wattnow

SAIEE SUPPORTS SKILLS DEVELOPMENT AND PROFESSIONALISATION OF ELECTRICAL ENGINEERS

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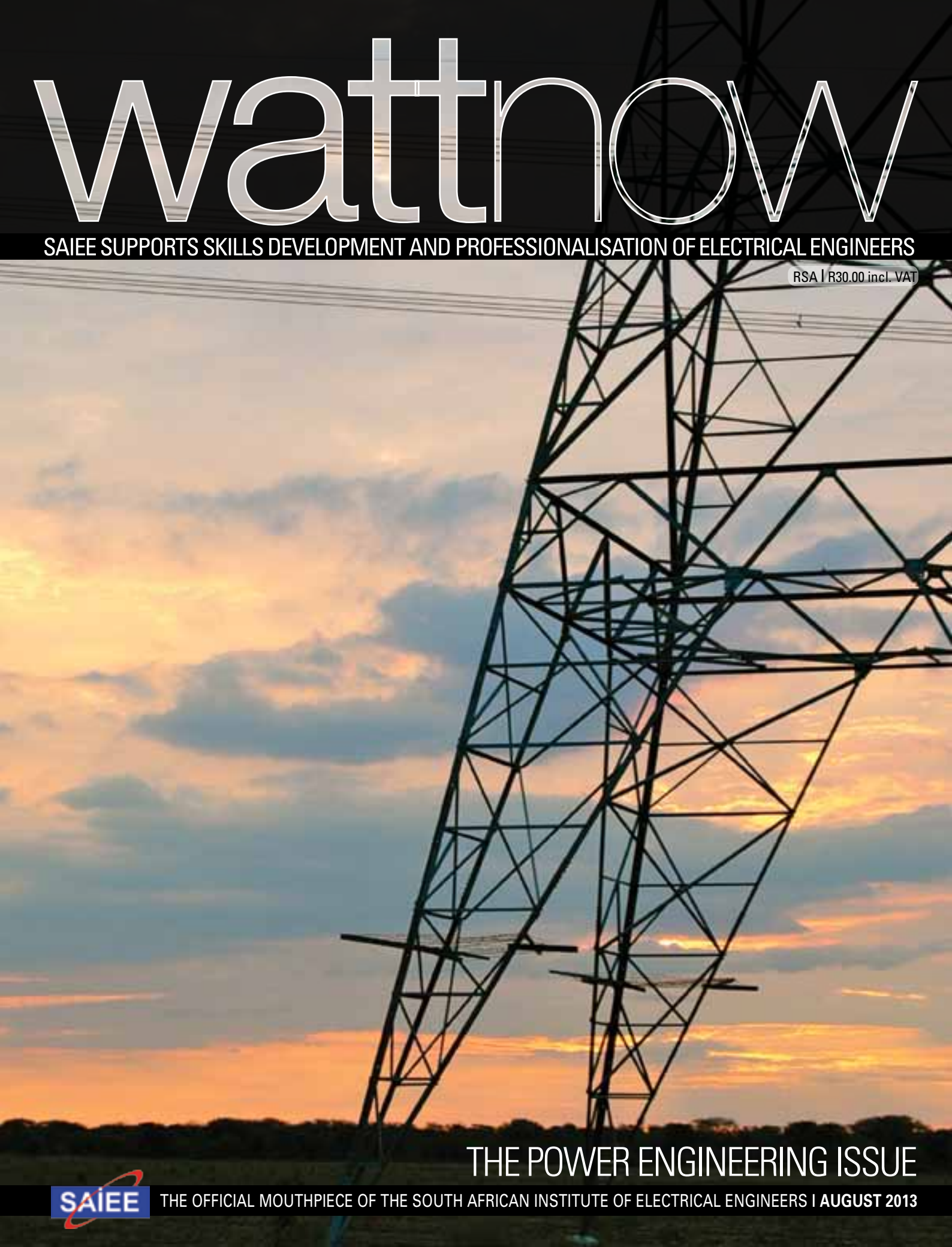

THE POWER ENGINEERING ISSUE

SAIEE THE OFFICIAL MOUTHPIECE OF THE SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS I **AUGUST 2013**

contents

wattnow magazine

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August brings us closer to the end of winter - or so we hope. Whilst we are cuddling up to try and stay warm, give some thought to what our theme: "Power Engineering" really means to the world.

In supporting our theme, this issue of the **watt**now features an article on the BRIC (Brazil, Russia, India and China) countries. As these economies develop, their demand for power grows. They currently account for nearly a quarter of the worlds GDP, but this figure is set to soar. Read more on page 22.

Our Technology section sports an article on Cyber Security Challenges, and the benefits South African SME's face for embracing Cloud Computing. Are your credit card details safe online?? Read more on page 30.

The theft of copper creates a massive problem for the industry, and affects businesses worldwide. On page 36, Gavin Strelec has written an article on the Eradication of Copper Theft –where are we going to draw the line?

Our energy demand is set to double by 2050 – this is according to studies from the World Energy Council and the United Nations. Our Green Section features an article "*In Sustainability, Information is Power*"– read more on page 44.

On page 56, Hermann Broschk shares with us the process in applying for a SAIEE Bursary. If you are planning to study engineering next year, but finances are standing in your way, give Dudu Madondo a call at the SAIEE Head Office. Read about the selection process on page 56.

The annual SAIEE Charity Golf Day is taking place on the 18th of September at the Randpark Golf Club in Johannesburg. The SAIEE President, Paul van Niekerk, has chosen Girls & Boys Town as his charity. The playing fees per four-ball costs R2000 (non-sponsored) and R1 800 (sponsored). Come join in the fun, as there are many prizes to be won. Contact Gerda Geyer on 011 487 3003 or email on geyerg@saiee.org.za.

I wish you a great month ahead – enjoy the read.

Minx

Earn CPD Credits

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

SAIEE MEMBERS

Write a winning Engineering article for **watt**now and win an iPad!

wattnow prizes will be awarded for articles written by SAIEE members that are published in the **watt**now magazine and that are adjudged 'excellent' by a panel of experienced engineers and academics. Articles of between 1500 and 2000 words in the Engineering categories of Communications, Control, Computers & Software and Power as well as General Interest and Science, written by SAIEE members, in good standing, and published in **watt**now will be eligible.

SAIEE members have broad and expert experience and knowledge about many Engineering projects topics in which they have been involved. **watt**now wants to access and record the experience and knowledge of the SAIEE member community and publish this to a wider professional audience.

Write about your (or others') experience and help to spread knowledge, interest in and history of our great engineering capabilities and achievements.

ARTICLES WILL BE JUDGED ON THE FOLLOWING CRITERIA:

- General technical professional interest
- Accuracy and Reliability, Technical Correctness
- Currency and relevance
- Coverage and Objectivity
- Style, language, illustrations, article structure, etc.

Awards will be made at the Annual SAIEE Banquet for the best article in each category, published between September and August of the past year. Note that a prize for each category is available but will only be awarded if articles are judged to be of a sufficient standard. The prizes for 2013 will be Apple iPads. The judging panel will be made up of experienced members of the Engineering fraternity, including academics and industrialists and their decision is final. Detailed rules are available on the SAIEE website - visit www.saiee.org.za

SAIEE
South African Institute of Electrical Engineers

The image of the iPad is not necessarily the model to be awarded.

Greetings to you all.

In June, I had the pleasure of visiting the KZN centre, and managed to visit both Pietermaritzburg and Durban.

I was very generously hosted by Veer Ramnarain the Chairman of the Kwa-Zulu Natal Centre.

My 'day job', when I do not have SAIEE obligations, has taken a positive upturn regarding electrification in Africa. Due to the rapid development of electrification in Africa, as part of the United Nations Millennium development goals to eradicate poverty, the Global Sustainable Energy Partnership (GSEP) has introduced a programme code named SE4All, an acronym for sustainable energy for all. This is a project to provide universal access to electricity, in all the developing nations of the world.

By harnessing the collective experience from the Global Sustainable Electricity Partnership (GSEP), the intention is to accelerate electrification. The ultimate objective is to establish 100 million new connections worldwide by 2030. This includes approximately 50 million connections in Africa.

The idea is to develop a roadmap to plan the systematic development of electrification of rural areas throughout Africa. This will include mini grids that will initially be "off the National grid", but designed for future connection to the grid. Consequently these 'Mini grids' will be supplied from Hybrid renewable energy plants with sophisticated demand side load management.

Also included in this programme is the introduction of a standardised protocol for utility communication for smart grids, to facilitate DSM (Demand Side Management). This communication will be a combination of fibre optic links such as OPGW (Optical Ground Wire) and power line carrier systems.

All of this development makes me think about the diversification of sub-disciplines in the electrical industry within the SAIEE.

Power Generation, High Voltage transmission, distribution, power system protection, control and Instrumentation, measurements, telecommunications, and computer sciences come to mind.

Hence, over the years, various institutions and organisations have been established in an attempt to create a home for each sub-discipline within the Electricity industry. So we now have a multitude of associations such as The South African Institute of Measurement's and Control (SAIMC), The Institute of Certificated Mechanical and Electrical Engineers (ICMEESA), The Computer Society of South Africa (CSSA), to name but a few.

All of these worthy professional bodies have been established to serve a particular need in the Electricity industry, and all of them are closely related to the aims and objectives of the South African Institute of Electrical Engineers. Although all of them cater for specific identified needs, I believe that ultimately, they are all resort under an all-encompassing 'umbrella' of the Electricity Industry.

We have recently built a beautiful new home for the SAIEE in Observatory. In my opinion, I believe that it could and should serve the whole industry.

The training and meeting facilities offered at SAIEE house will be beneficial to all. Our CPD and mentoring administration will make a big positive difference to the industry and will assist young aspiring Engineers, Technologists and Technicians in registering with the statutory body, ECSA.

All the best for this month, chat again soon

Paul van Niekerk Pr. Eng
SAIEE President 2013

WATTSHOT

Gadgets and gizmos for you... go ahead, spoil yourself! You deserve it!

Code: 18505 - Solar Rock Light – R79,95

Code: 18186 - Solar House Numbers (black) - R 149,95 each

Powered by the sun

One of the best and most inexpensive means of improving the aesthetic appeal of your home's outdoor areas is to add solar-powered outdoor accent lighting. The Lighting Warehouse's Decorative outdoor solar lighting can instantaneously uplift the visual appeal of your outdoor areas – giving them an elegant and inviting look at night, without adding a cent to your monthly electricity bills. For more info, visit www.lightingwarehouse.co.za

J.Fold Superslim Isosceles

Introducing The Original Sports Wallet, a sleek and slim profile Loungemaster black wallet, featuring 100% top grain leather that is ultra rugged and uber stylish. Slide one of these wallets into your (pant or suit) pocket and you won't even know it's there, it's that thin, it's that light.
Price: R550 (incl.)

High Speed Ferrari Hot Lap

Consider what will be running through your senses if you were strapped inside a championship winning Ferrari F360 race car, driven by racer Jaki Scheckter around the Zwartkops International raceway. Feel the exhilaration and ultimate performance of what a proper Ferrari track car can do. This experience includes 4 laps.
Location: Zwartkops Raceway, Pretoria
Price: R2100 (incl.)

Bluebeards Revenge Luxury Shaving Cream (100ml)

"Blue Beards" Of The World Unite!
Millions of men all over the world share a common problem - that tough stubble that seems to defy the attentions of the every shaving cream or foam and blunts the edge of the keenest razor - "Blue Beard".

The Bluebeards Revenge has been formulated to the very highest standards in luxury shaving cream manufacture. From an almond size amount and a little water, you should have enough luxurious, thick and creamy lather to load your brush for at least two passes of the razor.

Based on average use a 100ml tub of The Bluebeards Revenge typically lasts 2-3 months.

As well as slowing down beard regrowth, DECELERINE™ relieves and soothes the effects of shaving (especially skin prone to irritation and dryness) by providing moisturisation and protection to facilitate it's regeneration.
Price: R195 (incl.)

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

Grand Rock High Ball Glass & Ice Ball

The bottom of the glass has our ROCK which creates a natural liquid motion increasing the nosing of aromas.

ICE BALL: Fill the included silicone mold to fill line and put in the freezer to make a single solid ice ball that outlasts traditional ice cubes

ROLLING: The shape of the glass makes rolling easy without spilling. A slight hand movement rolls the ice ball around the ROCK evenly and cool your favorite beverages to perfection.
Price: R260 (incl.)

iPhone® Rhodium Cufflinks Set

This stylish pair of cufflinks that will add flair to any cuff. Rhodium cufflinks are not only exquisite but durable, so they'll last a lifetime without the need for polishing using corrosive/messy liquids.

Rhodium is a chemical element that is a rare, silvery-white, hard and chemically inert transition metal and a member of the platinum group. Naturally-occurring rhodium is found as the free metal, alloyed with similar metals, and never as a chemical compound. It is one of the rarest precious metals, and the most costly.

Rhodium is a so-called noble metal, resistant to corrosion, found in platinum- or nickel ores together with the other members of the platinum group metals.
Price: R240 (Incl.)

Padintosh Cover for iPad 2/3

Released to much fan-fare in 1984, the original Apple Mac 128K design has remained iconic well into the 21st Century and is right at home adorning the Padintosh for iPad 2/3 - the perfect retro accessory for your everyday nostalgic, tablet toting Apple head.

As respected as the old-school Apple Mac has become, in today's world the size factor is just not practical. The Padintosh allows you to show off the latest in tablet technology – the new iPad - while still displaying your appreciation for the Mac Daddy of all personal computers.

The Padintosh protects your phone from bumps and scratches and is compatible with all iPad Smart Covers. Relive your 80s youth without losing your technological edge! Price: R298 (incl.)

LED down-lights are shining the way forward

South African energy-saving and back-up power solution specialist, Mr. Power, has recently added new LED down-lights to his product offering.

50 watt down-lights have a bad reputation for burning out quickly, chewing electricity and getting stuck in the fitting – all of this is because they draw a lot of energy, most of which is lost in heat. In some extreme cases, they can even become a fire hazard. Mr Power's LED down-lights are the solution to all these problems. They are of such a high quality their lifespan is anywhere between 15 000 and 25 000 hours! Assuming they are on for an average of four hours a day, the LED down-lights will last well over 20 years. AND, Mr Power guarantees them for two years from purchase.

Visit www.mrpower.co.za.
Price: R189 (incl.)

WATTSUP

PRESIDENT'S INVITATION LECTURE

From l-r: Mr Paul van Niekerk (SAIEE President), Prof Justin Jonas (Guest Speaker), Mr André Hoffmann (Junior Vice Presdident), Dr Angus Hay (SAIEE Past President) and Mr Stan Bridgens (SAIEE Business Director)

Mr John and Mrs Priscilla Gosling with Mr Stan Bridgens.

Mrs Margaret and Mr Mike Cary (SAIEE Immediate Past President).

Mr Derek Woodburn with Mrs Elizabeth van Niekerk.

On Thursday, 20 June 2013, the University of Johannesburg played host to the SAIEE President's Invitation Lecture. The speaker were non other than Professor Justin Jonas, who is the Project Scientist on the South African SKA (Square Kilometre Array) Project and heads up the Department of Physics and Electronics at Rhodes University. The SKA will be the largest science infrastructure in the world when it is completed. Africa will host a large fraction of this infrastructure. The various activities of the SKA South Africa project office were outlined in this hour long presentation and generated many questions from the audience. Prof Jonas were presented with the coffee table book written by Dirk Vermeulen, "Living Amongst the Stars", who were in the audience and then autographed the book for Prof. Jonas.

From l-r: Mr Dries Niemand, Mr Andries Tsabalala (SAIEE Past President) and Mr Michiel Grobler

ACTOM ELECTRICAL MACHINES WINS R130-MILLION ESKOM POWER PLANTS MV MOTORS REPLACEMENT CONTRACT

Intense competition for a major contract by Eskom for the manufacture and supply of medium voltage motors to replace most of the aging units operating in its coal-fired power plants was aroused globally when the utility invited tenders for the contract in mid-2010.

A combination of favourable factors in leading local manufacturer ACTOM Electrical Machines' bid for this highly sought-after contract resulted in it winning it in August last year.

The contract, dubbed the Motor Upgrade Programme (MUP), is worth R130-million and encompasses design, manufacture and supply of a total of 125 motors for 10 of Eskom's coal-fired power stations, namely Arnot, Komati, Camden, Hendrina, Kriel, Matla, Duvha, Lethabo, Grootvlei and Kendal. The company commenced deliveries of the new motors in November last year and is scheduled to complete them in mid-2014.

The motors, consisting of a mix of ACTOM Electrical Machines' well-known UNIBOX and MS4 series customised units, range in power from 200 kW to 10 MW and are for use in a wide variety of applications that include ID fans, FD fans, PA fans, mills, conveyors, boiler feeds and cooling water pumps.

