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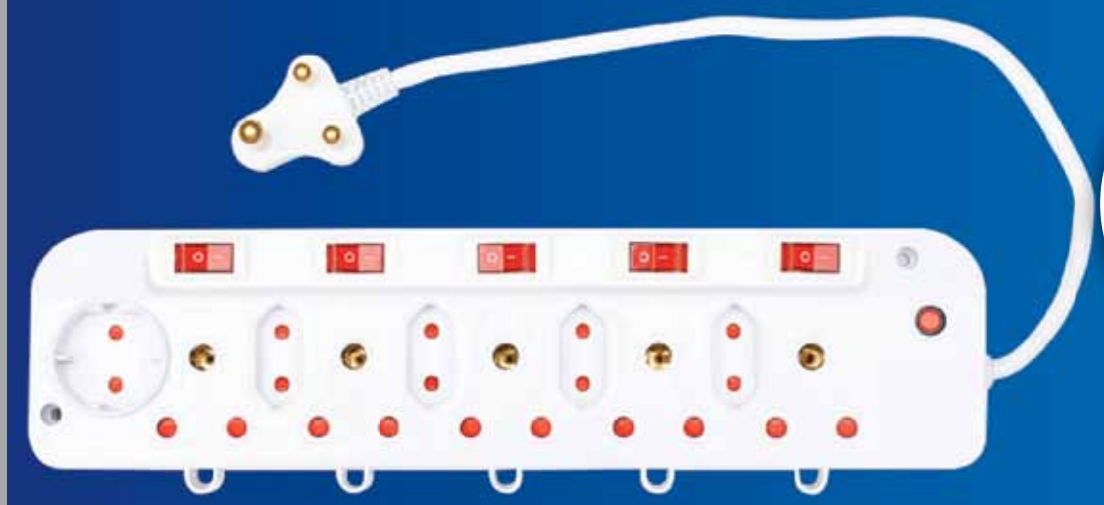

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As at 05/01/2014

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wattnow magazine

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SAIEE 2013 OFFICE BEARERS

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Deputy President	Pat Naidoo
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Junior Vice President	T.C. Madikane
Immediate Past President	Mike Cary
Honorary Treasurer	Viv Crone
Honorary Vice President	Sarel Schoombie

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5905

With April lurking around the corner, we feel the days getting shorter and a bit nippier and with this comes the huge power demand with warming up our homes. Therefore I feature 'Utilities' in this issue.

Let me take a step back and tell you about my very productive 3-day visit to the PowerGen Africa and Distributech Conference and Exhibition in Cape Town. I've met absolutely wonderful people from across the world, made some lucrative plans for the **watt**now and the SAIEE, with engineers very interested in joining this professional institute and what we offer.

I am working on a paper, which I will present at a **watt**now breakfast in the near future, and I will share it with you all. Something that is very dear to my heart and I believe you, as professionals in your own rights, can join me in this venture. Watch this space.

Getting back to this, the Utilities issue of **watt**now, we feature an article on how Utilities can overcome the 'death spiral', on page 26. We also feature an article from Warrick Pierce, an energy consultant who shares with us his take on solar-aided power generation vs concentrating solar power. This article appears on page 30.

On page 34 I took the liberty in featuring a press release from Eskom where they urge consumers to use electricity wisely.

I have a beautiful and very interesting paper from Ludwig Everson who wrote about an energy efficient approach to housing on page 42. This gave me some food for thought and it goes to show that just a few minor adjustments in our homes can save us money.

In our Technology section on page 48, I feature a paper from Shadil Singh about how Distribution Automation provides greater visibility to an organisation's electrical network.

There is big things happening in the Institute – look out for next month issue where I will be sharing more news with you.

Have a wonderful April, until next time, enjoy the read.

Minx

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

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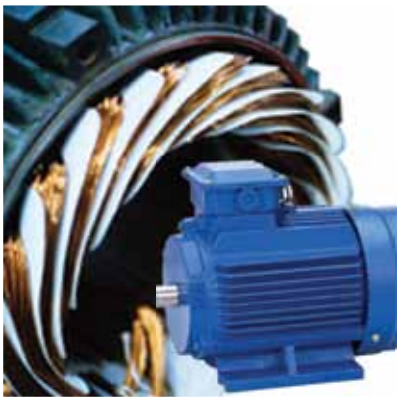

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Greetings to everybody from the desk of the 2013 SAIEE President.

This will be the last letter from me as the 2013 President of the SAIEE, I will hand over the reins to Dr Pat Naidoo in April 2014.

In March 2013, I was given the honour to take up the prestigious position as the President of the South African Institute of Electrical Engineers, to follow on from the enormous presence and great minds of my predecessors that have taken care of our institute over the past 105 years.

My year of office has flown by, and I am now writing my last column as the President of our proud Institute.

The SAIEE is a dynamic institute and must continuously strive to keep up with all developments, and as such is always looking for new challenges, and improved ways and means to serve its members.

The following is a summary of some of the changes that have occurred during the past year:
The SAIEE Office bearers introduced a restructuring committee, this committee was made up of the current office bearers, together with the available past presidents with a specific brief to examine the aims and objectives of the SAIEE, and to assess if the current structure and organisation will meet the strategic objectives in the future.

As strategy comes before structure, the first function was therefore to reassess the strategic objectives of the SAIEE and to determine if we are meeting the needs of our members, and what should be done to correct this if required.

The strategy which has been developed over the past few years was confirmed, and it was agreed that the SAIEE constitution requires some minor tweaking and modification to create an enabling environment aimed at modernizing the Institute to do more for our current members and encourage membership growth.

Thanks to the efforts of Past President Mike Cary, who had agreed to chair the committee, the constitution has now been amended by a majority vote of members to provide for the introduction of an Executive Committee and Corporate partners.

Eligible organisations that support the aims and objectives of the SAIEE and are involved in an industry that is relevant and applicable to the Institute can now apply to the SAIEE to become Corporate Partners of the Institute.

FINANCES

The assets of the SAIEE been enhanced by the construction of the beautiful new SAIEE house, and Innes house has been fully restored to the magnificent building that it once was, and will eventually house all the SAIEE historic artifacts for display.

Despite this large capital expenditure over the past few years, the total assets have once again grown to close to R40 M by means of judicious investment.

In general, I can report that the SAIEE is in a very sound financial position, and is well managed by the Executive staff of the SAIEE.

PROFESSIONAL DEVELOPMENT

The Professional Development committee has been responsible for a record number of CPD training courses and the validation of conferences. This service has grown dramatically, and is now being offered in all centres, my appreciation to Sue Moseley for efficient running of this

programme. In addition, this committee is responsible for the coordination and monitoring of interviews and registration of Professional Engineers in cooperation with ECSA, and some 269 new Professional Engineers have been registered during this year.

The Professional Development Committee has identified a shortcoming in the system for registration of Engineers, in that insufficient training and practical experience is obtained during their candidacy phase. Consequently a new function has been introduced for the mentorship of candidate Engineers. The executive staff of the SAIEE has waded through mountains of red tape to secure limited CETA funding for the mentorship of engineers which we see as a service to our members and civil society.

MEMBERSHIP

As reported last year, the SAIEE membership had grown from 4952 to 5993, and thanks to a concerted membership drive, by our Director and staff the numbers have once again increased considerably, to over 6000.

EDUCATION & TRAINING COMMITTEE

The SAIEE Education and Training committee, have introduced an updated marketing video to encourage young people to enter the field of Engineering, and have this year awarded ten under-graduate bursaries to deserving students, in addition, this committee administers the ISH post-graduate bursary scheme, and is available to offer this service to other organisations.

EVENTS

The Bernard Price memorial lecture this year was presented by Dr Vincent Cerf, who is sometimes known as the father of the internet, but with the day job title of Vice President and Chief Evangelist of Google, and is internationally well-known as the face of Google.

The lecture was well advertised and over 800 people attended at the Wits Medical School lecture auditorium. Vint's lecture was amazing, he appealed to young and old, the internet geeks and those of us that are still struggling with modern communication media like me - for those of you who missed it, it is still available on the SAIEE website which can be found at http://www.saiee.org.za/Default.aspx. Thanks Vint.

