Professional Engineer and held the GCC for Electrical Engineers. He passed to higher service in December 2012 at the age of 85 years.

Fred was also active in the Association of Municipal Electricity Undertakings (AMEU) and served as President of that Association for the 1990/91 term. Although retired from municipal service for a number of years, he was an active member of the Good Hope Branch of the AMEU having been Chairman and, until quite recently, served as its Secretary.

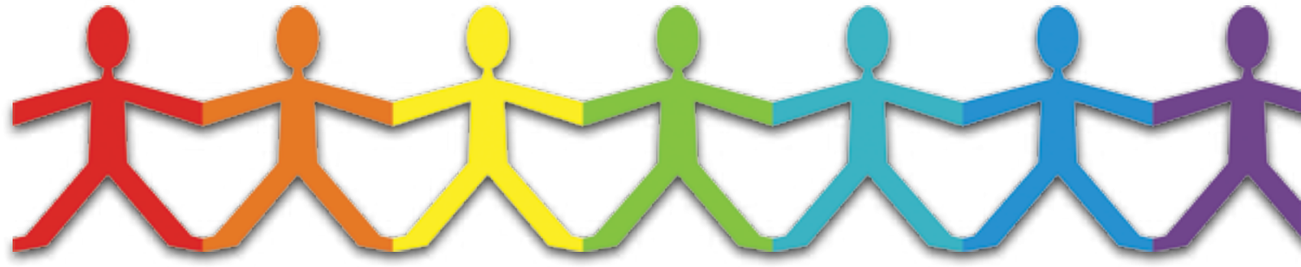
Fred was born in December 1927 and brought up in Cape Town. He was a product of Rondebosch Boys High and the University of Cape Town where he gained his B.Sc. in Electrical Engineering. He served a pupilage with the S A Transport services in the early 1950's and joined the Somerset West Municipality in 1954 as deputy Town Electrical Engineer.

His remaining working life was served with the Cape Town City Council to which municipality he moved in 1955. He occupied various positions in the Department and progressed through the staff ranks until his appointment as CEE in 1986, a position he held until his retirement in 1993.

Under his leadership the Electricity department grew in stature to an undertaking having an annual budget of some R800 million, supplying nearly 250 000 consumers with a maximum demand of 850 MW and a staff complement of 2500. Amongst other things, he had a special interest in project engineering and management, feasibility studies including the effect of tariffs, electrification of low cost housing and the financial implications of these developments on tariffs, power system planning and demand studies.

Fred's wife Mona pre-deceased him by some four years but he is survived by three sons, six grandchildren and one great-grandchild, to all of whom we extend sincere sympathy in their sad loss. wn

Say wat?



ENGINEERS UNITE

In my 50 years in electrical engineering I have never heard of engineers collectively striking. I have also not experienced engineers marketing themselves by educating the community about what and how engineering impacts on their everyday lives.

BY I STAN BRIDGENS
PR ENG **I** DIRECTOR **I** SAIEE

Engineers never charge for consulting on telephones in answer to any query or request for advice and generally underrate themselves to the point of accepting self satisfaction as the only reward. Their interest lies in understanding conceptualising, synthesising, adding value and producing a quality service/design or product. Pity but this is the first problem that needs to be acknowledged!

The second problem is that engineers are trained for independent thought and innovative thinking. They also are required to think wide and out the box not only in synthesising and design but also in verbally exploring solutions for other than engineering problems.

Thus it is seldom engineers agree without much wrangling and debate and more the pity are not very comfortable in collaborating with others of like, with a view to collectively addressing issues in the macro arena that effect them regarding relevance, recognition and status. This is the second quandary that engineers need to recognise as a limiting characteristic in today's world.

I have heard the comment by the uninformed with more of the 'gift of the gab' that engineers battle to communicate and they are technocrats lacking in worldly sophistication. I can also relate to an event where I was standing in front of 300 grade 12 learners from different schools in Gauteng the purpose of which was to encourage them to take up electrical engineering as a career. I started by asking them to put up their hands if they knew what an electrical engineer does? To my amazement not one hand was raised - and you cannot tell me all of them were shy or overawed by the occasion.
So if I am so wise as to the problems inherent in the engineer's make-up and the low appreciation they enjoy – what is the solution?

I am pleased to say that I had a serendipitous meeting with civil engineers the other day and they have a concept that indicates that they, like me, are worried about the pending crisis if nothing is done to raise the level of awareness of the important part engineering plays in our everyday lives to keep us safe and sound - but more important what engineering contributes to the economy of the country.

Their concept is phrased in the word 'CIVILUTION'. Of course my immediate reaction as an electrical engineer I would have preferred a word like 'electrocution' or 'electrodynamics' or something to erase the idea that all engineering is civil – but on reflection this would be sour grapes because the concept is exciting and if accepted by the other engineering disciplines (bearing in mind my comments above about engineers never easily agreeing) can be the vehicle to address the problems and challenges the engineering fraternity is facing. Or should I say the enormous challenges the country is facing that engineers can address?