Tony Teixeira, ACTOM Electrical Machines' General Manager, said an important factor forming part of the technical qualifications that counted in the company's favour in being awarded the

Mpho Motloung, a Contracts Engineer for ACTOM Electrical Machines, checks over some of the motors produced for Eskom's power stations.

contract was the great care that was taken by its engineering team in ensuring complete mechanical interchangeability between the new and the old motors.

"This is a key requirement of the contract, for which we, as the supplier, carry the responsibility. It involved a lot of painstaking and time-consuming work visiting all the sites to confirm that our dimensions and other parameters for the existing motors were correct," he explained. *"We also had the advantage of having produced and supplied the majority of the original motors in conjunction with our international technology partners at the time, so we were already familiar with their performance and load characteristics."*

Most of the existing motors have been in operation for over 30 years.

K-SUN LABEL CARTRIDGES

K-Sun has added 11 new cartridges to its LABELShop line of thermal transfer adhesive-backed tape and heat-shrink tube cartridges for use with K-Sun label makers, printers and labelling systems.

The black on orange adhesive tape is used in electrical and datacom installations for labelling panels, cables and wires, as well as for warning and safety applications. The tape colour complies with the ANSI/TIA/EIA 606A label standard and ANSI/ASME for warning labels, pipe markers, signage, wire/cable and other identification needs. Black on white and black on yellow extra-strength industrial adhesive tapes are designed for maximum permanence in extreme and regular industrial and laboratory environments. The adhesive is twice as strong as the original LABELShop industrial adhesive, which has been tested to withstand temperatures from -18°C to 177°C.

Black on Photoluminescent (Glow in the Dark) adhesive tape is for high visibility in low light situations, including safety applications, facility markings and wayfinding aids. The white on black heat-shrink tube provides a high contrast,

seamless and professional image for wires and cables such as coaxial cable, Cat 5 cable for LAN and Ethernet and other datacom, electronic and electrical needs.

K-Sun is represented locally by Aspercon.

WATTSUP

HIGH CALIBRE LEADERS FOR AURECON'S GAUTENG AND CAPE TOWN OFFICES

"Aurecon is a client-focused organisation for which maintaining high levels of client service excellence is a top priority," says Albert Geldenhuys, Managing Director of Aurecon South Africa. He adds that *"selecting high-calibre leaders to fulfill leadership roles throughout our business plays a vital role in ensuring we remain focused on achieving this aim."*

In line with this, the group is excited to confirm two senior management appointments in South Africa.

Effective as of 1 July 2013, Phil Hendricks will fulfil the role of Office Manager for the group's Gauteng offices, while Ferdi Nell will fulfil the role of Office Manager, Cape Town.

Phil Hendricks
Aurecon Office Manager | Johannesburg

Ferdi Nell
Aurecon Office Manager | Cape Town

AGILE AFRICA MAKES ITS DEBUT

The Joburg Centre of Software Engineering (JCSE) at Wits University has announced its plans to jointly host Africa's inaugural Agile Africa Conference. Co-host of the event is ThoughtWorks. Themed Agility in Africa, the conference will take place at the Alex Theatre in Braamfontein, Johannesburg from 12-13 August 2013.

The guiding hand behind Agile Africa 2013 is JCSE Director, Professor Barry Dwolatzky. He says the inaugural conference is about creating something significant from nothing and aims to showcase agile software development within an African context. *"We have secured a number of well-known international speakers and together with partners such as ThoughtWorks, hope to build an impressive conference and brand."*

According to Dwolatzky, the conference already exists in India and the Americas, so why not Africa! The JCSE expects practitioners, executives and academics to attend and enjoy access to prominent international Agile experts, and to share their experiences and ideas with peers from other parts of Africa.

"We have some outstanding keynotes lined up including renowned Agile expert, Martin Fowler from ThoughtWorks, who will discuss software design in the 21st century," says Dwolatzky.

Ivar Jacobson, one of the world's most famous software engineers, will present a keynote titled: SEMAT and Agile – Perfect Partners.

Other highlights include Amr Noaman Abdel-Hamid, one of the drivers of Egypt's GoAgile programme. *"Amr has been influential in bringing Agile development to Egypt and the Middle East and will be sharing case studies from Egypt around the Process Increments Method, which builds upon agile values and principles, and reuses some well-known agile practices and techniques,"* says Dwolatzky.

David Hussman and Mitch Lacey, both from the US, have delivered highly rated keynotes at Agile gatherings around the world and will also be present. Hussman's presentation will challenge attendees to think and rethink how current processes are helping, hindering or hurting business, while Lacey will review patterns to ensure success (or failure) of agile transitions.

Other Agile practitioners from South Africa and Africa will also form part of the two-day agenda.

For more information, please visit www.AgileAfricaConference.com.

DEEBAR CAPE EXPANDS

Deebar has expanded its Cape Town branch with the appointment of Gareth Horton. Horton previously worked for Moeller Electric as an 18 year veteran of that company, with the last 7 years spent managing its operations in Cape Town.

Horton has been a consistent over-achiever during his time in Johannesburg and while managing the Cape Town office. He is trained in both the mechanical and electrical fields, and has extensive experience in plant maintenance, switchgear, systems, motor control, automation, sales and customer relations.

The acquisition brings into the branch 25 years of industry experience to compliment the already proficient Gary Fulton, a 17 year veteran of electrical engineering. Deebar's Cape Town team now offers a combined 42 years experience in motor control products and its applications.

The well-established switchgear and automation company is now poised to allow customers easier access to a one point of contact for all of their electrical needs. According to Horton, initial focus will be on establishing and strengthening relationships between the branch and its customers, while introducing the complete projects solutions to them.

Deebar Cape Town has experienced tremendous growth in recent years, which stems from Deebar's tendency to offer unsurpassed customer service alongside the vast product range offered, Fulton said *"Now we will proactively bring our technical capabilities, problem-solving experience and project solutions directly to our clients,"* says Horton.

Deebar is known as an innovative leader in Electrical Mining products, Bulk Material Handling, Engineering, Automation, Switchgear supply, Trapped Key Interlocking and Sheet Metal Fabrication. Through this diversity we have the capability of offering all clients a complete solution from a single supplier.

From Left to right: Lee Dalton, Gary Fulton, Gareth Horton, (sitting) is Linda Van Zyl.

PASTERNACK RELEASES LINE OF LOW FREQUENCY ATTENUATORS

Pasternack Enterprises, Inc., an industry leading manufacturer and global supplier of RF and microwave products, introduces a brand new line of 3 GHz and 4 GHz frequency attenuators. This line of low frequency coaxial attenuators is specially suited for in-the-field uses and other general purpose applications where costly stainless steel designs and high performance are not required.

The new 3 GHz and 4 GHz fixed attenuators from Pasternack can be ordered with combinations of SMA and N connectors. This line of 50 ohm RF microwave attenuators operate to a maximum frequency of 4 GHz depending on the configuration and come in 1 dB, 2 dB, 3 dB, 6 dB, 10 dB, 15 dB, 20 dB, 30 dB and 40 dB attenuator varieties. A total of 63 directional and bi-directional models are available for sale and all are RoHS and REACH compliant.

Pasternack's 3 GHz attenuators and 4 GHz attenuators have peak power ratings ranging 5 Watts to 200 Watts depending on the design. These RF attenuators are manufactured with large aluminum heatsink cooling fins which help to quickly dissipate heat during operation. The superior cooling of these low frequency attenuators allows them to effectively operate between a temperatures of -55 to +125 degrees C, making them an ideal solution for a wide range of environmental conditions.

"Our new 3 and 4 GHz attenuators are an ideal complement to our expanding RF attenuator family," says Gerry Camacho, VP of Technical Marketing at Pasternack Enterprises, Inc. *"These lower frequency attenuator versions provide our customers with a new in-demand product line previously not represented by our other attenuators."*

The new 3 GHz and 4 GHz low frequency attenuators from Pasternack are in-stock and available now. You can view the entire line of these new products by visiting http://www.pasternack.com/pages/Featured_Products/3-ghz-and-4-ghz-attenuators-new-from-pasternack.htm directly. Pasternack Enterprises, Inc. can be contacted at +1-949-261-1920.

WATTSUP

POWERTECH TRANSFORMERS RE-SECURES STATUS AS A LEVEL 3 BBBEE CONTRIBUTOR

Powertech Transformers, a subsidiary of Powertech and the JSE listed Altron Group is pleased to announce that, in an audit conducted by independent BBBEE accreditor, Empowerdex, it re-secured the status as a level 3 BBBEE contributor, equivalent to an AA rating in terms of the Department of Trade & Industry's Codes of Good Practice ("DTI Codes"). The audit was completed in June 2013.

Powertech Transformers recognises the importance of transformation, not only within the company but also within the broader South African business environment. Its objective was to retain its "Level 3" contributor status in terms of the DTI Codes and in attaining the overall score of 81.42% (which is an increase from the previous score of 76.37%) or an "AA" rating is an enormous achievement for the company despite the challenges in the market presently. Scores increased particularly under the black ownership and black management criteria. This means that its customers will now be able to claim 110% of procurement spend for their own black economic empowerment rating.

Bernard Meyer, CEO Powertech Transformers says, *"Powertech Transformers is considered a world class transformer manufacturer and a leader in transformation. The Empowerdex rating emphasises our total commitment to Broad Based Black Economic Empowerment and thus to transforming the South African workplace."*

Powertech Transformers' objective for the next audit is to improve on its existing rating and plans have been introduced to improve on scores where the business has not attained full points in terms of the DTI Codes.

PTT supplies a full range of transformers, from generator step-up to transmission and distribution transformers in their three factories. The range includes three-phase and single-phase units, auto-transformers, arc-furnace, locomotive and traction transformers, miniature sub-stations, NECRT's as well as LNER's and shunt reactors.

CRANE PARTS FOR AFRICA

Konecranes Southern Africa has been given the go ahead to establish a one-stop Parts Distribution Centre in Johannesburg, which will service the whole of sub-saharan Africa.

Not only will the African Distribution Centre support and supply Konecranes parts but it will also do so for all makes of cranes and hoists, backed up and supported by the Konecranes Central Global Distribution Centre based in Hyvinkaa, Finland.

"This is a great credit to Konecranes South Africa as there are only 13 Konecranes Distribution Centres out of 47 countries where Konecranes are present", said John MacDonald, Service, Sales and Marketing Director of Konecranes in South Africa. *"It has taken many months of planning to get the final approval by Konecranes Global Parts Distribution. It will give Konecranes Southern Africa another major string to our bow in terms of growing Konecranes' crane and hoist business as well as service and maintenance on offer for all makes of cranes in Africa".*

The African Distribution Centre will be managed by Celeste Viljoen, who has considerable experience in managing the spare parts division at Konecranes in Johannesburg. The Distribution Centre will be based at Konecranes' current Southern Africa head office in Johannesburg.

"A centralized email system, Efecte, will be used for spare parts enquiries. Efecte simplifies and improves the management of enquiries being received on a daily basis", explains Ms Viljoen. *"A team of three highly trained Offer Management people will be assisting with supplying offers. We are aiming for an offer turnaround time within 24hrs, depending on the request."*

DC Team | Carlo, Celeste and Alec

"Prices and availability have changed dramatically. We are increasing our stock holding significantly, which will have a great impact on our delivery. Our delivery punctuality increased six-fold in the first three weeks since we started running the new DC system", said Ms Viljoen.

The system is already up and running and will be fully operational by September 2013.

REFORMS KEY TO POWER AFRICA SUCCESS - AfDB

The African Development Bank (AFDB) will, as part of its support for U.S. President Barack Obama's Power Africa initiative, deepen and expand its work in reforming the energy sector. Already a major investor in the energy sector, the AfDB will scale funding for energy production, transmission and distribution infrastructure, cross-border power pools, as well as government policy and regulatory reforms. The Bank will particularly emphasize reforms for national power utilities, many of which are in need of better business models and financial reinforcement.

"We expect to allocate as much as $3 billion over the next 5 years. This will leverage at least 4 times more investments in the energy sector. Our interventions will include investment loans, reforms, advisory, and guarantees," AfDB President Donald Kaberuka said in Dar es Salaam, in reference to Tanzania, Kenya, Ethiopia, Ghana, Liberia, and Nigeria - the Power Africa priority countries.

"Reforms are the key," Dr Kaberuka said. *"The billions of dollars available for investment in the energy sector will translate into actual bulbs in people's homes and electricity necessary to grow small businesses if state utilities run efficiently and effectively. The policy reforms will facilitate and enhance cross-border energy markets."*

The main financial source for the Bank's assistance to the energy sector in the Power Africa countries is the African Development Fund (ADF), which is its concessional window. The ADF contributed $1.4 billion out of the Bank's $1.6 billion over the last five years in the six priority countries' energy investments.

Addressing CEOs in Tanzania, US President Barack Obama said that he saw Africa as the next major success story and with Power Africa he wanted the US to be part of that success.

"So that's why I announced Power Africa - our initiative to double access to electricity in sub-Saharan Africa. I want to thank the African Development Bank for its partnership, as well as many companies that have stepped up with commitments, including some here," President Obama said.

Donald Kaberuka
AFDB President

"I have to say, those who are involved in this process, they continually tell us the problem is not going to be private-sector financing. The problem is going to be getting the rules right, creating the framework whereby we can build to scale rapidly. That's what we're committed to doing."

President Kaberuka welcomed the initiative: *"Power Africa is a timely initiative and the Bank will work with the six countries for a successful implementation."*

POWERTECH QUADPRO CATCHES THE TRADE WINDS

With a R36 million share of Eskom's new wind farm, Powertech QuadPro has announced its presence in the market.Its first successful tender under the Powertech QuadPro banner is a huge milestone for the newest company in the Powertech stable. *"You can be convinced of your company's ability to do a job, but unless a customer puts its faith in you by awarding a contract, it's all just talk,"* says Harry Browne, CEO of Powertech QuadPro.

Winning this contract shows that Powertech QuadPro is spot on with the value it offers. Harry describes the substation market as the most competitive he has ever experienced. *"South African projects attract between 12 and 15 bidders, which was unheard of a few years ago. It has become exceptionally difficult to win a job, and pricing is crucial."*

The African market displays similar trends. Recently in Rwanda, for example, Powertech QuadPro was up against 17 bidders, many of them from Europe and Asia. *"That tells me there is no work in Europe,"* says Harry.

Against this backdrop, Harry is justifiably proud of winning the bid to deliver a 132/11kV substation for Eskom's Sere wind farm project near Vredendal in the Western Cape. The value of the contract is R36 million.

Harry Browne | CEO Powertech QuadPro

MORE ABOUT SERE

Sere is situated on a 7 400ha site close to Vredendal, a region in South Africa with an attractive wind resource. South Africa's overall wind capacity is estimated to be over 10 000MW.

WATTSUP

MXIT BACKS UP FOR THE FUTURE

A burgeoning business and a move to new premises prompted the administrators of Mxit, South Africa's mobile social network, to take a careful look at its IT infrastructure and, in particular, the provision for backup power to address all-too-common power outages on the local grid.

"Mxit has a number of levels of failover in its business model," explains IT Operations engineer, Stephan Buys, *"but when we established our new data centre in Stellenbosch we decided to introduce additional redundancy into the system as part of our upgrade plans."*

Mxit commissioned the Cape Town branch of Johannesburg-headquartered power provisioning specialist, Powermode, to take care of immediate power protection with a system that could also address future requirements with business expansion in mind.

"Uptime in all our business activities is important for Mxit," explains Buys, emphasising that between 400 and 500 million messages are sent via the Mxit network each day between 7.3 million active members who record over 700 million page views of apps per month.

The solution presented by Powermode was its own, Q-On branded uninterruptible power supply (UPS) system which, thanks to its modular construction, can be easily expanded to meet future needs thus reducing total cost of ownership over the long term.

"We handed the assignment to Powermode who managed the installation of the UPS, undertook all the electrical wiring and – for good measure - installed the air conditioning system in our data centre as part of a turnkey project," says Buys.

The Q-On M-Series UPS is available in a basic 15 kVA configuration which, in Mxit's case, was expanded with the addition of modular units to 45 kVA on installation.

"The M-Series is designed to provide power protection for mission-critical applications incl. data centres containing power-sensitive IT and telecommunications equipment," says Powermode MD Jack Ward.

"It incorporates hot-swappable UPS modules with each module - operating in parallel on a load-sharing basis - being a complete UPS incorporating charger, inverter, static switch and control unit."

L-R: Stephan Buys, IT Operations engineer at Mxit and Jacques van Niekerk, Technical Manager at Powermode.

Buys confirms that the Mxit data centre is already operating at around 83% of its back-up capacity. *"We've pushed it to 97% in a successful load test, so it won't be long before another module will be needed for addition to the Q-On system,"* he says.