My appreciation to Dr Angus Hay and Gerda Geyer who made all arrangements to get him to South Africa in liaison with Google SA. Unfortunately, Vint is a busy Executive and much in demand for speaking engagements around the world, so he was not available to travel to the various centres.

The Office Bearers then agreed to have a second lecturer, and with the help of Vice President Andre Hoffmann, we managed to secure good sponsorship and arranged for 17 year old Easton La Chappelle, also from Colorado in the US to conduct a whistle stop tour to all SAIEE centres in South Africa and do a lecture and demonstration of a neuro-controlled artificial hand and arm that he had designed and built in his bedroom. Over 750 people attended Easton's lectures around SA.

In addition, a very interesting President's Invitation Lecture was presented by Professor Justin Jonas on 20 June 2013 entitled *"The SKA South Africa project - mega-science in Africa"* thank you Justin.
The annual SAIEE banquet took place on the 1st November 2013 at the Wanderers Club where members and their guests were treated to a most enjoyable evening.

CENTRES

During the year I was privileged to visit the SAIEE centres on two different occasions. We established a new centre in Bloemfontein, to be known as the Central Centre. These Centres are providing a great service to members.

This year, the previous administration building of the SAIEE in Johannesburg, Innes House was completely renovated and brought back to its former glory when it was built as the Astronomer's home. The design of this building was influenced by Herbert Baker, and during next year it will be equipped with artifacts as the SAIEE's museum to assist in our endeavour to encourage the development of learners to become engineers.

My thanks and appreciation to Max Clarke and the historical section for their enthusiastic hard work in this regard.

For many years now, the SAIEE has published the African Research Journal, which has grown from strength to strength.

In November 2011, we decided to take over the publishing of the SAIEE monthly magazine **watt**now. Thanks to our Managing Editor, Minx Avrabos, this has now become a very successful publication, which I look forward to read every month.

My thanks to the Office Bearers and Council, who have kindly shared their collective knowledge and experience and assisted me during my term of office.

Particular thanks to Stan Bridgens, and the SAIEE staff, who ensured that all events and meetings ran successfully. A special word of thanks to Gerda Geyer who uncomplainingly assisted and guided me with all of the arrangements during the year.

Kind regards,

Paul van Niekerk | Pr. Eng | FSAIEE
2013/2014 SAIEE President

Vote of thanks to the outgoing President, Mr Paul van Niekerk

It is my pleasure to propose a vote of thanks for Paul for his contributions to the Institute during his year of office.

The following quote from Paul encapsulates his contributions: *"Although my theme for the year started out as "Independent Power Production and Infrastructure Development", it has evolved to concentrating on Infrastructure development, and more particularly, "Skills Development" as required for the National Development Plan."*

To this end he participated vigorously in a number of ECSA forums, and amongst the initiatives, he supported the engineering skills survey in conjunction with the Council for the Built Environment, and the "Thought Leadership Project."

Paul has also paid attention to the skills pipeline, and presented prizes to top learners at the Bergville Community Building Programme, which is supported by the SAIEE.

Paul is also concerned that the Electrical Engineering community is fragmented. The SAIEE, with in excess of 6000 members, is the dominant Institute representing electrical engineers.

However, there are a number of other organizations such as the Computer Society of South Africa, the South African Institute of Measurement and Control and the Certified Engineers, which also have electrical engineers amongst their membership.

He has initiated talks with these organizations.

Paul traveled to all of the centres during his Presidency. Towards the end of 2013, he and other Office Bearers attended the establishment of a centre in Bloemfontein.

The Bernard Price lecture took a different form this year, mainly due to the availability of lecturers. The first part was a lecture from the father of the Internet – Vincent Cerf, and proved to be very successful.

Paul also hosted the second part of the lecture with Easton La Chapelle at six different venues throughout South Africa. The 17-year old Easton hails from Colorado, USA. At his tender age, he is making waves in the robotics industry, and had full attendance at all the venues.

During Paul's year as President of the SAIEE, the refurbishment of Innes House was completed – a real assets to the Institute. The first room of our museum was recently introduced to SAIEE Council and staff, this all due to Paul's support.

In conclusion, I wish on behalf of the SAIEE, to propose a vote of thanks to Paul for his able leadership and all of his contributions during his term. I wish him every success in his future endevours.

Thank you!

Mike Cary | Immediate Past President

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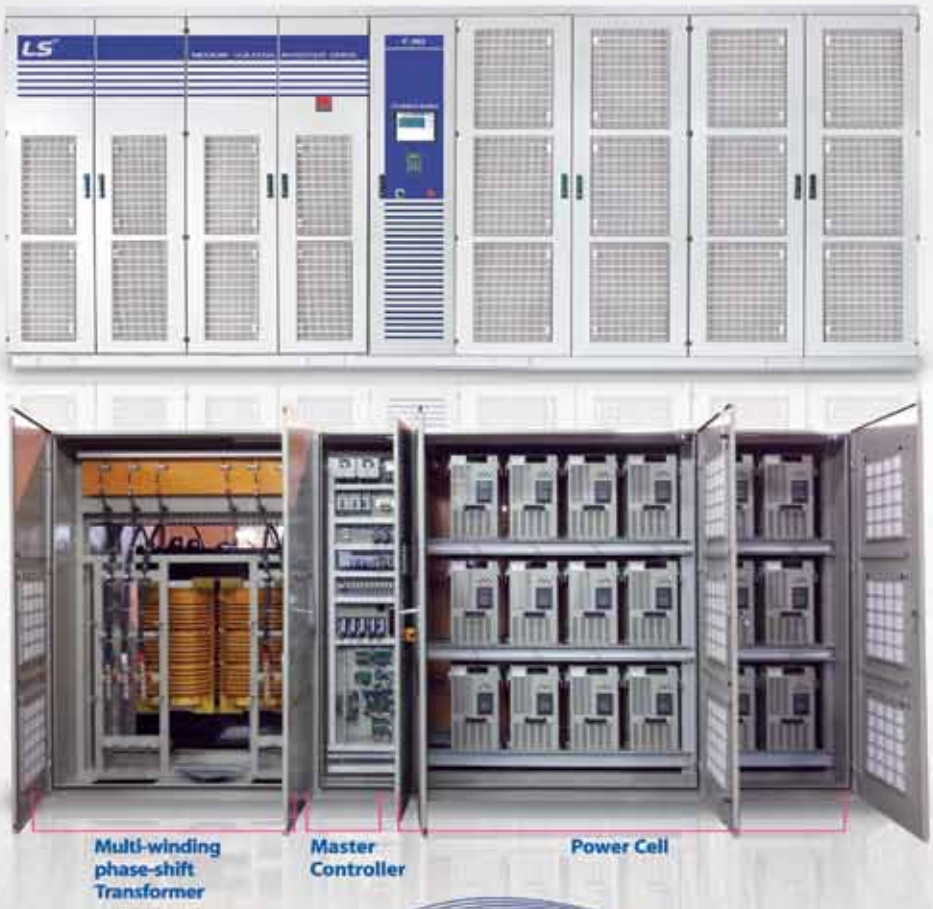

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WATTSHOT

Herewith showcasing some of the latest cool gadgets nd tools for men that are now available. A gadget, tool and gizmo for every one... whether it is a gift or just a self-spoil - go ahead, you deserve it!

The doorbell for Smartphones

Doorbot is Wi-Fi enabled, a video doorbell that allows you to see and talk with visitors through your smartphone from anywhere in the world. Price: R3,350 (incl. VAT)

Fluke 805 Vibration Meter

The 805 Vibration Meter is an easy-to-use tool for technicians performing preventative bearing inspections.
www.comtest.co.za

Flap Discs For Industrial Use

A new range of abrasive flap discs are now in stock. These items come in boxes of 10.
www.acdcexpress.com

FLIR's Measurement tools

The new product lineup includes an advanced digital multimeter, two clamp meters, NCV detector, moisture meter, and videoscope. www.flir.com

Low-cost current transducers

LEM introduces a cost-effective and technically superior alternative to resistive shunt/optocoupler.
denvertech@pixie.co.za

New Electrochemical Sensors

SGX Sensortech announced the launch of eight new sensors to complement their range of industrial and commercial gas sensing products. www.denvertech.co.za

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

NudeAudio keeping you on the move and connected

Thanks to this incredible portable speaker you have the opportunity to share music, videos and gaming with those around you.The NudeAudio portable speakers are now available at leading retail outlets nationwide (Musica & Look & Listen) from R 299.99 to R 1,299.99.