I cannot claim to understand all the detail because I need to interact more with the civils but the concept appears to me to be so fitting to address the issues I have outlined and hereunder is my attempt at explaining. Engineers of all disciplines need closer collaboration and on matters where there is agreement. So effort should be put into establishing common ground and concreting this into a Memorandum of Understanding (MoU). Forgive me using a civil metaphor 'concrete' because I cannot think of an electrical one. (What about "consolidating" -Editor)

Engineers need to speak with one voice. This essential is borne out by the fact that the community, and dare I say decision makers, do not appreciate the uniqueness of the different engineering disciplines. See my experience outlined above about 300 scholars not knowing.

This is the engineers finest hour and now more than ever is the time to get together, to work together on a structured approach to produce position papers, strategic plans and most important, leader, to take this to government and others as a solution to the dilemma of engineers and opportunities that will be missed if this engineering contribution is ignored.

It is not a secret that many engineers in their current working situation are suffering depression, have lack of enthusiasm to produce. They feel and are disempowered by structures that nullify their decisions and recommendations, but not their responsibility and accountability. This must change now or the community will suffer the consequences of waning safety measures and unforeseen incidents detrimental to their well being. The self satisfaction I speak of above is still important to engineers and sadly this is another de-motivation that drives engineers to seek other ways to earn a living outside engineering. One must accept that the training of engineers is such that they somewhat easily adapt to change and this is evident by the number employed in the financial sector to the detriment of engineering sector.

OK, enough of my bleating. Let us do something. The concept of Civilution by the civils I feel must be supported. Their plan is to canvas all disciplines with a view to coming on board apart from the MoU's and finding common ground.

Strategic and position papers on political and economic matters need to be compiled and agreed by all disciplines of engineering and presented to government and decision makers across the board.

These will gain insight and hopefully understand the message of engineers and facilitate appropriate reaction to remedy their plight as well as recognise the opportunities being lost .

Civilution is not a revolution by engineers but an uprising of the status of engineers bringing into focus the importance of what engineering means to South Africa.

I, for one, am all for it and I urge all voluntary associations to really take this concept of Civilution to their executives and to support an initiative that brings engineers together – for once!

BY I FELIX BOSCH
NED I AM(SA) I MECH E (RTD)
SM(SA) IEE (RTD) I MDP (UNISA) I AEP (UNISA
CERT. OF COMP. (UNISA) SKILLS DEVELOPMENT FACILITATOR.

A Review of the Apprenticeship System during the Fifties

Looking back at the apprenticeship system in force in the fifties, there can be no doubt at all that it functioned very-well, and produced artisans of a far superior standard than the semi-trained products of the"learnership" system in force at present.

As a Skills Development Practitioner, and having been employed at a Further Education and Training (FET) College, I have first-hand experience of this. What were the success factors of the system? To ascertain this we need to investigate the scenario and I will use my experience as an apprentice during this period to navigate through the system, as I have the facts, figures and documents thereof to back-up the information provided.

First and foremost, the apprenticeships were controlled by the; 'APPRENTICESHIP ACT No. 37 of 1944, (as amended by Act No. 28 of 1951). *Note: all references in this article are to this ACT.* Some salient points are:

CLAUSE 16.

(1) The Minister may, subject to the provisions of...

(a) Designate any trade comprised in an industry as a trade in respect of which the provisions of this Act shall apply...

(b) Define such trade by reference to the work performed therein, the operations of which it is composed or the type or class of premises upon which the work or operations are performed.

(2) The Minister may in the same manner, prescribe –

(a) The qualifications including the minimum age (which shall not be lower than fifteen years) and educational standard required for apprenticeship;

Qualification	Remarks/Alternates
National Std 6 (Form 1)	
National Std.7 (Form 2)	
National Std 8 (Form 3)	
National Tech. Cert. Part I	NTC I, Junior Certificate (Tech) - 6 Subjects
National Tech. Cert. Part II	Std 9, Form IV
National Tech. Cert. Part III	Matriculation, Std X, Form V
National Advanced Tech. Certificate Part I	Minimum Of Three Subjects
National Advanced Tech. Certificate Part II	Minimum Of Three Subjects
National Engineering Diploma (NED)	Six subjects at ATC II Level, Mathematics Compulsory. An (A) Language at Matriculation Level, with 50% pass is, accepted as a subject.

NOTE: The alternates are not necessarily equivalents, and differ in status, but are on the same level.