"Fortunately, our UPS has the capacity to reach 120 kVa so there is a significant amount of expansion available from this single unit."

Ward adds that the space-optimised design of the Q-On M-Series – around 20% smaller in terms of foot-print than conventional UPS systems of comparable power – frees up real estate in space-constrained environments such as data centres.

"The redundant, fully scalable design also complements many of the features found in the latest high-performance servers, switches and storage devices that support business-critical applications including converged networks and network storage," he adds.

RAILWAY CURRENT AND VOLTAGE TRANSDUCERS

LEM, of Geneva Switzerland, have released a new catalogue describing the latest additions to their comprehensive range of current and voltage transducers, optimized for railway/ traction applications. The 47 page catalogue describes the technologies LEM employ in their transducers, ie, open-loop, closed-loop fluxgate, closed-loop C type and the very new digital isolating technology for voltage transducers. The catalogue outlines transducers for rolling stock, track side/substations, heavy mining trucks, current monitoring on points machines and transducers optimized for the detection of leakage current.

The catalogue describes LEM's quality standards, offers a transducer selection chart and explains in detail product coding, mechanical details of each transducer together with details of the five year warranty that LEM offer.

For more info, visit www.denvertech.co.za

ZEST ELECTRIC MOTORS' MV MOTOR SEMINARS WELL ATTENDED

MV Motor Seminar presenters from left : Carlos Grillo, WEG Research & Development Engineering Manager; Edson Cristofolini, Zest WEG Group Product & Projects Manager and Glauco Cisz, WEG Service Manager.

Zest Electric Motors' first medium voltage (MV) motor seminars, held in Johannesburg and Durban in June 2013, proved extremely popular in both centres with over 200 MV participants attending the three one-day events.

"As a high-tech supplier we're committed to incorporating the latest global trends into our products," Jamie Wilson, Zest WEG Group Marketing Manager, says. *"The seminars were convened to share the latest trends in MV motor technology, design techniques and best practices with regards to long term storage and operation of MV motors with the market, as well as to showcase our MV motor range to local technical decision makers who need efficiency and reliability from the significant investment associated with MV motors."*

"We constantly seek to communicate with customers, sharing information and advising them on developments that will benefit their productivity. By gathering over 200 engineering professionals to focus on MV motors, we were not only able to impart an immense amount of information but these events also helped establish open-door relationships, and a deeper level of trust, between supplier and user," Edson Cristofolini, Zest WEG Group Projects and Product Manager, says.

The seminar programme included presentations on international trends in MV motor technology and international trends in tests, installation and operation of MV motors and showcased the WEG MV product range. In preparation for the event, the three technical presentations were submitted to the South African Institute of Electrical Engineers (SAIEE) for validation purposes.

Zest WEG Group was duly granted CPD (Continuing Professional Development) accreditation for the seminar and participants were able to claim 1 CPD Credit as per the Engineering Council of South Africa's CPD policy.

"The participants showed particular interest in the technology and application of MV motors, the various options available, such as synchronous, slipring or squirrel cage motors on MV drives, and which of these options is best for their specific applications," Cristofolini says. *"MV motors are among the most important elements in an application, so the choice of MV motor goes beyond pricing to the performance and life of the motor."*

WITS CELEBRATES TWO WINNERS IN THE NSTF AWARDS

Wits University congratulates Professors Lesley Cornish and David Block for winning under their categories in the 15th NSTF-BHP Billiton Awards. The University is proud of these ambassadors for Science, Engineering, Technology and Innovation (SETI) who were lauded for their exceptional contributions at a gala dinner recently.

To a researcher, for an outstanding contribution to SETI through research capacity development over the last five to 10 years: Lesley Cornish, Professor (Physical Metallurgy), School of Chemical and Metallurgical Engineering, and; Director of DST/NRF Centre of Excellence in Strong Materials, University of the Witwatersrand.

To an individual or a team for an outstanding contribution to SETI through communication for outreach and creating awareness over the last five years: David Block, Professor of Applied Mathematics and Astronomy, University of the Witwatersrand

NSTF Chairperson Professor Brenda Wingfield said: *"Africa is rising. This statement echoed around the continent as the African Union celebrated its 50th anniversary. As a country and a continent we have much to celebrate."*

Prof David Block

Prof Lesley Cornish

Invitation to Join the SAIEE Historical Section

The Historical Interest Group (HIG) of the SAIEE was formed in 1979. Its main objective was to preserve items of historical interest and importance to electrical engineering in South Africa, and to establishing a museum to house as many of these as possible. This small group of enthusiastic Members, under the leadership of GJ Korvink, began the collection of electrical artefacts for display. They then extended their focus to include electrical engineering technical books and periodicals for a reference library.

The facility provided for the HIG to operate in, and for the storage of artefacts and books, was the building behind Innes House, known as the Simulator Room. This was originally built as servant's quarters for the Union Astronomer, whose residence it was. After WW2 it was extended to create facilities to train and test truck drivers by using a mock-up truck cab and simulator, coupled to cine-photography technology.

This screened films of the road from Johannesburg to Durban. The space within the facility was adequate for the collection of books. However, there was insufficient space to store the growing collection of artefacts, even with the installation of a mezzanine floor in part of the building, and a shipping container located outside. Many of these items had to be stored off-site in rooms provided by different authorities.

Due to the physical size of many artefacts, not much on the Heavy Current side such as generators, power transformers, high voltage switchgear, traction, etc., could be stored. The bulk of the collection is represented by Light Current developments such as telephones, radio, instrumentation, etc.

With the growing desire to create an SAIEE museum of the history of electrical engineering, and preserve the achievements made by South Africans, the Council of the SAIEE decided in July 2003 to elevate the status of the HIG to that of a "section". It therefore became the Historical Section (HS). Max Clarke, well known in Municipal Electrical Undertakings, had been the Chairman of the HIG since February 1994. He still continues to lead the HS towards the reality of the creation of the SAIEE Museum.

Readers will recall that Mike Cary wrote, in his President's message in the September 2012 **watt**now magazine, that in 2009 the Historical Section had motivated the construction of our new head office building. This was to make available Innes House - which at that time housed our Administration staff - could be used to house parts of the Museum, Library and meeting rooms.

The HS monitored the construction of the new building. As soon as the storage basement area was complete, all artefacts and shelving from the container were moved to the basement. Max Clarke wrote about the removal of the container on a rainy day in the first freshly redesigned issue of **watt**now November 2011.

After the new SAIEE House was completed in 2011, refurbishment started on the 100 year old Innes House. This is one of the best preserved examples of the work of the Architect, Herbert Baker and is part of our National Heritage.

Max Clarke
Chairman | Historical Section

With the completion of the refurbishment of Innes House, in readiness for its new role as an SAIEE Museum, the HS team is working on the design of the first display room. This has been chosen to be a theme display of the history of telecommunications in South Africa.

The HS team is a small, dedicated group of Members and friends, many getting on in years, and less mobile than they would like to be. The Team is not only conceiving themes, and assisting with the planning of displays, but continuing with the traditional work of sorting and cataloguing books and artefacts. The HS Team meet at the SAIEE site every Thursday morning. However, the time is not set firm, and participating members can choose any day of the week to undertake agreed tasks.

Traditionally HS attracts its members from retired Engineers and Technicians. Not only are they available, but they have spent a life-time working in the electrical engineering industry. Their contribution is not only their labours, but also their knowledge and experience, which is invaluable for the task of creating a Museum. Right now there is a real need for new HS members to complement the team!

Think about it, and if you have the time, and inclination to join fellow engineers on the HS challenge, please send an e-mail to Max Clarke at mppc@mweb.co.za.

WORLD ENERGY CONGRESS 2013: *100 days to go*

Countdown to World Energy Congress 2013 in Daegu marked by official messages of support from Presidents of China and Korea

With only 100 days left until the opening of the 22nd World Energy Congress in Daegu, Korea, more than 180 leading government officials, corporate executives and energy experts from 55 countries have already been confirmed to speak at the world's premier energy event. The event will mark one of the biggest ever international gatherings of energy ministers in Asia, underscoring the importance of the Congress in addressing global energy issues.

President Xi Jinping of the People's Republic of China and President Park Geun-hye of the Republic of Korea pledged support to the Congress during their summit in Beijing on June 28.

The Congress has also recently been endorsed by the UN-sponsored Asian and Pacific Energy Forum and the Forum for East Asia-Latin America Cooperation.
Among senior government officials attending the Congress will be:

- Sultan Ahmed Al Jaber, Minister of State; CEO, Masdar, UAE
- Suhail Mohamed Al Mazrouei, Minister of Energy, UAE
- Hussain Al-Shahristani, Deputy Prime Minister for Energy, Iraq
- Saleh Alawaji, Deputy Minister of Electricity; Chairman, Saudi Electricity, Saudi Arabia
- Basile Atangana Kouna, Minister of Water Resources and Energy, Cameroon
- José Maria Botelho de Vasconcelos, Minister of Petroleum, Angola
- U Than Htay, Union Minister for Energy, Myanmar
- Ken Hughes, Minister of Energy, Alberta, Canada
- Elham Mahmoud Ahmed Ibrahim, Commissioner for Infrastructure and Energy, African Union, Ethiopia
- Bruno Kapanji Kalala, Minister of Hydraulic Resources and Electricity, DR Congo
- Isak Katali, Minister of Mines and Energy, Namibia
- Martin Kuba, Minister of Industry and Trade, Czech Republic
- Christine Loh Kung-wai, Under Secretary for the Environment, Hong Kong
- José Manuel Soria López, Minister of Industry, Energy and Tourism, Spain
- Onkokame Kitso Mokaila, Minister of Minerals, Energy and Water Resources, Botswana
- Sospeter Muhongo, Minister of Energy and Minerals, Tanzania
- Etienne Dieudonné Ngoubou, Minister of Petroleum, Energy and Hydraulic Resources, Gabon
- Alexander Novak, Minister of Energy, Russia
- Elizabeth Dipuo Peters, Minister of Energy, South Africa
- Ith Praing, Secretary, Ministry of Industry, Mines and Energy, Cambodia

- Federico Renjifo Vélez, Minister of Mines and Energy, Colombia
- Pavel Šolc, Vice-Minister of Energy and Industry, Czech Republic
- Walter Steinmann, State Secretary for Energy, Switzerland
- Jero Wacik, Minister of Energy and Mineral Resources, Indonesia
- Taner Yıldız, Minister of Energy and Natural Resources, Turkey
- Mike Underhill, Chief Executive, Energy Efficiency and Conservation Authority (EECA), New Zealand
- Sang-jick Yoon, Minister of Trade, Industry and Energy, Korea
- Youcef Yousfi, Minister of Energy and Mining, Algeria

The World Energy Congress was officially endorsed by the Presidents of the People's Republic of China and Republic of Korea at their recent summit meeting where the two leaders agreed to cooperate in the successful staging of the event in Daegu as part of bilateral efforts to promote regional and international partnerships.

China supported Korea's bid to host the 22nd World Energy Congress when it was selected in 2008 and China is also expected to send one of the largest delegations to the Congress.

Lee Jong-ho, the Secretary General of the Congress Organising Committee, said: *"The 22nd World Energy Congress will be the biggest meeting of energy leaders this year and we are delighted that the Chinese government under President Xi Jinping has recognized the importance of the Congress to the global energy sector and voiced its support during the summit meeting with President Park Geun-hye."*

Dr Christoph Frei, Secretary General of the World Energy Council, added: *"Preparations for this year's Congress are nearing their conclusion and the calibre of speakers, participants, guests and exhibitors is unparalleled. The world is facing an unprecedented series of challenges, at a time of increasing uncertainty, complexity and pace of change. Asia, the world's energy powerhouse, is the ideal location to map out the next steps that global leaders need to take in order to ensure a safe and sustainable energy future for communities around the world."*

More than 250 companies have already confirmed their participation as sponsors and exhibitors or through sending large delegations to the Congress. A total of 5,000 participants from more than 100 countries are expected to attend. The Congress will provide a unique opportunity to network with key policymakers and business leaders in the global energy sector, while learning about future market trends. The WEC's three year study programmes highlighting energy scenarios to 2050, the world's available energy resources and energy policy rankings will all be unveiled along with reports from many others, including the IEA, during the four day event.

The number of prominent speakers is expected to grow in the weeks ahead. Senior executives from Royal Dutch Shell, Saudi Aramco, Gazprom, ConocoPhillips, Tokyo Gas, Woodside Energy and Pemex will address issues affecting the oil and gas sector.

Senior representatives from E.ON, Eletrobas, KEPCO, GDF Suez, Eskom, TEPCO, EDF Energy, Duke Energy and State Grid Corporation of China will share their visions about the future of the utilities industry. General Electric, Alstom, Areva, Westinghouse, ABB, Siemens, Suzlon, Schneider and IBM will discuss innovative energy technologies.

Leaders from the United Nations, as well as the heads of the IAEA, IEA, UNFCCC, IPCC, OPEC and the SE4ALL will join the leaders of development banks and organisations to engage with the business community to identify solutions to providing sustainable energy for all.

A full list of speakers is available on the Congress website at www.daegu2013.kr wn

Earn CPD Credits

BRIC-built power houses

As economies develop, their demand for power grows. The BRIC countries – Brazil, Russia, India and China – currently account for nearly a quarter of world GDP but this figure is set to soar.

BY | PENNY HITCHIN

New power stations are needed and the imperative is to establish affordable, low-carbon energy from secure sources of supply. In pursuit of this goal, each of the four BRIC nations now has nuclear reactors, which collectively generate more than 11 per cent of global nuclear-fuelled electricity.

Russia started nuclear generation more than 50 years ago, India more than 40 years ago, Brazil in 1982 and China in 1994. Russia, India and China all have ambitious expansion plans for nuclear power – and Russia and China are increasingly keen to find opportunities to export nuclear goods and services.

China currently accounts for 41% of reactors under construction globally, and India 11%. Russia plans to double nuclear output by 2020. Brazil is the BRIC's nuclear minnow with only modest plans for future nuclear generation.

The Fukushima Daiichi disaster in March 2011 slowed nuclear development worldwide. Some governments decided to phase out nuclear power and abandoned plans for new nuclear but the BRICs pressed on.

China suspended approvals for nuclear reactors for a few months while it designed a new nuclear regulatory regime and in June 2011 it resumed its nuclear expansion programme. Russia implemented checks on its nuclear plants and in June 2011 announced a 15 billion rouble ($530 million) national nuclear safety upgrade programme to install additional power and water supply back-up. In India, task forces introduced safety recommendations to improve the safety of reactors in use. Brazil carried out security checks at its two reactors and, finding no risk of a similar accident, let its nuclear programme continue.

RUSSIA: AIMS FOR TRANSITION TO FAST REACTORS

Russia currently produces more than 17.5% of its electricity from nuclear generation. Across ten power stations run by Rosenergoatom (Rosatom), the country has over 30 operational reactors, the world's fourth largest fleet behind the US, France and Japan. Eleven more reactors are under construction.

Country	Units	MW (net)	Construction start	Grid Connection
China	26	27 400	2007-2010	2012-2016
Russia	10	8258	1983-2012	2013-2017
India	7	4824	2002-2011	2013-2016
Brazil	1	1245	2010	2018

Table 1
Nuclear reactor construction in BRIC nations, July 2012

BRIC-built power houses

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Although Russia has been generating commercial nuclear power for more than five decades using its own reactor designs, new nuclear development ground to a halt after the Chernobyl disaster in 1986, followed by the Soviet Union's disintegration. The industry picked up towards the end of the century, when Russia secured deals to export reactors to Iran, China and India. Early this century the domestic nuclear construction programme then revived. The last 15 years have also brought a marked rise in the efficiency of Russia's nuclear reactors.

In June 2010, Russia's government approved plans for 173 GW of new generating capacity by 2030, of which 43.4 GW will come from nuclear. The government's 2010 Federal Target Programme (FTP) set out plans for nuclear's share in electricity supply to hit 25–30% by 2030, 50% by 2050 and 70–80% by 2100. Russia's existing nuclear reactors consist of 17 pressurised water reactors (PWRs), 13 light water graphite reactors, and one BN-600 fast–breeder reactor. The capacity totals 24 164 MW. Five older reactors are permanently shut down.

The FTP assumes development of VVER (Vodo-Vodyanoi Energeticheskiy Reactor) PWR technology this decade. Russia is a world leader in fast neutron reactor technology and Rosatom's strategy to 2050 involves a transition to fast reactors with a closed fuel cycle using MOX fuel. Fast reactors are projected to generate 14 GW by 2030 and 34 GW by 2050.

Reactors currently being constructed include seven VVERs – each of about 1200 MW – two small reactors to serve as floating power modules supplying power and heat to isolated coastal towns, and Russia's first Generation III fast reactor, the Beloyarsk-4 BN-800.