Espresso for the car

Handpresso Auto helps you optimize your coffee break wherever you are.
Price: R2 399.00 (incl. VAT)

Rechargeable power backup

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Space coaster DIY

With this Space Coaster you can build a spectacular, gravity-defying rollercoaster for marbles! Price: R399.00 (incl.)

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Through the unique technology, the revolutionary answer to the demands of today's mobile society. Price: R1 699.00 (incl)

Bluebeards Revenge

Slice through stubble the Bluebeards way with this truly stunning, bespoke double edge safety razor! Price: R895 (incl. VAT)

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Seize this opportunity for a unique aerobatic aerospace adventure.
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The AOC 16" USB Monitor

16" class USB monitor, 1366 x 768 resolution and folded stand.
Price: R1 480.00 (incl. VAT)

WATTSUP

SAIEE Partners evening

A rainy Saturday evening found the SAIEE playing host to its council members and their partners to a sumptious dinner at the Johannesburg Country Club. It was an evening where we networked and got to know the women behind their men and vice versa. The 2013 SAIEE President shared a few anecdotes about his year as president which had the guests in stitches. The evening came to a delightful end with Angela Price sharing her experience on how it is to be living with an engineer.

It was an evening enjoyed by all and the ladies each walked away with a gift.

L – R: Paul van Niekerk (2013/4 SAIEE President), Roger Price, Angela Price and Elizabeth van Niekerk.

Pat & Maureen Naidoo

Viv Crone & Bea Laquet

Andreas & Minx Avrabos

Liz & Wayne Fisher

Stan & Margaret Bridgens

Margaret & Mike Cary

Hermann & Julie Broschk

Jan-Harm & Anlia Pretorius

du Toit & Elize Grobler

Sy & Dawie Gourrah

Mzwandile & Refilwe Buthelezi

TC & Mahle Madikane

George & Sharon Debbo

Derek & Jeanette Woodburn

Anton & Gerda Geyer

Michelle & Angus Hay

Ian & Melonie McKechnie

Viv Cohen & Hermann Broschk

Kiki Meneses & Craig Smith

Jacques & Ansie Smith

Calvin & Sue Moseley

Jacob & Gladys Machinjike

Hendri & Elmari Geldenhuys

Patrick & Bianca O'Halloran

WATTSUP

New CEO appointed at PTSI

Power Technologies (Pty) Ltd (Powertech), a wholly owned subsidiary of the JSE listed Altron Group has appointed Mr. Hennie Du Plessis as the new Chief Executive Officer of Powertech System Integrators (PTSI) with effect from 3 March 2014.

Du Plessis is registered as a professional Engineer (Pr Eng) with the Engineering Council of South Africa. He joined the Altron Group as the CEO of Bytes Healthcare Solutions (BHS) from 1999 to 2010. Subsequently, he became CEO of Bytes Document Solutions (BDS) in 2010 to 2012. He then moved into private consulting where he had many clients including Bytes, Powertech and Altron. Du Plessis was instrumental in the amalgamation of Strike Technologies, TIS and Powertech IST into what is now known as Powertech System Integrators.

Neil Kayton, CEO of the Powertech Group, says, *"Du Plessis is not new to PTSI. His knowledge of our business, markets and business structure as well as his proven record of leading teams in Project Management, gives us great confidence of his ability to take PTSI to new heights. The team has welcomed him and he is receiving the necessary support to enable him to re-position the PTSI business."*

Mr Hennie du Plessis
CEO | Powertech System Integrators

Altaaqa Global wins at Middle East Electricity Awards

Peter den Boogert (front row 2nd from left), GM Altaaqa Global & Khalil Abdul Malik (front row 3rd from left), GM PEC & winners of Middle East Electricity Awards 2014

Altaaqa Global, as a global temporary power and energy solution specialist, recently won *'Power Project of the Year'* for its Yemen power project and was highly commended for its role in innovation, social responsibility and impressive delivery during the Middle East Electricity Awards 2014, held at the Dubai International Convention Centre in Dubai, United Arab Emirates.

According to the judges, *"Altaaqa Global played a critical role in the electric power industry. This award category is given to a company that offers the best planning, delivery and execution of any power plant in the Middle East region."*

"Altaaqa Global won in this category for its excellent design, innovative power solutions, fuel savings, record-breaking project installation and an exceptional commitment to provide support to its client."

The 54 MW temporary power plant was built in just 23 days from signing the contract and has the capacity to supply up to 150,000 homes with electricity, benefitting more than half a million people in the city of Aden.

Helukabel makes clean sweep

A special range of cables designed to repel dirt and prevent the accumulation of material on its surface has dramatically improved hygiene in "clean room" environments such as hospitals, restaurants and food manufacturing facilities throughout the world.

As a result Helukabel's specially developed Nanoflex product range was recently awarded the international Wire and Cables Technology award for excellence in the cabling and connectors category. The prestigious award showcases the best products available worldwide in the wire and cabling sectors.

Nanoflex cable technology from Helukabel was recognised for its technologically advanced antimicrobial insulation materials that prevent the spread of harmful organisms through the wiring harness and thereby contributes towards the improvement of hygiene standards throughout the world.

Doug Gunneweg
Managing Director | Helukabel SA

South African entrepreneurs conquer UK

Fourteen entrepreneurs comprising of 12 businesses returned to South Africa recently, following a successful International Trade Programme (ITP) to the UK. This is the third such trade trip for South African entrepreneurs in two years and the results for their businesses and job creation back home are proving to be very positive.

The ITP aims to stimulate trade between South African entrepreneurs and UK partners, fast tracking the growth of local entrepreneurial businesses which are key to economic growth and job creation.

Hundreds of entrepreneurs from across the country applied with the most successful being chosen during a rigorous selection and training process at the end of 2013.

Made possible by MEDO - which connects large companies (annual turnover above R35 million) with emerging and smaller enterprises - and sponsored by British Telecom Global Services (BT), this tour yielded its best success rate ever. Success is based on actual agreements concluded.

Bjarke Gotfredsen, Joint CEO & Co-founder, MEDO, says: *"Our first tour had a success rate of 20%, our second 50% and this one I would say anywhere between 70 to 80%."*

MEDO entrepreneurs return to SA following a successful ITP trip

The success is due to a number of factors. *"The entrepreneurs are more prepared for the tour every year and as tour facilitators we have also learnt where to go and we have built up better connections. For example, where we stayed this time was better for the entrepreneurs in terms of getting around as it didn't take as much time as before."*

He also says their partners in the UK are better prepared. *"Our UK partners put in a big effort and they have been building on the momentum from the first tour. Coventry University was extremely insightful for example, hosting 10 lecturers presenting not just on technology, but also on entrepreneurship. Each entrepreneur also gave a short presentation on their businesses and ideas and connections were then brainstormed with the experts at Coventry University."*

"This was also the first time that BT sent two representatives on the tour and it was very helpful to have them along" says Gotfredsen.

Rodney Heubner, Contract Manager, Sub-Saharan Africa, BT Global Services, was one of the representatives on this tour. *"The success of the tour for me was on the faces of the entrepreneurs when they had a meeting and secured a deal or contract. I was impressed with all of them as they did their homework before we went over."*

The next MEDO tour will be in September this year. Interested entrepreneurs can find out more information closer to the time on www.medo.co.za

WATTSUP

MOVING EARTH: Officials from the Eastern Cape Department of Health and the Coega Development Corporation break ground on the Sipetu District Hospital project.

