

# wattnow

THE SAIEE SUPPORTS ENERGY EFFICIENCY AND THE ENVIRONMENT

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issue



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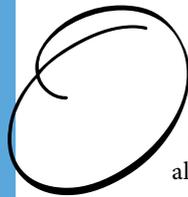
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October – the 10th month of the year. I already hear Christmas music in the stores and see retailers selling Christmas decorations – which makes we want to ask: “Where did you park your space-ship? Not again!” I’ve barely come to grips with writing ‘2012’ and, within 2 months, we will be going into 2013!!

Well, talking about parking a space ship, we feature Space in this issue of wattnow. On page 18, Thinus van As writes on the Powering of Spacecraft, which, according to Sir Richard Branson, it is often easier to design something complex than it is to design something simple.

You will find a step-by-step article on “Manufacturing & Testing of High Voltage Current Transformers” on page 24, aptly written by Robin Coombs.

On page 34, you will find an article which describes a synchronising and scheduling system for application on wide area synchronised data acquisition applications and fault location in power systems, using GPS technology.

Page 42 sees Mr Hunt sharing with us a few “Items of Interest” in his career – it makes for an ‘interesting’ read. He also shares with us his “Memories as a War Time Appie”, on page 48.

On page 44, Thandiwe Nkambule informs us on how e-tolls really work. She takes us behind the scenes of the dreaded white elephant lurking on the horizon.

On page 61 you will find our monthly crossword. You will see that we have secured a new sponsor to the crossword, Bergman Fisher Associates – we welcome them on board and at the same time, I wish to thank Algae-X for their year-long commitment in sponsoring the crossword. It did not go unnoticed.

Soon, you will be receiving an invitation to join us at the wattnow birthday Bash, on the 16th of November at 7:30am. Please keep this space open in your diary and keep a look out for your invite. Cost, R150 p/p. There will be great prizes to be won. Do not forget your business cards, as it is where you will do business and meet new people.

Herewith your October issue, enjoy the read!



Visit [www.wattnow.co.za](http://www.wattnow.co.za) to answer the questions related to these articles to earn your CPD points.

*Minx*

*The IDC provided an international guarantee facility to Vektronix in East London where Samsung flat-panel television sets are assembled. The net result has been the creation of 153 secure jobs.*

The IDC continues to identify and provide development funding for projects that will contribute to the accelerated building of South Africa's industrial capacity and the creation of sustainable jobs. Visit [www.idc.co.za](http://www.idc.co.za) to find out more.

After more than 35 years, Vektronix, the first TV manufacturing plant in South Africa, remains a flexible and cost-effective consumer electronics manufacturer in the country.

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reetings to All.

The past month has been a busy one. The Institute hosted the 61st Bernard Price Memorial lecture titled “Integrating Renewables in the Power System of Tomorrow: Definitely not Business as Usual.” The lecture was presented by Dr Nickolas Filon Frydas. Nick obtained his Doctorate in Glasgow and works for the International Consulting Group Mott MacDonald Ltd mainly involved in Energy Policy, Power Sector reforms, and Market Design.

The world’s population is expected to grow to 9 billion by 2050. Currently only 1 billion have access to electricity and the demand is expected to grow by 55% in the next 18 years.

As fossil fuels are fast becoming depleted, besides the climate change considerations, alternative sources of primary energy have to be used. Nick coined the phrase: “Decarbonising the Power System.” He outlined the various forms of primary energy available, and demonstrated that the 2 most plentiful sources were wind and solar power. The problem is that both of these are uncertain and variable. To overcome this problem one would need to dispatch alternative power in the event of wind not blowing, or the sun not shining. The system operator would have to forecast the future demands for power. The accuracy of the forecast is affected by the variability of wind – 8% uncertainty, and the length of time before the forecast – real time forecasting being more accurate. To minimize the uncertainty, storage, interconnectivity with neighbouring systems, and demand side management can be used. Buying

capacity or “active demand” would be a way to reduce the load on generation capacity. This will lead to a paradigm shift of demand following generation instead of the other way round, which is the current situation. To manage this, Nick supported energy markets, where the Independent System Operator would operate on 4 markets – future, monthly auction, day-ahead, and intraday (real-time). The ISO would be able to purchase balancing capacity to meet the demand. He also stated that the ISO should own, operate and maintain the transmission system.

In terms of decarbonising power he cited the example of electric vehicles replacing internal combustion engines. In the UK there are currently 32 million vehicles. If 10 million cars had to plug in to the grid at the same time, the additional demand would be 80 GW, the current maximum demand in the UK being 60 GW, and the installed capacity 75 GW.

He concluded by demonstrating that the only way to manage the situation with real-time tariffs and trading was the use of smart meters, and that the System as we know it will definitely have to change from that developed in the 20th century – a major challenge for the engineers of the future !!!

The lecture was presented at Cape Town on the 19th (60 attendees), co-hosted by the Witwatersrand University on the 20th (130 attendees), at Bloemfontein on the 21st (25 attendees), at Port Elizabeth on the 25th (110 attendees), at East London on the 26th (35 attendees), and Durban on the 27th (54 attendees). As you can see, it was quite a hectic schedule, and we are very grateful to Nick and Mott MacDonald for Nick’s time.

Mike Cary | SAIEE President 2012

A coastal engineering wonder was born when two men put their heads together for the good of their coastline – and coastlines around the world. It all began in 1963, when a storm devastated the Eastern Cape coast of South Africa. Anxious to protect their harbour, two East London engineers developed a series of branching concrete blocks called dolosse that, when piled together, could absorb the ocean's power. The simple design was so successful that the men decided not to patent it, which is why these unique blocks can be found in their millions in over 100 countries across the globe.

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# WATTSHOT

In this issue, we feature some gadgets and gizmos for the tech savvy!



## JAGUAR PERFORMANCE EDT 100ML

Male virility and sporty elegance captured by this innovative fragrance. Bearing the signature of the renowned master perfumer Harry Fremont, of Firmenich New York, PERFORMANCE is a fragrance combining the remarkable characteristics of Jaguar: streamlined power and sheer performance. A member of the fresh-aromatic family of fragrances, the cool spiciness of basil and tingling of mandarin orange generate an explosive top note. This surprising beginning is followed by a fresh minty medley, skillfully underpinned by the strength of cypress, lending unexpected character to the aromatic first impression. A must-have! R420 (incl.)

## SALT + POWER

Recharge your meals and energise your tastebuds with these cheeky salt and pepper pots. Salt + Power are the same size and shape as normal D-cell batteries, but tip them up and they'll dish out your favourite table condiments.

A clear vertical strip shows how much "charge" is left in each battery. When the flavours finally go flat, just pop out the rubber bung underneath and refill! It's as easy as A, AA, AAA. Retailing at R199.



## POWERTRAVELLER POWERMONKEY DISCOVERY

Featuring a state-of-the-art 3500mAh lithium polymer battery, the sleek powermonkey discovery offers users real power on the move.

Housed in a stylish full aluminium case with 6 high bright pin point LED lights, the powermonkey discovery will recharge an iPhone twice, standard mobile phones 3-4 times, or give iPods / MP3 players up to an additional 120 hours playtime. It is also compatible with e-readers, Sat Navs, handheld games consoles, portable GPS systems and more! Cost R699.



The products in the **wattshot** section can be purchased online on [www.mantality.co.za](http://www.mantality.co.za) unless otherwise specified.

## HOME CINEMA POPCORN MAKER KIT

The popcorn maker machine. Nothing makes a trip to the cinema like a box of freshly-popped corn. Goodness knows how this sweet/savoury snack became so inextricably linked but watching a movie just isn't the same unless you're scoffing handfuls of the fluffy nuggets.

The only problem is, with cinema tickets getting pricier and home cinema systems getting cheaper, we're just not going to the movies as much. Which means we're having to settle for shop-bought popcorn or the not-quite-as-good microwavable stuff. Well no more!

The Home Cinema Popcorn Maker Kit will make mountains of the hot, spongy wonders using the same technology as your local multiplex. Simply load the hopper with the included Premium Raw Kernels and set it humming. There are no messy ingredients involved, and tidying up is easy! When you've popped enough corn for everyone, shake on either the caramel or butter seasonings and serve. But not in your usual Tupperware bowl - serve it like the cinema!



The Home Cinema Popcorn Kit comes with 25 flat-packed boxes in the classic cinema style. Filled with fresh, hot popcorn, it's the ideal accompaniment to a movie night with friends, entertaining the kids, talking through your holiday snaps or savouring those rare quiet nights in. Now all you need is a 4ft hotdog and a bucket of coke. Sells for R1,860



## DIGITAL HEAD AND NECK MASSAGER

Who doesn't want to reduce stress? A quick and easy way to promote inner peace, this massager will help you increase productivity, improve sleep, and enables you to fully enjoy all that life has to offer. From the hard working mother to the elderly grandfather, this massager is easy to use and great for all ages. It can even be powered by 4x AA batteries (not included), so you can use it on the road or after your next exhausting business trip. Retail price R1,500

## CELLUON MAGIC CUBE® VIRTUAL PROJECTION KEYBOARD

The Magic Cube is a compact and versatile product; it is a projection keyboard and multi-touch mouse, all in one easy-to-use product. It connects easily to any Bluetooth HID devices, including the latest iPhone, iPad and Android devices. You can also plug-n-play with Windows and Mac OS devices via USB connection. With just a single flick of a switch, the Magic Cube is ready to pair wirelessly with your mobile device. It fits easily in your pocket and it is perfect for on the go. You'll be sure to turn heads the moment you start typing on the Magic Cube. Retail R1,499



# WATTS HOT

## SAMSUNG GALAXY NOTE 10.1

Samsung recently announced the launch of GALAXY Note 10.1 globally; an extension of the GALAXY Note category and today this much anticipated product arrives on local shores.

The GALAXY Note 10.1 is outfitted with the functionality and precision of a pen and paper on a 10.1-inch large display, providing endless possibilities to elevate a user's creativity, productivity and learning abilities. Featuring an intuitive user experience and armed with a 1.4GHz quad-core processor and 2GB RAM for enhanced performance, GALAXY Note 10.1 is designed to simplify idea capture, information access, and multi-tasking, making each easier and faster. GALAXY Note 10.1 allows users to express their ideas naturally and efficiently. GALAXY Note 10.1 is available in South Africa at an approximate RRP from R8 499.



## SURGE ARRESTERS WITH ACTIVSENSE TECHNOLOGY

DEHN's Blitzductor XTU, with actiVsense technology, is a universal surge arrester that automatically adapts itself to the nominal voltage of the installation. Designed to protect information and automation systems, the combined lightning current and surge arrester can be used for all voltages in the 0 – 180 V DC range. Blitzductor XTU also continuously adapts its voltage protection level to the currently applied signal voltage and is ideally suited for all fluctuating signal applications. It is capable of carrying lightning currents up to 10 kA (10/350 µs).

For more info, visit [www.surgetek.co.za](http://www.surgetek.co.za)



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# WATTSUP

## BERNARD PRICE MEMORIAL LECTURE 2012 TOUR



*Delegates at the Wits BP Lecture, from l-r; Angus Hay, Mike Cary, Nick Frydas, Viv Crone.*



*SAIEE President Mike Cary, Margaret Cary with Nick Frydas.*

International energy regulation specialist, Nick Frydas is headlining the South African Institute of Electrical Engineers' (SAIEE) annual country-wide 2012 Bernard Price Memorial Lecture series, which kicked off in Cape Town this year.

Nick Frydas works for global engineering and management consultancy Mott MacDonald and is recognized as an international authority in his field.

The title of the lecture is *'Integrating renewables in the power system of tomorrow - definitely not business as usual!'*. The subject will review challenges around climate change and security of supply leading to the decarbonisation of the power system. It

will tackle issues of large scale integration of Renewable Energy Systems (RES) into power systems. With renewable energy capacity steadily growing worldwide, issues around integration are an increasing concern: carrying reserve for response, uncertainty of wind and solar output and curtailing RES when 'spillages' can't be managed. These are all problems which keep dispatchers awake at night and Frydas will be exploring some of the technical and regulatory solutions to this.

The lecture series is named after the late Dr Bernard Price because of his great contribution as an engineer to the power supply industry in South Africa, as a President of the Institute and as founder of

the Bernard Price Institutes of Geophysical Research and of Paleontology at the University of the Witwatersrand.

Mike Cary President of the SAIEE said: *"We are pleased to have such a renowned speaker for this prestigious lecture. The SAIEE Centre Chairmen, as hosts, would like to invite members, friends and students to attend these free lectures and benefit from the knowledge and experience of our visiting lecturer, Nick Frydas. Being present, will not only be of great interest to engineers and anyone recognizing the significance of this subject, but also allow attendees to pay tribute to the engineers, past and present, who have so greatly contributed to the course of technical excellence in this country."*



*A WEG 30 MVA 138/69 34.5/13.8 kV mobile substation with an hydraulic goose neck and articulated rear wheels to accommodate tough terrain and any logistic challenge.*

## ZEST ENERGY MOVES STRONGLY INTO MOBILE SUBSTATIONS

Zest Energy, part of the Zest WEG Group, is poised to complete a contract awarded by Eskom for the design, construction, supply and commissioning of four 22 kV mobile distribution switching substations, in line with the power authority's policy of standardising this equipment across the board. Custom trailers have been designed to suit Eskom's standard equipment dimensions and to remain within the South African road ordinance.

## WORLD FIRST SWH FROM SOUTH AFRICA



After two and half years of struggling to get a corrosion proof solar water heater, MaxLite has officially unveiled their WaterLite 110Lt plastic, gravity outlet system.

Trevor van der Vyver, CEO of MaxLite has registered a patent for what he believes is a world first plastic SWH which has passed SABS 1307 and eligible for the ESKOM rebate.

The tank and outer skin of this unique system is produced entirely from polyethylene. Polyethylene is a plastic material manufactured by SASOL in South Africa.

The need for such a system stems from the shortage of products compliant with SABS installation and system standards. Currently many South African suppliers manufacture and supply systems with a

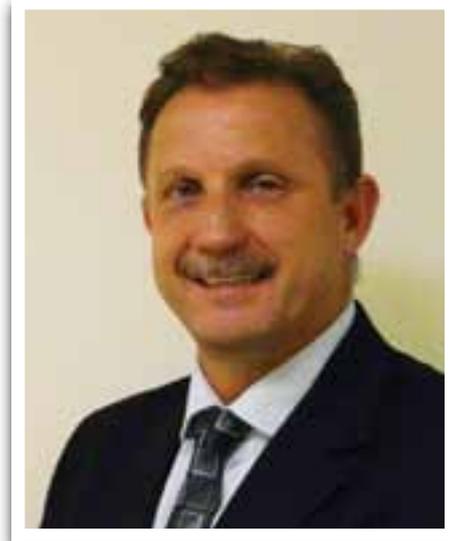
design which originates in the East. The so-called low pressure systems, as seen all over the country, are not designed for the South African SABS water piping reticulation design. The water piping configuration in China is different to S.A.

Poor water quality is one reason why geysers rust and fail, the other is poor quality product. Water quality in many areas cannot be guaranteed and for this reason we have our baby in the WaterLite range.

SABS standards are often upgraded to suit the changing times. Recently SANS 151 was upgraded to accept polyethylene gravity outlet geysers.

The new WaterLite baby will probably be followed by other systems but without the van der Vyver South African registered patent.

## POWERTECH GETS NEW CEO



*Bernard Meyer*  
CEO | Powertech Transformers

Bernard Meyer has been appointed as Chief Executive Officer for Powertech Transformers with effect 1 August 2012. Bernard replaces Leon Viloen who was promoted to Chief Operating Officer of Powertech on 1 July 2012. Bernard has an Electrical Engineering degree from the University of Stellenbosch. During his career he spent twenty years with Eskom, covering all facets of the utility's Distribution business, ranging from Network Asset creation, Electricity Delivery to Field Services and Customer Services Departments. Bernard joined Powertech Transformers in 2007 as Engineering Manager and was promoted to Chief Operating Officer for Powertech Transformers' Power Division in 2009.

***Incorrect information printed on pg 32 of August issue.***

*Mr Kulkarni is from Air Products South Africa (Pty) Limited who manufactures, supplies and distributes a diverse portfolio of atmospheric gases, specialty gases, performance materials, equipment and services to the Southern African region. Air Products touches the lives of consumers in positive ways every day, and serves customers across a wide range of industries from food and beverage, mining and petrochemicals, primary metal and steel manufacturers, chemical applications, welding and cutting applications to laboratory applications.*



## IIW REGIONAL CONGRESS

The IIW Regional Congress, with the theme 'Advancing Science and Technology of Welding in Sub-Saharan Africa', will be held on the 7th and 8th of November 2012 at Emperors Palace.

The congress will include an exhibition of new products and technologies.

Professor Andy Kourasaris will present the Jaeger lecture, with the topic, 'The welding landscape in South Africa'.

At the regional congress, the CEO of the International Institute of Welding (IIW), Cecile Mayer, as well as the President, Baldev Raj, will also deliver presentations. In addition, papers will be presented on welding and NDT related topics such as Energy, Processing, Transport and Automotive.

Delegates interested in attending the congress can e-mail Kim Stevens at [stevensk@saiw.co.za](mailto:stevensk@saiw.co.za).