(b) The period of apprenticeship, the variations in such period which may be allowed, and the circumstances under which those variations may be allowed;

(c) The rates according to which apprentices shall be remunerated, the circumstances under which those rates may be reduced, or shall be increased, and the extent of the reduction or increase: Provided that, no rate based on the quantity of work shall be prescribed;

(d) The classes which apprentices shall attend during their periods of apprenticeship, the number of days on which, the hours within which, and the number of hours during which they shall attend such classes during any week in any year;

(f) The full-time technical training courses which the apprentice shall attend, the period or periods of the attendance and the intervals at which those courses shall be attended;

(g) The types of work in which the employer shall provide training for apprentices, the proportion of the working hours during which and the stages during the apprenticeship period at which he shall provide such training in each type of work;

(h) The tests or examinations either practical or theoretical or both (including qualifying trade test) which apprentices shall undergo at prescribed stages during the apprenticeship period and the circumstances under which any apprentice shall be exempted from any part or the whole of any such test or examination.

It might be prudent to review the technical qualifications in force during the period under consideration, ie middle to late fifties.

I satisfied the requirements (16) (2) (a) to be indentured as an apprentice, ie. fifteen years of age, medically fit, and with the Junior Certificate. Consequently on 4th January 1954, I commenced my apprenticeship, at the Pretoria Works of ISCOR.

I previously attended the Pretoria Technical College for three years, forms 1, 2 and 3. and during this period received 1024 hours of acceptable technical training. In terms of (16) (2) (b) I received a remission of 1 year and 3 months of the apprenticeship period, and this meant I would have to serve 3 years and 9 months. The only other remission provided for in the ACT is by means of a trade test in the fifth year.

On the first day I arrived at ISCOR, and

A Review of the Apprenticeship System during the Fifties

continues from page 53

together with other new apprentices we were first addressed by Senior Management and then the Personnel Manger, after which we were handed over to the Apprentice Supervisor, Mr Piet Cambell.

The electrical group were then taken to the Electrical Workshop where we were to spend the first year. The first week was challenging as we were at the mercy of the 'seniors' the previous year's intake who considered it their duty to initiate us in the most demeaning manner possible. Every lunchtime we had to entertain them by standing on the workbench and singing, no matter how good the performance was, you were amidst loud boos, grabbed dunked into a trough of not very clean liquid and then smeared 'all over' hair included with pitch black old-grease, ex-loco workshop. The worst was to come they waited at the pay office and robbed us of our first week's pay, which was used to buy eats for a party.

The time in the Electrical Shop was spent working with the journeymen on rewinding all types of electrical motors, transformers, coils and welding sets. Later I was given tasks to perform on my own such as rewinding small armatures, transformers and miscellaneous coils.

During this year I obtained the NTC ll Certificate (with distinction). The Certificate was endorsed *"MAY BE EXEMPTED FROM THE WRITTEN PORTION OF THE EXAMINATION OF THE ELECTRIC WIREMEN'S' REGISTRATION BOARD.*
ISCOR had an incentive scheme that rewarded apprentices who studied diligently, attended classes regularly and passed the relevant examinations. The award was cash, based on the average percentage obtained number of subjects passed, and obtaining highest marks in Union (Country), that could be used for purchasing books or tools. The photo at the beginning of the article was taken during an award function in the office of the Training Manager; Dr F Malherbe.

After the first year the apprentices were placed-out to various sections within the works, and my first stop was at the Coke Ovens. Here I received experience on the electrical equipment on plant such as coal conveyers, crushers, and loaders as well as equipment at the by-products plant.

My next stop was at the Light Mills; here I together with a journeyman did maintenance on lighting, cranes, panels as well as miscellaneous cabling and wiring. During this period I received the NTC III Certificate *(Distinctions in three subjects, highest marks in the country in two subjects).*

In my fourth-year I was posted to the Works Drawing Office, here I was able to become conversant with drawing office administration and practice. I was mostly involved in preparing drawings of all the carbon brushes in use for compiling a reference manual to aid ordering spares and keeping stocks.

My next stop was at Engineering Construction, this group was involved in all large new developments at the works, such as the erection and commissioning of the arc-furnace. I was personally involved at the establishment of the Dolomite Quarry at Mooiplaas, this involved setting-up substations cabling earthling and panel-wiring. During this period I obtained the ATC l Certificate *(With Distinction).*

Early in my Fifth-year I was sent on several courses in preparation for the trade test. During a panel course I gained experience in the design, wiring and fault-finding on several types of panels. The cable course was hands-on experience making-off steel wire and tape armoured, lead sheathed resin impregnated paper power cables. This included wiping the glands and attaching the lugs.

Early in 1957, in my fifth-year, I was informed that I would be doing my Trade Test on the 11th and 12th of February.

On the appointed day I boarded the 5:30 train to Johannesburg and then a bus to the John Orr Technical College where the test would be conducted.