This is due to be ready for testing and commissioning this year, with first criticality in September 2014. The first unit is intended to demonstrate the use of MOX fuel made from weapons-grade plutonium at industrial scale, validating the closed fuel cycle technology.

Russia is also developing the BN-1200 fast reactor but this is unlikely to be operational this decade.

	2010	2011	% increase	Share of world total (2011)
Brazil	3.3	3.5	7.8	0.6
Russia	38.5	39.2	1.6	6.5
India	5.2	7.3	39.6	1.2
China	16.7	19.5	16.9	3.3

Table 2
BRIC nations' annual nuclear power consumption
(Source: BP Statistical Review of World Energy, 2012)

CHINA: EXPANSION AND LOCALISATION

China may have been the last BRIC nations to start nuclear generation but it unquestionably plans the fastest expansion. With 14 reactors coming into operation in less than 20 years and more than two dozen new reactor builds underway, mainland China is the world's leading nuclear construction hotspot. Nuclear capacity currently totals 10.8 GW, but China's ambitious plans are for at least 60 GW by 2020, 200 GW by 2030, and 400 GW by 2050.

China used foreign technology and expertise to kick-start its commercial nuclear power programme but is rapidly becoming self-sufficient in reactor design, build, operation and fuel-cycle management. Construction of the first commercial reactors, 994 MW French PWR units supplied by Framatome (now Areva), was managed by French utility EDF working with Chinese engineers. Generation started in 1994 and 1995. The next two reactors using the same technology started generating commercially in 2002 and 2003, and featured 30% localisation. The CPR-1000 (Chinese Pressurised Reactor) derived from this work can now be entirely manufactured in China, although the licence prohibits exporting the design.

China's first 'home-grown' nuclear power plant was a 300 MW PWR (CNP-300) which started operating in 1994. The first upgraded 600 MW PWR (CNP-600) entered commercial operation in April 2002 and the second in May 2004.

Atomic Energy of Canada (AECL) has built two CANDU reactors in China. The 665 MW pressurised heavy water reactors (PHWRs) came into operation in 2002 and 2003, but no further PHWRs are planned.

Russian PWR technology was used at Tianwan where two 1060 MW VVER reactors with western instrument and control systems were built under a co-operation agreement. The first unit entered commercial operation in June 2007 and the second a year later. More VVER reactors are due to follow.

Eight years ago China sought overseas bids to build four big Generation III reactors and to transfer technology so that it could swiftly develop localised production of new reactors. Westinghouse – in competition with Areva (EPR) and Atomstroyexport (VVER-1000 model V-392) – won the bid with its AP1000. With the build and technology transfer programmes now well underway, the localised CAP 1000 will join the CPR 1000 as the mainstay of China's nuclear expansion programme. There are plans to design 1400+ MW versions of both reactors. In a separate contract, without the technology transfer element, Areva is building two1650 MW EPR reactors.

In the longer term, China is eyeing fast neutron reactors. The 65 MW Chinese Experimental Fast Reactor (CEFR) achieved criticality in July 2010 and was grid-connected in 2011. A Chinese Demonstration Fast Reactor (CDFR) project is due to start construction in 2017 for commissioning 2022. Another fast neutron project is for two 880 MW Russian BN-800 fast reactors at Sanming, which were due to start operation in 2019 and 2020, although financial negotiations have delayed the project.

INDIA: EMBRACING FOREIGN TECHNOLOGY

In June, the reactor pressure vessel of Taishan Unit 1 was successfully lowered into place. Source: Areva

BRIC-built power houses

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India operates 20 nuclear power reactors with a combined capacity of 4 GW. Another five reactors are under construction but the nation plans an ambitious roll-out to get 14 600 MW of nuclear capacity on line by 2020 and 27 500 MW by 2024. By 2050, India plans to supply a quarter of its electricity from nuclear power. To meet these objectives, massive investment and development are clearly vital.

Official foreign nuclear co-operation was interrupted by India's nuclear weapons test in 1974, stopping imports of nuclear technology and fuel for many years. In 2009, the ban on nuclear technology export to India was lifted and it now imports technology from the US, France and Russia, although its recent Civil Liability for Nuclear Damage Act has raised concern among potential foreign suppliers over the extent of third-party liability.

India's nuclear strategy – intended to deliver energy security beyond 2050 – is a three-stage programme. The first stage involves building and operating PHWRs using India's available but limited uranium resource, producing electricity and plutonium.

The second stage is to develop plutonium-fuelled fast breeder reactors producing electricity and more plutonium and uranium-233 from thorium – India leads the world in research into the thorium fuel cycle and has considerable thorium resources. The plan's third stage is for reactors based on the thorium cycle to produce electricity and uranium-233.

India's first reactors, two 150 MWe Boiling Water Reactors (BWRs) built on a turnkey contract by GE, started operating in 1969. The remaining 18 operational reactors are PHWRs ranging in capacity from 90 MW to 490 MW. The first was built in collaboration with AECL and started generating in 1972.

India's self-sufficiency has not always led to efficiency. Delays plague construction and operational targets have rarely been met. The 2011 lifetime load factor of 57.3 per cent is the lowest in the world. Four 700 MW PHWR reactors are currently being built and are due on line by 2017.

India's first large PWR nuclear station, consisting of two VVER-1000 reactors, is being built at Kudankulam in Tamil Nadu. In 2010, India signed agreements with Areva for the first two in a series of six reactors at Jaitapur in Maharashtra, plus the supply of fuel, but the contract has not yet been finalised. In June 2012 Westinghouse and Nuclear Power Corporation of India Ltd signed a memorandum of understanding supporting future construction of AP1000 reactors at Mithivirdi in Gujarat.

Issues around insurance and finance will need to be settled before India can have confidence that its nuclear expansion plans are realisable.

BRAZIL: STOP–START PROGRAMME

Brazil has the smallest nuclear sector of the four BRIC nations and – unlike the other three – it only uses imported technology. After following an erratic approch to nuclear power over the last four deades, Brazil now has two operational reactors and one under construction.

Brazil's nuclear involvement started in 1971 when the government awarded a turnkey contract to Westinghouse to build its first reactor at Angra, a coastal site between Rio de Janeiro and Sao Paulo. The 626 MW Angra 1 PWR started commercial operation in 1985.

In 1975, the government, seeking nuclear self-sufficiency, signed an agreement with West Germany to supply eight 1300 MW reactors over 15 years. The deal included a technology transfer agreement intended to establish a Brazilian supply chain to manufacture the bulk of the components. Brazil's economic problems scuppered the scheme at an early stage. Construction of the 1270 MW Angra 2 PWR resumed only in 1995 and the reactor started generating in 2000.

Today, Angra 1 and 2 form Brazil's entire nuclear fleet, with a combined capacity of 1896 MW, which delivered 3.2 per cent of its electricity in 2011.

Construction of Angra 3, designed to be a twin of unit 2, started in 1984 but was suspended within two years. In November 2006, the government resurrected its nuclear ambitions and announced plans to complete Angra 3 and build another four 1000 MW nuclear plants. In 2008, Brazil's nuclear utility Eletronuclear agreed a deal with Areva to complete construction of Angra 3. Work resumed in 2010, but the plant is not expected to operate until 2016, at the earliest.

To enlarge the country's nuclear energy capacity, Electronuclear considered Westinghouse's AP1000, Areva-Mitsubishi's Atmea-1 and Atomstroyexport's VVER-1000 technologies. The utility's initial siting studies have looked at locations in the country's northeast, as well as at Angra and elsewhere in the south.

In May 2012, the government said that construction of any new plants would not commence until after 2020.

Nuclear's high-capital cost and the growth of renewable energy contributed to this decision along with strikingly poor public acceptance of nuclear – Brazil was ranked last in an IPSOS 24-country study, which found that 89% of its population is against nuclear power.

EXPORTING NUCLEAR SERVICES

Russia and China both have an eye on opportunities for exporting nuclear technologies and services. Russia has exported VVER reactors to Iran, China and India, while China has built two CNP-300 reactors in Pakistan.

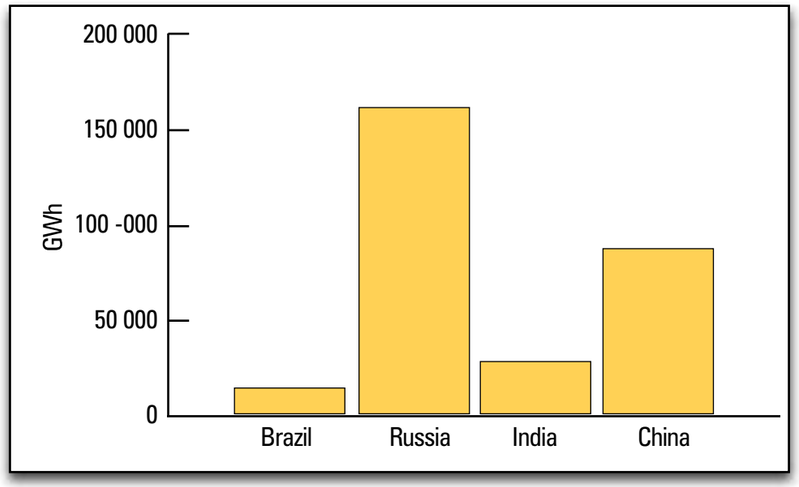

Table 3
Annual electric power production on BRIC nations, 2011
Source: IAEA-PRIS, 2012

Russian and Chinese companies are reported to be seeking a foothold in UK nuclear power generation by buying Horizon Nuclear Power, a joint venture owned by RWE and E.ON. The joint venture is currently up for sale after its parent companies quit UK nuclear, citing concerns over the current economic viability of nuclear power in Britain.

China's State Nuclear Power Technology Corporation and Westinghouse could be in competition over Horizon with China Guangdong Nuclear Power Corporation aligned with Areva.

Both reactor designs, the AP1000 and the EPR, are under construction in China, and both Westinghouse and Areva have established tie-ups with the Chinese firms.

Rosatom is also believed to be interested in the UK nuclear market, but its VVER reactors would have to undergo a lengthy regulatory Generic Design Approval process, making that an unlikely deal.

BRIC'S ROLE IN FUTURE TECHNOLOGY

Although nuclear power is an established technology, it is very much a work in progress. The uranium-based nuclear reactor is inefficient and burns only a small proportion of the highest quality fuel, leaving a lot of radioactive material. The relationship between nuclear energy and nuclear weapons, the unresolved issue of long-term nuclear waste management, and ongoing safety and security challenges all mean that the drive to improve nuclear generation technology is vital if nuclear energy is to be safe, secure and affordable.

Russia is a world leader in fast reactor technology development. India leads world research into thorium reactors and China has active research programmes for both thorium and fast reactors. These three countries share a desire to make nuclear a mainstay of their electricity generation and are committed to development of the technology. In the decades ahead they could be world leaders in a new generation of nuclear generation.

UAE: ON A FAST TRACK TO JOIN THE NUCLEAR POWER 'CLUB'?

About 30 countries operate commercial nuclear power reactors and the United Arab Emirates (UAE) wants to be the next. Construction of the first of four new reactors is reported to have started, with production of the first nuclear power scheduled to start in 2017.

The UAE decided in 2008 that nuclear energy was the way to meet its projected rise in electricity demand from 15.5 GW in 2008 to more than 40 GW by 2020. Developing a nuclear power programme means investing in a capital-intensive, hazardous and

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highly technical industry requiring a lot of infrastructure. Historically, it has been a slow and expensive business, requiring government commitment, ongoing R&D, a complex regulatory regime, skilled staff, a supply chain and arrangements for spent fuel and radioactive waste management.

The Emirates Nuclear Energy Corporation (ENEC) was set up to devise and implement plans. The UAE is using joint venture arrangements to create a nuclear industry within a decade by buying in established technology, skills and systems.

The UAE sought bids to supply 5 GW of nuclear power by 2020 with another 15 GW to follow using standardised reactor technology. By mid-2009, ENEC had a short list of three bidders promoting their own reactor design. Areva's Evolutionary Power Reactor (EPR) was backed by a consortium of Areva, Suez and Total. GE-Hitachi proposed its Advanced Boiling Water Reactor (ABWR), while a Korea Electric Power Company (KEPCO) consortium offered its APR1400 PWR.

In December 2009, the KEPCO consortium, which comprises Samsung, Hyundai and Doosan, was awarded a $20 billion contract to build four APR1400 reactors in the UAE.

The foreign joint venture partners will supply the fuel and take responsibility for spent fuel. Operating the reactors for 60 years will double the value of the contract.

KEPCO operates 20 generators in Korea, but this was its first reactor export project. The Generation III advanced PWR design was certified by the Korean regulators in 2003 and the first units, being built at Shin-Kori in Korea, are due to enter commercial operation in 2013 and 2014. These units will be the 'reference plants' for the UAE. The reactor has a projected 48 month construction period and a 60-year design life.

UAE is fast-tracking the build up of infrastructure and skills. Its Federal Authority for Nuclear Regulation (FANR), set up in 2009, has close links with the US Nuclear Regulatory Commission and the two-step licensing reviews, issuing a Construction License followed by an Operating License is based on the US model.

ENEC expects to employ over 2000 people by 2020, and has a target of 60% of them being from the Emirates. An ambitious training programme is being set up, which includes placements in Korea, Japan and the USA.

As to the vexed issue of nuclear waste, UAE says it is developing a national storage and disposal programme in parallel with exploring regional cooperation options. wn

Artice courtesy of Power Engineering International.

Units 1 and 2 of the Taishan EPR nuclear plant, which is currently under construction in China. Source: Areva

Cyber Security Challenges for SMEs

The assets of a business are vitally important to its operations. These assets not only include the physical infrastructure, amongst others, but also the business information.

BY I GINO BOUGAARDT I MSAIEE
PR. ENG. I BCom HONS (INFORMATION SYSTEMS) I MSc (ELECTRICAL ENGINEERING) I BSc (ELECTRICAL ENGINEERING) UCT

Business information can include sensitive information of an intellectual property nature to customer related information such a credit card details. Information is a business asset of value that needs to be strategically managed and protected in terms of confidentiality, integrity and availability. This includes not only the information but also the systems and hardware used to store, process and transmit the information[6,15].

Failure to protect business information can lead, for example, from losing a competitive edge in the marketplace, to financial ruin.

Information security (confidentiality, integrity and availability) is a challenge for South African small to medium sized enterprises (SMEs) engaged in e-commerce and they are susceptible to cybercrime. Cybercrime is a criminal activity that makes use of electronic devices to instigate incidents such as theft of information, sabotage of data networks, manipulation of information, deletion of information, denied access to information and damage due to malicious software. South African SMEs do not have the time, funding and expertise in information security to combat cybercrime[2]. Cybercrime can consequently go undetected and hence many may never be reported[8]. Furthermore, a lack of disciplined security record keeping procedures in SMEs only exacerbates the problem of detecting and recognising cybercrime[2,7]. Recognition of cybercrime is aided by the ability, utilising technology, to detect any electronic crimes through scanning and monitoring information/technology systems, documenting these security activities, which are used to conduct security audits.

Recognising and detecting cybercrime is an essential step in addressing the problem. However, it is equally important to minimise and prevent losses due to cybercrime, through testing Information Technology (IT) systems for vulnerabilities so that they can be mitigated. These losses can be of a financial nature and this affects the economic growth of the SME. This is counterproductive to the economic policy of the South African government, for they depend on SMEs to contribute significantly to the economic growth of the country. Moreover, SMEs contribute over 40% to the Gross Domestic Product (GDP) of

Cyber Security Challenges for SMEs

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South Africa and they are a major source of employment and income generation[7].

The purpose of this paper is to review and discuss the current information security challenges experienced by South African SMEs. The focus is to show that these challenges could be solved by migrating their businesses, in part or whole, to the cloud as opposed to managing their businesses with traditional IT approaches.

SMEs face numerous challenges. Therefore, only challenges that could be addressed by the cloud are discussed. This paper will be useful to SME owners, IT practitioners in SMEs and cloud providers that seek to understand information security from an SME perspective.

The paper begins by explaining and discussing the information security challenges that South African SMEs face. It discusses the security challenges and benefits for SMEs that migrate their businesses to cloud computing. Finally conclusions are drawn.

INFORMATION SECURITY CHALLENGES FACING SOUTH AFRICAN SMES

SMEs face numerous challenges with regard to information security, cybercrime and recognition of cybercrime. This problem requires SMEs to secure and protect their systems from attackers by implementing an effective information security solution.

- **INADEQUATE INFORMATION SECURITY SOLUTIONS**

An information security solution is a defence system that is implemented to protect systems and hardware used to store, process and transmit information. It also includes technologies such as Identity Access Management (IAM), application security and network security amongst others. The security solution should integrate these security technologies in a cohesive and intelligent manner, with a holistic approach, across the organisation's systems[4]. However, SMEs security solutions are designed in a piecemeal fashion, which is problematic.