Construction of Ntabankulu's new district hospital gets underway

Construction work on a new Eastern Cape Department of Health (ECDOH) project in Ntabankulu has begun in earnest and was marked by a sod turning ceremony in February 2014.

Major earth and civil works construction is already underway as building is about to start at the Sipetu District Hospital where a new hospital facility is planned.

"This hospital marks the Eastern Cape Department of Health's dedication to service delivery and providing decent health services to our people," said Eastern Cape MEC for Health, Sicelo Gqobana.

Innovation key to economic growth

In light of government's multi-trillion infrastructure spend in coming years, innovation is key, according to international consulting firm Royal HaskoningDHV CEO Nyami Mandindi.

In 2012, President Jacob Zuma announced a R4-trillion infrastructure spend over a 15-year period in order to boost economic development and growth. Government is expected to spend R845 billion in the next three years. The massive infrastructure drive opens a bigger role for private sector participation in the economy.

Speaking at a function in honor of Royal HaskoningDHV's clients in Pretoria recently, Mandindi said: *"We need to be innovative in the way we operate. Our appeal is that our clients encourage initiative and innovation by adopting design processes that embrace and promote better solutions and best practices.*

Meanwhile, there is evidence that the commitment to green buildings is gaining momentum in South Africa. Local companies expect levels of green buildings levels to more than triple in the next three years, says Green Building Council South Africa (GBCSA) CEO Brian Wilkinson. Speaking at the same function, Wilkinson said the share of South African firms highly dedicated to green buildings was growing at a faster rate than anywhere else in the world.

2014 Valeo Innovation Challenge

This year, 1412 students around the world are participating in the Valeo Innovation Challenge, with a large contingents from every continent. A total of 969 teams of engineering students from 55 countries and representing 455 universities have submitted their projects, with the goal of winning the €100,000 first prize.

Sixty Valeo experts and a number of independent scientists will review each of the submitted projects to select the 20 teams that will continue on to the next stage of the contest. The 20 short-listed teams will be announced on April 15, 2014, and Valeo will grant each of them €5,000 to create a functioning prototype.

The six teams that submit the most innovative projects will be chosen on September 16, 2014. They will be invited to Paris a month later to present their projects to a jury chaired by Jacques Aschenbroich, Valeo Chief Executive Officer, and comprised of members of the Group's senior management team, as well as eminent figures from the worlds of science and design. The jury will designate the winning team, which will receive €100,000, with the second and third-place teams each receiving €10,000.

The goal of the Valeo Innovation Challenge is to invite students to imagine equipment that, between now and 2030, will make cars more intelligent and intuitive. Students taking part in the Challenge are asked to develop bold, revolutionary solutions for the cars of the future.

SAIEE Fellow receives prestigious award

Maj Gen J.M.Dippenaar (Rtd) Chairman of the Council of Military Veterans Organisations of SA (CMVO) handing SAIEE Fellow, Lt Col Bill Bergman (Rtd) the Award of Appreciation for exemplary services rendered in the furthering the activities and aims of the CMVO and military veteran affairs.

The CMVO looks after the interests of military veterans particularly with respect to the registration of military veterans whose names are on the military veterans data base. This list is compiled by the Dept. of Military Veteran Affairs. Veterans are entitled to certain benefits such as medical, housing, education, employment and pension.

Congratulations Bill, the SAIEE salutes you!

Maj Gen J.M.Dippenaar (Rtd) (left) handing the Award of Appreciation to SAIEE Fellow, Lt Col Bill Bergman (Rtd).

More Postmasburg learners set to benefit from Kumba bursaries

Kumba Iron Ore's Kolomela mine announced another 20 bursaries to learners in Postmasburg at the end of February to join the Kolomela Scholarship Bursary Programme. On the programme they will receive the necessary support to equip them for their future studies and careers.

Kolomela has given 54 bursaries to learners from the Blinkklip, Ratang Thuto and Postmasburg high schools since 2011 to develop, prepare and enable them for tertiary studies to follow any career they dream, and hopefully, to join the Kumba talent pool when they complete their studies.

As part of the bursary programme, participants will do a reading course as well as English, mathematics and science classes to aid their cognitive development. Emotional development courses throughout the year will also be provided to enable them to, among other things, motivate themselves and effectively cope with pressure. Furthermore, in order for them to develop their career interest and provide exposure to engineering, geology and surveying, they will attend the University of Pretoria's engineering week, go on a mine tour and do career guidance psychometric assessments. Health assessments are also provided as part of physical support.

This year, the programme is available to any learner from these schools from Grade 9 to Grade 12 who achieved 60% for Mathematics and physical science at the end of the previous year. With this scholarship, learners have the opportunity to receive cognitive, emotional and social support that will aid in improving school achievement in order for them to study after school.

Aart van den Brink, general manager of Kolomela mine, notes that Kumba is committed to furthering social development of the communities around its operations.

"We are committed to contributing to the steady supply of suitably qualified professionals from Postmasburg in future as well as providing access to high-quality training, which is a key attraction and retention tool for us as a company.

Uplifting the youth by providing a bursar programme like this, is one of the Kumba's strategic initiatives, and we are proud of the successes that this programme has already demonstrated."

Aurecon sustains excellence with six PMR awards for 2014

Aurecon has once again excelled in the national survey of consulting engineers undertaken by the management journal Professional Management Review Africa (PMR.africa).

The company achieved six Diamond Arrow Awards (highest rated in sector) for the following sectors:

- Civil consulting engineers
- Structural consulting engineers
- Civil and structural consulting engineers
- Electrical consulting engineers
- Mechanical consulting engineers
- Combined electrical and mechanical consulting engineers.

"PMR awards are highly recognised in industry and are a good measure of both technical excellence and brand awareness. They are also a good measure of the level of service we provide our clients and Aurecon's ability to serve our clients' best interests," said Albert Geldenhuys, Managing Director RSA.

"We are humbled by the fact that our dedication and commitment to these aims are being recognised by our clients," concludes Geldenhuys.

Highlights and outcomes of the Africa Energy Indaba

The 6th Africa Energy Indaba, which took place at the Sandton Convention Centre from 18 - 20th February, attracted over 400 South African, African and global energy leaders to what is the leading energy conference on the continent. Africa Energy Indaba 2014 provided a platform for robust discussions between private and public sector energy players on finding suitable energy solutions for Africa.

Adopted by the World Energy Council (WEC) as its African regional event, presented by the South African National Energy Association (SANEA) and supported by the African Union and the NEPAD Planning and Coordinating Agency, delegates were exposed to energy discussions at the highest levels.

The Gauteng Growth & Development Agency has a strategic partnership with the Africa Energy Indaba. GGDA CEO, Siphiwe Ngwenya commented on this year's event, *"Our mandate as the Gauteng Growth & Development Agency is to be the premier catalyst for innovation, business growth and socio-economic development within the Southern Africa region. It is therefore important that Gauteng Province hosts world class business events and conferences that bring world leaders to Gauteng, to catalyse business deals, spark new partnerships and drive business growth in the region. The 2014 Africa Energy Indaba solidified Gauteng's status as a world class African city. Over 400 national and international energy experts and professionals came together to plan Africa's energy landscape for the next 10 years and beyond."*

Energy Minister, Dikobe Ben Martins opened the 2014 Energy Indaba and told delegates that Parliament had been instructed to "fast-track" proposed legislation to level the playing field between utility Eskom and independent power producers. He further made the bold statement that Eskom could not be "player, referee and linesman".

Marie-José Nadeau, Chair of the World Energy Council, the largest non-aligned energy body in the world, attended the event and remarked: *"I have seen first-hand how the Africa Energy Indaba has been able to bring policymakers and business leaders together to act on the goals of accelerating energy access in a sustainable way, and I am pleased that positive steps have been taken during the meeting to build a new consensus for the region. The World Energy Council stands united with African leaders to support the continent's drive to deliver the necessary policy, regulatory, and market environments for sustainable development."*

Africa's wealth of energy resources and untapped potential was highlighted at the conference, as was the need for more enablers that can unlock energy access for the broader population and new markets. The event brought together these enablers, whilst also investing in the next generation of energy leaders through the World Energy Council's Future Energy Leaders' Programme.