The tasks I had to perform were:
(a) Making-off a steel-wire armoured, lead sheathed, paper insulated cable, this involved 'wiping' the gland and attaching the lugs.
(b) Connecting a squirrel-cage motor to a star-delta starter.
(c) Making–off a stay-wire by attaching the no. 8 swg galvanised-wire to the thimble.
(d) A wiring exercise on a board using steel conduit, switches, plugs, sockets and VIR *(vulcanised India rubber)* insulated cables. All wiring-regulations had to be observed
(e) Fault-finding on a panel.

In due course I was informed that I had passed the Trade Test and consequently my apprenticeship contract was terminated.

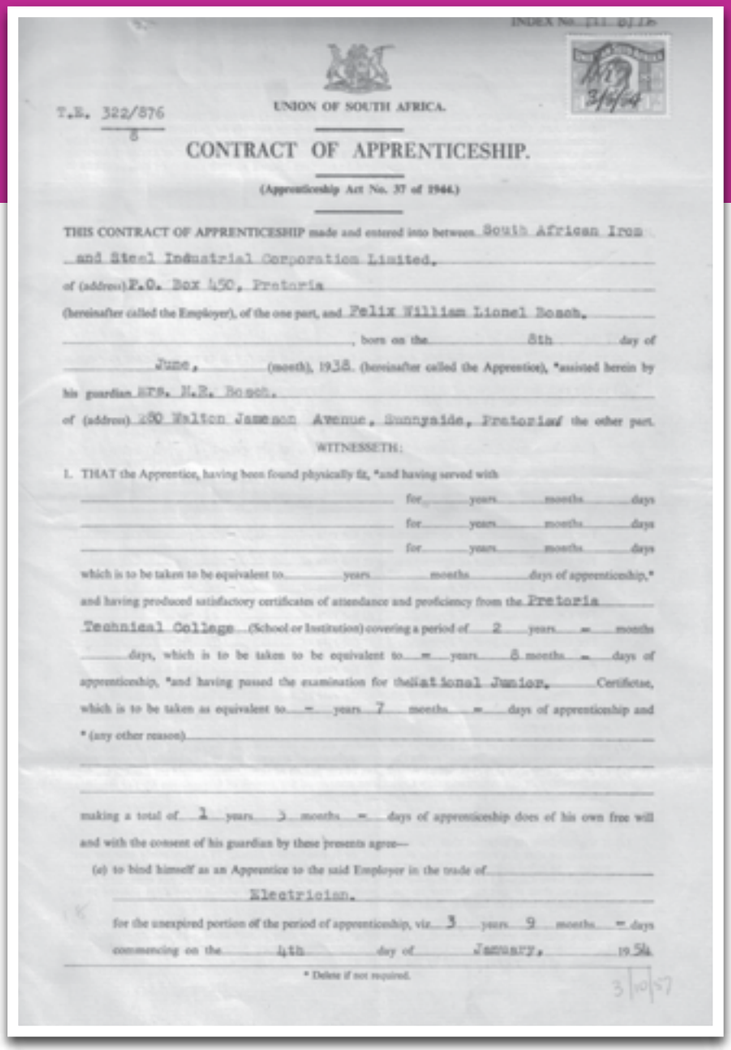
I therefore completed my apprenticeship in three-years, one month and 12 days, to, at the age of eighteen become the youngest qualified artisan in the country.

Although at this stage, by virtue of the exemption (from the written portion) probably qualified for a Wiremen's licence, it was not immediately granted.

Summarising the probable success factors:
(a) A sound, comprehensive and focussed legal basis; ACT 37 of 1944, as amended;
(b) the Legal Structure controlling the system, a Registrar and Board, Apprentice Committees, Training Boards;
(c Clear directives to employers of how the training of apprentices should be conducted, ie. varied, applicable and following a planned course;
(d) The courses that apprentices should receive and classes that they should attend;
(e) Screening applicants for apprenticeships for meeting the legal requirements and suitability;
(f) A dedicated apprentice Supervisor at the firm to monitor their progress;
(g) Incentive schemes to encourage apprentices to perform well;
(h) Only firms who had the facilities, infrastructure and personnel were permitted to train apprentices;
(i) Apprentices were mentored and trained under the guidance of experienced, and skilled journeymen, usually on a one-to-one basis.

The SETA's that have replaced the Training Boards are not succeeding and several of the SETA's have been closed-down due to maladministration.

Their system with modules, unit standards, assessors' and facilitators is a dismal attempt at force-feeding practical and theoretical training to, in many cases, unsuitable candidates. wn


UNION OF SOUTH AFRICA.

CONTRACT OF APPRENTICESHIP.

(Apprenticeship Act No. 37 of 1944.)

T.B. 322/876

THIS CONTRACT OF APPRENTICESHIP made and entered into between South African Iron and Steel Industrial Corporation Limited, of (address) P.O. Box 450, Pretoria (hereinafter called the Employer), of the one part, and Felix William Lionel Bosch, born on the 8th day of June, (month), 1938. (hereinafter called the Apprentice), *assisted herein by his guardian Mrs. M.E. Bosch, of (address) 280 Walton Jameson Avenue, Sunnyside, Pretoria* the other part.