Businesses can have many applications and systems running, and each of these have their own threat profile and risks. IT practitioners therefore design unique security solutions for each of these. This approach can be costly to implement, and furthermore are often disjointed, patched and thus cannot comprehensively monitor and report on the complete security landscape of the organisation. Moreover, the piecemeal approach has a disadvantage of not keeping up-to-date with security requirements as the complexity of the business systems increase[3].

- **POOR SECURITY RISK MANAGEMENT**

Piecemeal designs make security risk management a challenge, especially for SMEs with a lack of expertise in IT.

Piecemeal designs result in parts of the organisation's system not being monitored by the security solution. Attackers can exploit this. It is therefore impossible to record and document any security activities in these areas of the system. Consequently, this makes it impossible to identify risks and to detect cybercrime. As the complexity of business systems increase and, due to technological changes, the ability to identify, assess and to mitigate risks is impeded.

The purpose of risk management is to reduce or eliminate risk, if possible, to acceptable levels[13].

- **SOFTWARE VULNERABILITIES**

Risk management procedures are set out in the information security policies of the organisation. In relation to security, they give direction as to how various risks are to be prioritised for mitigation, based on the severity of the risk, and its location in the information system[11].

Risk mitigation could involve investing in security software technologies. However, SME managers often shun good security systems and practices due to various reasons of which funding constraints and their complacency regarding security are a few[7]. Nevertheless, SMEs that invest in security software technologies have to keep them up-to-date so that they can detect the latest threats. Moreover, various business software packages that are implemented in the organisation also have to be kept up-to-date.

Any software vulnerabilities could be exploited for malicious intent such as injecting malicious code into the software to change its nature, e.g. SQL injection attacks into databases[3]. SQL injection attacks attempt to gain unauthorized access to databases, while cross site scripting (XSS) attacks inject malicious scripts into the web content of web pages to gain access to private information[1].

XSS attacks target Web 2.0 web pages since they offer multi-fold services. Web 2.0 is a key technology that enables the use of Software-as-a-Service (SaaS) over the internet, connecting a cloud consumer to a cloud provider.

INFORMATION SECURITY CHALLENGES AND BENEFITS EMBRACING CLOUD COMPUTING

SaaS along with Platform-as-a-Service (PaaS) and Infrastructure-as-a-Service (IaaS) are the three service delivery models of Cloud Computing (figure 3.1).

Cloud Computing is defined as a model that provides convenient on-demand access, via a broad network (e.g. mobile phones, tablets, laptops and desktops), to a shared pool of configurable computing resources (e.g. software, storage, servers, networks, services). This is as a pay-per-use service that can be rapidly provisioned and released with minimal management effort or cloud service provider interaction[9,10,12].

SaaS, PaaS and IaaS internet services utilize virtualisation technology (virtual machines), and can be deployed in a public cloud, private cloud, community cloud or a hybrid cloud. A public cloud is used by the general public, whereas a private cloud is used by one organisation.

A community cloud is used by consumers from organisations with shared interests. However, a hybrid cloud is a combination of public, private and community clouds. SaaS offers cloud consumers software applications that run on the cloud infrastructure while PaaS provides software development environments/ tools to cloud consumers. IaaS provides storage, processing, computation, network capabilities etc. on which operating systems and applications can run[14].

From a cloud service model architecture point of view, SaaS can be stacked on PaaS, IaaS or directly on the physical cloud infrastructure (figure 3.1). Furthermore,

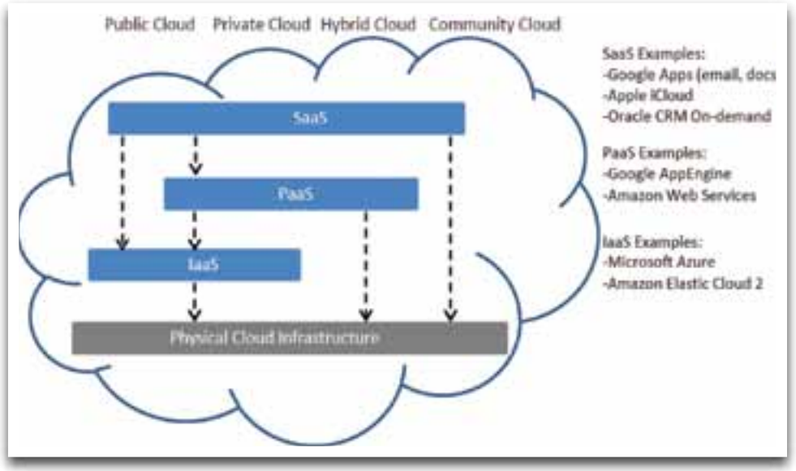

Figure 3.1 Cloud Delivery Service Models and Cloud Deployment Models

PaaS can be built upon IaaS or directly on top of the physical cloud infrastructure. IaaS is built upon the physical cloud infrastructure. As a consequence of this cloud service model architecture, there are security tradeoffs where the security responsibilities depend on the cloud service model.

- **SECURITY RESPONSIBILITIES IN THE CLOUD**

The cloud service provider is responsible for the security of applications in SaaS. This is beneficial for SMEs as the management of software packages, e.g. updating/upgrading software shifts to the cloud. The security of the platform (PaaS) is the responsibility of the cloud provider. However, the security of the applications that are developed on the platform is the responsibility of the cloud consumer[12].

Cloud service providers that offer Security-as-a-Service could be utilised by cloud consumers to assist in improving the security in the applications they develop on the platform. Security-as-a-Service scanners include, for example, Static Application Security Testing (SAST) and Dynamic Application Security Testing (DAST). These detect and discover vulnerabilities. SAST technology analyses applications for security vulnerabilities at the programming and testing phases of the software life cycle (SLC), whereas DAST technology analyses applications at the testing and operation phases of the SLC (figure 3.2)[4].

The security of the underlying infrastructure (IaaS) is the responsibility of the cloud service provider while the operating systems, and applications that run on IaaS, is the responsibility of the cloud consumer. The security risk is transferred, in part, to the cloud service provider, depending on the services provisioned.

The cloud service provider's security risk management practices should be detailed in their information security policy. The intelligent use of various security technologies (e.g. SAST, DAST) from the cloud can assist cloud consumers to achieve

Cyber Security Challenges for SMEs

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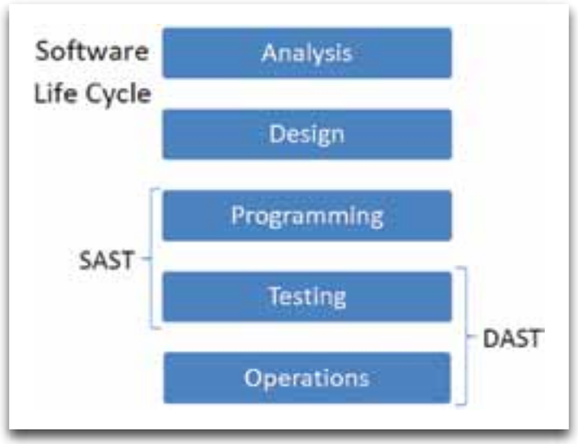

Figure 3.2 SAST and DAST in SLC

a holistic and integrated information security solution.

• HOLISTIC INFORMATION SECURITY SOLUTIONS

An intelligent approach to information security will be to collect the information reports from various security scanners (e.g. applications, networks, IAM) and monitors (e.g. databases, access control), and aggregate it in a persistent repository that can be queried for analysis.

Moreover, intelligent security actions and decisions can be taken, based on the analytical studies of the integrated and correlated information[4]. Compared to the traditional security approach, which works in silos (piecemeal design), the holistic approach utilises security technologies in an interactive way. For example, SAST and DAST technologies interact to provide better accuracy of vulnerability detection in applications. SAST and DAST technologies have both strengths and weaknesses, and hence correlating the security scan results from both improves the accuracy of detecting vulnerabilities. Therefore, integration, interaction and correlation are key elements to holistic security solutions that can be provided in the cloud as Security-as-a-Service.

Other application security technologies such as software composition analysis, software hardening and shielding, and data masking, are useful in the programming, testing and operations phases of the SLC[5].

CONCLUSION

SMEs design piecemeal information security solutions for their systems, which are inefficient, costly to implement and, furthermore, are often disjointed, and patched. The complete security landscape of the organisation cannot therefore be comprehensively monitored and report on.

Furthermore, security risk management becomes a challenge, since piecemeal designs result in gaps in the organisation's systems that are not monitored by the systems comprise of multiple business software, which need to be kept up-to-date, so that vulnerabilities are not exploited by cybercriminals.

Managing the information systems is cumbersome for SMEs, as they lack the security expertise, time and funding to do so. The security services in cloud computing could be a solution for SMEs, if they manage their security responsibilities.

The Security-as-a-Service offerings in the cloud can assist SMEs to achieve a holistic information security solution. wn

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Earn CPD Credits

The Eradication of Copper Theft

The theft of copper is tantamount to economic sabotage! It directly costs the industrial and utility businesses an inordinate amount of money, but consequential losses to equipment and interruptions to processes and consumers are difficult to estimate.

BY I GAVIN STRELEC I BSC WITS I PRENG I MSAIEE

In light of the grievous impact, and proven simple alternatives being available, it is difficult to contemplate that no effective solution has ever been implemented in a widespread fashion in the local industry, ostensibly due to practical or cost issues.

At this stage, effective solutions have been applied in various other countries, peculiarly, for example, Spain, Sweden and the USA, but somehow South Africa seems to be lagging behind particularly in context of the relative magnitude of our challenge.

The context of this article was developed around utility installations, particularly substations, but the generic principles apply to all utility and industrial electrical situations. The article proposes to address earthing copper theft, and encourage practical application without any technical compromise, and yet significantly lower life cycle costing.

RISKS ASSOCIATED WITH EARTHING SYSTEMS

In the hierarchy of risks associated with earthing, the foremost risk is the loss of functional earthing due to theft, which is an obvious safety risk to personnel and equipment. In order to successfully "eradicate" earthing theft, it is necessary to utilize materials that possess essentially no recovery value, ensuring that functional earthing is always maintained. To develop the solution from the simple "mitigation" to the complete "eradication" of earthing theft, it is paramount that the entire system be built up from such materials, and not only those conductors that are relatively accessible. Some proven methods for mitigation of theft, such as concrete encasement of earthing, have proven effective, but are only a partial solution unless the entire system is protected in this way. And still, would-be thieves have demonstrated undue perseverance in accessing valuable materials and suitable mechanical protection may become cost prohibitive.

Concealed copper earthing in foundation as applied in Eskom Distribution

The Eradication of Copper Theft

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The second highest risk to earthing is poor connections, which compromise the performance of the system, despite the use of suitable conductors. Therefore the solution must address the connections in order to improve the reliability of the system and improve conductor utilization, in order to reduce costs.

CONDUCTORS

Copper is ubiquitous as an earthing material due to a unique combination of technical attributes that render it a favoured choice over other practical and cost-effective metals.

Historically, it is primarily copper's relatively high nobility that makes it suitable for earthing installations, particularly in below ground applications. Copper also meets the high ampacity requirements of some installations with modest cross sections, due to the second highest conductivity of all metals. Copper's only caveat is its high scrap value which motivates persistent unauthorized "harvesting".

Aluminium possesses favorable conductivity at approximately 60% that of copper, but it is highly reactive and thus prone to corrosion, and is not suitable for buried applications. Furthermore, aluminium still presents significant scrap value.

With steel conductors, considerable cross sections are required to compensate for corrosion and the relatively high material resistivity, typically 8,5 times higher than copper. Galvanized steel conductor sections with 90µm zinc coating are only suitable for around 10 years in most buried applications according to a US National Bureau of Standards study. Experience has shown that modest galvanized steel sections may completely disappear after a few years in conductive soils, meaning that unprotected steel is not a feasible solution.

Ungalvanised mild steel earthing systems combined with sacrificial anodes, have been successfully used in Russia for some 750kV substation earthing installations decades ago. More recently, steel was used for substations for India's 765kV grid expansion. In both cases the primary motivator was much lower cost compared to copper, which is of course offset by significantly higher installation effort compared with equivalent copper.

It is interesting that some German utilities only use copper in installations close to source buses where fault levels are high, but downstream distribution networks are adequately earthed with mild steel.

So called "copper clad steel", referred to as "CCS", has been used in North America for about 100 years, having being invented and introduced by the Copperweld Corporation in 1915. Originally, CCS was probably used primarily due to its lower cost compared to solid copper, and subsequently the anti-theft benefits have been proven.

Large steel sections used in Indian 765kV substation

Copper clad steel has less recovery value than ordinary steel, and hence has virtually eradicated earthing system theft in all countries where it has been implemented. It is simply not feasible to remove this material where there is more accessible mild steel.

Probably the most extensive study on underground corrosion of earthing materials was conducted by the National Bureau of Standards (NBS) between 1910 and 1955, involving some 36 500 specimens, including CCS, at 128 locations throughout the US. The summarized service life according to the above study is as follows:

- 10 mils (254µm) acceptable for 40 yr. service life
- 13 mils (300µm) acceptable for 50 yr. service life
- 10 mils is the basis of the local SANS1063 standard for earth rods.

In CCS conductors, it is the metallurgical bond or "interdiffusion zone" between the copper and steel that is the key to corrosion resistance, as this bond effectively prevents moisture ingress, and thus galvanic corrosion from occurring.

The above service lifetime is applicable to most soils. The potential for corrosion is related to the resistivity of the soil and this evaluation should be done in accordance to SANS10199. Soils particularly aggressive to copper such as those containing sulphides may corrode copper conductors at an accelerated rate, and therefore require additional corrosion protection e.g. sacrificial anodes, in order to realize such lifespans. The nature of the soil should be investigated as part of the geotechnical survey and mitigation techniques applied accordingly.

Rod CCS conductors are preferred from an "anti-theft" perspective. Qualitatively, rod conductors are more distinct from their solid copper counterparts, than what stranded CCS conductors are from stranded copper. Local experience has shown that implementation of copper electroplated steel earth rods in Eskom Distribution for the last 10 years was extremely successful. Initially some attempts to cut the conductors as evidenced by cutting marks were discovered, but no documented incident of theft ever reported.

Stranded CCS conductors used in SA as early as the 60's showed comparatively significant tampering as the conductors look like copper and do not exhibit significantly lower ductility, meaning they are more readily misidentified as copper.

Solid rod conductors are preferred to stranded equivalents for the following reasons:

1. Corrosion – With CCS, the copper-thickness-to-strand-diameter ratio is maintained, therefore rods would have a substantially better service lifespan.
2. Robustness – The above means the rod is also more resilient to coating damage and other handling issues. The rod is also substantially more difficult to cut and MAY discourage tampering.
3. Mechanical rigidity – High short circuit currents causing movement in earth conductors, particularly superficial connections are easier to cater for with the more rigid rod conductors.
4. Skin effect - The rod has better material utilisation.
5. Cost – Drawing down the rod and the "laying-up" to form a stranded conductor would increase process time and cost.

The only concern about rod conductors is the difficulty in installing the conductors due to relatively high rigidity. This is not considered to be a challenge as typical rods may be approximately 10mm diameter or less, and if fabricated from low carbon

Copper plated steel earth rods used for the earthing of structures in Eskom Distribution

The Eradication of Copper Theft

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Bending copper plated steel rod

steel and fully annealed, are very easy to work with an inexpensive bender as shown below.

CONNECTIONS

In conventional earthing systems, the connections, such as bolted clamps or crimps between elements, limit the conductor utilization, and therefore the capability of the entire system.

Earthing systems allow maximum temperature limits, depending on the connection type. Recommended final temperatures for bolted connections are set at 250˚C in standards like IEEE 80. Since the fusing temperature for copper is 1083˚C, this results in conductor utilization of about 20%. Brazed connections permit better utilization with a temperature limit of 450˚C. Crimped connections have various design dependent temperature limits, but are generally also specified at 450˚C. Exceeding temperature limits will compromise the integrity of the connection. Exothermic welds permit full temperature rise up to the conductor fusing temperature. Notwithstanding the above, special application specific limits must also be placed to prevent personnel injury or fire for example in LV distribution in plant facilities.

Popular standard copper clad steel conductors have equivalent copper conductivities of 20, 30, or 40%. Consequently conductor cross-sections must be substantially increased, if temperature limits are to be maintained. Therefore it is recommended that exothermic welds are used, wherever practical, for the following reasons:

a. Optimum conductor utilization: Exothermic welds permit full conductor utilization up to the fusing temperature of the conductor, resulting in less conductor cross-sectional area required for a given rating.
b. Corrosion: There are no maintenance requirements associated with exothermic connections since there is no connection interface susceptible to corrosion and is therefore recommended for buried connections. Exothermic connections are also suitable for connections between dissimilar metals e.g. copper and steel and are therefore preferred for connections between earthing conductors and structures.
c. High mechanical integrity: This weld is robust and impossible to remove if done correctly.