"The Africa Energy Indaba has its own energy about it. Six years strong, it gets better and better making it the most authentic African Energy conference on the planet," said Greg Nott, Africa Energy Indaba steering committee member.

Emerging from the discussion on the results from the 2014 WEC Issues Monitor, it was clear that the role of governments is the most critical component in solving energy challenges.

The discussion on the 'energy trilemma' (the three challenges of energy security, social equity and environmental impact mitigation) highlighted the challenges for Africa in providing reliable, equitable and affordable electricity access with minimum impacts on the environment.

MEC for infrastructure Development, Ms Qedani Mahlangu joined international energy gurus in calling for a global paradigm shift to achieve a sustainable solution to the 'energy trilemma'.

MEC Mahlangu said, *"We need to move beyond business as usual. The energy trilemma is more poignant to developing countries within the African continent than ever before; we need to develop energy policies which decisively address the conflicting challenges of energy security, social equity and environmental sustainability - we need a cohesive solution"*.

Dave Wright, member of the African Energy Indaba steering committee highlighted two important points that emerged during the VIP, invitation-only Energy Leaders' Dialogues Session, which was co-hosted by Eskom's Brian Dames and WEC's Secretary General Christoph Frei. *"More work needs to be done to understand what the South African shale gas resource is capable of (how big it is, and how much gas it can produce). Secondly, the development of the shale gas resources (if it is worth it) will take much longer than it has in the US because all the associated infrastructure will need to be put in place,"* said Wright.

Demetri Pappadopoulos, Special Adviser at Cennergi, a key sponsor of the event, was very positive: *"It was great to see the growth and increase in attendance of the event. The quality of the sessions was very high and we can see the event maintaining its flagship status as the leading energy conference on the continent,"* said Pappadopoulos.

"As an organisation sponsoring and participating, we were encouraged to see the discussion contents widening, especially when it comes to shale gas. A lot of misinformation was dispelled, and it's evident that the disparate parties have come closer together through the Africa Energy Indaba," he said.

Eskom power emergency wake-up call to large businesses to look at energy efficiency and going green

African Utility Week to focus on helping large power users be more energy efficient

"*It is our responsibility to use power responsibly*" – that was the response from Nicolette Pombo-Van Zyl, African Utility Week programme director on Eskom's declaration of a power shortage emergency last week citing a risk that rotational load shedding could be implemented.

"*We know we're in a tight spot capacity-wise, and winter is on its way. We need to make sure that by the time the season changes, we are thinking differently about how we use electricity, so that we don't put ourselves or Eskom under undue pressure,*" Pombo-Van Zyl, continued.

African Utility Week, taking place in Cape Town from 13-14 May has a strong focus on large power users in Africa, helping them reduce costs while increasing productivity through energy and water efficiency solutions. The expo floor is also host to two days of free, practical, CPD-accredited technical workshops for all electrical engineers, technicians and contractors working in the power and water industry. Topics include renewable energy and energy & water efficiency.

Pombo-Van Zyl continues: "*not only looming power shortages, but also the implementation of a carbon tax, coming into effect in January 2015, should be a spur for businesses to explore alternatives to carbon production and improve their internal energy efficiency. While it is Eskom's responsibility to provide power, it is ours to make sure that we use it responsibly. Wastefulness around any resources, especially one we know to be finite, should be actively discouraged. We all remember the 2008 blackouts and load shedding vividly and desperately want to avoid a repeat of that situation.*"

ENERGY MANAGEMENT SYSTEMS

"*The developed world is experiencing a decline in energy demand whereas developing countries are expected to experience an acceleration in energy demand*", according to Alf Hartzenburg, Senior Project Manager Western Cape - Industrial Energy Efficiency Project, National Cleaner Production Centre of SA, CSIR and chairman in the large power users track at African Utility Week.

He continues: "*as economic growth in African countries is set to take off corresponding energy demand is expected to balloon. Any business seeking to remain competitive in the new world of declining energy reserves and seeking a sustainable solution must seriously consider the implementation of the ISO 50001 aligned energy management system.*"

ARCELORMITTAL SAVED R90-MILLION IN ENERGY BILL

The ISO50001 energy management system was implemented with great success at ArcelorMittal's steel plant in Saldanha, the single largest electricity consumer in the Western Cape, and resulted in an astounding R90 million energy bill savings in one year.

According to General Manager, Dhesan Moodley, Saldanha launched a focused energy management strategy in 2010, with resources allocated both in terms of people and capital expenditure. He adds: *"initially the potential was determined through an existing project list and doing an energy audit on the plant to determine further possible savings. After ISO 50001 was implemented, energy management is now part of our daily routines. Energy saved: baseline value 160 MW (saved 10.6MW on baseline in 2012) or 6.6%."*

GOING GREEN

"Concentrating Solar Power or CSP is the best technology for South Africa for future electricity production. It is already cheaper than new coal fired power stations, if you include all the costs for fuels during a lifetime", says Professor Dr.-Ing. Frank Dinter, Eskom Chair in CSP and Solar Thermal Energy Research Group (STERG) at the Department of Mechanical and Mechatronic Engineering, Stellenbosch University. He is also a speaker at Clean Power Africa, which forms part of African Utility Week, and explores greener and cleaner technologies for the utility industry. Says Prof Dinter: *"CSP has the big advantage to collect and store heat to produce electricity on demand, meaning also after sunset and during the night. South Africa has started to add solar thermal power plants to its existing power plant park. Soon everybody will recognise CSP plants as having real capacity and that it fits perfectly into the South African grid."*

The award winning 14th African Utility Week and Clean Power Africa conference and expo is taking place at the CTICC in Cape Town from 13-14 May 2014. It is attended by more than 5000 power and water professionals from more than 30 African countries and 70 worldwide, at what is the largest utility gathering of its kind on the continent.

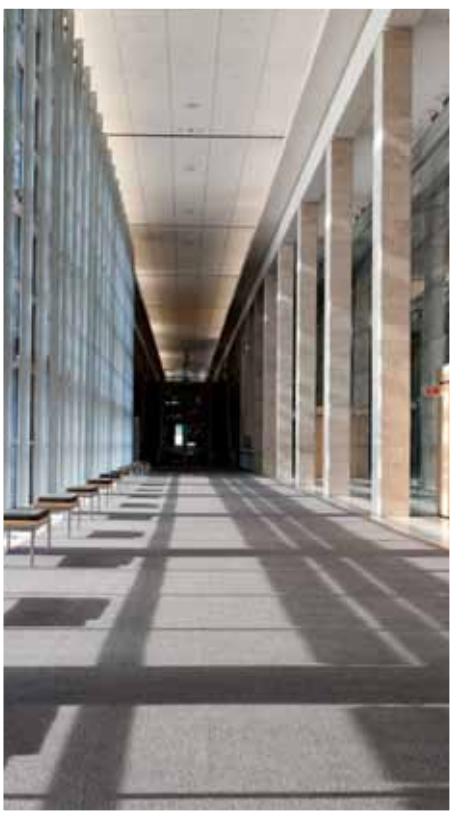
Discussions, workshops, exhibits and site visits will focus on the industry disciplines of metering, clean power, water, large power users, investment and finance, transmission & distribution, smart grids and generation.

The energy & water efficiency and the renewable energy workshops are presented by the South African Renewable Energy Technology Centre (SARETEC) and the Southern Africa Association for Energy Efficiency. wn

EVENT DATES AND LOCATION:

Conference and Exhibition:
13-14 May 2014
Focus day: 12 May 2014
Site visits: 15 May 2014

Location: Cape Town Convention Centre, Cape Town
www.african-utility-week.com



A new lease on life for NamPower's Van Eck Power Station

Namibia, like its fellow Southern African Power Pool members is currently facing an electricity shortage. Namibian generation capacity is only around 380MW with a demand of over 450MW. At the moment the shortfall is made up by electricity imports but member countries are struggling to meet their own needs so these imports are no longer reliable.