# WATTSUP



Luigi Pistilli  
Service Manager | Pitney Bowes SA

## DAHLE SHREDDER PROVIDES A BREATH OF FRESH AIR FOR OFFICE WORKERS

The fine dust produced by office equipment is a covert hazard. Although it is not visible and office workers cannot feel or taste it, it can pose a considerable threat to health. Document shredders contribute to the level of fine dust in the office atmosphere.

The Dahle shredder, with CleanTEC filtration technology, ensures a healthier, safer work environment. *“Each time you shred paper, tiny dust particles are produced and travels through the air. Office workers then inhale these particles. The smaller the particles, the more harmful they are to your health,”* says Luigi Pistilli – Service Manager at Pitney Bowes South Africa.

Dahle CleanTEC shredders are designed and manufactured with an integrated dust filter to substantially reduce fine dust particles.

*“Paper is fed into the Dahle CleanTEC shredder and the dust is collected above the shredder’s cutting cylinders. This dust is then forced through a specially developed three-ply filter,”* Pistilli explained.

The fully recyclable filter comprises non-woven materials and is situated at the back of the machine. Tests undertaken by TÜV NORD (international provider of security, inspection and certification services in the fields of industry, mobility, natural resources, aerospace, education and training) clearly indicate that 98% less fine dust particles are released by the Dahle CleanTEC document shredders than with standard document shredders.

## TERACO WINS DINX



Lex van Wyk  
Managing Director | Teraco

Teraco Data Environments, South Africa’s first vendor neutral data centre, has won the bid to host the Durban Internet Exchange (DINX). Teraco is set to make internet history with this announcement by providing Durban-based ISPs with a local exchange for the very first time. Lex van Wyk, Managing Director at Teraco says that the launch of the exchange is a major step towards contributing to the health and growth of the internet in South Africa.

*“The installation of DINX within our Durban facility has been a long time coming and is a big step for the internet in South Africa. Juniper kindly donated the network switches and Teraco the power and space requirements for the internet exchange. We’re proud to say it’s already installed and operational,”* says van Wyk.

Graham Beneke from the Internet Service Providers Association (ISPA) says that the new exchange is fundamental to furthering economic and societal growth in South

Africa. *“DINX serves as yet another critical hub for internet data exchange in South Africa minimising our need to send domestic internet traffic onto long-distance international links which ultimately results in higher costs and latency.”*

*“DINX will enrich South Africa’s internet ecosystem and pave the way for growth in other areas like cloud applications,”* says Van Wyk.

Derek Hershaw, CEO of MWEB ISP says *“Teraco, through its continued build of neutral and open access centres, has already positively contributed to the cost of Internet access in South Africa, and I have no doubt their hosting of DINX works towards the same goal of improving the overall Internet economy in our country.”* *“Internet traffic is increasing in Durban and with the introduction of DINX, we’ll see improved performance for traffic within the metropol, cost-savings and an extra layer of redundancy,”* says van Wyk.

## ABERDARE CABLES COMMITTS TO TRANSFORMATION AND LIFTS FORMAL BBBEE STATUS TO LEVEL 2

Aberdare Cables, a Powertech company within the JSE-listed Altron Group, has improved its BBBEE status to Level 2 (AAA) following a recent formal evaluation by BBBEE rating and research agency Empowerdex.

Aberdare Cables Human Capital Executive, Erica Da Silva says that Aberdare has always been of the view that Black Economic Empowerment is both significant and essential to the South African economy. Accordingly, Aberdare has remained focused on extending its BBBEE in practical, measurable and meaningful ways.

*"Our goal has always been to lead the cable industry through empowerment, transformation and people development," says Da Silva. "Our view is that the best means of adding value to BBBEE is investment in the development of people with the knowledge and appropriate skills. Ultimately this will ensure that South Africa continues to be self-sufficient in the manufacture of products essential to the maintenance, development and expansion of critical power distribution and telecommunications infrastructures."* Da Silva stresses that the improved rating reflects the company's commitment to its customers in all sectors, particularly state-owned enterprises including Eskom, Transnet, Telkom and Municipalities.



## DIMENSION DATA AND EES IN PARTNERSHIP ON 2014 BRAZIL WORLD CUP STADIA

EES (Cape Town, South Africa) and Dimension Data (South Africa and Brazil) have been formally appointed by the builder and operator consortium in Fortaleza Brazil to oversee aspects of the 2014 Brazil World Cup stadia design, and build criteria that ensure compliance with FIFA specifications.

These include Mass Access Control, CCTV Security, Audio-visual Network Capacity, Broadcast Network and Data Facilities, Wifi, Network and Structured Cabling Provision. Dimension Data and EES have significant experience

in designing and project managing the provision of Information and Communication Technology (ICT) solutions to the built environment.

EES occupied the lead role in the special systems and electronic infrastructure design of two of the 2010 Soccer World Cup Stadia in South Africa, these being Cape Town Stadium and Nelson Mandela Stadium in Port Elizabeth. Through a rigorous tender process Dimension Data was awarded the contracts to supply and install all electronic systems and infrastructure to the same two stadia, including several systems in four of the other World Cup 2010 stadia.

The experience and knowledge gained from the professional design, management and technical implementation in the construction of these facilities, is being used to develop the intelligent infrastructure for the Brazil stadium.



*A TGM condensing extraction steam turbo generator set operating at a paper mill in Brazil. This set is similar to that which will be supplied and installed at Mondi Richard's Bay facility.*

## ZEST ENERGY SECURES MONDI STEAM TURBINE CONTRACT

Zest Energy, part of the Zest WEG Group, has secured the contract to supply a new steam turbine to leading international paper and packaging group Mondi's Richards Bay mill. This project will see the supply of the largest turbine ever manufactured by Brazilian company TGM Turbinas (model CTE63).

Not only will the project be the first of its kind to use the combination of a TGM turbine and an alternator manufactured by Electric Machinery (EM), it will also be a first for both equipment manufacturers to have their equipment installed in South Africa.

The Mondi contract is also the first time since WEG acquired EM, that TGM and EM equipment has been used in combination worldwide.

# WATTSUP

## KEITH EDMOND CONFIRMED AS CEO FOR ABERDARE CABLES



Keith Edmond  
CEO | Aberdare Cables

Aberdare Cables, the power cable manufacturer subsidiary of Powertech Technologies (Pty) Ltd (Powertech), who are in turn a wholly owned subsidiary of the JSE-listed Altron group, has confirmed the appointment of Keith Edmond as chief executive officer (CEO) with effect from 1 September 2012.

Edmond first joined Aberdare in 2009 as CFO. He was then appointed marketing, sales and distribution director in 2010 and in March 2012 he was promoted to CEO-designate, after the announcement of the retirement of Mr. Harry Coetzee from 31 August 2012.

Edmond holds Bachelor and Honours degrees in Accounting Science. He is a Chartered Accountant SA and a member of both the SA Institute of Chartered Accountants and the Gauteng Society of Chartered Accountants.

*"Aberdare Cables is one of the largest operations within Powertech and a major business in the Altron group. It was imperative that we appoint a strong leader to*

*drive this business forward. We believe that Keith possesses the right skills for the role,"* says Neil Kayton, Powertech Group CEO.

In the tough current economic climate Edmond sees his key objective as achieving sustainable growth for the company. Commenting on his future ambitions for Aberdare Cables, Edmond says, .

Aberdare Cables has three manufacturing sites in Gauteng, Port Elizabeth and Pietermaritzburg. It is a major player in all areas of the cabling industry and provides the broadest cable and related product range and have the greatest installed capacity.

Aberdare's merger with Crabtree, a manufacturer of electrical accessories such as plugs, switches, sockets and circuit breakers, affords opportunities for further growth. Considerable synergies between both companies are leading to greater efficiency in both operations, generating a positive impact on its customers. The company also recently improved its BBBEE status to Level 2 (AAA).

## TERACO PEERING EXPERT APPOINTED TO WAPA COMMITTEE



Michele McCann | Business Development  
Manager | Teraco

Michele McCann, Business Development Manager at Teraco Data Environments has been appointed on the Wireless Access Providers' Association (WAPA) committee. McCann, who joined Teraco in May 2012, brings expertise across peering, content and carrier aggregation as well as an in-depth knowledge of the local market place to the committee.

Ingi Deutschlander, WAPA General Manager says, "WAPA is pleased to have Michele on board, as she brings with her years of industry experience, a keen understanding of the challenges faces by WAPA members within the larger context in South Africa, as well as a can-do attitude that will help propel

*momentum in key areas such as marketing and business enabling opportunities for the members. We look forward to working with her to achieve these goals."*

The appointment, which is effective immediately, will enable McCann to assist the committee in creating awareness of the WAPA community and goals, as well as further drive the ambitions of the association. "I'm excited to get stuck in," says McCann. "I've always enjoyed the process of product development and taking it to market, and I believe that this experience is going to guide me in my role on the committee and possibly even see the future review of a WAPA INX."

## SOUTH AFRICA TAKES UP THE ENERGY EFFICIENT LIGHTING DESIGN CHALLENGE

The fact that South Africans are embracing an energy-efficient and planet-conscious lifestyle has been highlighted by the more than 570 entries received from both professional and amateur designers for the 2012 Eskom Energy Efficient Lighting Design Competition.

With the introduction of the competition to secondary schools for the first time this year, through an extensive lobbying programme, Eskom has seen an increase in the number of entries from all corners of South Africa before the cut-off on Friday, August 31. Winners will share the R214 000 prize money on offer and also honoured with the prestigious Sparks Trophy.

Highlighting opportunities for energy efficient lamps and technologies in

the residential market, the biennial competition has helped stimulate widespread acceptance of green lighting designs and systems, making it an important part of Eskom's ongoing programmes to instil a culture of energy and resource consciousness among South Africans.

Andrew Etzinger, Senior General Manager of Integrated Demand Management (IDM) at Eskom says: *"The lighting design competition continues to stimulate transformation in the market, motivating lighting designers, architects and interior designers, as well as amateur designers, to use energy efficient lighting in their portfolios, encouraging the residential market to think energy efficiently and inspiring consumers to adopt innovative and green lighting concepts."*

Tanya Smit (pictured right) from the Greenside Design Centre is the regional finalist in the Student category for Eskom Energy Efficient Lighting Design Competition. The judges all agreed that her design called the Tri-Lum Luminaire was

a safe, flexible, versatile and unique design which offered ambient lighting while adding to the aesthetics of any room.

Other regional finalists include:

- Special/Scholar category regional finalist – Grade 3 pupil Thomas Granig
- Harry Bartelink regional finalist in the professional category
- Special/Amateur category regional finalist: LDC67 – Pieter Holtzhausen



## NEW CLX ELECTRIC CHAIN HOISTS WITH FAST POWER CYCLE AND A SERVICE LIFE THAT IS FOUR TIMES LONGER

Konecranes series CLX02/05/10: powerful and durable electric chain hoists for cranes and assembly cells. Konecranes has expanded its range of workstation lifting systems to include the chain hoists of the CLX series. These newly developed models have several advantages: they are more powerful, 25% faster and their service life is four times longer. The new CLX electric chain hoists can be employed as standalone applications such as in assembly cells for the processing industry, as well as in workstation and gantry cranes.

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### Director

Our client is an internationally acclaimed consulting engineering practice providing exceptional consulting services in MEP, with a particular focus on prestigious projects incorporating state of the art solutions.

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**Package negotiable to R 1 800 000**  
(excluding performance related component)

**Further information at: [www.edm.co.za/40269](http://www.edm.co.za/40269)**

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To discuss these opportunities in the strictest confidence contact Gary Drummond at EDM on (011) 462 2525.

Alternatively e-mail a detailed CV to [gary@edm.co.za](mailto:gary@edm.co.za)



# Powering Spacecraft

Modern, and even not-so-modern, electronics are a constant inspiration to those who have even the faintest idea of what it takes to design, build and operate such systems.

I marvel at the speed and complexity of computers, smart phones and even the lowly microwave. It works, and does so constantly and reliably. But, as Sir Richard Branson once said, it is often easier to design something complex than it is to design something that is simple. Once could then reason that to make that simple system consume as little power as possible would be very close to impossible. This would require engineering expertise, and a stable, robust power source.

**BY I THINUS VAN AS**

Pr. Eng. | B.Eng.(Stell.) | M.Sc.Eng. (Electrical Engineering)(Stell.) | M.SAIEE

Spacecraft are very complex scientific instruments that have to overcome seemingly impossible odds in order to carry out Mankind's need to explore. They have to be light, operate in the most unforgiving of environments and do so reliably and accurately. This article will explore different ways in which spacecraft designers have chosen to power these complex machines. You will see that it is not as easy as dumping a good old car battery in it. The following diagram indicates what type of power source would suit a specific application. RTG, Photovoltaic array, fuel cell and battery sources will be discussed briefly in this article.





## **RADIO-ISOTOPE THERMOELECTRIC GENERATORS (RTGS)**

This type of power source is used where solar panels would be impractical for reasons that will be discussed later. Radioisotope Thermoelectric Generators (RTGs) have provided power for some of the US space program's greatest successes,

including the Apollo (12 to 17) lunar landings and the Viking landers that first explored the dusty red landscape of Mars. The 35-year old Voyager spacecraft and the Pioneer missions of 1965-1973 all had RTGs on board to power them. As is well-known, the incredible Voyager spacecraft are still operational after 35 years and are

expected to make new and ground-braking discoveries within the next few years, as it escapes the influence of our solar system's most massive object, the sun. Spacecraft that currently sport this type of power plant are Cassini spacecraft currently orbiting magnificent Saturn, and New Horizons, on its way to explore Pluto.

# Powering Spacecraft

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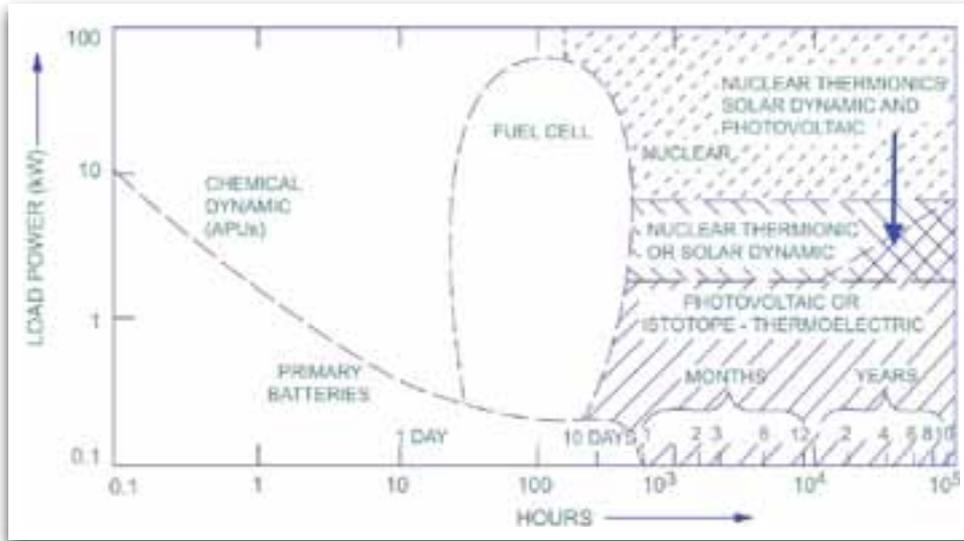


Figure 1 -- Power source selection [Source: MIT]

converted into electricity and the excess will be radiated into space via cooling fins.

Figure 4 shows an artist's view of the New Horizons spacecraft as it reaches Pluto. Of course sunlight will not be plentiful at that great distance and solar arrays would not work at all. The RTG is visible bottom left. Note the cooling fins.

The RTG assembly is done as follows (refer to Figure 2): first, the plutonium dioxide fuel is used in its heat-resistant, ceramic form which reduces its chance of vapourising in fire or reentry environments, for instance when something goes wrong during launch, or if this type of source was used in a reusable spacecraft.

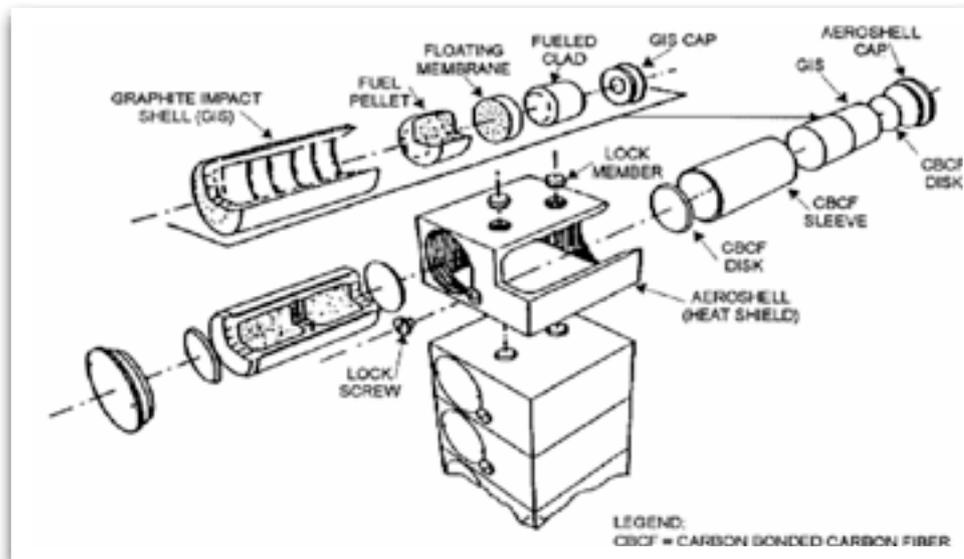


Figure 2 -- RTG assembly [Source: NASA/JPL]

This ceramic-form fuel is also highly insoluble, has a low chemical reactivity and if fractured, tends to break into large particles and chunks that cannot be inhaled by a human. This is good should something go wrong and the spacecraft makes its way back to earth and so it helps to mitigate the potential health effects from accidents involving the release of this fuel.