WITNESSETH:

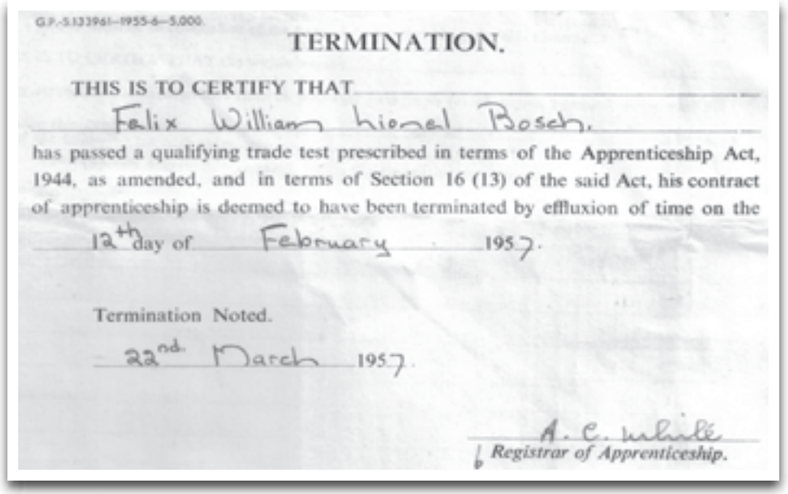
1. THAT the Apprentice, having been found physically fit, *and having served with
for years months days
for years months days
for years months days
which is to be taken to be equivalent to years months days of apprenticeship,*
and having produced satisfactory certificates of attendance and proficiency from the Pretoria Technical College (School or Institution) covering a period of 2 years – months days, which is to be taken to be equivalent to – years 8 months – days of apprenticeship, *and having passed the examination for the National Junior Certificate, which is to be taken as equivalent to – years 7 months – days of apprenticeship and
* (any other reason)*

making a total of 2 years 3 months – days of apprenticeship does of his own free will and with the consent of his guardian by these presents agree—

(a) to bind himself as an Apprentice to the said Employer in the trade of Electrician,

for the unexpired portion of the period of apprenticeship, viz. 3 years 9 months – days commencing on the 4th day of January, 19 58

* Delete if not required.


G.P.-S.133961—1955-6—5,000.

TERMINATION.

THIS IS TO CERTIFY THAT

Felix William Lionel Bosch,

has passed a qualifying trade test prescribed in terms of the Apprenticeship Act, 1944, as amended, and in terms of Section 16 (13) of the said Act, his contract of apprenticeship is deemed to have been terminated by effluxion of time on the 12th day of February 1957.

Termination Noted.

22nd March 1957

A. C. Whittle
Registrar of Apprenticeship.

APRIL ...over the ages

COMPILED BY | JANE BUISSON-STREET
PR ENG | SSAIEE

1 April - aka April Fools' Day

1891 - A telephone link between London and Paris came into operation

1924 - The first gramophone that changed records automatically was introduced by HMV.

2 April

1873 Toilets were fitted on to British trains, but only in the sleeper cars.

5 April

1955 Churchill resigns.

6 April

1896 The modern version of the Olympic Games began in Greece. French aristocrat Baron Pierre de Coubertin was the driving force behind it. His goals were to promote physical fitness as well as understanding between nations.

9 April

1806 Birthday of Isambard Kingdom Brunel the British engineer whose achievements included projects such as Bristol's Suspension Bridge and the Great Western railway track.

10 April

1633 Bananas go on sale to the British public for the first time!

1912 "Madam, even God himself could not sink this ship". Crewman to a Titanic passenger as the she set sail from Southampton.

13 April

1935 A London to Australia flight service was started by Imperial Airways and Qantas.

15 April

1955 McDonald's opened their first store in San Bernardino, California.

16 April

1912 "The unsinkable does the unthinkable", the Titanic sunk on her maiden voyage. She collided with an iceberg that caused a 91m gash in the ship's right hand side.

18 April

1955 "Einstein Dies" in his sleep at the age of 75. He is regarded as one of the greatest intellects in human history.

21 April

1634 The birth of Jan van Riebeeck, the Dutch naval surgeon who founded Cape Town, South Africa.

1918 Baron Manfred von Richthofen, World War I's most feared fighter pilot, was killed thereby ending the Red Baron's reign of the skies.

25 April

1859 Building of the Suez Canal began. Ferdinand de Lesseps, the engineer and designer, was supervising.

1874 The birth of Guglielmo Marconi the Italian electrical engineer. Marconi was awarded the Nobel Prize for physics in 1909 for his work on the transmission and reception of radio waves.