On evaluation of the countries options for increased power generation, an attractive option was to rehabilitate NamPowers Van Eck Station situated in Windhoek. This 120MW Coal fired plant was built in the early seventies and is very close to the end of its life. Virtually all major equipment needed to be replaced, not only that but in its condition and with the cost of coal constantly increasing, operating the plant had become completely uneconomical.

After a comprehensive feasibility study was completed by American company Black & Vetch NamPower took the decision to embark on a N$ 300 million project to restore the aging power station to its former glory. In addition new and modernised equipment would be added to ensure on-going economic efficiency and reliability.

A decision was also taken to install equipment that could operate with a locally manufactured and more cost efficient "green coal" integrated with normal imported coal to fire the four boilers. This "green coal" is derived through a torrefaction process of harvested invader bush which is then pelletized and distributed into the furnace along with coal.

South African company MBH Energy Pty Ltd was contracted by NamPower to do the rehabilitation job which included renewing and improving the firing equipment on all four boilers to ensure successfully and efficient firing of the mixed fuel.

The scope of work included a range of new and modernized equipment. Firstly in order to successfully introduce the more brittle green coal into the furnace area without pulverising it, the decision was taken to replace all the old mechanical coal feeder spreaders with new DSC underthrow feeders. The new feeder design combines air assist with an Underthrow

rotor mechanism. This unique design discharges the fuel in the underside of the rotor, enabling the blades to contact the coal for a longer period of time. This design feature, in conjunction with the pneumatic distributor plate, facilitates a more horizontal trajectory of the fuel, which distributes the fine particles more consistently onto the bed area. This promotes better combustion efficiency by reducing the carbon content of the ash. This system is ideal for distributing fuels of inconsistent size and is a first for the African continent.

Another upgrade to the Van Eck Power Station is the replacement and modernisation of the moving DSC Roto Grate system. Modernisation of this includes a new support beam structure, air seals, chains and grate bars as well as a new arrangement for the rear tuyeres, all of these components have developed and drastically improved over the last two decades. The grit re-firing system has also being rebuilt and optimised with 10 new re-firing lines inclusive of cinder return nozzles and return pick up assembly. The changes made to the grate and furnace system will ensure better performance and less down time for the plant which will give increased annual productivity and efficiency of the boilers.

MBH Energy will return two boilers back into service for NamPower in January 2014 with the other two expected to be back in service by June. The van Eck Power station is expected to be running at its full capacity of 120 Mega Watts before 2015 allowing the country to reduce its energy imports from neighbouring countries. wn

POLITICAL INSECURITY BARRICADES MUCH NEEDED FOREIGN INVESTMENTS IN THE NORTHERN AFRICAN POWER SECTOR

Renewable energy appears the most feasible solution to bail the region out of a power crunch.

Electricity demand in North Africa is escalating as a result of extreme climatic conditions, economic development and rising living standards, as well as sustained population growth. Supply of electricity, however, is plunging. Hot summers are driving the extensive use of air conditioning, which has led to sharp surges in peak electricity demand. The challenge of operating with grossly inadequate power supply infrastructure is compounded by political instability, which has stalled progress on many power generation capacity expansion projects, especially in Egypt, Tunisia, and Libya.

In this environment, the implementation of structural reforms, such as the establishment of independent electricity regulatory bodies and the revision of fossil fuel/electricity tariffs subsidies, is expected to be a priority. Further development of the sector will depend on the success of the political and economic transition process that is occurring in each country. Foreign investors have adopted a wait-and-watch approach in countries where violence rose unexpectedly.

New analysis from Frost & Sullivan, Power Infrastructure Tracker in Northern Africa, analyses the existing and projected power infrastructure of North Africa and finds that the total power installed capacity in the region amounted to 61,623.3 MW in 2012 and estimates this to reach at least 120,000 MW in 2020 (if the political situation stabilises in countries like Egypt and Libya).The renewable energy installed capacity amounted to 5,929.1 MW by the end 2012; approximately 9.6 percent of the total installed power generation capacity. The study covers Morocco, Algeria, Tunisia, Libya and Egypt.

In addition to the security issue, the power sector also has to deal with restricted financing, unfair subsidies for conventional (fossil fuel) energy, and inadequacies in regulatory frameworks (non-cost-reflective electricity tariffs).

"Each of the five Northern African countries has outlined a strong pipeline of power generation capacity expansion projects, including ambitious renewable energy projects," notes Frost & Sullivan Industry Analyst for Energy & Environment Celine Paton. *"However, the pace of implementation of these projects will depend on the ability of each government to stabilise security and implement the required political and economic structural reforms."*

With the exception of Morocco, a resource-strained country that uses mainly coal, all Northern African countries strongly depend on natural gas for electricity generation. Despite a sturdy impetus from each government within the region to develop renewable energy power projects, it is expected that natural gas will remain the primary feedstock for electricity generation until at least 2020.

"The potential of renewable energy is deemed strong in North Africa, with numerous feasibility studies confirming the abundant potential for solar and wind power," states Paton. *"In the case of renewable energy installed capacity, Egypt is the most advanced, followed by Morocco, with both countries exhibiting a keen desire to develop renewable energies."*

PROACTIVE AND SYSTEMATIC APPROACH NEEDED FOR LIGHTNING SAFETY

"A proactive and systematic approach to lightning safety is essential to mitigate the risks to people, communities and animals posed by lightning. Data reportedly indicates that there are up to 100 lightning related fatalities each year in South Africa, with a reported probable injury rate of many times that".

Ian McKechnie, director of specialist consulting and forensic engineers INNOPRO, noted this in advising that an integrated and holistic approach was essential to ensure both lightning safety of people, as well as protection of property, plant and equipment.

"An effective and properly considered lightning safety and protection plan lies at the core of this approach", commented McKechnie. *"Such a plan must consider the risks, and the resultant safety and protection approach applicable to the particular situation, and must be integrated with other related plans and policies related SHEQ, OHS, maintenance and engineering, and the like, depending on the particular circumstances."* He added that the risks to be considered are not just lightning exposure risks, but also those related to, for example, maintenance and operational factors and the consequence of non-compliance or system failure.

McKechnie noted that Innopro has developed a structured and integrated approach to lightning safety and protection. He commented that *"such a structured and integrated approach ensures that a systematic process of assessment and evaluation is followed by a sound design and implementation stage. It is also important that the ongoing maintenance of the system is properly planned and implemented, to ensure the ongoing performance of the installation"*. He commented that the approach is applicable across various sectors, including aviation, telecommunications, mining, petrochemical (oil & gas) plants and other infrastructure, as well as educational, sporting and agricultural facilities, as some examples.

He added that their assignments and projects are performed or supervised by registered, highly qualified and experienced professional engineers, which ensures that their clients benefit from a uniquely high level of expertise in this sector. *"Our clients*

can be secure in the knowledge that they are dealing with a team of professionals who can provide them with objective and sound advice and solutions, irrespective of the solution implications" he enthused.

He commented further that as specialist consulting and forensic engineers, and not contractors, they were often able to include the client's own personnel and contractors in implementing the solution, thereby ensuring knowledge transfer and "ownership" of the implementation, as well as effective use of existing resources. *"This can have huge benefits in terms of ongoing maintenance and integrity of the solution"* he concluded.

INNOPRO's lightning solutions have been effectively applied not only in South Africa, but also internationally in diverse countries such as Mozambique, Zimbabwe and Sierra Leone, and their services are offered on a world-wide basis.

WORLD CLASS CONSULTANCY SERVICES' POWER AND ENERGY DIVISION LOOKS FORWARD TO A GOOD YEAR

With the current state of the power and energy market, SMEC South Africa has positioned itself well by introducing a new addition to its functional groups, the Power and Energy division.

SMEC functional head of Power and Energy, Andre van der Walt, notes that since establishing the Power and Energy division in July last year, the division has already acquired measurable success and is working on major projects within the power and energy sector.

With its holistic approach to business and projects, the SMEC Power and Energy division is able to see projects through from inception right through to completion, providing customers with tailored local solutions backed by Global expertise.