As with any connection, quality is critical. With exothermic connections it must be ensured that a manufacturer-accredited contractor performs the connections, and that all connections are quality checked during construction. If correctly done, exothermic connections are the most reliable of the connection types, requiring no maintenance.

INDUSTRY STANDARDIZATION

Industry standardization is also pursued via a NRS (National Rationalized Specification) working group (NRS102) with representation from large utilities and industrial customers e.g. Eskom, Sasol and Mittal. The NRS objective is to limit the permutations of technical applications and thus promote standardization in the local industry.

In view of rationalization, the minimum number of recommended options is determined from consultation with all local users. This standardization presents obvious benefits for users in terms of standard application solutions reducing engineering input and other like material management of spares and for new projects. The local industry benefits from better pricing that originates from larger manufacturing volumes of standard types.

The investigation considers local manufacturing input in terms of a manufacturer interest group comprising of local fabricators which will inform practical manufacturing considerations for the optimum techno-economic and practical selection of the solution.

The output from the working group is a guideline detailing practical recommendations. The chairman is also fast-tracking publication in order to provide early guidance to the industry in order to curb the primary risk to earthing systems! wn

Taking Software Integration to the Next Level

The largest automobile plant in South-Korea has recently commissioned their software subcontractor to integrate EG4K and its' software into their existing CIMON SCADA software.

COMPILED BY | WAYNE BROMFIELD **|** IMPACT ENERGY

Following the success of the project, 33 EG4K units were installed at the plant.

The automobile plant expanse reaches over 244,727m² and has an annual production of 2.3 million cars annually.

The Power Quality Monitoring system that was in use prior the integration, displayed real-time RMS voltage and current measurements. The main drawback of the system is its inability to analyze power consumption and power quality parameters comprehensively. Due to a non-repairable hard disc failure in one of their main Servers, this auto manufacturer was prompted to look for an alternative power quality analysis system. Increase in annual automobile sales meant that they needed to plan the building's extension in one of their assembly lines with great urgency. The existing power quality analysis system failed to provide them with vital information regarding the trend loads, making the planning of the extension nearly impossible.

As all the installed EG4K devices could be configured and integrated into their CIMON SCADA system the process was much more simplified. Situated on their OPC Server, this integration allowed the CIMON SCADA to display comprehensive data measured in real-time on a 52 inch plasma display panel, providing full control over all the analyzers.

This upgrade also meant that engineers could now in addition access the EG4K's PQSCADA Server via the investigator software providing:

IN-DEPTH ANALYSIS

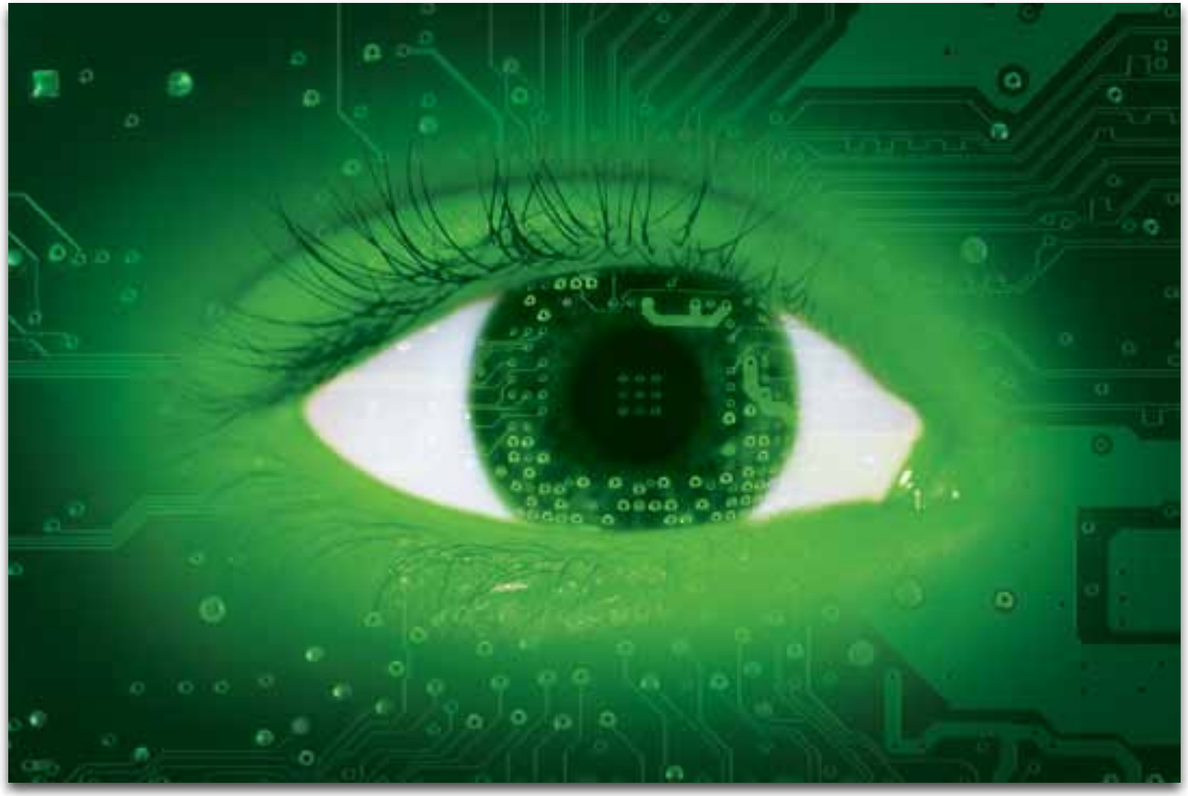
Powerful analysis software, that allows you to zoom in and out of time. With simple click of your mouse, you can zoom in on data from a year pinpointing it down to a millisecond in order to identify, the finest Power Quality parameter details and differences.

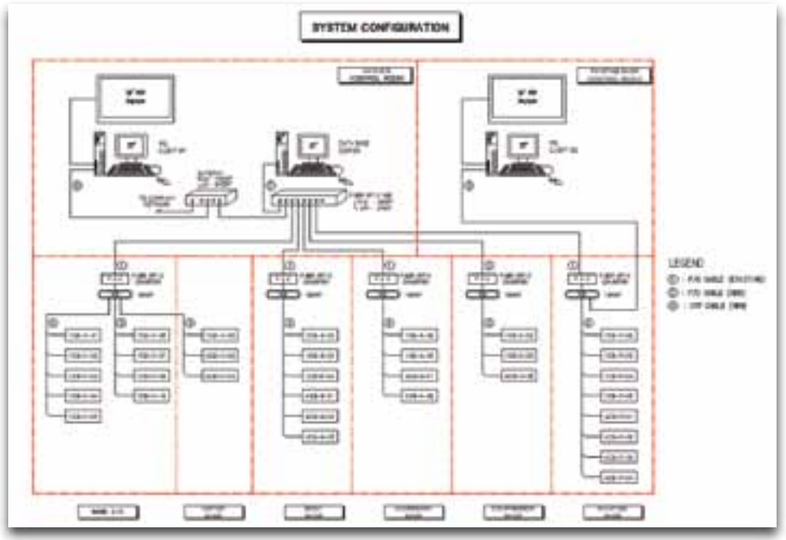
WAVEFORM CONTINUOUS RECORDING

Unique raw data (waveform) continuous recording at an extremely high sampling rate, therefore there is no need to worry about missed events due to incorrect setup. Furthermore, abnormalities propagate through the network as it is recorded on various devices that are all synchronized in time; thereby providing you with a clear and comprehensive picture on the condition that lead to the failure.

The successful integration of the propriety software into the plant's existing system, meant that the company's electrical engineers were now able to utilize the comprehensive data measured for their building plans. The installation system suits the plants needs by providing them with:

- Detailed and Comprehensive Data: The system's unique capability is its data-storage capacity, allowing it to effectively record and measure the facility's power consumption and load trends. Information is relayed periodically according to the plant's report requirements.
- Lucrative: An adaptable Power Quality solution that is integrable into any existing SCADA system. The investigative software's comprehensive data ensures effective planning and cost, operation, and maintenance of equipment.
- Automated Reports: Generated by the investigator software, this reporting system is not only based on EN50160 standards, but also on a wide range of standards from other major countries. The templates may also be uniquely adapted to suit the needs of individual user-standards and requirements.
- Remote Monitoring Capabilities: The investigative software is specifically designed to connect either via TCP/IP/RTU/GPRS Wireless for ease of use. This enabled the data to be analyzed over the company's network, at any remote location on a PC.





CIMON System Configuration – Post EG4K PQSCADA Software Integration & Upgrade

As Power Quality is of the utmost importance for the facility, especially during Spot-Welding, the automation palnt installed unbalanced equalizers. With a culmination of 6 large equalizer and systems, the facility optimized their power quality, with savings in energy, and a vast improvement in the quality of their production, especially in their Spot-Welding.

CONCLUSION

The adaptability of the investigative software exceeds individual client needs and expectations as it can easily be integrated into any existing system, cost effectively and with ease. wn

Earn CPD Credits

Our planet today is wrought with environmental challenges: climate change, biodiversity, raw material depletion, and endangerment from hazardous substances and waste, to name a few.

BY I ALAIN DIGEON I SCHNEIDER ELECTRIC

In Sustainability, Information is Power

According to studies from the World Energy Council and United Nations, our increasing population will cause energy demand (already a source of stress due to the finite nature of fossil fuels) to double by 2050. To limit global temperature increases and potentially catastrophic environmental changes from the effects of meeting this demand with inefficient technologies at current consumption levels, world leaders have also emphasized the imperative to cut our carbon emissions in half by this same year.

Driven by both regulation and a desire for sustainability, organisations are working to mitigate their environmental impact and emissions. The missing element to sustainability is neither legal nor ethical - it is informational. Without comprehensive information about the products they use, organisations cannot make the decisions required to achieve sustainability goals. In the drive for sustainability, knowledge is power.

Labelling green products is an effective way for buyers and consumers to understand the environmental impact of the products that they are purchasing. The emerging requirements for green labels or 'eco-marks' are still evolving, but it is critical to outline standards that all product manufacturers must use so that purchasers can be confident in the sustainability promise to the market.

A significant gap exists in the market for the labelling of industrial products. Filling this gap is critical so that large industrial enterprises can have a transparent profile of all information related to the chemical content, energy usage, and environmental impact of the products that they purchase. Additionally, organisations must be able to effectively observe environmental policies, assess sustainability efforts, and ensure compliance with environmental legislation. All of these pressures are becoming increasingly important to a variety of stakeholders. Wholesalers, distributors, and other mid-chain organizations increasingly are fielding questions from end users and system integrators regarding the environmental/regulatory compliance, carbon footprint, and life cycle sustainability of the products they want and need to meet their goal of ensuring they are marketing truly green manufacturing, operations, and end products.

As these organisations begin to ready their green labelling efforts, this paper suggests a new Green Premium™ eco-mark, a Type II ISO 14021 standard developed to give the market and purchasers confidence in the promise of green.

Just as deceptive marketing within the food industry over the past few decades has led to consumer distrust and demand for greater transparency in product manufacturing and marketing, a similar need for visibility into the composition and impact of industrial products is emerging. While several labelling efforts have been implemented, there is not yet

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an accepted, industry-wide label allowing companies and their customers to have a complete view into the sustainability of the components, materials, and/or products they are purchasing.

Driving this need for a label is the undeniable surge in societal demand and regulatory pressure to adopt and build sustainable products. According to research firm Frost & Sullivan, major global environmental issues are expected to significantly increase in importance, attention, and regulation over the next decade. For instance, by 2020, companies can expect to adhere to mandatory global sustainability standards for cradle-to-cradle production processes - no matter what the product. Even today, walk the aisles of any retail store, and you'll find a wide range of products promoting everything from landfill-friendly packaging to new product formulas that mitigate environmental impact. Read the annual report of any Global 2000 organization and it will include a discussion of the company's sustainability initiatives. Governments and other regulatory bodies around the world continue to put pressure on companies with new regulations designed to safeguard the environment.

In the face of this global movement, many of today's large manufacturers and companies are reluctant to make a comprehensive shift in this direction. This hesitation is due to a number of factors. Some perceive a lack of widely available, sustainable components and materials. In a challenging economy, others cut environmental corners to avoid a higher price point for the raw materials and components which ultimately go into the end product. Still others practice 'green-washing' by promoting some 'green' elements of their business, without addressing core sustainability issues - decreasing consumers' trust in green. In 2006, for example, Kimberly-Clark, one of the world's largest personal and health-care products companies, was caught in a confrontation with Greenpeace.

After closely examining the company's operations, Greenpeace accused Kimberly-Clark of green-washing, and attacked its claims of sustainability and social responsibility by stating the raw materials for many of the company's disposable products had been culled from ancient forests, such as the boreal forest of Canada. To avoid such problems, a sustainability-focused label is greatly needed.

Compound this with additional consumer demand for visibility into how a product was made and where it came from, and the pressure on the supply chain is clear. To avoid accusations of green-washing, enterprises now face the challenge of providing services, materials, and end products that minimize environmental impact from creation to disposal. The only way businesses can comply with the regulatory and consumer pressure is through comprehensive knowledge of the products and materials they use - and then making the right business decisions with that information. When it comes to sustainability, knowledge is power. And power is increasingly shifting to those organisations that have knowledge of the environmental impact of the products they use, manufacture, and market.

WHY DO WE NEED TO ADOPT AN ECO-MARK?

In large part, the need for eco-marks is being driven by dramatic changes to the world around us. For much of the late twentieth century, our fossil fuel resources seemed infinite. As late as 1999, some experts described our world as 'drowning in oil', a phrase coined that year in an issue of The Economist. These experts predicted we had more than enough oil to carry on rapid global industrialization and development for many years into the future. Just over a decade later, we face volatile energy prices, environmental disasters, climate change, and geopolitical crises in the oil-producing regions of the world.

Energy, and managing our environmental resources, are among the most challenging issues of our time. Today, the emerging truth is everyone - business, government, and individuals - must understand and evaluate the environmental impact of the way they live, work, and play.

As a result, market studies, news, and analysis consistently point to three megatrends that have emerged and are driving the adoption of eco-marks:

- The need for global energy security;
- The desire for minimal product impact on the biodiversity, environment, and health;
- Increased social and regulatory pressures as a result of environmental, safety, and climate change concerns.

Energy security is the first megatrend driving the adoption of eco-marks. In an effort to mitigate fossil fuel depletion and reliance on oil-rich countries, countless dollars have been invested in the research and development of a widely available, affordable renewable energy source, but there is no 'miracle-drug' on the energy horizon. This fact, coupled with our fossil fuel-centric infrastructure, puts energy security as a central risk for countries around the world - especially emerging economies experiencing rapid industrialisation.

To secure global energy supplies and ensure future generations are able to continue sustainable living, we can no longer blindly consume large quantities of energy to power our factories, our vehicles, and our homes. Possessing the knowledge to actively manage our energy via intelligent products and processes is an imperative - both in a financial and environmental sense.

The second megatrend driving the development and adoption of eco-marks is the public's desire for products with minimal environmental impact on the environment - at every point in their life cycle. A lack of transparency has prevented manufacturers and users from understanding what goes into products, and this has created environmental disasters both big and small. For example, billions of cellular phones, computers, and other consumer electronics are manufactured every year; but, until recently, they were built with little to no consideration of the impact on the environment when last year's phone is cast into a landfill in favour of this year's model.

This lack of consideration of the full environmental impact opens the possibility of toxicity during use and disposal. It creates waste by not outlining the potential recyclability of the product. But there has been a backlash. Both regulation and responsibility are causing individuals, companies, and governments to push for knowledge about the impact of the products they use, at every step of the product life cycle.

The third megatrend driving the introduction of eco-marks is the increased social and regulatory pressures resulting from environmental, safety, and climate change concerns. These pressures are emerging as legal and administrative requirements around carbon emissions and chemical substances reporting, as well as internal sustainability policies, which are beginning to become standard practice in business. Regulation is an important factor, and increasingly complex regulations are being introduced in every corner of the globe. In tandem, sustainable business and operations best practices are emerging to meet societal pressures from consumers, employees, and advocacy groups concerned about climate change. These groups are responding to our global energy challenges, and crave the implementation of sustainable, safe products that will leave a healthy world for future generations. For example, a survey conducted by the Massachusetts Institute of Technology found the American public is significantly more concerned about global warming than just a few years ago, with over 60% of American respondents listing climate change and global warming as serious concerns, and expressing the need for action to be taken to reduce carbon emissions. Given that 50% of projected emissions reductions will come from energy efficiency over the next 20 years, consumers will need intelligence around the efficiency and consumption of their products to help meet these goals.