1953 A paper was published which, for the first time, established the structure and function of DNA (deoxyribonucleic acid) the molecules that store the body's genetic code. Francis Crick (British) and James Watson (American) built a model depicting how the strands coil in a double helix. Their work was made possible by the X-ray diffraction studies of Maurice Wilkins (Irish).

27 April

1932 Imperial Airways starts an air service between London and Cape Town.

1986 *"Nuclear meltdown fears come true at Chernobyl. The nightmare of meltdown in a nuclear reactor has finally come true"*. US spy satellites detected a fire at the power station just outside Kiev in the Ukraine. It is believed that a catastrophic failure of one of the reactor's welded pressure vessels was the cause of the meltdown of fuel in the core. This type of water-cooled reactor is not used in Britain or the USA.

30 April

1772 The world's first dial weighing machine is patented by London's John Clais.

1945 Adolf Hitler commits suicide.

1948 Amsterdam's Motor Show exhibits the first Land Rover.

Excerpt from "On this day - the history of the world in 366 days. Published by Octopus Books.

SAIEE Membership Benefits

Members of the SAIEE now enjoy the following a wide array of benefits:

You simply cannot afford not to be a member!

- A discount of up to R1110 on their ECSA registration fee, which is due in April every year, provided that they join the SAIEE before the end of March that same year.
- Upon joining the SAIEE there is a standard entrance fee of R700, an annual membership fee of R923 for Members, and between R1129 and R1223 for Senior members depending on age. Most of this will be recovered through the ECSA discount.
- SAIEE members receive 11 issues of the wattnow magazine valued at R330.
- The SAIEE Africa Research Journal (ARJ) our peer reviewed research publication (which incorporates the SAIEE Transactions) is also available to SAIEE member's quarterly upon request.
- The real rewards of being a member can be realized through attending monthly lectures, debates, tours and site visits organized by the SAIEE. These are mostly free of charge and provide refreshments at no extra cost. Members are awarded valuable CPD credits for attending these events.
- Membership has significant career benefits, as membership holds prestige and recognized status in the profession. SAIEE gatherings provide excellent opportunities for members to interact with normally inaccessible captains of industry.
- SAIEE letters after your name indicate your membership grade and are a useful measure of your experience.
- Members receive generous discounts on the SAIEE run CPD courses and earn (category 1) CPD credits. Members also have the option of joining the wattnow online CPD program at a fraction of the cost.
- The SAIEE mentorship program assists members to gain professional status through the Institutes large database of mentors.
- SAIEE members are awarded 1 CPD credit (Category3) for being a member of the SAIEE.
- Members are able to serve on organizing committees and gain valuable experience and professional networking in doing so.
- Use the electrical engineering library at SAIEE House.

APPLICATION REQUIREMENTS FOR SAIEE MEMBERSHIP

It is always exciting to receive an application as it means that we will soon be welcoming another new and valuable SAIEE member to our family of nearly 6000 members. However, more often than not the application is incomplete. To avoid unnecessary delays in the process it is important to highlight the problems regularly experienced within the administration with received applications:-

Many applicants do not read the list of requirements.

WE REQUIRE THE FOLLOWING DOCUMENTS:

- Copy of the applicants ID;
- Certified copies of achievement certificates;
- A copy of the applicants latest CV;
- The completed application form;
- Proof of payment for the application and membership fee which are required upfront. ***Please use surname and initials as payment reference.***

Copies of the required documentation should accompany the application forms but unfortunately we still find application forms are sent in without it.

A number of applicants do not complete the application forms adequately, ***please complete the form in full.***

Payment of both application fees and membership fees are frequently not paid timeously.

Only once all the above requirements have been met is the application considered complete, enabling the process to continue efficiently.

Please, help us to help you receive the many benefits of SAIEE Membership sooner rather than later!!

2013 Membership fees

Rates as from 1st January 2013

Grade of Membership	Annual Subscriptions paid by 28 February 2013		Annual Subscriptions paid after 28 February 2013		New Members FEES * see Notes 1 & 4 below.	
	RSA incl VAT (R)	Outside RSA excl VAT (R)	RSA incl VAT (R)	Outside RSA excl VAT (R)	RSA incl VAT (R)	Outside RSA excl VAT (R)
Student	**117**	82	130	92	130	92
After 6 yrs study	**752**	526	835	593	835	593
Associate	**752**	526	835	593	835	593
Member	**831**	582	923	648	923	648
after 6 years	**972**	680	1,079	765	n/a	n/a
after 10 years	**1,016**	711	1,129	801	n/a	n/a
Senior Member	**1,016**	711	1,129	801	1,129	801
after 6yrs/age 40	**1,102**	771	1,223	868	1,223	868
Fellow	**1,102**	771	1,223	868	1,223	868
Retired Member (By-law B3.7.1)	**465**	326	515	365	n/a	n/a
Retired Member (By-law B3.7.3)	**nil**	nil	nil	nil	n/a	n/a

NOTE

1. Entrance fee for all grades of membership is R700 (except Students which is free)
2. Transfer fee to a higher grade is R400.00 for all grades of membership (except Student within 3 months of qualifying).
3. Members are encouraged to transfer to a higher grade when they qualify. It will be noted that the fees of Member and Senior Member grades after 10 and 6 years respectively are equal to the fees at the next higher grade.
4. Members elected after June 2013 pay a reduced subscription fee.