SMEC's Power and Energy services extend through all stages of project delivery, including: feasibility studies; front-end engineering; modelling and analysis; engineering design; procurement; contract management;construction supervision; quality-assurance and operation; and maintenance services.

"With the service offering that SMEC Power and Energy is able to offer and the medium-term outlook for the sector looking promising with significant infrastructure capital spend on the cards, SMEC Power and Energy is looking forward to at a bright future," states van der Walt.

Speaking on infrastructure development within South Africa, van der Walt says: *"The key to unlocking the infrastructure expenditure lies with the Presidential Infrastructure Coordinating Commission's ability to enable the roll out of the National Infrastructure Plan (NIP). The NIP, which was adopted in 2012, intends to transform the economic landscape while simultaneously creating a significant number of new jobs and strengthening the delivery of basic services. SMEC Power and Energy is well placed to take advantage of the NIP, as it comes to fruition."*

Currently, SMEC Power and Energy is involved in two significant South African energy projects. The larger of the two projects is being developed by a local developer for submission in Round 4 of the Department of Energy's Renewable Energy Independent Power Producer Programme (REIPPP). On completion, the project will provide power to more than 13 000 mid-income households.

"In addition, we are working on a community electrification project in the Mogalakwena Municipal area, in the Limpopo province, whereby we will be providing our services to ultimately supply some 1440 household with electricity. We are currently in the design phase of the project and need to investigate the best electrification options for the community," explains van der Walt.

SMEC Power and Energy's technical and consulting engineering expertise are mainly focused on servicing the transmission &distribution, hydropower, renewables and industrial sectors within Africa.

"Our Transmission & Distribution business is the most active of our market sectors given the huge need for expansion and refurbishment of the power supply network in South Africa – mainly through Eskom and Municipal authorities," explains van der Walt.

"As a team we are aiming high. There are a number of existing opportunities that we are pursuing that would get us to the position of one of the leading players in the power and energy market. The division is attracting fantastic talent and we are well-positioned for continued growth in the coming future. Our medium-term target is to grow the business by approximately 20% per year for the next three years. We believe that we are taking a realistic, aggressive approach to growing the new division," concludes van der Walt.

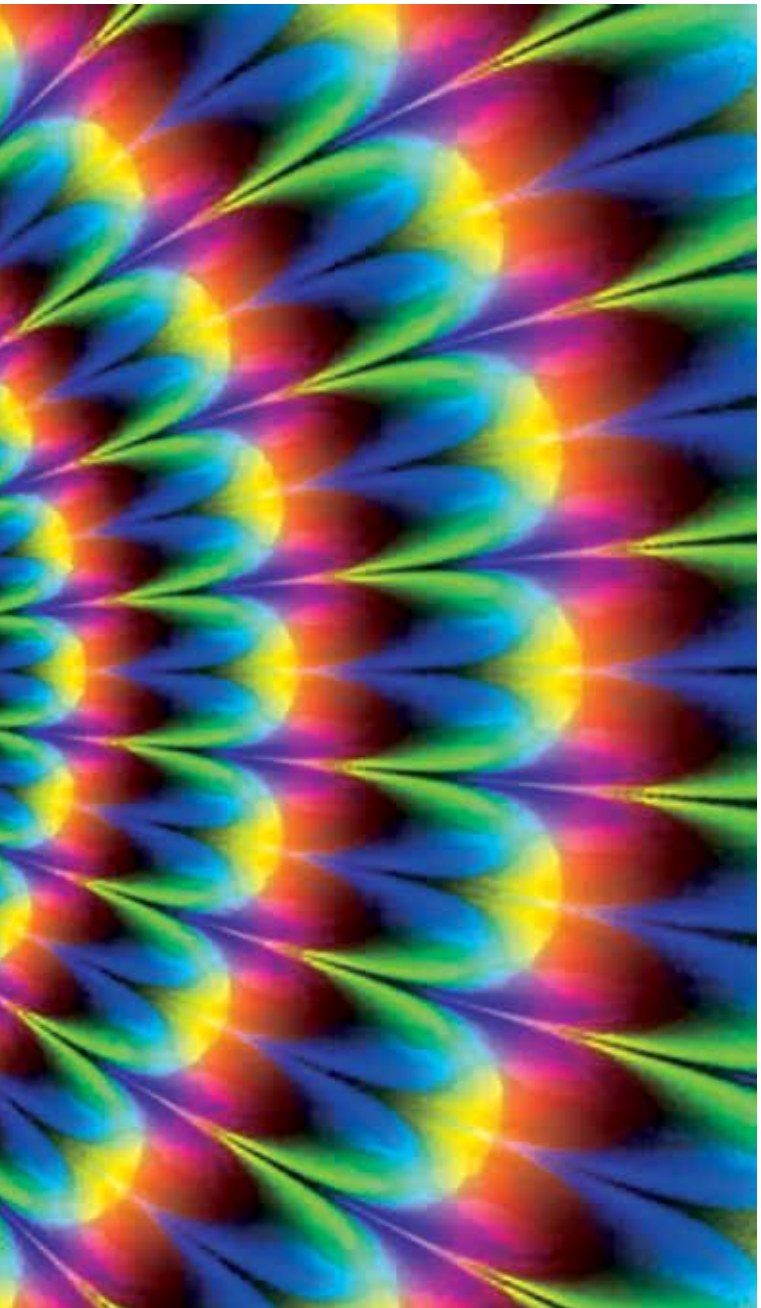
SUNCYBERNETICS APPOINTS YOUNG DESIGN ENGINEER

SUNCybernetics, the partnership venture between German-based SUNFarming and South African consulting company, Energy Cybernetics, is creating job opportunities for the youth of South Africa. The most recent appointment is that of Junior Technical Design Engineer, Faure van Schalkwyk, a B.Eng graduate from the North West University engineering faculty.

Utilities Can Overcome the "Death Spiral"

The future electricity grid requires a whole new social compact between utilities, regulators and the public in order for it to remain relevant.

COMPILED BY | MINX AVRABOS



Utilities continue to hold on to 100-year old business models-invest in equipment, turn the customers' meters, and earn a steady profit. But, for the first time utilities' profits are being undermined by a changing energy sector.

But, as the industry faces an unfamiliar and uncertain future, traditional business models must be done away with. This will affect the way they plan, conduct business and serve their customers.

A number of innovative energy service suppliers have increased significantly and is disrupting the traditional relationship between the utility, regulators, and customers. Because customers are gaining access to technology that can save and generate electricity, utilities need to adopt innovative business strategies in order to stay ahead of the competition which wasn't there before.

A kind of "death spiral" or "vicious cycle" has been created. As customers leave the utility service and provide their own power, the departing customers' share of utility costs fall on fewer customers. This raises utility rates causing more customers to leave the grid. To avoid this, utilities need to devise new business models, taking into consideration the changing environment, technology and the customer. The new electric power industry will have to be designed with three objectives in mind- creating a decentralized control paradigm, equipping the system for low-carbon supplies, and establishing a business model that promotes increased efficiency.

MAINTAINING RELEVANCE

The Deloitte Center for Energy Solutions points out, *"The time is ripe for significant transformation because the potential for dramatic disruption to the existing electricity operating model is coming not from one direction, but from many -- demand, technology, regulation, new products, and new competitors."*

While some utilities choose to avoid the changes by undermining distributed technologies in order to keep customer dollars flowing to utilities, we believe this approach is doomed to fail as it is not in the public's interest. Instead, the utility should embrace the opportunities offered by distributed generation and energy efficiency technologies. Why? Because it is not going away anytime soon, if ever.

There are a number of ways that the utility can remain relevant. It is up to the utility and policy makers to determine what will work best in that particular environment. The utility can be limited to a role as a "wires company," maintaining the part of the grid that is a physical monopoly -- the wires and poles -- while competitive providers supply the rest. At the other extreme is the "energy services utility," which owns and operates all the necessary systems to deliver energy services to consumers. Between these two, a "smart

Utilities Can Overcome the "Death Spiral"

continues from page 27

integrator" or "orchestrator" role involves utilities partnering with innovative firms to coordinate and integrate energy and related products and services without utilities necessarily delivering all of them.