RTGs are lightweight and compact. Contrary to popular belief, RTGs are not nuclear reactors, as they have no moving parts and do not use fission (a nuclear reaction in which a heavy nucleus, such as uranium, splits into two lighter nuclei and in the process releasing energy) nor fusion (a nuclear reaction in which two light nuclei, such as hydrogen, combine to form a heavier nuclei, such as helium, and in the process releasing energy) processes to produce

energy. They produce power by the naturally radioactive decay of plutonium (mostly Pu-238, a non-weapons-grade isotope). The heat generated by this decay is changed into electricity by solid-state thermoelectric converters. Figure 2 shows the construction of an RTG.

Figure 3 shows the comforting glow of a plutonium fuel pellet already in the decaying process. The heat that is visible will be

Second, the fuel is divided into 18 small, independent units, each with its own heat shield and impact shell. This design reduces the chances of fuel release in an accident because all modules could not be equally impacted in an accident.

Third, multiple layers of protective materials, including iridium capsules and high-strength graphite blocks, are used to protect the fuel and prevent its accidental

release. Iridium is a metal that has a very high melting point and is strong, corrosion-resistant and chemically compatible with plutonium dioxide. These characteristics make iridium useful for protecting and containing each fuel pellet. Graphite is used because it is lightweight and highly heat-resistant.

Despite the attention to safety, potential RTG accidents are sometimes mistakenly equated with accidents at nuclear power plants. It is completely inaccurate to associate an RTG accident with Chernobyl or any other past radiation accident involving fission. RTGs do not use either a fusion or fission process and could never explode like a nuclear bomb under any accident scenario. An accident involving an RTG could also never (well, never say never?) create the acute radiation sickness similar to that associated with nuclear explosions.

### SOLAR ARRAYS/SOLAR PANELS

Solar panel arrays are a clean and practical power source for spacecraft as it has many advantages. These advantages include low cost (when compared to other sources of power) and the fact that it is safe for the people building it, testing it, and launching it. Should something go wrong during the launch of a spacecraft with solar arrays installed, rumours of nuclear contamination would not run riot. They have many disadvantages too, unfortunately. The first few disadvantages that comes to mind are that the sunlight at distant planets are not sufficient to sustain a spacecraft with science instruments on board, and of course batteries will need to be charged for when the spacecraft is in the shadow of the planet under surveillance.



Figure 3 - Decaying Plutonium fuel pellet: providing energy through heat.



Figure 4 - New horizons spacecraft that will explore Pluto in 2015.

The next image and table indicates what the Sun would look like from other planets and it is easy to see why solar arrays would only work up to a certain point, and no further.

The figure 6 shows the relative size of solar array that would be required to power a

spacecraft at different planets (the Saturn-studying Cassini spacecraft is used as an example).

When studying figure 6, it would seem that solar arrays at Saturn would simply be too big. Being too big in size is not a concern at the planet, but it is of course

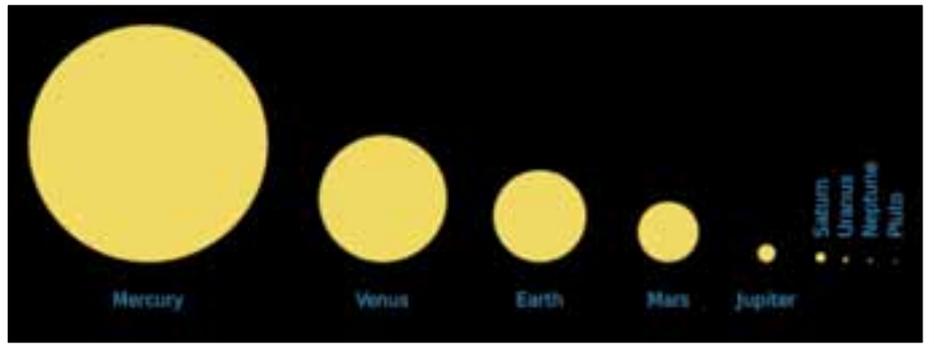


Figure 5 -- Our Sun, as seen from other planets

Planet	Distance to Sun [AU]	Relative Sunlight Intensity	Intensity in Lux	Approximate equivalent light
Mercury	0.387	6.677	667,700 300,000	1m from hospital theatre light
Venus	0.723	1.913	191,300	
Earth	1.000	1.000	100,000	Bright "Earth" day
Mars	1.524	0.431	43,000 30,000	Typical "Earth" day In the shade on bright "Earth" day
Jupiter	5.203	0.037	3,700 1,500	Kitchen
Saturn	9.539	0.011	1,100 350	Bright television studio Business office
Uranus	19.18	0.0027	270	"Earth" sunset or sunrise
Neptune	30.06	0.0011	110 80	Typical soft-lit living room
Pluto	39.53	0.00064	64 20	Typical night-lit sidewalk

# Powering Spacecraft

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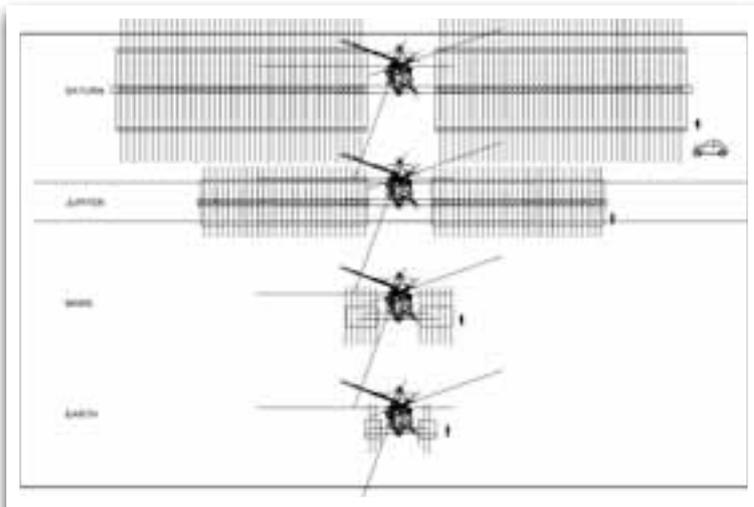


Figure 6 -- Relative size of solar arrays [Source: NASA/JPL]



Figure 7 -- Magnificent ISS [Source: NASA]

a concern when trying to launch the spacecraft. During launch, the spacecraft would have to be packed into the smallest space possible and then deploy once out of the Earth's atmosphere. This adds more complexity and cost because a mechanical structure would be needed to deploy such an elaborate solar array.

The most famous spacecraft which employs solar panel arrays is of course the International Space Station. The space station spends some time in the shadow of the earth as well and would of course require batteries to be charged during times where the ISS receives sunlight. Here massive solar arrays and heavy batteries could be employed because the ISS was constructed in stages and it did not have to all fit into a single launch vehicle.

## FUEL CELLS

A fuel cell is a device that converts the chemical energy from a fuel into electricity through a chemical reaction with oxygen or another oxidizing agent. Hydrogen is the most common fuel, but hydrocarbons such

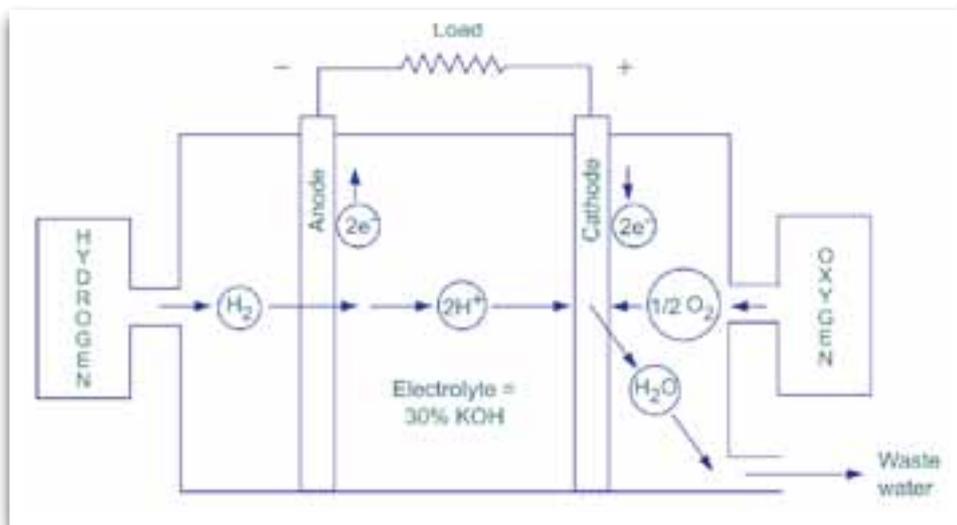


Figure 8 -- Fuel cell operation diagram [Source: MIT]

as natural gas and alcohols like methanol are sometimes used. Fuel cells are different from batteries in that they require a constant source of fuel and oxygen to run, but they can produce electricity continually for as long as these inputs are supplied [Source: Wikipedia].

Fuel cells were used in the space shuttle as one component of the electrical power system. Three fuel cell power plants, through a chemical reaction, generate all

of the electrical power for the vehicle from launch through landing rollout. Before launch, electrical power is provided by ground power supplies and the onboard fuel cell power plants. Each fuel cell power plant consists of a power section, where the chemical reaction occurs, and a compact accessory section attached to the power section, which controls and monitors the power section's performance. The three fuel cell power plants are individually coupled to the reactant



Figure 9 -- Ex-Workhorse of NASA: the Space Shuttle



Figure 10 – Space Shuttle fuel cell. The shuttle employed three of these. [Source: NASA]

(hydrogen and oxygen) distribution subsystem, the heat rejection subsystem, the potable water storage subsystem, and the electrical power distribution and control subsystem. The fuel cell power plants generate heat and water as by-products of electrical power generation. The excess heat is directed to fuel cell heat exchangers, where the excess heat is rejected to Freon coolant loops. The water is directed to the potable water storage subsystem. It is important that the fuel cell is properly insulated against open space in order to avoid the “exhaust” water from freezing and clogging the waste pipes or potable water storage system.

## BATTERIES

As figure 1 indicates, batteries are really only practical for missions that are shorter than 10 days, and do not require large amounts of power as they are heavy and expensive. Batteries would only be a feasible option for upper atmosphere weather balloons and for applications where the batteries are not the primary source of power, i.e. where another source is employed to charge the batteries.

Examples of these are the International Space Station, Juno spacecraft, Hubble Space Telescope and many others. These batteries, as can be seen, have a very wide operational temperature range – they are not too scared

	Silver zinc	Lithium sulfur dioxide	Lithium carbon monofluoride	Lithium thionyl chloride
Energy density (W h/kg)	130	220	210	275
Energy density (W h/dm <sup>3</sup> )	360	300	320	340
Op Temp (deg C)	0-40	-50 – 75	? – 82	-40 – 70
Storage Temp (deg C)	0 – 30	0 – 50	0 – 10	0 – 30
Storage Life	30-90 days wet, 5 yr dry	10 yr	2 yr	5 yr
Open circuit voltage(V/cell)	1.6	3.0	3.0	3.6
Discharge voltage(V/cell)	1.5	2.7	2.5	3.2

The following battery types are most suitable to operate in space.

of low temperatures, but, as we all know, they are not too comfortable with heat. Temperatures can get as high as 120°C and as low as -120°C in space where batteries would be a feasible power source, so it is imperative that they be insulated from these extreme environments.

In manned missions, care needs to be taken to get rid of hazardous gases if they are formed during the charging or discharging cycles.

efficiently (read: within budget and better than expected!). But, engineers manage every time to foresee all the obstacles and plan accordingly. More often than not, the developed system performs much better, and for longer, than expected. **wn**

Spacecraft	Power Required	Power Source
Voyager 1 & 2	320W	RTG
Apollo LEM	4kW	Batteries, Fuel Cells
Cassini	300W	RTG
Juno	486W	Solar Arrays (14kW installed power on earth)
Space Shuttle	14kW	Fuel Cells
Hubble Space Telescope	2.8kW	Solar Arrays
International Space Station	131kW	Solar Arrays
Curiosity Mars Rover	110W (Really!)	RTG
Spirit Mars Rover	100W	Solar Arrays
Opportunity Mars Rover	100W	Solar Arrays

Figure 11 – Examples of Spacecraft power requirements

**SUMMARY**

In summary, a table that provides examples of spacecraft and their power sources. When considering the extreme environment of heat and cold in space, it seems very difficult to manufacture a power source that can work reliably and



# Manufacturing & Testing of High Voltage Current Transformers

BY | ROBIN W COOMBS | Pr.Tech.Eng. | M.SAIEE

## H I G H V O L T A G E C U R R E N T T R A N S F O R M E R S

### MANUFACTURE AND TESTING

There are four basic types of high voltage current transformers;

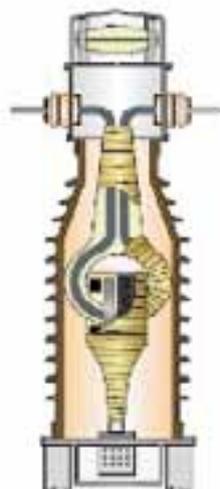
- Hairpin tank type
- Cascade/eye bolt
- Top core
- Combined current-voltage

The hairpin tank type is typically made in South Africa for voltages up to and including 132 kV, and is oil filled.

The top core is for higher voltages, up to and including 800 kV. It is imported and is filled with Sulphur Hexafluoride Gas. (SF<sub>6</sub>).



*Hair-pin/Tank type*



*Cascade/Eye-bolt*



*Top-core*



*Combined current-voltage type*



**THIS ARTICLE LOOKS AT THE 11 TO 132 KV HAIRPIN TANK TYPE MADE IN SOUTH AFRICA.**

The first stage in the manufacture of a High Voltage Current Transformers consists of making the Secondary Coils.

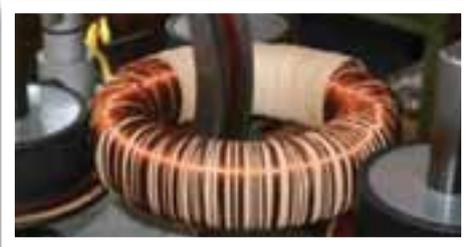
A core is made from grain orientated silicon steel wound in a toroidal shape. This core is then annealed at 800 degrees Celsius.



Once it has cooled down it is covered with insulating material.



Copper wire is then wound around the core, depending on the specified burden, ratio and accuracy required.



*Copper Wire Being Wound Onto The Core*

This assembly is then covered with insulating material and sent to the test department for checking that the winding ratios are correct and within specification.



*Testing Of Secondary Coils*

The winding ratio of each Secondary coil is tested for turn accuracy. This is done by injecting the full load current (1000A 1200A etc) through the coil, and measuring the output.

# Manufacturing & Testing of High Voltage Current Transformers

*continues from page 25*



The accuracy must be within 0.25% for type X CT's and 0.2% for metering CT's. or it is rejected.



*Primary Winding*

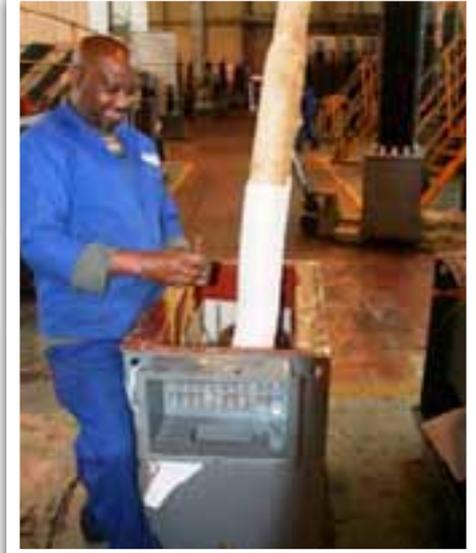
The primary winding is made from annealed copper wire bent into "U" shape. This is then covered with high purity crepe paper. This paper has a high mechanical and dielectric strength and has low losses.



*Solid copper conductors bent into "u" shape*



*Insulating tape being wrapped onto copper*



When fully assembled the complete current transformer is placed into the secondary oven and dried.



*Solid copper conductors wrapped together*

Aluminium foil screens are then layered onto the paper at strategic levels. These screens are to reduce and control high voltage stresses.

The primaries are then dried in a special oven where moisture is trapped externally for monitoring the moisture content.



*Primary drying oven*

The secondary coils are then placed over the primary windings and the completed units installed into steel enclosures.



*Secondary drying oven*

Once fully dried, the insulator is mounted on a base plate and is attached to the tank. The primary conductors are then bolted onto the copper connection stubs.

*Oil Filling Rig*



*Porcelain Insulators*

The completed current transformer is filled, whilst in a vacuum, with highly refined pre-heated insulating oil, after which it is sent to the test department.

### **PARTIAL DISCHARGE**

Partial Discharge (PD) is an electrical discharge that occurs across a portion of the insulation, between two conducting electrodes, without completely bridging the gap. PD is caused when there is a discontinuity in the insulation.