By-law B3.7.1 reads "a member in good standing who has been a member of the Institute for at least ten (10) consecutive years, has reached the age of sixty (60) and who is no longer actively engaged in the profession, may apply to Council for an adjustment in the amount of his subscription.

By-law B3.7.3 reads "any member complying with the conditions of B3.7.1 but who has been a member of the Institute for not less than 25 consecutive years, shall be exempt from the payment of further subscriptions." Members who comply with the requirements of By-Law B3.7.3 may make written application to Council for exemption form paying subscriptions.

By-law B3.9 reads "any member in good standing who has been a member for fifty (50) consecutive years shall be exempt from the payment of further subscriptions."

Members not in good standing by failing to pay their subscriptions by end of June of each year will be struck-off the SAIEE membership role - subject to Council decree.

Members in good standing and no longer in substantive employment and do not receive payment or salary for work done may apply to Council for a reduction in their annual subscriptions.

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Mentorship

The offer comes at a time when our country is suffering a shortage of skills, and we believe that mentoring is an essential requirement in the training and development of the next generation of engineers. If, as a member of the SAIEE, you believe that you need a mentor you can request a mentorship service from the Institute.

The service will be of particular benefit to those young engineers working under the leadership of busy and pressurized Professional engineers, who may not have the time to assist young engineers in discussing and planning their career paths.

This initiative is particularly relevant to young engineers who are working in an environment devoid of engineers or with non technical managers. The young engineer may feel frustrated because he or she cannot benefit from the wisdom of an experienced engineer.

It will give a young engineer, the mentee, a chance to talk to a mentor, who will be his or her advisor, teacher and role model, away from the work environment. His or her mentor, matched to a similar profile, will understand the mentee's work and personal situation, having been there him- or herself.

The mentee will be able to discuss problems and frustrations with his independent mentor, who would have no stake in the outcome, and who would be able to provide an unbiased opinion and advice. The mentee might not be able to do so with his superiors, particularly if he is unhappy, and is considering an alternative career. The mentor and mentee could arrange to meet regularly, on terms that would suit both parties. The goal is to ensure both Mentee and Mentor have enough time to communicate any concerns or advice they have.

The mentor could recommend to the mentee what course of action to take without being too prescriptive while the final decision and the consequences remain with the mentee.

Among its more than 5500 members the SAIEE has many experienced engineers who are willing to act as mentors. They are spread across the country and include engineers who are experienced in steelworks, furnaces, rolling mills, mining, manufacturing, electrical generation, transmission and distribution, through to light industrial, process control, instrumentation, telecommunication, robotics, automation, software development and engineering management of these sectors.

So if you feel that you would benefit by talking to a mentor, please contact Sue Moseley on the number below. She has a database to match the profiles of mentors and mentees. wn

SAIEE

PROSPECTIVE SAIEE MENTORS

If you feel you that you have the time and interest to help mentees, please contact Sue Moseley on 011 487 9047 or suem@saiee.org.za.
In addition you gain CPD credits for when you are required to re-register.

Have some fun and stand a chance to win R1000. Complete the April issue crossword puzzle and send it with your name, surname and contact details to: *Managing Editor, April 2013 Crossword Puzzle, P.O. Box 751253, Gardenview, 2047* or email it to *minx@saiee.org.za*. The completed crossword puzzle should reach us by no later than **30 April 2013**. The winner of R1000 will be announced in the June 2013 issue of the **watt**now magazine.

win R1000

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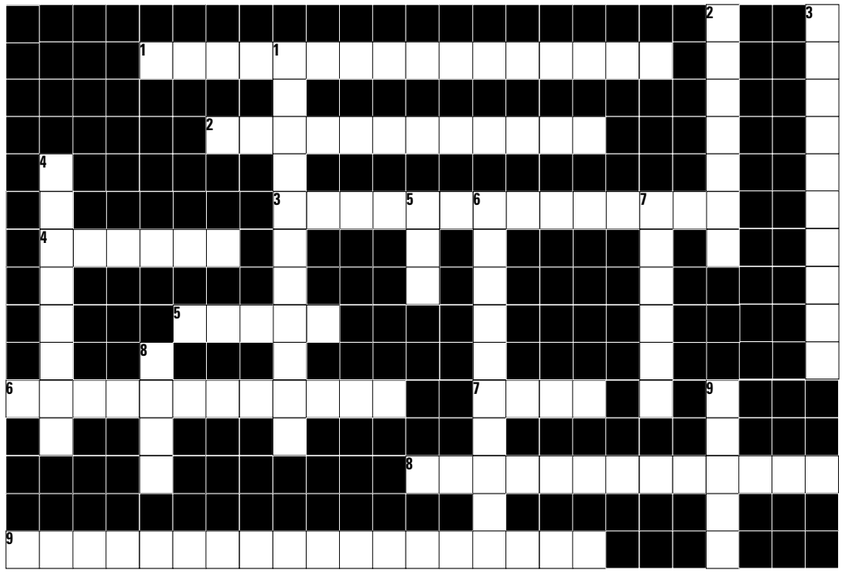