These megatrends are not cyclical pressures that will fade over time. They represent a secular change in the way business is conducted. As a result, companies must adapt now. Whether building new facilities or designing products, progressive companies are now thinking long term. They are choosing to build their facilities - and their businesses - with efficient, sustainable products and technologies that will meet legal, societal, and business requirements well into the future.

Products with both high transparency and readily available composition and compliance information will allow businesses to save energy (and money) in the short term. Just as important, they will prevent expensive equipment overhauls and replacements as regulation and other factors force change in the future. The key to success when making this initial investment is complete and total certainty about the components, equipment, and materials they are purchasing. The key is trustworthy information.

In many cases, companies currently at the forefront of adopting sustainable products and environmental policies are those involved in industries that are energy intensive, such as energy generation and distribution, and extractive

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industries like mining, manufacturing, and transportation. These organisations have the greatest potential to impact our environment and are facing the greatest societal and governmental pressures. In many cases, they are responding accordingly. This exemplifies the power of these pressures to reshape business operations. As public demands increase, even companies with lesser environmental impact will be expected to comply.

It's not only energy-intensive industries currently pushing for sustainable products and solutions. Developers of long-life products, such as ships and buildings, want to know exactly what is in the components of products they are manufacturing, selling, and marketing to customers - especially in the face of stricter and more complex regulations. Liabilities inherent in components and materials must be addressed and accounted for. That makes access to sustainability and carbon footprint information critical to a company's long-term growth and product strategy. A new generation of standards is emerging to help meet this need for information.

THREE TYPES OF ISO 14020

The ISO 14020 series of standards addresses a range of approaches to environmental labels and declarations, including eco-labels, self-declared environmental claims, and quantified environmental information about products and services. There are three types of 14020 standards, as defined by the International Organisation for Standardisation (ISO), a global standard-setting body composed of representatives from various national standards organisations.

The first is Type I, which involves environmental labelling around principles and procedures, and is based around significant life cycle characteristics. These labels are awarded by a third-party organisation, often with a government background or high-visibility profile (such as an industry association), with criteria set by that governing body and a defined certification or auditing process. An example of this is the Green Label of Singapore, which has had more success with appliances and consumer products - such as refrigerators and air conditioners - than with industrial products. Many Type I categories have not covered the industrial electronics space. Even though these products are critical to sustainability reporting and policies, this oversight has caused them to be left behind.

Type II, the most commonly used industrial and private sector rating, incorporates self-declared environmental claims about products from their manufacturers. Because they do not use pre-determined characteristics, Type II labels are self-governed, and companies set up requirements for their own products and services. However, this self-policing leaves significant margin for gaps. For example, a company wishing to create a Type II label for its products could just focus on one phase of the life cycle, such as carbon emissions during the usage phase. This would leave out potentially significant impacts, such as emissions during the manufacture of the product, or environmental impacts during disposal. Although several industrial companies such as Panasonic, Omron, and Siemens have published and undertaken their own Type II ratings systems, these programmes have shortcomings that prevent their customers from receiving a truly comprehensive environmental picture, leaving customers to obtain necessary information on their own. For example, Panasonic and Omron Type II ratings provide a tremendous amount of knowledge on the usage phase of their products, but lack detailed information on the End of Life (EoL) phase.

This could result in confusion, the disposal of still-usable components, and improper recycling, leaving society to absorb the clean-up costs. In contrast, programmes like the Type II rating system from Siemens provide an assessment of all of the life cycle phases of a product, but fail in providing a clear and complete picture of the chemical make-up and data of a product. This could lead to significant challenges for users as they attempt to meet compliance and regulations. The development of more and more Type II labels signifies a positive shift in the private sector toward a more sustainable and responsible mindset. However, it is crucial that subsequently developed Type II labels take all phases of a product's life cycle into account, as well as clear and accessible information into a product's chemical composition. Only a comprehensive eco-mark can provide manufacturers and users a comprehensive picture.

The third standard, Type III, involves labelling around the product life cycle assessment, typically at the state or regional level. Similar to nutrition labels on food products detailing fat, sugar, and vitamins, these labels list a menu of a product's environmental impacts throughout its life cycle. Though they can be set by the industrial sector or by independent bodies, these ratings do not judge products - leaving that task to consumers. Instead, they compile an environmental score for

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each product that consumers can use to compare goods.

One Type III label is the ECO-LEAF programme, which was designed and implemented by the Japan Environmental Management Association. Although several large manufacturers such as Fuji, Hitachi, Toshiba, and Matsushita (Panasonic) have applied for and received this label on their products, most are for consumer-oriented products with a short life, such as photocopiers, telephones, scanners, and printers. Type III ratings are designed to be objective. They rely on the user to decide how to best interpret and evaluate the data provided, an often daunting task - especially when the data is not presented in a clear and concise way.

WHAT INFORMATION SHOULD AN ECO-MARK COVER?

When customers purchase a product with an eco-mark, they should be given a comprehensive portfolio of knowledge about the product. A comprehensive eco-mark should include information about the following crucial categories:

- Restriction of Hazardous Substances (RoHS) compliance;
- Substances of Very High Concern (SVHCs)
- Registration, Evaluation, Authorization, and Restriction of Chemicals (REACh) assessment and compliance;
- Product Environmental Profile (PEP); and End of Life Instruction (EoLI).

THE ROHS DIRECTIVE

The RoHS directive was rolled out in the European Union in the summer of 2006. It requires the elimination of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ether (PBDE) flame retardants in certain electrical and electronic equipment (primarily household and IT/technology equipment) marketed to consumers.

Compliance with this directive is especially important for breakers, circuits, and other wiring devices found in homes and offices, and specific compliance data should be included with every industrial product eco-mark.

SVHCS: SUBSTANCES OF VERY HIGH CONCERN

An SVHC is a chemical substance (or part of a group of chemical substances) specifically identified under the European Union's REACh regulation. A substance may be considered an SVHC if it meets one or more of the following criteria:

- It is carcinogenic;
- It is mutagenic;
- It is toxic for reproduction;
- It is persistent, bioaccumulative, and toxic;
- There is scientific evidence of probable serious effects to human health or the environment, which give rise to an equivalent level of concern.

REACh regulation addresses the production and use of chemical substances, as well as their potential impacts on both human health and the environment. Often cited as one of the most complex regulations in the history of the European Union (as well as one of the most important in decades), it is the most stringent law regulating chemical substances and affects industries throughout the world.

REACh is rolling out to all European industries. It will require companies manufacturing or importing chemical substances into the European Union in quantities of one ton or more per year to register these substances with the European Chemical Agency, or, for products in which one or more SVHC are present at more than 0.1% of the object's mass, to communicate this information to the buyers.

Because REACh also applies to substances often found in objects, essentially any company importing goods into or producing them in Europe could be affected. With legislation underway to pass a REACh programme in China and/or Korea, the imperative for manufacturers to abide by these regulations is clear.

This makes REACh compliance critically important when sourcing components for products and machines, as companies must be aware of what they are purchasing - not only for the assurance that they are complying with current legislation and regulations, but also for the benefit of their employees, customers, and end users.

Furthermore, under REACh legislation, the European Chemicals Agency/European Union can require companies to develop plans to substitute SVHCs with a safer alternative. Coupled with the regulation that businesses affected by REACh are required to capture, manage, and submit information on the chemical properties and effects of their products, companies must be able to easily access this data.

PEP – PRODUCT ENVIRONMENTAL PROFILE

A PEP provides comprehensive information about the composition of a product, down to its raw materials. PEP provides information around:

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- Constituent materials, or the raw materials which make up the composition of the product;
- The recyclability rate of a product - dove-tailing into the other information and instructions provided in the EoL aspect of a product;
- The environmental impact the product has throughout its life cycle phases, via analysis of its 11 key performance indicators (KPIs). These indicators primarily focus on the carbon footprint of a product and its air toxicity, as well as relay key information on water and raw material consumption and depletion.

A PEP is especially useful for companies seeking to monitor, control, and/or reduce their carbon emissions. Knowledge of a product's carbon emissions, and, subsequently, how a specific product will impact climate change and global warming, is one of the most critical aspects of purchasing and implementing a truly sustainable product.

Although a product's carbon emissions are most often considered during the usage phase of its life cycle, a comprehensive eco-mark should include information about the emissions of a product throughout every phase of its life cycle.

These phases include the creation and manufacturing of a product; its transportation throughout the value chain to its end user; its installation into specific processes and operations; its usage; and, through its operations as well, additional emissions created during the disposal, recycling, and/or degradation of the product.

EOLI – END OF LIFE INSTRUCTION, RECYCLABILITY RATE, AND BILL OF MATERIAL

An eco-mark must also address the highly neglected life cycle planning aspect of a product's end-of-life (or EoL). The EoL stage ultimately leads to the disposal of a product after its useful life cycle is over. Today, lack of information can lead to negligent planning for product EoL. Many companies are left in the dark about how to dispose of their products properly - leading to the need for society to absorb the cost of responsible disposal.

An eco-mark can solve this challenge for customers by providing them with a comprehensive overview of a product's constituent materials (also identified in the PEP) and the recyclability rates of its products, along with a comprehensive EoL instruction manual. The manual indicates information that mitigates personal hazards prior to beginning recycling operations; the identification of parts to be dismantled for reuse purposes; selective treatment to mitigate environmental hazards and pollution; use of single recyclable materials; and incompatibility with ordinary recycling processes.

When companies have access to critical information about the last stage of a product's life, they are able to achieve compliance with their own sustainability and recycling policies, reducing environmental hazards from wrongful disposal or recycling. Additionally, they are able to re-use parts of the equipment for other purposes - increasing financial and operational efficiency. The re-use of parts also adds another layer of credibility to a company's sustainability story, eliminating the need for the additional, carbon-emitting manufacturing and transportation of replacement products. With comprehensive information in these four categories, RoHS; SVHCs/REACh compliance; PEP; and EoLI, organisations will have the knowledge they need to make the right sustainability decisions for their business.

CONCLUSION

Good intentions and government regulation alone cannot help companies to meet their sustainability goals. What's needed is Information? Transparency. Knowledge. At the end of the day, trusted knowledge is truly power.

Taking an environmentally conscious, progressive stance towards becoming sustainable has benefits which more and more companies are beginning to realise.

In addition to being able to cultivate and capture more growth opportunities, market share, and the ability to realise higher prices and profits as a result of adopting sustainable products, companies both large and small are reaping significant internal benefits as well. In fact, 44% of companies which are sustainability leaders within their industries are able to improve employee retention and/or motivation *(source: McKinsey 2011 Global Survey: The Business of Sustainability)*, increasing productivity and in turn, profits.

The question for companies today is not if, but how, they should incorporate sustainability into their business models. The foundation of a comprehensive sustainability initiative is understanding the composition and impact of the products that a company uses. wn

Google invests $12 million in 96 Megawatt South African Solar Site

Google has just invested $12 million USD in a new solar energy project in South Africa; it is the internet giant's first renewable energy investment outside of North America and Europe. The project is called the Jasper Power Project, a 96 megawatt solar photovoltaic site in the Northern Cape Province, near Kimberly.

BY I JONATHAN KEANE

The funding will ensure that Jasper becomes one of Africa's largest and most productive solar energy projects. The plant could ultimately power 30,000 homes in South Africa and generate up to 18 gigawatts of renewable energy by the year 2030.

When we consider investing in a renewable energy project, we focus on two key factors. First, we only pursue investments that we believe make financial sense," according to an official blog post from Google. "South Africa's strong resources and supportive policies for renewable energy make it an attractive place to invest—which is why it had the highest growth in clean energy investment in the world last year."

"Second, we look for projects that have transformative potential - that is, projects that will bolster the growth of the renewable energy industry and move the world closer to a clean energy future. The Jasper Power Project is one of those transformative opportunities."

The investment comes at a crucial time for South Africa, which has experienced energy shortages in recent years. In 2008, a dangerously low shortage resulted in blackouts across the country and crippled much of South Africa's economic growth at the time.

Previously, Google has invested $1 billion USD in renewable energy in North America and Europe, with this venture bringing them into Africa for the first time, with more investments in energy across the continent possible in the near future. At the time of its announcement, Google confirmed that the Jasper development will create up to 300 construction jobs and 50 permanent jobs at the site. wn

STAR PERFORMER SAVES ENERGY

In many countries around the world, just like South Africa, where the voltage supply is inherently unstable, voltage optimisation has been used for well over a decade to save energy and reduce carbon emissions. During the last ten years the technology has also been constantly evolving, with Powerstar's fixed and electronic-dynamic systems becoming the market leading solutions.

Voltage optimisation systems address the imbalances between a building's voltage supply and the demands of the electrical loads, by bringing the supply in line with the on-site electricity required. This reduction in voltage used, in turn results in electricity costs and carbon emissions being lower. There are two types of voltage optimisation system on the market; fixed and electronic (also referred to as variable or electronic-dynamic).

Fixed systems, like the original multi award winning, UK manufactured, Powerstar system, drop the incoming voltage by a set amount, to match the optimum voltage profile of the site.

Should a building have an unstable voltage supply however, high night loading, secure or critical data, then a system using electronic-dynamic voltage optimisation technology, like Powerstar MAX, will be required. A solution like Powerstar MAX systematically manages the peaks and troughs in power supplied by the National Energy Grid, ensuring the voltage supplied to a site at a constant, stable, level.

Both the fixed and electronic variations of voltage optimisation have been well received by companies across the world, as buildings new and old can access the benefits of voltage optimisation.

To date, the systems have been installed into premises across a variety of sectors including manufacturing sites, supermarkets, hotels, storage facilities, warehouses, processing plants, call centres, offices and public sector buildings.

Exact savings will vary depending on the building and the type of installation however, it is fair to say that Powerstar voltage optimisation solutions will deliver between 12%-15% savings. As one of the most efficient systems, Powerstar has actually achieved savings of up to 26% of total electricity consumption and related CO_2 emissions, without compromising the supply to electrical equipment. The reduced voltage and improved power quality delivered by voltage optimisation products also enhances equipment lifespan. Reducing the need to repair and replace essential equipment is just another way voltage optimisation can help save money. Although the systems can be installed in a matter of hours, a voltage optimisation system should not be viewed as an off the shelf solution. In order to maximise the savings and benefits, a site-specific survey should be carried out by the manufacturer or consultant to ensure the most appropriate solution is installed for the requirements of the building,

With a track record in dependability and recorded savings to reduce energy consumption, carbon emissions and costs, Powerstar is a proven, reliable, and cost-effective energy saving solution. It is also the only voltage optimisation unit in the world to be granted a patent on its design; ensuring unrivalled efficiency.

Tsebo Energy Solutions (TES) is the official South African distributor of the Powerstar range of products. TES will assess the customer's energy data using consumption intelligence (CI) systems and then provide a clear proposal outlining the guaranteed savings a Powerstar installation would generate.

For further information about Powerstar voltage optimisation system in South Africa please contact southafrica@powerstar.com or call +27 87 940 8111.
Visit the Powerstar website at www.powerstar.com

STUDYING IN 2014?

Apply now for a SAIEE bursary

The SAIEE has for many years provided bursaries for suitable candidates to study for a diploma or degree in Electrical, Electronic or Computer Engineering. The bursaries are for prospective students as well as for students who have completed there 1st, 2nd, or 3rd year at a recognized South African tertiary institution.

BY I HERMANN BROSCHK
FSAIEE I CHAIRMAN OF BURSARY COMMITTEE

The SAIEE Education and Development Fund has made the necessary funds available to finance a number of bursars annually. These bursaries are awarded in accordance with the SAIEE General Rules, Conditions and Guidelines for the selection of bursary applications. These funds are supplemented by funds from long standing bequeaths from past presidents, members of the SAIEE and prominent businessmen. These include amongst other Harry Aspinall, former head of the Electrical Department of the Witwatersrand Technical College and fellow and past president of the SAIEE.

Arthur Trevor Williams bequeathed funds for a scholarship and was a member of the SAIEE and a well-known businessman.

Jack Yelland was a fellow and an honorary member of the South African Institute of Electrical Technician Engineers (SAIETE). When the SAIETE merged with the SAIEE in 2000, the remaining funds of the SAIETE were transferred to the SAIEE to be invested, and the proceeds used to fund a bursary to be named - The Jack Yelland Fund.

After Victor Wilson's untimely death in 2009, his wife bequeathed funds for a SAIEE bursary. Victor was past president and fellow of the SAIEE.

SAIEE funds as well as funds bequeathed have been astutely invested resulting in the funds growing and providing the necessary funds for the allocation of new bursaries as well as servicing of existing bursaries, this culminated in the award of 10 bursaries for 2013.