Partial Discharge can often be observed with the commissioning of new equipment due to improper installation, poor design or poor workmanship. It is known that poor workmanship can lead to “infant mortality” of MV/HV networks with a disproportionate percentage of insulation failures being observed within the first 1 to 3 years of service.

After initiation, the PD can propagate and develop into electrical trees and interfacial tracking, until the insulation is so weakened that it fails completely through breakdown to earth. This process can take anything from a few hours to several years to break down completely.

Early detection is essential if this breakdown is to be averted, thus the need for a PD test early in the testing phase.

Voltage is applied to the current transformer primary, and raised in steps up to the rated operating voltage. The amount of discharge is measured, and must be less than 10 pC (picocoulombs) (a coulomb is a unit of electric charge, 1 amp for 1 second).

If any discharge is detected at any stage, the test is aborted, and the CT returned to the oven for further drying. If it fails again it is rejected.



*Partial Discharge Detector*

Once the CT has passed the PD test it is then subjected to a Tan Delta test.

### **TAN DELTA TESTING**

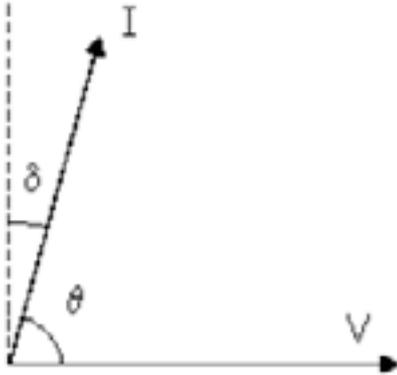
Tan Delta, otherwise known as loss angle, or dissipation factor testing, is a diagnostic method of testing transformers, cables etc. The object of the test is to determine its life expectancy by checking the dielectric strength of the insulation.

If the insulation is free from defects, such as water trees, moisture or air pockets, the unit approaches the properties of a perfect capacitor.

With a perfect capacitor, the voltage and current are phase shifted by ninety degrees and the current through the insulation is capacitive. If there are impurities in the insulation, the resistance of the insulation decreases, resulting in an increase of resistive current through the insulation, and it is no longer a perfect capacitor. The current and voltage will no longer be phase shifted by ninety degrees. The extent to which the phase angle is less than ninety degrees (the loss angle) is indicative of the level of insulation contamination. This “loss angle” is measured and analysed. By measuring IR/IC we can determine the quality of the insulation. The tangent of the loss angle will indicate the level of resistance of the insulation. The greater the angle the greater the contamination. If the angle is greater than 0.5% then the CT is rejected and sent back for re-drying. If it again fails it is totally rejected.

# Manufacturing & Testing of High Voltage Current Transformers

*continues from page 27*



## WATER TREES

Water trees are small tree shaped channels, found within the insulation, caused by the presence of moisture. In the presence of an electrical field, these tree-shaped moisture channels eventually lead to the inception of Partial Discharge (PD). This eventually leads to the formation of electrical trees, which grow to a point where insulation failure occurs. The tan delta test shows the extent of water tree damage.



*Typical water trees*



*Tan Delta Measuring Set*

## FINAL ASSEMBLY

Once the current transformer has passed all of the Quality checks and tests, it is taken to the spray painting booth where a final coat of paint is applied.



*Tan Delta Readout*



*Finishing Bay*



*High Voltage Test Bay*

The finished product is then inspected by the Quality Controller where the secondary resistances are checked to ensure that no internal connections have failed. The paint thickness is also checked. The oil level is checked and topped up if required. Any abnormalities are recorded and an internal Non Conformance Report (NCR) is raised.

These abnormalities have to be corrected and the NCR closed out before the client is invited to inspect the product. The client is then invited to carry out a final inspection and all test reports are made available.

## TRANSPORT & HANDLING

Current transformers must be handled with care. The porcelain insulator can easily crack, and a hairline crack is very hard to see, but it can lead to catastrophic failure, with oil leakage and moisture ingress. The two connection stubs are a very convenient lifting aid but must NOT, under any circumstances, be used for lifting or manoeuvring as this will cause distress to the porcelain insulator.

The correct, and only, method of lifting is to use the lifting lugs mounted on the oil tank. Due to the now "out of balance" unit the CT could easily tip over, so long slings must be used to increase the height of the balance point. Care must be taken when moving as the CT can now sway and be damaged.

If care is taken with the handling and storing, the life of the CT is extended considerably. **wn**

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# Inspection and Servicing of Fire Alarm System

SANS 0400 is a legal standard which states: "Any owner of any building who fails to maintain any provisions made to satisfy the requirements of sub regulation (T)1(1) (e) shall be guilty of an offence". (T) 1(1) (e) states "adequate means of access and equipment for detecting, fighting and extinguishing fire is provided". In short, by law the building owner has to maintain his fire systems or be liable for prosecution.

The following is an abridged and modified extract from the current SANS (South African National Standard) and has been provided to identify and highlight the responsibilities of all involved with the maintenance and servicing of fire alarm systems in buildings

## RESPONSIBLE PERSON

The user needs to appoint a single, named responsible person to supervise all matters pertaining to the fire alarm system. The role of the responsible person is to ensure that the system is tested and maintained in accordance with the recommendations of this standard, that appropriate records are kept and that relevant occupants in the protected premises are aware of their roles and responsibilities in connection with the fire alarm system. It also needs to be the duty of the responsible person to ensure that necessary steps are taken to avoid situations that are detrimental to the standard of protection afforded by the system and to ensure that the level of false alarms is minimized.

## RECOMMENDATIONS

The following recommendations apply:

- A single, named responsible person should be appointed to supervise all matters pertaining to the fire alarm system. The responsible person should be given sufficient authority to carry out the duties described in this sub clause and should normally be the keeper of the documentation below
- The responsible person should ensure that the control and indicating equipment is checked at least once every 24 h to confirm that there are no faults on the system.
- The responsible person should ensure that arrangements are in place for testing and maintenance of the system in accordance with the recommendations outlined in this document.
- The responsible person should ensure that the system log book is kept up to date and is available for inspection by any

authorized person (e.g. representatives of enforcing authorities and property insurers).

- The responsible person should ensure that all relevant occupants of the protected premises are instructed in the proper use of the system. Particular care should be taken to ensure that relevant occupants are able to interpret fire, pre-alarm and fault indications, and that they are adequately familiar with the appropriate controls, including those associated with initiation of fire alarm signals, silencing of fire alarm signals and resetting the system. It should also be ensured that all occupants are aware of the measures necessary to avoid the generation of false alarms. Relevant occupants should also be instructed in the facilities for disablement and the circumstances in which they should, and should not, be used. In premises in multiple occupation, it should be ensured that sufficient representatives of each occupier are instructed.

- The responsible person should ensure that appropriate action is taken to limit the rate of false alarms as outlined below.
- The responsible person should ensure that a clear space of at least 500 mm is preserved in all directions around and below every fire detector, and that all manual call points remain unobstructed and conspicuous.
- The responsible person should establish a liaison between those responsible for changes in, or maintenance of, the building fabric (including redecoration etc.) to ensure that the work does not unnecessarily compromise the protection afforded by the system, create system faults or cause false alarms. If structural or occupancy changes occur or are planned, the responsible person should ensure that any necessary changes to the fire alarm system are considered at an early stage.

- When changes are made to the system, the responsible person should ensure that record drawings and operating instructions, supplied in accordance with the recommendations provided within the Standard.

The responsible person should ensure that the following spare parts are held within the premises:

- Six frangible elements and appropriate tools for manual call points, unless there are fewer than 12 manual call points in the protected premises in which case only two spare frangible elements with appropriate tools need be held;
- Such other spare parts agreed between the user and the organization responsible for servicing the system.

### **ACTION IN THE EVENT OF PRE-ALARMS**

A pre-alarm can be a response to a slow

growing fire or to indicate detector contamination. Whatever the reason, the following actions should be taken:

- Determine and thoroughly inspect the area from whence the pre-alarm has originated;
- If a fire is discovered, carry out the predetermined fire routine;
- If no fire is discovered, record the events or activities near the suspect detector in the log book and, if there is need for work to be undertaken on the fire alarm system, inform the maintenance company.

### **LOG BOOK**

A log book needs to be kept for the purpose of recording all events that occur in respect of the system, including fire signals, fault signals and work on the system. This information may be of value to the organization that services the system and

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# Inspection and Servicing of Fire Alarm System

*continues from page 31*



if special action is taken to address false alarm problems.

The following information should be recorded in the log book:

- The name of the responsible person;
- Brief details of maintenance arrangements;
- Dates and times of all fire alarm signals (regardless of whether the signal is a false alarm or is initiated as the result of a test, fire drill or genuine fire); if the fire alarm signal has resulted from the operation of a manual call point or fire detector, the device and its location should be recorded;
- Causes, circumstances surrounding and Category of all false alarms;
- Dates, times and types of all tests;
- Dates, times and types of all faults and defects;
- Dates and types of all maintenance (e.g. service visit or non-routine attention).

## COMMENTARY

It is essential that all fire alarm systems are subjected to periodic inspection and servicing to ensure the system is functioning correctly and all so that unrevealed faults are identified.

Preventive measures need to be taken to ensure the continued reliability of the system, identifying and rectifying the cause false alarm problems and providing the end user with a report highlighting any changes to the building that affect the protection afforded by the system.

Periodic inspection and servicing should

be carried out by a competent person with specialist knowledge of fire detection and alarm systems, including knowledge of the causes of false alarms, sufficient information regarding the system, and adequate access to spares.

Generally, this task should be outsourced to a reputable fire alarm servicing organization, however, if, in-house employees are used for this task, it is essential these employees have been trained and certified by the original equipment manufacturer and have been exposed to training on the requirements of the standard as would be expected when using a fire alarm servicing organization.

Competence of a fire alarm servicing organization can be assured by the use of organizations that are third-party certificated, by a certification body, to carry out inspection and servicing of fire alarm systems.

## RECOMMENDATIONS FOR PERIODIC INSPECTION AND TESTING OF THE SYSTEM

Some analogue addressable fire detection and control systems include automated test procedures that identify system faults and individual detector conditions by checking the detection device's analogue values and comparing these with algorithms which determine the condition of the sensing chamber.

Where these type of systems are deployed, routine testing under this sub clause may be modified to omit testing which is proven to be unnecessary by the equipment manufacturer, provided it can be proven that the automatic monitoring achieves the same objective as the appropriate test recommended within this document.

In the case of detectors (all types), tests should ensure that products of combustion are capable of passing unhindered from the protected area to the sensing chamber/elements of the detector and not simply test the ability of the detector to sample/verify the status of the atmosphere already in the sensing chamber.

The recommendations in this clause should be carried out by a competent person as described above, the period between successive inspection and servicing visits should be based upon a risk assessment, taking into account the type of system installed, the environment in which it operates and other factors that may affect the long-term operation of the system. The recommended period between successive inspection and servicing visits should not exceed six months.

If a risk assessment shows a need for more frequent inspection and servicing visits, then all interested parties should agree the appropriate inspection and servicing schedule. If this recommendation is not implemented, it should be considered that the system is no longer compliant with this standard.

The following are applicable:

- The system log book should be examined. It should be ensured that any faults recorded have received appropriate attention.
- A visual inspection should be made to check whether structural or occupancy changes have affected the compliance of the system with the recommendations of this standard for the siting of manual call points, automatic fire detectors and fire alarm devices.

# *It is essential that all fire alarm systems are subjected to periodic inspection and servicing...*

Particular care should be taken to verify whether:

- All manual call points remain unobstructed and conspicuous
- Any new exits have been created without the provision of an adjacent manual call point
- Any new or relocated partitions have been erected within 500 mm horizontally of any automatic fire detector
- Any storage encroaches within 300 mm of ceilings
- A clear space of 500 mm is maintained below each automatic fire detector, and that the ability of the detector to receive the stimulus that it has been designed to detect has not been impeded by other means;
- Any changes to the use or occupancy of an area make the existing types of automatic fire detector unsuitable for detection of fire or prone to unwanted alarms;
- Any building alterations or extensions require additional fire detection and alarm equipment to be installed.
- The records of false alarms should be checked. The rate of false alarms during the previous 12 months should be recorded. Action taken in respect of false alarms recorded should comply with the recommendations of the Standard.
- The standby battery should be disconnected and full load alarm should be simulated.

- Batteries and their connections should be examined and momentarily load tested with the mains disconnected (other than those within devices such as manual call points, detectors and fire alarm sounders of a radio-linked system), to ensure that they are in good serviceable condition and not likely to fail before the next service visit.

Vented batteries should be examined to ensure the fire alarm functions of the control and indicating equipment should be checked by the operation of at least one detector or manual call point on each circuit. An entry should be made in the log book indicating which initiating devices have been used for these tests.

- The operation of the fire alarm devices should be checked.
- All controls and visual indicators at control and indicating equipment should be checked for correct operation.
- The operation of any facility for automatic transmission of alarm signals to an alarm receiving centre should be checked. Where more than one form of alarm signal can be transmitted (e.g. fire and fault signals), the correct transmission of each signal should be confirmed.
- All ancillary functions of the control and indicating equipment should be tested.
- All fault indicators and their circuits should be checked, where practicable, by simulation of fault conditions.
- All printers should be tested to ensure that they operate correctly and that characters are legible. It should be ensured that all

printer consumables are sufficient in quantity or condition to ensure that the printer can be expected to operate until the time of the next service visit.

- Radio systems of all types should be serviced in accordance with the recommendations of the manufacturer.
- All further checks and tests recommended by the manufacturer of the control and indicating equipment and other components of the system should be carried out.
- On completion of the work, any outstanding defects should be reported to the responsible person, the system log book should be completed and a servicing certificate issued. **wn**



*Watch this space - in the next issue of **wattnow**, we feature "Recommendations for periodic inspection and testing of the system".*



# A GPS Based Time-Stamping and Scheduling System for Wide Area Power System Measurements

This article describes a synchronising and scheduling system for application in wide area synchronised data acquisition applications and fault location in power systems, using Global Positioning System (GPS) technology. The system hardware features an inexpensive commercial GPS receiver, serial communications link to a host computer and a dedicated real time clock. This article is based on the M.Sc.Eng. (Elec.) thesis of the author, obtained at the University of Stellenbosch in 2002.

**BY I THINUS VAN AS**

Pr. Eng. | B.Eng.(Stell.) | M.Sc.Eng. (Electrical Engineering)(Stell.) | M.SAIEE

Much progress has been made in recent years to improve fault location systems for long transmission lines [3,4,7,8,9], using GPS timing features. This method typically deduces the fault location from synchronised sampled travelling waveforms obtained at two different geographical locations such as the substation terminations of the transmission line as shown in figure 1 [6]. The algorithm for determining the fault location often involves signal-processing methods such as wavelet analysis [5,7,9].

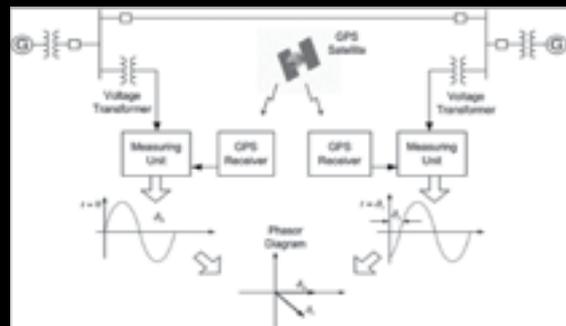


Figure 1: Simplified block diagram representation of a GPS based fault location.



GPS-based synchronization technology is also used for measuring the phasor values of voltages and currents at different geographical locations in the network at particular instances of time, also known as Wide Area Measurements (WAMs). This type of information is very useful for the calibration of system state estimation predictions and for determining system stability margins, line loading, etc. Synchronized sampling and measurements can also be implemented in other monitoring and control devices and systems, such as Remote Terminal Units (RTU's) for Data acquisition systems, digital fault recorders and sequence-of-events recorders [5].

This article describes the implementation of a cost-effective hardware topology for facilitating GPS-based synchronized data acquisition for fault location and WAMs applications.

### **FUNCTIONAL OVERVIEW**

The operating principles of the proposed synchronization and scheduling system can be summarized as follows:

- The GPS satellites receive time updates from an atomic clock in the United States [2]. This timekeeping is tied to Coordinated Universal Time (UTC). At the start of every second, the GPS satellites transmit a set of timing signals,

which is received and decoded by the earth-based GPS receiver. The receiver generates a pulse, referred to as the One-Pulse-Per-Second (1PPS) signal, to mark the beginning of the current one-second interval[1,2,5]. The accuracy of this pulse depends on the performance of the receiver, and is in the order of 500 ns for the receiver used in this application[1, 10].

- The synchronisation system uses the 1PPS signal to reset a binary counter. This counter employs a 1 MHz clock, with a maximum count of 220 or 1 048 576, and maintains a count of the number of  $\mu$ s elapsed since the last reset.
- The synchronisation system also interrogates the GPS receiver via an

# A GPS Based Time-Stamping

continues from page 35



RS232 serial interface at the start of each second to obtain the time in hours, minutes and seconds.

- When a trigger signal is received from an external data acquisition system, the system logs the trigger time in hours, minutes, seconds and microseconds. This timestamp can be obtained by the acquisition system via an RS232 interface or 8-bit data bus.
- The synchronisation module can also compare the real time in hours, minutes, seconds and microseconds with a pre-programmed value to generate an external trigger signal at the appropriate moment.