ACROSS

1. The term used for an electric current which produces a magnetic field. (16)
2. A substation is part of 3 systems, name one of them. (12)
3. In 1889, which company was granted the concession to supply electricity to Johannesburg and Pretoria? (7&6)
4. See 4 Down.
5. Surname of the person who independently discovered the operation of a transformer in 1831. (5)
6. An instrument for detecting electric current. (12)
7. High-voltage direct current (abbr.)
8. What illuminated Cape Town's Table Bay docks in April 1882? (8,5)
9. SF_6 (18)

DOWN

1. What is a static electrical device that transfers energy by inductive coupling between its winding circuits? (11)
2. Name of the other person who independently discovered the operation of a transformer in 1831. (7)
3. See 2 across. (10)
4. Who invented the induction coil in 1836? (8, 6)
5. Electromotive Force (abbr.)
6. What is located in a substation on both the high and low voltage side of a large power transformer? (20)
7. Name two of the mines who were awarded the rights to supply electricitity to nearby mines owned by Consolidated Goldfields Group in 1897. (6, 4)
8. See 7 down.
9. Supervisory Control and Data Acquisition (abbr.)

February issue answers:

ACROSS 1 Fossil Fuel **2** James Blyth **3** Geothermal **4** Of **5** HBar **6** VAWT **7** OTEC **8** NECSA **9** Betavoltaics

DOWN 1 Flashsteam **2** Cogeneration **3** Drysteam **4** Photovoltaic **5** Binary Cycle **6** Yes **7** Heron **8** Alexandra **9** Hello

Terms and conditions: 1. Only one entry per person. 2. Winners will be notified via email. 3. Incorrect information will automatically disqualify the entrant. 4. Anybody may take part except the office staff of the SAIEE, their family members and members of the Publications Committee. 5. **watt**now magazine and the SAIEE cannot take any responsibility for lost entry forms or any damage, losses or injuries related to the draw of the prize. 6. The winner must be prepared to be photographed and such photograph will be published in the relevant issue of the **watt**now magazine. 7. Closing date for entry is 30 April 2013. 8. The winner will be announced in the June 2013 issue of the **watt**now magazine. 9. The Managing Editor's decision is final and no correspondence will be entered into.

Calendar of events

If you want to see your function or event listed here, please send the details to Minx Avrabos at minx@saiee.org.za

APRIL 2013

8-11	Power & Electricity World Africa	Sandton Convention Centre	www.terrapinn.com
9-10	Sustain & Build Africa	Sandton Convention Centre	www.terrapinn.com
9-10	The Lighting Show Africa	Sandton Convention Centre	www.terrapinn.com
29-30	ICECECE 2013	Holiday Inn Sandton, Johannesburg	www.waset.org

MAY 2013

4-6	Led Expo Mumbai	Mumbai, India	www.biztradeshows.com
8-9	Electrical Manufacturing and Coil Winding Expo	Frontier Airlines Center, Milwaukee, USA	www.biztradeshows.com
13-17	2013 PowerEng Conference	Instanbul, Turkey	www.powereng2013.org
14-15	African Utility Week	Cape Town International Convention Centre	www.african-utility-week.com
23	President's Invitation Lecture	University of Johannesburg	geyerg@saiee.org.za

JUNE 2013

3-6	ECCE Asia 2013	Melbourne , Australia	www.ecceasia2013.org
16-19	2013 IEEE Transportation Electrification Conference and Expo	Metro Detroit MI , USA	www.itec-conf.com
23-26	2013 IEEE 14th Workshop on COMPEL	Salt Lake City UT , USA	www.ece.utah.edu/compel13
24-27	Road Trans Africa 2013	Sandton Convention Centre	www.terrapinn.com

JULY 2013

23-26	KZN Industrial Technology Exhibition 2013	Durban Exhibition Centre, Durban	www.kznindustrial.co.za
16-19	2013 IEEE Transportation Electrification Conference and Expo	Metro Detroit MI , USA	www.itec-conf.com
23-26	2013 IEEE 14th Workshop on COMPEL	Salt Lake City UT , USA	www.ece.utah.edu/compel13

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