The SAIEE bursars have produced very good results with very few failures over the past years. Some important conditions and aspects, which apply to the awarding of the bursaries, are as follows;

- Applicants must be South African Citizens.
- Bursaries are only for undergraduate studies at a recognized South African tertiary institution.
- Selection of bursars is awarded on merit.
- Demographics as well as the socio-economic circumstances of the parents/guardian are to be taken into account.
- The funds provided are for tuition and prescribed books only.
- Application of dependants of members of the SAIEE will receive preference.

The closing date for the submission of bursary applications is 30 October 2013 and late submission will not be considered. Application forms are available from the SAIEE in Johannesburg or can be downloaded from the SAIEE website.

It is of utmost importance that the stipulated conditions of the application form and all the required documentation, certified by a commissioner of Oaths is included with the applications. Applications not providing all the necessary information and documentation will be disqualified.

STUDY LOANS

In addition to the bursary scheme, the SAIEE has a "Study Loan" assistance scheme for suitable applicants who have not been awarded a bursary, this scheme is to assist these applicants to commence or continue with their studies in Electrical or Computer Engineering. If an unsuccessful applicant is prepared to apply for such a loan, the SAIEE will provide the necessary application form, which can be submitted to a participating bank. The SAIEE will pay the interest rates of such a loan for the duration of the year and continue to pay the interest until the degree or diploma has been completed.

BURSARIES FUNDED BY OTHER COMPANIES AND ADMINISTERED BY THE SAIEE

The SAIEE provides an administration service for bursaries funded by companies or organizations that do not wish to administer their bursaries. A fee for these services will be levied by the SAIEE. These bursaries must be for studies leading it a degree or diploma in Electrical or Computer Engineering at a South African tertiary institute. They will be subject to the rules of the SAIEE bursary scheme as well as conditions etc. stipulated by the organization if these differ from those of the SAIEE. The SAIEE is prepared to select suitable applicants from their bursary applications to submit to an organization or a company's bursary fund.

SPONSORSHIP FOR APPLICANTS WHO WERE NOT AWARDED SAIEE BURSARIES

The SAIEE receives in excess of 500 applications per year of which a large percentage are disqualified, of the remaining applications only approximately 10 bursaries are awarded. A considerable number of applicants usually meet all the criteria for the award of a bursary but are not selected. These are ideal applicants for a bursary funded from other sources. To alleviate this situation and assist these worthy applicants, the SAIEE welcome sponsors who would be prepared to fund these applicants. The SAIEE would administer these bursaries.

Furthermore these bursars could be employed by the sponsor's organization after the completion of their studies if required.

VOCATIONAL TRAINING

The SAIEE receives numerous enquiries from bursars and other students, whose courses require vocational training during vacation. This particularly applies to technicians and technologist students whose curriculum stipulates compulsory training at specific times during their courses. This training is compulsory before their degrees and diplomas are issued. In addition students who have completed their diplomas or degrees also require practical training as engineer of technologists/technician in training. The SAIEE does not have the means to provide the above facilities and any assistance from organization or companies welcomed by the SAIEE.

For more information regarding the SAIEE bursary scheme as well as sponsorship and loans please contact:
The Secretary
Bursary Administrator
Dudu Madondo
Tel: 011 487 3003/9045
Email: dudum@saiee.org.za

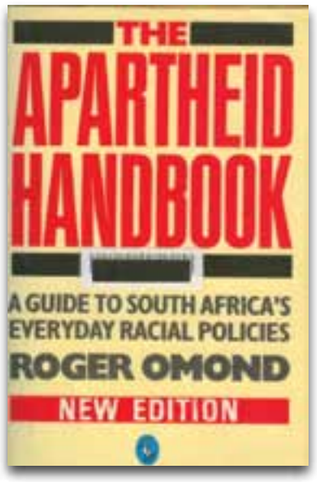
August

ORIGIN Old English , from Latin augustus *'consecrated, venerable'* ; named after Augustus Caesar, the first Roman emperor.

COMPILED BY I JANE BUISSON-STREET
SSAIEE I PMCSSA

1 August

1873 Today Hallidie's Clay Street Hill Railway Co kept their promise that they would take the fatigue out of one of San Francisco's most daunting inclines by opening a new service – a cable railroad. Each of the new cable cars that operate with 853m lines is fitted with a device that grips a moving continuous cable embedded in the roadway.



1985 The USA agrees to sanctions against South Africa to protest against apartheid.

2 August

1865 Alice's Adventures in Wonderland by Charles Dodgson (Lewis Carroll) is published today.

3 August

1914 *"The lamps are going out all over Europe; we shall not see them lit again in our lifetime."* Lord Grey, British Statesman on the eve of the First World War.

1926 England's first traffic lights are set up in London's Piccadilly Circus.

5 August

1858 The completion today of the world's first transatlantic telegraph cable is a dream come true for American financer Cyrus West Field who has sunk his considerable financial resources and mental energies into this monumental project. The cable, which runs between Ireland and Newfoundland, was laid jointly by the naval vessels USS Niagara and HMS Agamemnon.

1914 In Cleveland, Ohio, the world's first four way electric traffic lights are installed.

6 August

1890 The electric chair is used for the first time in New York.

1945 Atom Bomb Wipes Out Hiroshima.

9 August

1979 A furore was created today when Councillors in the Sussex seaside town of Brighton agreed to allow naturists to bare all on one of the less popular beaches in the borough. *"If God wanted us to walk round naked, we would all have been born that way."* – Anon

10 August

1889 The screw bottle top is patented by the Hope Glass Works near Barnsley, Yorkshire, England.

1966 Orbiter I, the first American moon satellite is launched.

12 August

1877 At the cutting edge of hi-tech: "Thomas Edison, the 30-year-old of new technology, is on the brink of developing his first wholly original invention. A small group of people at Edison's *"invention factory"* at Menlo Park, New Jersey, to witness a public demonstration of a new device – a phonograph – which records the human voice. They listened dumbfounded to a recoding of Edison reciting, "Mary had a little lamb". The phonograph has been ingeniously adapted from the telegraph repeater: a telephone diaphragm connects to an embossing needle which impresses on a suitable material the variations of the human voice.

1908 The Model T, the car that some are predicting will revolutionise motoring, started rolling out from the Ford Motor Company's factory today. The car is a sturdy four-cylinder number, which comes in two versions, the tourer and the roadster, retails at incredibly low prices: $825 (£445) for the roadster and just $25 (£13) more for the tourer. Volume production is fundamental to Ford's low-price policy. Ford intends to utilise standardised parts and an assembly-line method of production.

14 August

2003 Blackouts cause chaos in northeast America and Canada as 50 million people are without power.

17 August

1896 The first pedestrian to be killed by a car is knocked down in Croydon, England. The car was travelling at about 4mph (6,4kph).

1989 The first non-stop flight from London to Sydney was made by an Australian airliner.

20 August

1913 Harry Brearly cast stainless steel in Sheffield.

1940 Radar is used for the first time by the British in World War II.

1956 Britain's first nuclear power is generated at Calder Hall Power Station, Cumbria.

21 August

1959 America gets its 50th state – Hawaii.

1976 Mary Langdon joins the East Sussex fire department becoming Britain's first female "fireman".

1988 British pubs are now able to stay open 12 hours a day except for Sundays.

22 August

1989 The world's first pocket phone is launched by British Telecom. These phones operate within 100 yards of a public base station.

25 August

1819 James Watt, English inventor and inventor of the steam engine died today.

1841 Three women graduate from the Oberlin Collegiate Institute, Ohio and are the first women to be granted degrees.

1919 The world's fist scheduled international air service begins between Paris and London.

26 August

1936 The first high-definition television programmes seen in Britain were transmitted today from the BBC studios at Alexandra Palace, London, to the Radio Show at Olympia (Radiolympia).

1989 The Mini celebrates its 30th birthday today.

28 August

1850 The Channel telegraph cable is finally laid between Dover and Cap Gris Nez.

30 August

1860 The first trains in Britain begin operating.

1881 Germany's Clement Ader patents the first stereo system.

1901 The vacuum cleaner is patented by Scotsman Hubert Cecil Booth.

1963 A direct telephone line between the White House and the Kremlin became operational today.

31 August

1900 Coca-Cola goes on sale in Britain.

1972 Mark Spitz, American swimmer, wins five gold medals at the Berlin Olympic Games. Wn

On the light…(er..) side

I should have seen it coming, after all the little barometer/ gauge thingamajig on the TV was inching its way into the red and warning us to turn off appliances and so forth. However it still came as a shock when the lights went out just as I was preparing dinner for my book club.

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BY I ANGELA PRICE

It's in moments like this that I am so relieved to be married to an engineer. Do they roll over and play dead in a situation such as this; or suggest getting a KFC bucket special for the book club? Heck no! My man ran out into the garage and reappeared (small miracle…) with his camping gas stove, which he promptly set up in the kitchen and used to warm the soup. That was the easy part; he really pulled out all the stops however when he began to help prepare the starter - toasted bruschetta topped with pickled peppers. My Masterchef painstakingly held each little bruschetta on a fondue fork over the flames getting it toasted to perfection.

Our little fondue fork episode is about the closest my hubby has come to solving our power problems – I am under no illusion that he is any sort of power engineer. Re-wiring our DB board excites him, but saving electricity…nah…not so much. I, on the other hand, am convinced that I can single-handedly make a difference to the power crisis (the starfish principle and all that). I have given it some considerable thought - most recently whilst sweating away in a spinning class, staring at someone else's backside. Why, I wondered for the umpteenth time, do they not harness all this energy we are pumping out through our legs and into these bikes? Just think for a moment… if all this pedal power was used for propelling the ceiling fans, we would be greatly incentivised to pedal faster!

Back on the home front, I feel like I am the only one in our house waging war on the electricity crisis. I walk around the house switching off lights and muttering my mantra under my breath 'no one in the room, then turn off the lights!' I religiously turn off my laptop every night (mainly because I read an email about them overheating and burning the housedown). Somewhat frustratingly my electrical engineer of a husband does not share my dedication to 'the cause'. We have had some long 'discussions' about the benefits of turning off lights, turning down the geyser (or better still putting it on a timer) and changing to some of those rather expensive LED down lighters. He did however, agree to fix the pool pump timer, although I think part of the incentive was his shopping trip to Builders to get the new parts.

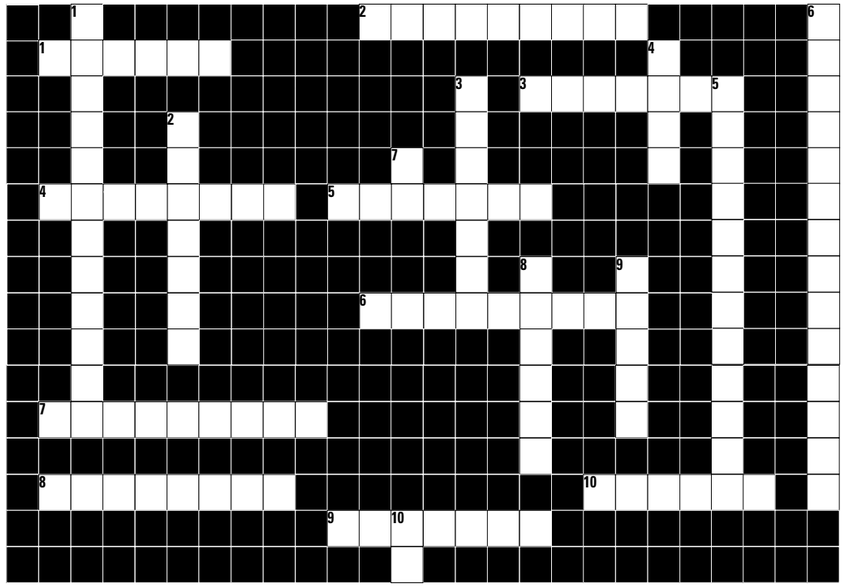
I have visions of eventually getting 'off the grid', even though we still have quite some way to go - I am however determined to persevere. We have a log burning fire place, the stove is gas and we plan to install a solar geyser. I grow my own veggies (which I feed with compost harvested from my wormery) and inch by inch I feel like I am getting closer to getting off that 'grid'- incentivised monthly by my electricity and water bill. And then every so often, someone (in)-considerately cuts the cables outside my house and takes me temporarily 'off the grid'.

Whilst watering my lettuce seedlings with worm wee I once again find myself wondering about energy producing spinning classes as I hum the chorus to the 90's hit by the German group Snap!...*'I've got the power'*. wn

Have some fun and stand a chance to win R1000.
Complete the August issue crossword puzzle and send it with your name, surname and contact details to: *Managing Editor, August 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 August 2013**. The winner of R1000 will be announced in the October 2013 issue of the **watt**now magazine.

R1000 win

BERGMAN FISHER ASSOCIATES, DESIGNERS OF A SAFER GREENER ENERGY EFFICIENT FUTURE, ARE THE PROUD SPONSOR OF OUR CROSSWORD PUZZLE.



ACROSS

1. See 1 down.
2. What electrical device converts alternating current to direct current? (9)
3. Whose transformer design became the prototype for all future transformers? (7,7)
4. What electrical device converts direct current to alternating current? (8)
5. See 3 down.
6. To transfer power, which type of system is the most common method used by electrical grids to transfer power? (9)
7. Who was known as "King of DC"? (4,5)
8. What did Ferranti invent at the age of 14? (3,5)
9. See 3 across.
10. Alternating Current (abbr.)

DOWN

1. In 1891, who installed the first major power system that was designed to drive an electric motor and not just provide electric lighting? (6,12)
2. Who was the 2011 SAIEE Engineer of the Year? (4,7)
3. In 1831, who made the greatest discovery with respect to power engineering in the world? (7,7)
4. See 2 down.
5. Which system transmitted 20 megawatts of hydroelectric power a distance of 200 km, including 10 km of underground cable? (8,4)
6. Which charity will be the benefactors of the 2013 SAIEE Charity Golf Day? (5,1,4,4)
7. Direct Current (abbr.)
8. In 1646, who was the first to use the english word "electricity"? (6,6)
9. What type of winding connection is used on a transformer when it is connected between phases of a three-phase system? (5)
10. Alternating Current (abbr.)

June issue winner:
A. Dabrowski | Pretoria

June issue answers:

ACROSS
1 Claude **2** Charles Wheatstone **3** Baudot **4** Morse **5** Electric Magnetic Telegraph **6** Bahrain **7** CW **8** Email **9** ICASA **10** Germany

DOWN
1 Share **2** William Cooke **3** Chappe **4** Albert Turpain **5** Simonstown **6** Telex **7** Facsimile **8** Cape Town **9** Telkom **10** Durban

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 August 2013. 8. The winner will be announced in the October 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

AUGUST 2013

6-7	The Digital Revolution in Africa	Hilton, Sandton, JHB	www.tmforum.org.za
13-15	M-Tech Congress	CSIR Conference Centre, Pretoria	www.m-tech.co.za
16	SAIEE Networking Breakfast - NERSA	SAIEE House, JHB	geyerg@saiee.org.za
19-21	Industrial & Commercial use of Energy conference	Newlands, Cape Town	www.cput.ac.za
27-30	9th IEEE International Symposium on Diagnostics for Electric Machines, Power Electronics and Drives - (SDEMPED 2013)		
		VALENCIA , Spain	www.ta.ieee.org
27-29	6th IDC Innovation Summit	Johannesburg	www.jnpr.co.za

SEPTEMBER 2013

6	Bernard Price Memorial Lecture	Wits, JHB	geyerg@saiee.org.za
16-18	3 Day MBA - Power & Electricity	Johannesburg	www.terrapinn.com
18	SAIEE Charity Golf Day	Rand Park Golf Course	geyerg@saiee.org.za
25-28	Eskom Expo for Young Scientists	Birchwood Hotel, Boksburg	geyerg@saiee.org.za

OCTOBER 2013

9-11	Africa Electricity 2013	Sandton, Johannesburg	www.africaelectricity.com
13-17	22nd World Energy Congress, DAEGU 2013	Daegu, Korea	www.daegu2013.kr
22-24	FILTECH International Conference & Expo	Wiesbaden, Germany	www.filtech.de
23	SANEA Lecture	Cape Town	www.sanea.org.za
29-31	Johburg Indaba, Investing in Resources & Mining in Africa	Sandton, Johannesburg	www.joburgindaba.com
30-31	Robmech 2013	University of KZN, Natal	www.robmech.co.za

M-TECH CONGRESS

13-15 AUGUST 2013
CSIR I PRETORIA

For more info contact Elmari Viljoen
083 306 2720; or
ElmariV@mwebbiz.co.za

Dr Jasper Coetzee, Managing Director of M-Tech and his team are hosting a conference on World Trends in Maintenance Engineering this year. Four very successful such conferences have been held in 1997, 1999, 2000 and 2001.

The Conference will be held in August 2013 at the CSIR Conference Centre in Pretoria.

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