The module can be connected to a personal computer via the serial port to transfer GPS navigational data and timing data. These features facilitate a versatile range of remote controlled applications.

## SYSTEM HARDWARE OVERVIEW

Figure 2 shows a block diagram overview of the system. The main components of the synchronisation module are a 24-bit counter and comparator, a real-time clock and comparator, an address decoder, a 4k FIFO memory, an 8-bit micro controller, a GPS receiver and a personal computer.

The 24-bit  $\mu$ s counter and an Hours, Minutes and Seconds (HMS) Real Time Clock (RTC) are implemented in two Erasable Programmable Logic Devices (EPLDs). Communication between these components takes place via an 8-bit bi-directional data bus, a 10-bit control bus and an 8-bit address bus. The control bus carries control signals between the EPLDs and micro controller, while the address bus includes eight address lines routed to the address decoder for addressing registers in

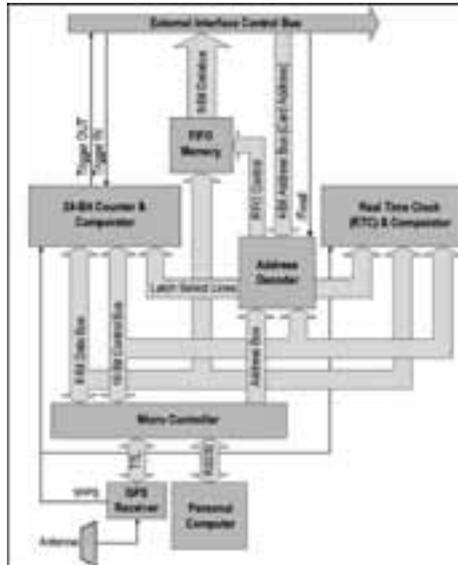


Figure 2: Block diagram overview of the synchronisation module.

the  $\mu$ s counter and the RTC. The address decoder also facilitates control of the FIFO memory.

The GPS receiver is connected to the micro controller through an RS232 port implemented in software, while the PC is connected through the hardware Universal Asynchronous Receiver Transmitter (UART) of the micro controller. The 1PPS signal from the GPS receiver is connected directly to the  $\mu$ s counter EPLD.

The TRIGGER OUT signal is generated when the time coincides with a pre-programmed value, while the TRIGGER IN signal is received from the equipment requiring time-stamping information and it latches the current time into a register from where it is made available as time-stamping information via the RS232 port or FIFO output bus.

## THE $\mu$ S COUNTER

Figure 3 shows a block diagram of the  $\mu$ s counter and comparator, as implemented

in the  $\mu$ s counter EPLD. This device includes an address decoder, a counter and a comparator. The counter uses a 1 MHz crystal-based clock signal and the 1PPS signal (from the GPS receiver) to maintain a count of the time in microseconds. The 1PPS signal resets the counter at the start of every second. A 20-bit counter is required, giving maximum count of 1048576.

However, the counter is implemented as a 24-bit counter in order to read the counter value as three 8-bit bytes. The address decoder facilitates reading from the individual 8-bit counter latches via the data bus. The comparator generates a signal when the pre-programmed  $\mu$ s setting matches the value contained in the  $\mu$ s counter. With this signal and HMSEqual the signal TRIGGER OUT is generated.

The control bus signals include the 1PPS signal, 1 MHz clock input signal clk, write signal /WR, read signal /RD and a TRIGGER OUT signal which indicates when a match of real and programmed time occurs. The 1PPS signal is also routed to the micro controller as part of the control bus.

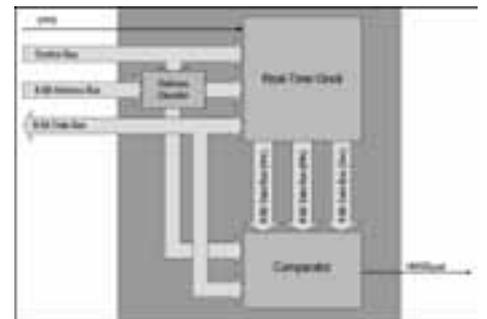


Figure 3: Block diagram overview of the  $\mu$ s counter and comparator.

In the  $\mu$ s comparator shown above the micro controller can write a trigger value to the comparator input latches via the data bus, using the address bus and /WR

signal. The comparator compares this value to the real time value contained in the counter. When a match occurs, and signal HMSEqual from the RTC also indicates a match of the hours, minutes and seconds at the same time, the module asserts trigger signal TRIGGER OUT.

## TIMING ACCURACY

Electromagnetic waves travel at a speed of approximately 300 000 km/s on a low-loss transmission line. Typical tower spans for HV transmission lines are in the order of 300 m, which implies that a timing resolution of 1  $\mu$ s is required to determine the location of a travelling wave source or reflection with an accuracy of one tower span. It follows that it is crucial that the clock input to the  $\mu$ s counter is sufficiently stable, i.e. of the order 1 PPM.

Conventional crystal oscillators can have an accuracy of 100 ppm down to 10 ppm, which is not accurate enough for the applications of this system. A more stable clock, such as an Oven Controlled Oscillator Crystal device is required. These oscillators are temperature controlled to increase stability of the output signal. They are produced to customer specifications, which can be anything from 1ppm to 0.1ppm, but are relatively expensive. Factors such as temperature, supply voltage fluctuations, the load on the crystal, and ageing of the crystal also affect the overall accuracy. It follows that a stable, well-regulated power supply and high input impedance load is needed.

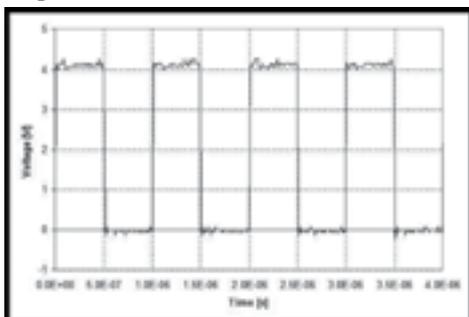


Figure 4: Measure 1ppm clock pulse.

## RESULTS

The 1  $\mu$ s pulse generated in the way as described above was found to be very

stable and accurate. Figure 4 presents the measured clock pulse.

In order to test the system, a “time-stamp request” signal was sent at a known, pre-determined time. The system would then, by using the developed techniques, return a result (in hours, minutes, seconds and microseconds) which may be compared to the known generated trigger event. Results were accurate and as expected.

## CONCLUSION

This article described the implementation of a cost-effective hardware topology for facilitating GPS-based synchronized data acquisition for fault location and WAMs applications. It is shown that features such as programmable trigger times and time stamping for data acquisition applications can be readily achieved using a commercial GPS receiver and a relatively inexpensive logic arrangement implemented using EPLDs. To maintain acceptable accuracy for demanding applications such fault location, expensive clock circuits must be used. **wn**

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### Author

Thinus van As received the M.Sc.Eng. degree in Electrical Engineering from the University of Stellenbosch in December 2003. He is a professional engineer currently employed in the renewable energy sector.

### Thesis Promoter

Prof. Johan Vermeulen received the B.Eng. degree in Electrical and Electronic Engineering from the University of Stellenbosch in 1981. He worked for the South-Africa utility ESKOM as a research engineer in the field of quality of supply from 1983 to July 1986, when he joined teaching staff at the Department of Electric and Electronic Engineering of the University of Stellenbosch. He received the M.Eng. and Ph.D. Eng. degrees in Electrical Engineering from the University of Stellenbosch in 1986 and 1995, respectively.

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BY I Thierry Boulanger | Director for IT Solutions - Africa

Consumers today are far more aware of their contribution to a greener South Africa – looking for ways in which to minimise their carbon footprint through integrating products and behavioral change into their home environments. However, this adoption has been slowed down by the preconception that this change comes at a price. Well the truth is that in fact it doesn't... Sure the immediate investment in some cases can be more expensive however; the long term benefits and cost savings far outweigh the initial expenditure.

# Shedding Light on LED Lighting

LED lighting is a perfect example of how consumers can maximise their energy spend and manage their eco efficiencies while saving costs within the home.. This is as a result of the global proliferation of eco-friendly policies and growing consumer awareness in energy savings and conservation and the part that LED lighting can play. In line with this trend, Samsung have launched a new range of LED retrofit lamps which reduce energy consumption by approximately 80% compared to incandescent and halogen lamps – saving consumers on their electricity bills.

What's more, they boast extremely long lifetimes of up to 15 years, ensuring that light bulb purchases are very few and far between. And if that wasn't enough, these bulbs ensure 90% fewer CO2 emissions, contributing to the

greener, eco friendly home environment. So does this then mean that you have to change all the lamps and lighting in your home?

No certainly not, LED retrofit lamps are LED-based lamps that can be fitted into existing sockets, replacing incandescent fluorescent or halogen bulbs, and are not only cost effective and eco-friendly, but boast other benefits such as quality lighting and competitive pricing within the market, not to mention comfortable, warm lighting – ideal for residential areas.

Furthermore, these bulbs include a total of 14 products, comprised of various LED light bulbs including; GU10, MR16, E27, candle and golf-ball types lighting - ensuring that consumers can now enjoy a wider choice of brightness, energy consumption and price efficiencies.

These lamps are manufactured by Samsung and come with a standard 3 year guarantee.

The range will be available from November 2012, through all leading retailers.

It is this diverse offering that addresses the key concerns and behaviors of today's consumers and will continue to drive the uptake of LED lamps over other lighting solutions, where consumers have the opportunity to change the ambiance of their homes and their lifestyles with an eco conscious perspective, and of course a saving one as well – something that is critical today where living expenses are already on the rise.

**So ask yourself... can you afford not to change to LED retrofit lamps?**



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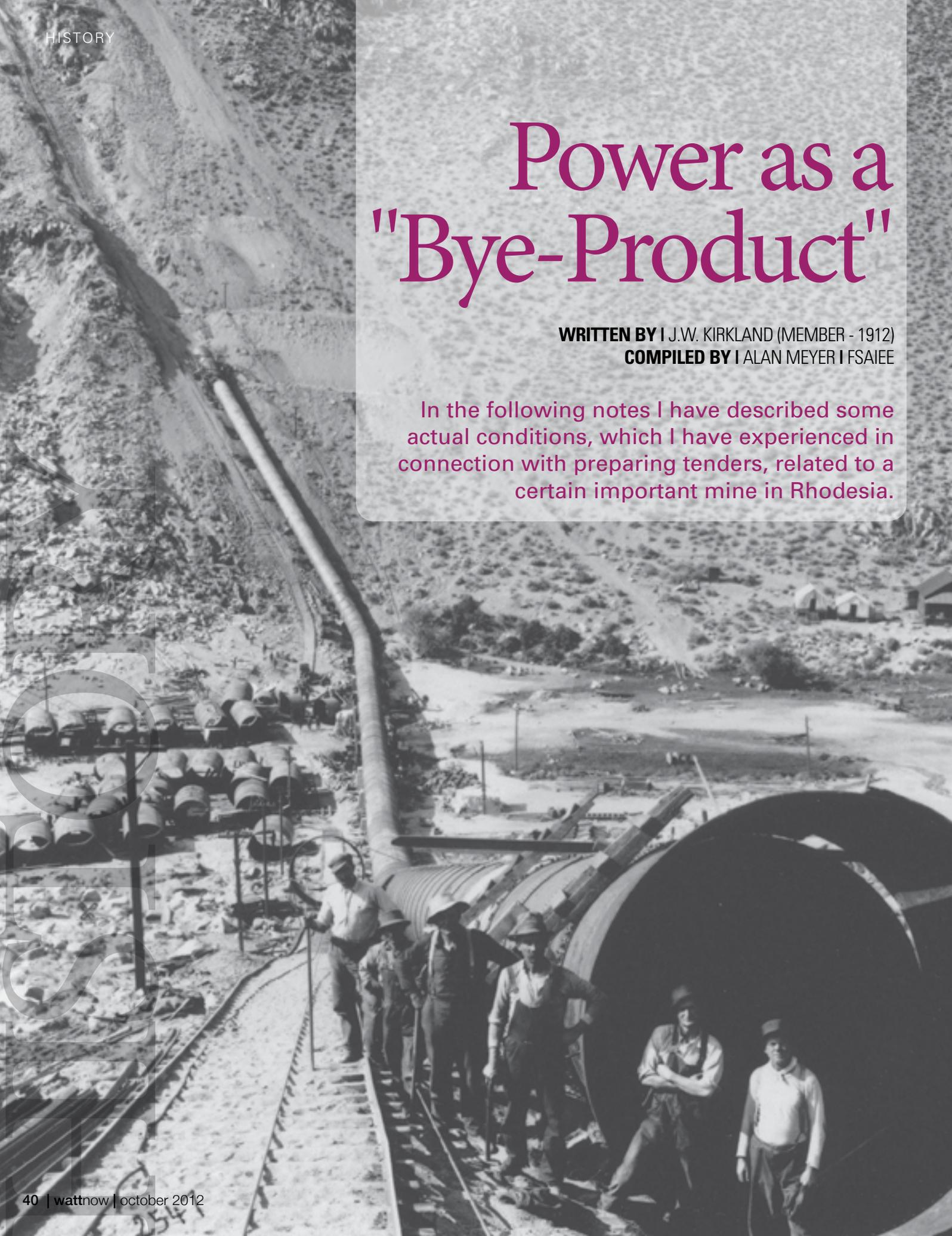
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 Lighting

# Power as a "Bye-Product"

**WRITTEN BY** | J.W. KIRKLAND (MEMBER - 1912)  
**COMPILED BY** | ALAN MEYER | FSAIEE

In the following notes I have described some actual conditions, which I have experienced in connection with preparing tenders, related to a certain important mine in Rhodesia.



WATT  
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## EXCERPT FROM THE TRANSACTIONS VOLIII - 1912

It is a somewhat unusual coincidence that two such favourable cases for getting considerable amounts of power, without incurring any fuel expense, should exist in a single property. These examples happen to be such a case.

Case No1: The mine is to be supplied with water from a river about eight miles away. In order to follow the shortest and most practical route, it is found necessary to pump the water to the top of a ridge which is some 615 feet higher than the pump house, and about 740 feet higher than the storage tanks at the mine. A small reservoir or standpipe will be placed at the top of the ridge.

The mechanical engineer responsible for the plant would not willingly let a chance slip to get so much of a good thing, and power for nothing. He has planned that the water, on its arrival at the foot of the incline near the mine, will be led to a double wheel Pelton turbine; each nozzle and wheel will be designed for a capacity of one of the river pumps, and one or two nozzles will be open depending upon how many pumps are running.

In this particular case, the place where

it is most convenient to locate the storage tanks is some 2,700 feet from the main engine room of the mine. It is highly desirable therefore, that there shall be nobody in attendance in the turbine house. That is why an induction generator (which is neither more nor less than a squirrel cage induction motor) of 125 h.p. capacity is preferred.

The second case of "bye-product power" is due to the location of the mine at a considerably higher level than the reduction works. Consequently, the ore has to be lowered down an incline. It will be noted that the gradient varies between level at the bottom and about  $30^\circ$  (since  $\sin 30^\circ = 0.5$ ).

The scheme adopted involves ore cars with an empty weight of 12,000 lbs. each and having a capacity of 20,000 lbs. of ore.

If the work done by the unbalanced descending load were wasted in friction-brakes, the necessity of keeping the brake shoes and brake paths cool would involve water circulation. which This would mean an undesirable and expensive complication of the gear. It was, therefore, decided to use regenerative electric braking by the chief engineer of the Mining Company.

The choice lay between the straight three-phase system and the Ward Leonard. Each system possesses certain advantages and disadvantages peculiar to itself.

Considering first the straight three-phase system, it is obvious that the arrangement will be highly efficient, the only losses extraneous to the mechanical gear being are those of the motor, since the rheostat losses are practically nil.

If it were not for the fact that the work to be done is negative, the outfit would not work at all, because a 125 k.W. generator is too small to run a 175 h.p. motor, and a 150 h.p. motor is too small to run a 125 k.W. generator. We have clearly used the wrong terms; what we have called the hoist motor is really is a generator.

The direct current dynamo of the motor-generator set is really a motor, not a generator. Finally, the 150 h.p. induction machine of the motor generator set is an induction generator, and not an induction motor. Looked at it in this light, it will be seen that there is the proper gradation in rating between the various machines. **Wn**

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# Items of Interest

BY I.L.E. HUNT | PR. ENG. RETIRED

## DEMAND CONTROL PSYCHOLOGY

When I first took over at the Village Council of White River in October 1973, we had had a Maximum Demand of 1650 kVA, but with a good load factor of some 0,65, as against that of some other towns of 0,35.

Much of this was due to the fact that all consumers, whether residential, business or agricultural were billed on a two part tariff. Approximately half being for Units and half for Amperes of maximum demand measured on maximum demand Thermal Ammeters.

Consumers were very conscious of their demand. Unfortunately these meters had to be read every month and reset and sealed, or consumers were upset. Later they were phased out, but they had done their job, however, if consumers could again be made aware of their demand, it might help the ease supply situation.

## SINGLE WIRE EARTH RETURN

In addition to the town, White River had rural consumers, fed off lines making a ring feed to the further end of town. These lines had three phases at 11 kV and an overhead earthed neutral/lightning conductor.

Single phase consumers were fed from pole mounted transformers at single phase, with primaries wound for 6350 volts and connected between phase and neutral, thus requiring only one drop out fuse link and one lightning arrester per connection.

During my 18 years with the Council, I was not aware of the loss of more than one such transformer and very few lightning arrestors, while on ESKOM's lines, I saw many such lightning arrestors blown.

It is my belief that in keeping the lines to 6350 V above earth, we were saved many replacements, and perhaps the installation of some neutral earthing devices along Eskom's lines could also save them many replacements.

## REVERSING SLIPRING MOTORS

During my second year of apprenticeship (1944) at USCO Vaal, we had a number of slipring reversing motors for the runout tables on various rolling mills.

To the best of my memory some of these motors on the 22 inch mill were 60 HP and had to reverse fairly rapidly for short ingots. Rotor resistances were used initially, but were replaced by Eddystats which were essentially large chokes. When the motors were started, full mains frequency was induced in the rotors and the current thus limited by the inductance.

When motors were at speed and put into reverse, the frequency induced in the rotors was then twice mains frequency, thus limiting rotor current to acceptable levels. As power factor was not measured at that time,

I am not aware of its possible influence, but I have not encountered such devices since. **wn**



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**Venue:** University of the Witwatersrand  
FNB Auditorium 101  
S 26 11.343 E 28 01.587

**Entrance:** Free

**Enquiries:** Brett Terespolsky (ieee@ee.wits.ac.za)

**Registration:** witsrobotvisit.tk (for catering purposes)



- Geminoid and Robovie are registered trademarks of the Advanced Telecommunications Research Institute International (ATR).  
- Geminoid H1 / H2 was developed by the Hiroshi Ishiguro Laboratory, ATR.  
- Geminoid F was developed by Osaka University and the Hiroshi Ishiguro Laboratory, ATR.



### Professor Hiroshi Ishiguro

Director of the Intelligent Robotics Laboratory at Osaka University who has research interests in distributed sensor systems, interactive robotics, and android science. Leader in development of the Geminoid series of human-sized androids.

### Nobuo Yamato

CEO of Vstone Co., Ltd. and director of Team OSAKA, a team which participated in RoboCup Soccer, winning the 2004 to 2008 humanoid league championships.



 Embassy of Japan



# How e-tolls really work...

"...road building is a government responsibility, thus, they (the government) should provide the funds for it."

BY I THANDIWE NKAMBULE | MSAIEE

The biggest issue that the [government] faced was to get the Toll Ring system approved at the beginning of the process. [Citizens] already bore heavy taxes including those for road transport. Cars are expensive to purchase; there is road tax and high insurance costs as well as high taxes on fuels." (*Ieromonacho, Potter, & Warren, 2006, p. 369*)

"Although the government sees the solution to the current transport crisis as increasing the road capacity,

there are serious doubts about the effectiveness of such a plan."

(*Price & Probert, 1995, p. 12*)

"Of course, the major question is why did the roads need to be tolled at all?...the government would have been unlikely to be able to fund the project from its normal sources for many years to come. Borrowing the money needed and then repaying it from toll revenue was an obvious way of bringing the project forward."

(*Lay & Daley, 2002, p. 263*)

"A basic tenet of political science is that massive civil disobedience can overturn any law. With electronic tolling systems, the disobedience does not have to be very massive to critically disrupt the system..."

(*Lay & Daley, 2002, pp. 263 - 264*)

"Road building cannot keep up with the rise in traffic... Techno-fixing means relying entirely on technology to solve the problem..."

(*Price & Probert, 1995, pp. 11-12*)



be of an economic nature – that we cannot afford to pay the tolls, that alternative ways to fund the road infrastructure must be investigated. For a number of reasons, including crime detection and monitoring, we never touched on issues of privacy or personal freedom, that e-tolling “will provide massive amounts of detailed, cumulative, personal, and potentially real time location and identification data” that may lead to “real time or retrospective surveillance of the movement of vehicles and/or people”, that “the driving habits and journey patterns of private citizens may be subject to routine scrutiny by outside interests, including potentially both government and private organisations “ (Ogden, 2001, pp. 123-124).

The aim of this article however, is not to discuss the pros and cons of e-tolling or its politics but it is to give an overview of what it is and how it works.

### WHAT IS E-TOLLING?

Electronic toll collection (ETC) involves the payment of a fee for the use of a section of a road where the identification of the vehicle and the subsequent financial transaction is undertaken electronically (Ogden, 2001). Two types of ETC have been applied in South Africa, namely “Boom-down” Electronic Toll Collection and Open Road Toll Collection; examples of these are shown in Figures 1 and 2 respectively.

“Boom-down” electronic toll collection is applied at the conventional toll plazas. Vehicles are fitted with an electronic tag and road users need to slow down when entering the toll plaza area for the tags to be read and for the tolls to be deducted from the accounts of the road users.

Open road tolling is a multi-lane, free flow electronic tolling system that allows for tolls to be collected without the vehicles having to stop (SANRAL, n.d.). This and its low operating costs make it attractive to both road users and operators (Ogden, 2001, p. 125). Open road tolling is what

SANRAL is intending to implement with its e-toll system.

The patent for open road tolling was lodged in the United States in 1997 by the Raytheon Company as “Open Road Cashless Toll Collection System and Method Using Transponders and Cameras to Track Vehicles.”

The system is cashless and typically consists of three components, which are: the roadside toll collectors, toll transaction processors and a revenue management system (see Figure 3). The three components are linked to each other by a fibre optic network.

For the open road toll collection system, the windscreen-mounted transponders or electronic tags on the vehicles communicate with the roadside reader that is mounted on a gantry straddling the highway. When a vehicle enters the vicinity of the roadside reader, the transponder transmits its identification data to the roadside toll collectors that are correlated with the vehicle detection data. The identification data, location data, and entry and exit data are processed by the roadside toll collectors to generate transaction reports for each vehicle.

The toll transaction processor processes the transaction reports to generate tolling transactions for each vehicle. The tolling transactions are forwarded to the revenue management system which generates tolls for each vehicle and bills the owner of the transponders for use of the toll road.

The system also has cameras that record images of the licence plates of the vehicles that pass through the gantries, therefore also recording those vehicles that do not have transponders installed.

The images of the license plates are processed using optical character recognition processing to identify the owner of the vehicle. Vehicle ownership data derived from processing the images of

Reading the above quotes one may think they have been made by South Africans in relation to government’s attempt to introduce urban electronic tolling (e-tolling) to pay for the road infrastructure development in the country. However, they were made by people in different countries all over the world, who also found themselves faced with the same situation that South Africans are faced with.

Although South Africans have made similar statements, our concerns have tended to

# How e-tolls really work...

*continues from page 45*



Figure 1. An example of a "Boom-down" electronic toll collection system.



Figure 2. An example of an open road electronic toll collection system.

the license plates are used to bill registered owners of the vehicles. The system may be applied in a different number of ways e.g. as described on its patent with images being captured only for vehicles without transponders or as SANRAL planned to apply it with images of all vehicles being captured, regardless of whether they have an e-tag installed or not.

### WHAT IS ON THOSE GANTRIES?

In Figure 4, the top and side views, of a roadside toll collector are illustrated. Typically, a roadside toll collector consists of two gantries that span both the entry and exit lanes of the toll road. The license plate cameras may be located on both gantries with lights that are used to illuminate the license plates in low light level conditions (see Figure 5 and 6). A light sensor may also be placed close to the cameras to monitor the light intensity at the roadside toll collector and provide feedback signals to the roadside toll collector that are used to control shutter, gain, and pedestal settings of the license plate cameras during lighting conditions that affect the quality of the images taken.

On the second gantry, vehicle detector and classification (VDAC) systems are usually mounted, along with vehicle-roadside communications (VRC) antennas that transmit and receive RF signals that communicate with the transponders, in transponder equipped vehicles.

The vehicle detector and classification systems include a laser-based sensor that generates a dual fan-beam scanning laser beam that is used to determine the speed, height, length and profile of vehicles as they pass a toll collection zone.

Adjacent to the toll road, in the vicinity of the gantries, a roadside control station is usually built. The roadside control station comprises a VRC reader, an application processor and a transponder locator that are coupled to each other, and transmit data and commands between each other as required to process transactions within the roadside toll collector. The application processor is also coupled to the license plate cameras, the lights, the light sensor and the vehicle detector and classification systems.

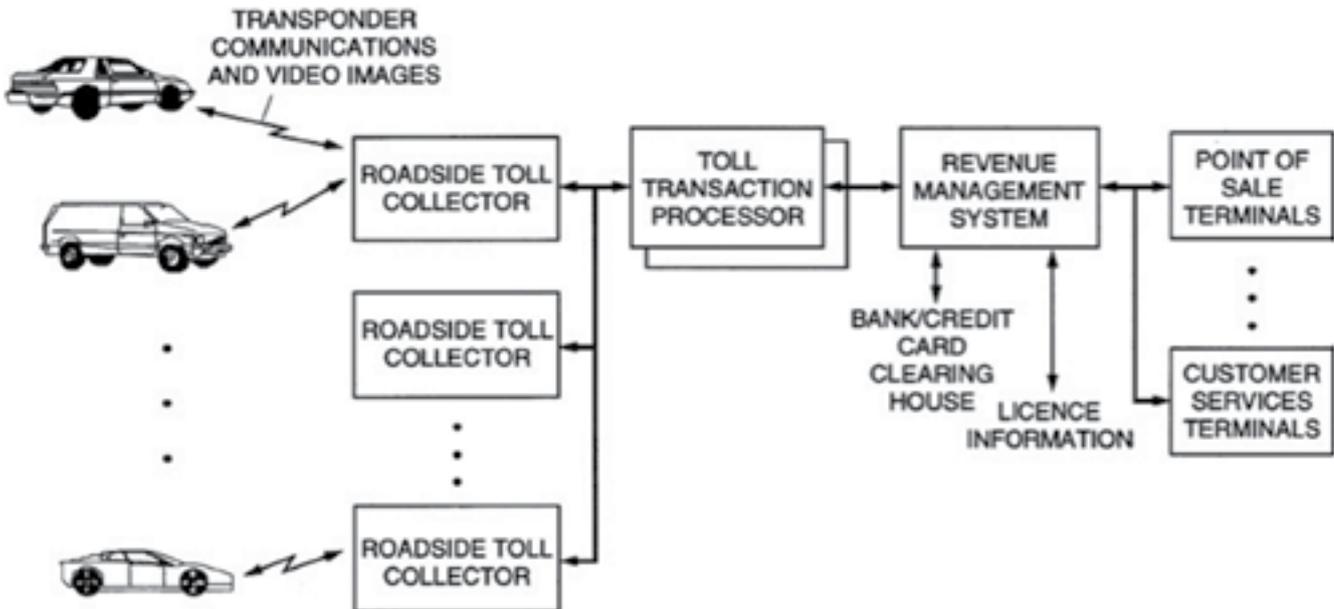


Figure 3. Electronic tolling system.

The VRC reader is coupled to the VRC antennas and is used to read each identification code (ID) transmitted from the transponders and write data to the transponders. The antennas have phase array elements to determine the angle of arrival of the signals transmitted by transponder. These angle of arrival measurements are combined and the geolocation of the transponder is determined. Measurements made at different times and at multiple transponder locations are processed to track the path of the transponder.

The VRC reader also includes redundant VRC processors that are coupled by way of one or more transmit/receive modules to the VRC antennas. The VRC processors use time-division multiplexing to communicate with the transponders. Multiplexing allows for communications with a large numbers of transponders at the same time and is independent of lane position of the vehicles. Successful communications is possible with closely spaced vehicles at speeds up to about 240 kilometres per hour. **wn**

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Figure 5. Equipment mounted on open road toll gantry.



Figure 6. Lights used to illuminate the vehicle license plates.

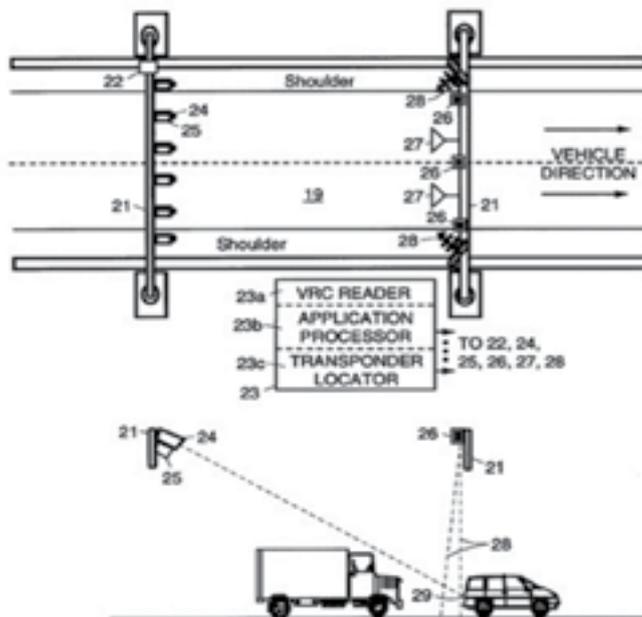


Figure 4. Top and side view of a roadside collector.

Item	Description
19	toll road
21	gantry
22	light sensor
23a	VRC reader
23b	application processor
23c	transponder locator
24	cameras
25	lights
26	vehicle detector and classification system
27	transponder locator antennas
28	VRC antennas
29	vehicle license plate



# Memories of a War Time Appie

I turned 16 in September 1942. Middle of world War II, passed Standard 9 in November and was privileged to be signed on for a five year indentured apprenticeship in the Electrical workshop of USCO Vaal Works.

**BY I L.E.HUNT I SM SAIEE**

As I had not been to Tech, but at a privately funded boarding school, I did not qualify for a year's rebate and so I had to start night school in the lowest level. At that time also we did not yet have Trade Testing.

There was a scarcity of almost everything in those years. Artisans fell under the controller of manpower, and were not allowed to change jobs without written permission. There was also bleating about a shortage of engineers and 'they' said to me "get Matric young man as it is like a ticket to ride on the bus". Since petrol was rationed to 300 miles per vehicle per month, the artisans I worked with built a gas producer onto a trailer, which they used in turn to go on their annual vacations to the Natal coast.

*As an apprentice we were also required to work overtime, usually for filing or manufacturing of contacts or winding coils for motors, or cutting slot insulation.*

We were required to attend night school three nights a week and one afternoon for Maths. The technical subjects were; machine construction and drawing, applied mechanics ( applied maths), and electricians trade theory/electrotechnics.

So, in addition to the foregoing, I had in my spare time to study for Matric by correspondence. This was quite an adventure until I was able to find a satisfactory Correspondence College and obtain the subjects of my choice, viz. English, Afrikaans, Maths, the compulsory three and Physics, Chemistry and Electrotechnics, the optional subjects. All had to be passed with a minimum of 50%. I have no regrets at my subject choice, as this stood me in good stead later in life.

The USCO Vaal Works had been commissioned in 1912 and much of the equipment was old. Typical of the motors was the one in our workshop, driving an overhead countershaft via a 2" by ¼" flat belt, and from which the lathe, grinder, power saw and pedestal drill were all driven by similar belts. The motor was open sided with sleeve bearings, and had to have the dust blown out of it at regular intervals.

Gap testing was also needed to ensure that the rotor did not rub on the stator. Most of the motors in the works were similar, and often metallic dust would accumulate between coils, heat up by induction and burn the windings, requiring a rewind.

With the exception of the 22 inch Mill motor at 5,5kV, started with a liquid starter, and running in one direction only, driving via a Vee-rope pulley, a large flywheel for a three-high mill stand where the sections

being rolled. It passed through the lower pair of rolls in one direction and the upper pair in the opposite direction. The other motors were all at 525 volts, as were motors on the mines.

Scarcity of materials required innovation. While enamelled winding wires and insulating varnishes were not generally available, double cotton covered wires were, and we were able to get shellac, which had to be dissolved in meths, from the pattern shop. Those cotton covered wires were drawn through a bath of this shellac, and wound onto drums on the lathe. When dry, these wires were wound onto wooden formers made in the Pattern shop, to make the coils needed for rewinding the motors. Only later did we get other varnishes like Glyptal.

As an apprentice we were also required to work overtime, usually for filing or manufacturing of contacts or winding coils for motors, or cutting slot insulation. After rewinding, the windings were doused in shellac and had to be thoroughly baked out.

Many of the motors were slip-ring reversing motors for the overhead cranes and runout tables for the rolling mills and most of those rotors had to be thread wound, as the slots were not open. They were operated by drum controllers with resistance banks in the rotor circuits.

Cabling materials were scarce and brass was needed for munitions production, so for making off cable ends we had to cut copper sheeting into strips which we tinned and formed to make cable clips which were then soldered onto the armouring and lead sheaths of the cables.

Some smaller cables, instead of the paper insulation, were insulated with VIR (Vulcanised India Rubber) and bundled together. That was of course long before PVC insulation.

Screwed steel conduit was in use then, and in addition to screwing threads on such conduit, we had to learn to drill and tap holes for screws into steel panels, in order to mount switchgear, fuse bases for wired fuses, and other items.

Heating for soldering was done using acetylene generated from carbide in a small drum. and At the KLIP works this acetylene, together with oxygen, was used for gas welding steel frames for mounting switchgear. Blowlamps using paraffin were also much used.

Of course there were many other things to learn about, such as switches, star-delta starters, auto transformer starters in oil baths, Osira mercury vapour lamps with their bulky chokes, electric furnace controls with hydraulic lifting gear, and HRC fuses Moulded case circuit breakers were not in general use then.

Later in life I noted that many top Engineers in Municipalities had started as apprentices. I believe that there was nothing wrong with a technical Matric and that the standard of those exams set by the Union Education Department was at least equal to the standard of the then Cape Matric

We need a return to the Technical Colleges and the Apprenticeship system. **wn**

# You said...



Dear Minx,

I found the latest issue of **wattnow** absolutely fascinating, especially the article on new technologies for high capacity submarine cables. I had no idea that coherent modulation had actually come to anything after the early attempts at STL in the UK had seemed so fraught with impossibilities.

I would like to take issue with one point in the article, however, on page 49 the content of a standard DVD is stated to be 4.7 Gbytes. I think that this should read 4.7 Gbits. Otherwise a superb update on the technology and my compliments to Mike Crouch for his introduction.

Bill Brading.

*ED - Thank you for your letter Mr Brading. Your letter was forwarded for comment.*

Hi there Minx

I was interested to read the article originally written by member FH Mitchell on his 1912 visit to various electrical factories in Europe. In it he mentions a "large turbo-generator factory in Berlin, in which one of the two largest generators so far designed (20,000 k.v.a.) was under construction". This week I am presenting Eskom's Basic Generator Engineering course for their young engineers, and next month the Intermediate course for their more experienced generator system engineers.

In the history section we discuss the development of generators since inception (from the original 1891 demonstration in Lauffen, Germany) to the 900MW giants at

Koeberg. So it was interesting to me since we specifically mention the 1912 milestone of 20MW!

In particular the writer lists the revolving field rotor design criteria (Centrifugal force, Balance, Critical velocity avoidance, Heat dissipation), and these have remained and are all still valid for today's designers - such as the 800MW Alstom machines being installed at the new Medupi and Kusile stations presently under construction.

Incidentally the article was gleaned from the Historical Interest Group's collection by Mr Alan Meyer, my first boss at General Electric, who taught me a lot about electrical machines, computers, and international affairs. Thank you Alan!

Best wishes,  
Bev Lawrence  
Fellow

*ED - Thank you for your letter Bev, a small world we live in.*

Dear Minx,  
**Aluminium (Poisonous to the Body) in ALL Deodorants !!!**

I have just tripped over this little gem whilst re-reading a back-number of my monthly "NUTRITION AND HEALING" Magazine for October 2010, written by Jonathan Wright, who upsets the Drug and the Medicine Industry with his very outspoken revelations. He has even been beaten up and his Surgery trashed as a deterrent (*but nobody ever owns up of course !!*).

In an article on the dangers ALUMINUM, he states that ALL Deodorants include ALUMINIUM which is essential for the suppressing of the nasty smelling perspiration from the Sweat Glands. This eventually accumulates in the nervous system and ultimately causes Nervous System disorders, especially Alzheimer's Disease !!

Incidentally, do you remember the Big Scare about Aluminium cooking utensils a few years ago??.. I checked this out on the Internet and it is fully documented.

Personally, I never use Deodorants (*which is why I stink !!!*). Jonathan says that the perfect solution to the 'Deodorant Problem' is to use ZINK OXIDE OINTMENT rubbed on before going to bed at night. He does not know how or why it works BUT IT CERTAINLY DOES !! What is more, it will last up to FOURTEEN DAYS INTO THE FUTURE!!

TIP: If you use deodorants, then you must include in your Will:- "I hereby donate my body to the Aluminium Industry for RECYCLING !!"

By "Poppa Howard"

*ED - Thank you for your letter Poppa Howard, you certainly have given us a few 'smelly' things to think about. **wn***

Send your letters,  
compliments, complaints,  
opinions to [minx@saiee.org.za](mailto:minx@saiee.org.za)



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The-Feed-a-Child team works closely with people who want to eradicate poverty and make a difference by striving to bring some hope to these children in need as well as building a vision to give them a brighter future.

Realizing the importance of nutrition to a child in the early ages, Feed a Child therefore focuses on the children to help them develop to their fullest potential through our feeding scheme.

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of Feed a Child for the next 12 Months is therefore to supply an excess of 2 500 000 (Two Million Five Hundred Thousand) meals to the needy.

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- Includes 25 essential vitamins and minerals,
- Provides Vitamin A, which is essential for normal sight and immune functions,
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- Feeding I Water projects
- Healthcare and Medical Services
- Education I Sustainability

It needs to be emphasized that we don't only feed people (although this is very important initially), but also work towards getting impoverished areas self-sustainable by planting crops, putting water projects in place, educating people, bringing on board Health and wellness services.

Become part of the valuable team of contributors and facilitate 2.5 million meals to children through this transparent project. All small contributions add up to countless long term benefits for this country we all call home.

### WHAT DOES THE LAW SAY ABOUT DONOR DEDUCTIBLE CONTRIBUTIONS?

Refundable donations (in cash or kind) to Public Benefit Organisations (PBO's) is limited to 10% of taxable income before deducting medical expenses and normal NPO donations, provided it is made to organisations which issue receipts in terms of Section 18A. Therefore, the donation value can be deductible in full if it falls within 10% of the taxable income.

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Putting action into someone's willingness to help!



# Say watti



I was interested to read the somewhat distorted article in May issue entitled "The Birth Pangs of the Rand Easter Show" by John Davies and this was followed by another short comment in the July issue. Whilst John has got the date of the first WAS (Witwatersrand Agricultural Society) show correct as 1894, the rest of the account is regrettably inaccurate.

**BY I** KEN W BAKER  
COMPSAIEE I HONFSAIMC

To cut a long story short, John is confusing "Electra and Mining" with the Rand Easter Show – poles apart.

## HISTORY 1

The Rand Show, also called the Rand Easter Show was first held in 1894 by the Witwatersrand Agricultural Society (WAS) and was opened by Paul Kruger at a venue called Milner Park, which is today the site of the University of the Witwatersrand's West Campus. In 1936 the Rand Show was named the Empire Exhibition to mark the occasion that we are familiar with. From 1936 it was referred to as the Rand Easter Show and established itself as a very successful commercial and industrial exhibition (*although agriculture, cattle and machinery continued and continues to this day as an important feature*).

In 1949, the company that I worked for at the time had the contract to install and operate the PA system using the Tower of Light as the control center with large horn speakers mounted at the top of the tower for music and announcements. Our company also had an exhibition stand together with several hundred other commercial enterprises (not cattle). This

extensive Rand Easter Show continued to be held at Milner Park until the mid 1980's when it was re-established at NASREC where today most other major shows, including "Electra and Mining" are held..

Certainly ELECTRA was not established the way in which John Davis reflects and certainly the Rand Show is NOT an off-shoot of Electra.

## HISTORY 2

Initially The Instrument and Control Society of Southern Africa (ICSSA) staged small annual specialized instrumentation events in a Physics Lab at Wits. We must take our hats-off to ICSSA for conceiving the excellent idea. But at the end of the day the ICSSA "physics table" concept was not considered to provide sufficient exposure for entrepreneurs in a growing industry, and the Rand (Easter) Show was too generalized for the engineering fraternity.

So in 1963 Ken Baker, together with three other shareholders (including Norman Pinker referred in John's article) formed a company called Scientific, Electronic and Engineering Exhibitions (Pty) Ltd (SEEEExhibitions) and this was without



question the first specialized exhibition company in South Africa.

Ken can add to several aspects to this to particular era of history in great detail.

SEEEExhibition's very first show in 1964 was named "In Step with the World" which focused on the Electrical and Electronic industry per se. After much deliberation and negotiation with the Witwatersrand Agricultural Society (WAS) executives we managed to arrange the hire of one hall at Milner Park for "In Step with the World". I well remember how extremely nervous WAS management were in agreeing to allow a commercial competitor to enter their Rand Easter Show monopoly. At the end of the day, management relented on condition that our shows were always to be held much later in the year.

The first "In Step with the World" was officially opened by Dr Nico Stutterheim, vice-president of the CSIR.

SEEEExhibitions continued with their specialized business (Nuclear, Scientific and Electronic, Electrical, Mechanical, Plastics) and in 1965 all our shows were

combined into one which we named ELECTRA. The first of these was held in the Empire Cafeteria Hall at Milner Park.

The Association of Supervisory Electrical Engineers (ASEE) used the Auditorium for papers to be read by the late Prof Bozzoli and Mr Aspinall of SEIFSA. It is assumed that as ASEE were part of the Programme of Events in the auditorium that the committee presumably decided to take an exhibition stand to join the other 70 odd companies already registered. They presumably got a stand through Norman but were too late to be included in the Buyers Guide.

The venue for Electra continued at Milner Park but later we transferred to the Carlton Center exhibition area. By 1970 the success of SEEEExhibitions (Pty) Ltd was evident. Ken Baker and his shareholders accepted an attractive offer and sold the business, along with the ELECTRA name, to Thompson Newspapers, a big British publishing concern at the time. Later the company changed hands again *Industrial Exhibition Organizers (Pty) Ltd* and eventually moved the infrastructure to Nasrec when Electra was renamed ELECTRA AND MINING - NOT the Rand Easter Show.

### SO – BRIEF SUMMARY:-

- Indeed ASEE did not sponsor Electra. Baker and his partners own cash and business acumen did that - thanks very much.
- Absolutely no claim to fame can be credited to ASEE or any of its members for the success of SEEEExhibitions or the name ELECTRA. Industry must, however, be thanked for helping to get the "show on the road" so to speak.
- ASEE had an Auditorium for their program but so did 12 or more other companies take the opportunity to present their own papers.
- HC Koch, President of the Transvaal and Orange Free State Chamber of Mines performed the official opening of Electra 65.
- ASEE continued with their participation in the program of events arena and were welcome exhibitors, but not main players.
- The Rand Show was open to the general public as a commercial, industrial, home industry, home appliances, etc. exhibition long before SEEEExhibitions or Electra were even dreamt of.
- I could go on and on. **Wn**

*The Rand Show, also called the Rand Easter Show was first held in 1894 by the Witwatersrand Agricultural Society (WAS) and was opened by Paul Kruger....*

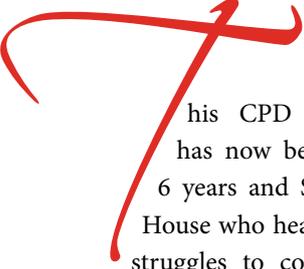


# SAIEE Doing a great job training

When the Engineering Council of SA (ECSA) introduced re-registration of engineers in 1996, and it became mandatory for all registered persons to prove their continuous professional development (CPD) in the preceding 5 years prior to re-registration – the SAIEE developed CPD training programmes to assist it's members and other engineers to acquire the necessary Category 1 CPD credits.

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

## *The SAIEE, being a registered voluntary professional learned society with ECSA, is licensed to validate or accredit courses run by providers in private practice.*



his CPD Training Programme has now been running for about 6 years and Sue Moseley at SAIEE House who heads up this programme struggles to cope with the demand. The courses have proved very popular with the younger practising engineers. However quite a large percentage of attendees are mature practitioners, either catching up with new technology, or learning about aspects outside their immediate field of expertise.

This year to date, Sue has run some 26 courses with a total attendance of 400 engineers. What has eased the logistics of running these courses is the use of the new facilities available at the new head office building, SAIEE House in Observatory. Since 2006, the SAIEE has made a significant impact in the training arena with an estimated 2000 engineers having attended the CPD training programme.

The Professional Development Committee chaired by John Gosling – a past President of the SAIEE – is the strategic engine under which these training programmes are directed. This important committee is very much involved with, and carries out, the professional work done by ECSA.

Professional Reviews for Candidates applying for professional registration, accreditations of electrical engineering programmes at tertiary institutions, and serving on the various committees at ECSA, are some examples of the work done by this committee, and indeed other senior members of the SAIEE.

One very interesting aspect is the demand for certain types of training. While many technical courses – fundamental theory and application are run, the trend appears to be a preference for non-technical courses. The SAIEE believes that a professional engineer needs more than just technical knowledge to be professional so courses like “technical report writing” and “engineering finance” and even “conflict management” as well as knowledge about legislation “consumer protection” are included in the menu of courses offered in addition to the pure technical content.

The SAIEE, being a registered voluntary professional learned society with ECSA, is licensed to validate or accredit courses run by providers in private practice. After a rigorous validation process the SAIEE awards CPD credits to courses run by providers.

The question is sometimes asked – if the SAIEE runs its own training courses and also validates courses run by providers and awards CPD credits – is this not like running with the hares and hunting with the hounds? In other words, the SAIEE is not totally independent and should not be “policing” others while doing the same thing itself?

The answer to this seemingly unhealthy arrangement is that that it is not. The situation in this country is such that training is a high priority, needed to address the skills shortage, and anything that can be done to alleviate this challenge is welcome.

The fact is that the SAIEE is not in competition with anyone in the training arena. Granted the SAIEE attendance fees are generally lower, but if required, the SAIEE will advertise Providers’ courses, and work in conjunction with any appropriate Provider, to run courses together. The common aim is to provide as much professional development as possible to anyone who needs it. Making use of the huge availability of expertise within the SAIEE membership of about 6000, allows for such members to “give something back to the fraternity”.

A new initiative being explored by the SAIEE is active mentorship in the workplace, where young engineers, who may not have easy access to an experienced engineer, can be mentored in the workplace. Alternatively they could engage with a similar profiled engineer remotely via the magic of modern communication technology.

The SAIEE is willing to work with any entity or individual, with similar aims of providing professional training or mentoring, for our young people in SA. Anyone, members or training entities out there interested in the same objectives – contact Sue Moseley on +27 11 487 9047. We all stand to gain in the long run.

Another area where the SAIEE has contributed for very many years is the awarding of bursaries for deserving scholars from all over SA. Details of this outreach will be featured in future issues of **wattnow**. 



**TALK GIVEN BY**  
**DR RAYMOND PATEL**  
**CEO | MERSETA**

## Skills and Training in Science and Technology – a merSETA\* Perspective

*Members of the National Science and Technology Forum, Honoured Guests, Colleagues, Friends, Ladies and Gentlemen:*

I am honoured by your invitation to speak on the crucial role of science and technology training in South Africa. This NSTF President's Forum comes at a most appropriate time... a time when government has upped the economic scale, thus placing ever more pressure on the need to generate sufficient numbers of artisans, especially those with a scientific and technological bent.

In the next three years, government will spend more than R800-billion in new and upgraded infrastructure and the SETAs are crucial for developing a skilled and capable workforce to support this inclusive growth path.

The mind boggles when we talk of this figure, but we need to be clear what government's intentions are. This amount will cover the entire economy, including energy, roads, rail, telecommunications and water.

Government says:

- R292-billion will be spent on South Africa's energy sector, including Eskom's programmes;
- R39-billion is earmarked for hospitals and clinics;
- R226-billion for transport and logistics; and;
- R32-billion for education infrastructure.

Looking at these projects, we might hazard a guess that it is a tall order. But the science and technology sector, including the NSTF, is clearly gearing up for the skills needed for these projects. Already, the National Student Aid Scheme is supporting several hundred thousand students at both FET Colleges and universities, while the merSETA alone supported and trained more than 20 000 people at post-school level in the past financial year.

At this juncture, I'd like to point out the merSETA's results for the past financial year. A total of 3 500 Memoranda of Agreement were signed by employers, of which 2 130 are still active and are strictly monitored by us.

The MoA contained the following number of learners on the different learning interventions:

- About 7 000 apprentices;
- About 9 500 people on learnerships;
- 10 650 skills programmes;
- 3 200 ABET learners;
- 1 500 sector specialists;
- 800 interns; and
- 3 100 experiential learners.

Also, the merSETA visited about 5 000 Small and Medium Enterprises, which were given guidance and support on the implementation of various skills interventions within their organisations. About 2 200 small companies were approved for Mandatory Grant payments between 2011/12.

Faced with these statistics, you might ask...what about quality and standards? Well, the merSETA signed 13 Service Level Agreements with the Quality Council for Trades and Occupations, in which we were delegated the responsibilities of Development Quality Partners (DQPs). As a DQP, the organisation facilitated the development of Occupational Qualifications for the Manufacturing, Engineering and Related sector, based on the QCTO model.

A formal agreement was also signed between the QCTO and the merSETA to develop new policies and procedures for the QCTO that will be based on best-practices within the SETA fraternities.

Our LETQA\* also actively participated in the implementation of the functions of the National Artisan Moderation Body (NAMB). This included providing and consolidating inputs and comments from industry to ensure a standardised and simplified process of artisan development in South Africa.

We have also partnered with Sci-Bono, a Section 21 Company mandated by the Gauteng Department of Education (GDE) to implement and manage the Gauteng Mathematics, Science and Technology Education Improvement Strategy. Just last week, the merSETA was a

key partner in the Sci-Bono-hosted National Science Week which attracted large numbers of learners and educators. We have also engaged key tertiary institutions to boost maths, science and technology skills.

We have an excellent agreement with the Nelson Mandela Metropolitan University, where we fund the Chair in Engineering Development. One of the functions of the Chair is to focus on learners and educators in rural communities in the Eastern Cape. This relationship provides a platform to about 1 500 learners in 10 Schools for meaningful career guidance.

We further have MoA with other FET colleges, including the Northlink College in Cape Town, the East Cape Midlands College and the University of Fort Hare. We are in the process of furthering our relationships with the Umfolosi Technical College in KwaZulu-Natal and at least five other FET colleges.

The merSETA hopes to advance training in science and technology at all relevant FET colleges by the year 2016.

As our Minister of Higher Education and Training Dr Blade Nzimande has noted, there is a steady growth, albeit still inadequate, in science, engineering, artisan and teacher education.

The strategic imperative of the merSETA, therefore, is to mirror the programmes that Government has aimed at securing our long-term economic future.

The five key priority areas of education, health, rural development, safety, crime prevention and job creation are all tied to education, skills development and economic activity.

Yes, many will say that we are not doing enough. But it is in public-private partnerships, such as the NSTF meeting today, that we can become winners.

I thank you. **Wn**

\* merSETA - Manufacturing, Engineering and Related Services Sector Education and Training Authority (South Africa)  
 \*LETQA - Labour, Education, Training, Quality Authority

# Request for SAIEE members to serve on SABS Technical Committees and the associated mirror committees of the National Committee of the International Electrotechnical Commission (IEC)

The Technology & Knowledge Leadership committee (TKL Com) of the SAIEE would like to call for responses from institute members to offer their technical know-how by participating in SABS Technical Committees as representatives of the Institute.

The main function of each committee is to make recommendations to the SABS on the need for new and revised South African Standards within the committees filed of expertise. Often the work requires the review of International standards, such as those from the IEC, to deliberate on their suitability for adoption or adaptation for publication as South African National Standards.

The SAIEE representatives in SABS technical committees are expected to provide sound, unbiased engineering judgment and advice when participating in these committees, thus adding value to the consensus process that leads to the publication of National Standards. The representative then reports back to the Institute on the progress of the SABS committees through the

For a list of the SABS technical committees, go to [https://www.sabs.co.za/Standardss/standards\\_tech.asp](https://www.sabs.co.za/Standardss/standards_tech.asp)

SAIEE members of SABS and other technical committees are expected to abide by a set of guidelines that are available from the Institute.

Should you be interested in representing the SAIEE on any SABS technical committee, please send your name and contact details to the Secretary of the Technology and Knowledge Leadership Committee, Ms Ansie Smith, email: [smitha@saiee.org.za](mailto:smitha@saiee.org.za)

South Africa is a member of the IEC, participating in the development of IEC standards through its 'mirror committees' – these are teams of local experts, who generally work by correspondence to comment and vote on draft international standards under development by IEC technical committees.

Each local IEC mirror committee liaises with a parent SABS technical committee. In the case of mirror committees, the members act in the personal expert capacity.

Many SAIEE members have technical expertise in the fields covered by IEC standards, and it is important that knowledgeable local technical experts take part in developing international technical standards in their fields.

## **BENEFITS**

Besides honing their expert knowledge and keeping abreast with international developments, members will get an opportunity to protect the local industry by influencing standards that may eventually apply to the country.

SAIEE members are therefore encouraged to be active members of the IEC mirror committees. Active participation can sometimes lead to individuals being nominated to serve on international working groups of the IEC, providing further opportunities to develop their expertise and to contribute to international standards when in their initial stage of development.

***Please contact the  
National Secretary of the  
SA National Committee,  
Paul Johnson, email:  
[paul.johnson@sabs.co.za](mailto:paul.johnson@sabs.co.za)  
to find out more about the  
IEC activities and where  
you might get involved.***

# SAIEE Membership Benefits

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

You simply cannot afford not to be a member!

- A discount of up to R1110 on their ECSA registration fee, which is due in April every year, provided that they join the SAIEE before the end of March that same year.
- Upon joining the SAIEE there is a standard entrance fee of R700, an annual membership fee of R923 for Members, and between R1129 and R1223 for Senior members depending on age. Most of this will be recovered through the ECSA discount.
- SAIEE members receive 11 issues of the wattnow magazine valued at R330.
- The SAIEE Africa Research Journal (ARJ) our peer reviewed research publication (which incorporates the SAIEE Transactions) is also available to SAIEE member's quarterly upon request.
- The real rewards of being a member can be realized through attending monthly lectures, debates, tours and site visits organized by the SAIEE. These are mostly free of charge and provide refreshments at no extra cost. Members are awarded valuable CPD credits for attending these events.
- Membership has significant career benefits, as membership holds prestige and recognized status in the profession. SAIEE gatherings provide excellent opportunities for members to interact with normally inaccessible captains of industry.
- SAIEE letters after your name indicate your membership grade and are a useful measure of your experience.
- Members receive generous discounts on the SAIEE run CPD courses and earn (category 1) CPD credits. Members also have the option of joining the wattnow online CPD program at a fraction of the cost.
- The SAIEE mentorship program assists members to gain professional status through the Institutes large database of mentors.
- SAIEE members are awarded 1 CPD credit (Category 3) for being a member of the SAIEE.
- Members are able to serve on organizing committees and gain valuable experience and professional networking in doing so.
- Use the electrical engineering library at SAIEE House.

## APPLICATION REQUIREMENTS FOR SAIEE MEMBERSHIP

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

Many applicants do not read the list of requirements.

### WE REQUIRE THE FOLLOWING DOCUMENTS:

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

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

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

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

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

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

# 2013 Membership fees

Rates as from 1st January 2013

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

## NOTE

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

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

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

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

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

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

# Mentorship

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

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

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

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

The mentee will be able to discuss problems and frustrations with his independent mentor, who would have no stake in the outcome, and who would be able to provide an unbiased opinion and advice. The mentee might not be able to do so with his superiors, particularly if he is unhappy, and is considering an

alternative career. The mentor and mentee could arrange to meet regularly, on terms that would suit both parties. The goal is to ensure both Mentee and Mentor have enough time to communicate any concerns or advice they have.

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

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

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



## PROSPECTIVE SAIEE MENTORS

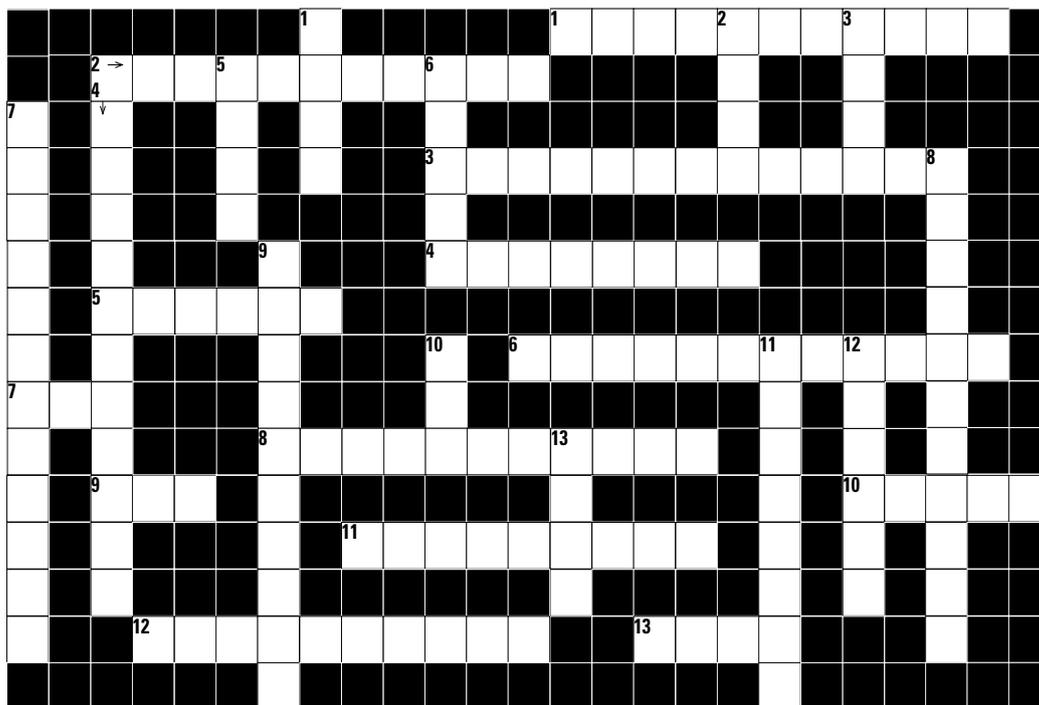
*If you feel you that you have the time and interest to help mentees, please contact Sue Moseley on 011 487 9047 or [suem@saiee.org.za](mailto:suem@saiee.org.za). In addition you gain CPD credits for when you are required to re-register.*

Have some fun and stand a chance to win R1000. Complete the October issue crossword puzzle and send it with your name, surname and contact details to: *Managing Editor, October 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 **31 November 2012**. The winner of R1000 will be announced in the February 2013 issue of the **wattnow** magazine.

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# R1000

win



## DOWN

1. Korea Aerospace Research Institute (abbr.)
2. Heavenly body. (4)
3. Against. (4)
4. The science and technology of space flight. (12)
5. See 12 across. (5,5)
6. Who established the fundamental mathematics of space travel in 1687? (5,6)
7. See 13 across.
8. The early era of space exploration was driven by a "Space Race" between which two countries? (6,5,6,6)
9. See 8 across.
10. Sun. (3)
11. What was the name of the first man-made object to orbit the earth in 1957? (8)
12. NASA Lunar Program. (6)
13. You do not need this document to go to the moon. (4)

## ACROSS

1. Who was the designer of the Mercury capsule, and contributed to the design of the Space shuttle? (6,5)
2. This is the science involved with the study, design and manufacturing of airflight-capable machines. (11)
3. The study of orbital motion. (13)
4. Which space shuttle, in 1981, launched the start of regular manned access to orbital space? (8)
5. See 6 down.
6. See 8 down.
7. Enhanced Learning Unit (abbr.)
8. In the early 20th century, who derived the famous rocket equation, the governing equation for a rocket based propulsion? (10,11)
9. International Space Station (abbr.)
10. Associated with the moon. (5)
11. The name of the latest US Rover to land on Mars. (9)
12. Who introduced cambered airfoils in 1891? (4,10)
13. Who was the first South African in space? (4,12)

**August issue winner:**  
Andzej Dabrowski from Pretoria

**ACROSS 1** Vanderbijl **2** Electrical  
**3** Humphry **4** Duvha **5** Edison  
**6** Isimosezulu **7** Eskom **8** Galvani  
**9** AMEU **10** Eight **11** Deforest  
**12** Gilbert **13** Alessandro

**DOWN 1** Harker **2** Thomas **3** Davy  
**4** Ansie Smith **5** Kusile **6** Nicola  
**7** Kimberley **8** Luigi **9** ARB **10** Lee  
**11** Rod **12** Tesla **13** GHG

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. **wattnow** 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 **wattnow** magazine. 7. Closing date for entry is 31 November 2012. 8. The winner will be announced in the February 2013 issue of the **wattnow** magazine. 9. The Managing Editor's decision is final and no correspondence will be entered into.



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

# Calendar of events

## NOVEMBER 2012

6-8	Power-Gen Africa	Sandton Convention Centre, Johannesburg	<a href="http://www.powergenafrika.com">www.powergenafrika.com</a>
7-8	2012 First National Conference for Engineering Sciences	AL-Nahrain University, Baghdad, Iraq	<a href="http://www.rces-2012.org">www.rces-2012.org</a>
7-9	Mine Manager's Show Africa	Riviera on Vaal Hotel & Country Club, Vereeniging	<a href="http://www.terrapinn.com">www.terrapinn.com</a>
12-14	2012 International Power System Conference (PSC)	Niroo Research Institute, Tehran, Iran	<a href="http://www.psc-ir.com/en">www.psc-ir.com/en</a>
14-15	2012 Southern African Energy Efficiency Convention	Emporer's Palace, Johannesburg	<a href="http://www.saeec2012.org.za">www.saeec2012.org.za</a>
14-17	2012 27th Convention of Electrical & Electronics Engineers	Hilton Hotel, Eilat, Israel	<a href="http://www.eng.tau.ac.il">www.eng.tau.ac.il</a>
16	<b>wattnow</b> Birthday Bash Networking Breakfast	SAIEE House	<a href="mailto:minx@saiee.org.za">minx@saiee.org.za</a>
22	SAIEE National Student Project Competition	University of Stellenbosch	<a href="http://www.saiee.org.za">www.saiee.org.za</a>
23-25	The Green Expo	International Convention Centre, Cape Town	<a href="http://www.thegreenexpo.co.za">www.thegreenexpo.co.za</a>
28-30	Solar & Energy Saving Products China Sourcing Fair	Gallagher Convention Centre, Johannesburg	<a href="http://www.tradeshow.globalsources.com">www.tradeshow.globalsources.com</a>

## JANUARY 2013

24-25	2013 SAIEE Presidents Summer Colloquium	SAIEE House, Observatory, JHB	<a href="http://www.saiee.org.za">www.saiee.org.za</a>
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## FEBRUARY 2013

4-7	African Mining Indaba	Cape Town International Convention Centre	<a href="http://www.miningindaba.com">www.miningindaba.com</a>
21-26	16th Biennial International Symposium on Toxicity Assessment	MSC Opera, Cape Town	<a href="http://www.naturalscience.co.za">www.naturalscience.co.za</a>
25-28	2013 IEEE International Conference on Industrial Technology	Cape Town International Convention Centre	<a href="http://www.icit2013.org">www.icit2013.org</a>

## MARCH 2013

12-16	2013 IEEE International Conference on Orange Technologies	Tainan, Taiwan	<a href="http://conf.ncku.edu.tw/icot2013">conf.ncku.edu.tw/icot2013</a>
13-14	4th annual IT Leaders Africa Summit	Johannesburg, RSA	<a href="http://www.kineticerevents.net">www.kineticerevents.net</a>
13-15	iEECON 2013 : International Electrical Engineering Congress	Chiang Mai, Thailand	<a href="http://www.ieecon.org">www.ieecon.org</a>
19-22	Conference on Systems Engineering Research 2013	Georgia Institute of Technology, Atlanta, USA	<a href="http://cser13.gatech.edu">cser13.gatech.edu</a>



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11	Organ Donor Foundation	0800 22 66 11	www.odf.org.za
29	Reliable Transformers	011 421 2333	www.reltrans.co.za
31	Fire Detection Agency	087 808 7527	www.fdia.co.za
38	Samsung	011 549 1500	www.samsung.com
41	Impact Energy	031 201 7191	www.impactenergy.co.za
43	Will Robots ever replace humans?		ieee@ee.wits.ac.za
51	Feed A Child Foundation	082 322 6815	www.feedachild.co.za
68	PowerGen Africa	021 913 5255	www.powergenafrika.com

## wattnow magazine

You are hereby cordially invited to join us at the wattnow Birthday Networking Breakfast. Many prizes to be won - don't forget your business cards.

<b>DATE</b>	16 November 2012
<b>VENUE</b>	SAIEE House 18A Gill Street, Observatory, JHB
<b>TIME</b>	7:30 for 8:00am
<b>COST</b>	R150 p/p - incl. hot breakfast
<b>RSVP</b>	Gerda Geyer - geyerg@saiee.org.za 011 487 9043 - <b>BY 2 NOVEMBER 2012</b>



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### OPENING KEYNOTE SESSION

Speakers include:

- Ms. Elizabeth Dipuo Peters, Minister of Energy, South Africa
- Mr. Brian Dames, Chief Executive Officer, Eskom, South Africa

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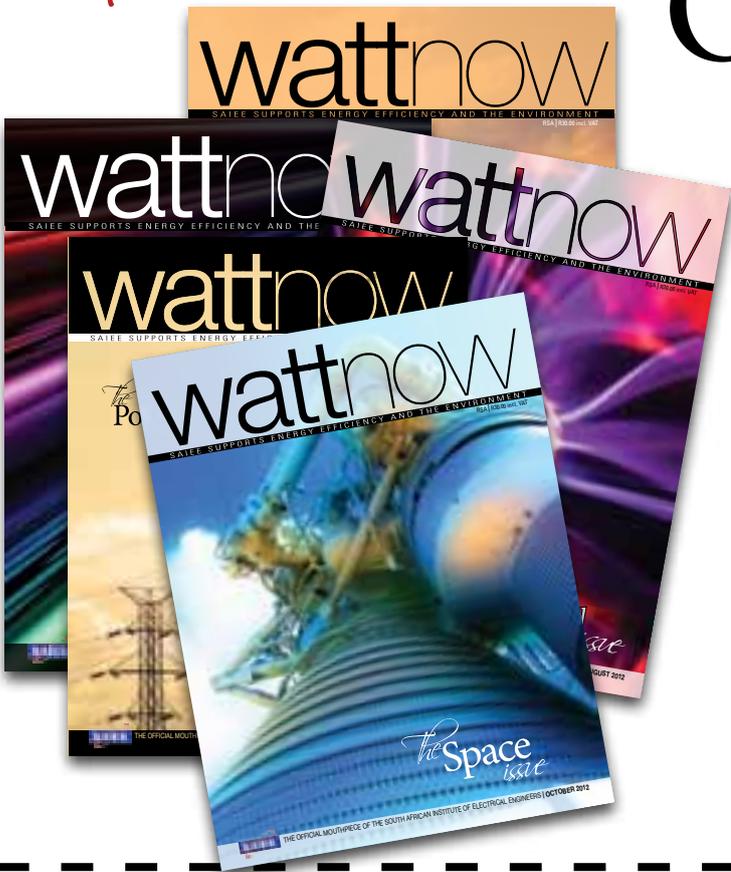


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