POLICY RULES THE ROOST

The power sector is heavily affected by policy. Utilities cannot establish new business models without the right policies in place. Whether in regulated, vertically integrated monopoly and monopsony (single buyer in a market) settings, or in competitive ecosystems, policy sets the rules. Policymakers must define societal outcomes, determine the legal and market structures under which companies operate, develop and implement the proper market and regulatory incentives, and follow up to make sure that policies are being achieved.

Policymakers and power companies should experiment with different responses to changes in the power sector. By doing this, they can create a range of new business models that work, as well as a diversity of regulatory structures that support them.

REGULATORY MODELS

It is up to the utility and policy makers to create regulatory models which aim to encourage change within the utility, as well as support public interest.

Ron Lehr and Bentham Paulos of America's Power Plan suggest three regulatory models for the utility:

The UK's new "RIIO model" (regulation for incentives, innovation, and outcomes) is based on broad-scale performance-based incentives with revenue caps. Utilities file business models to achieve the above-mentioned goals. New utility business models, recently filed with the regulator, show how utilities will accomplish a range of public policy outcomes, provide customers value for money and measure performance to support incentives. The RIIO model aims to pay utilities to deliver what society wants going forward, while U. S. regulation tends to focus more on whether society paid the correct amount for what it got in the past.

The so-called "Iowa model" describes a series of settlements entered into by parties and approved by regulators that led to electricity prices in Iowa that did not change for seventeen years. This is despite wind power rising to 25% of the generation mix, fluctuating fuel costs, and growing customer loads. The Iowa model proves that stakeholders can negotiate for and settle on a regulatory bargain that works for them to keep rates stable. It also supports shared earnings and utility profits in a less adversarial process. The largest Iowa utility, MidAmerican Energy, has announced plans to get to 39% by 2017. The approach also encourages the movement towards clean energy.

The "grand bargain" model combines elements of the RIIO and Iowa models. Most commissions are trapped in solving particular regulatory issues without any opportunity to look across all the issues and work toward comprehensive and coordinated outcomes. This can result in confusing and contradictory outcomes. In a "grand bargain" model, a commission would encourage utilities and stakeholders, including commission staff, to negotiate a comprehensive settlement to a range of desired outcomes.

The common thread for all three of these models is that they clearly define the goals and the parameters, encourage utilities to new and improved levels of performance, and grant the companies the flexibility to achieve them.

All three require unprecedented new levels of communication and cooperation, based on the fact that utility and regulatory "business as usual" will not be sufficient to reach solutions for the new challenges that the industry is faced with.

Companies and regulators need to experiment and find agreement, outside the traditional adversarial venues of utility regulation. They need to be given the flexibility to try new products or programs in the market place. wn

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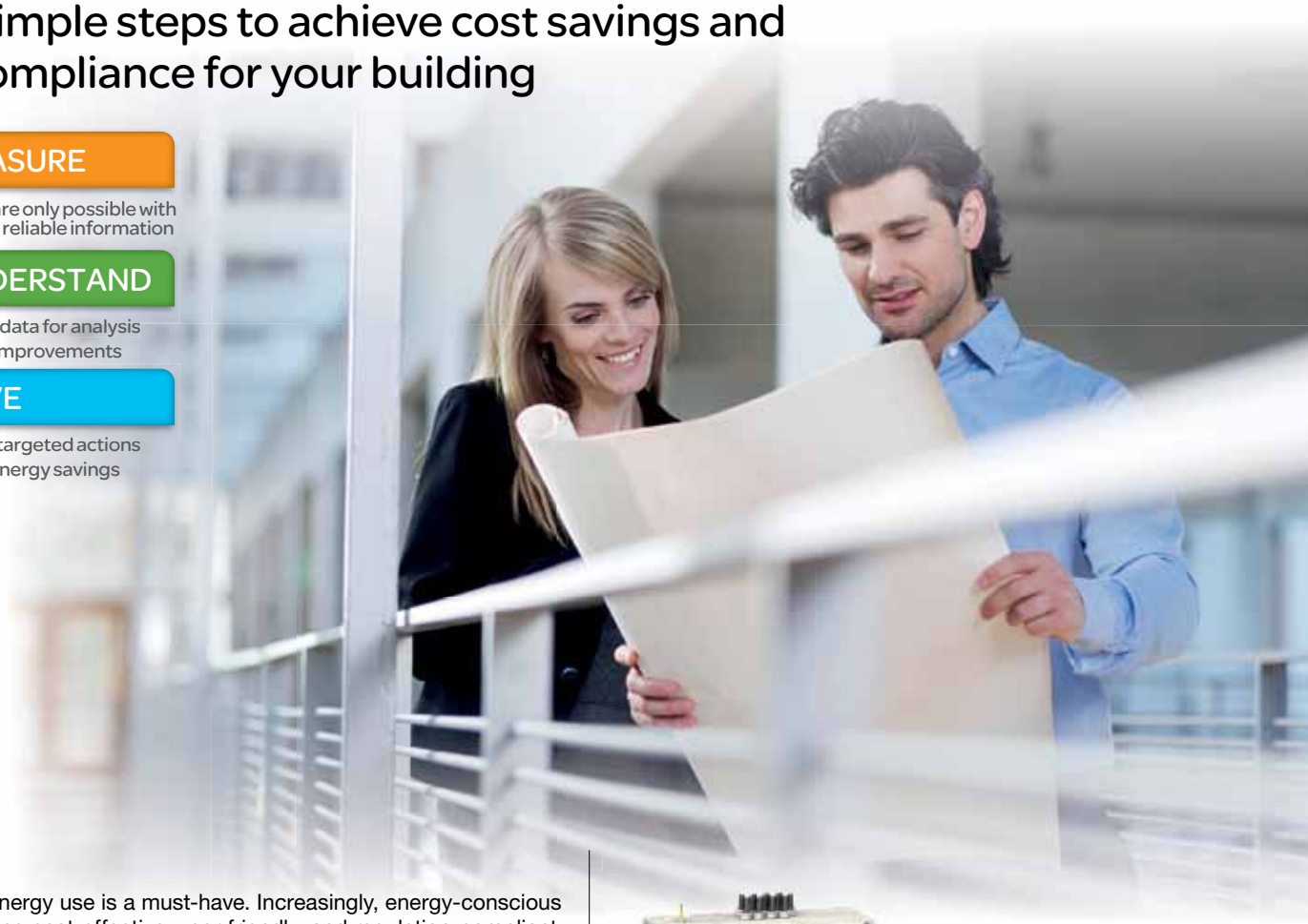

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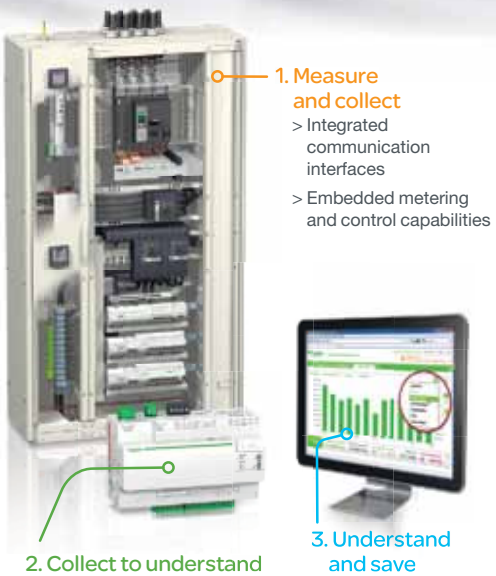

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A SOUTH AFRICAN CASE STUDY

Solar-aided Power Generation vs Concentrating Solar Power

BY | WARRICK PIERCE
ENERGY CONSULTANT, AURECON

Renewable energy resources can possibly provide effective sustainable energy solutions. However, the application of solar energy for power generation purposes is not currently competitive with conventional fossil fuel systems.

A recent academic study compared the solar aided power generation (SAPG) solution with that of a similar-sized stand-alone concentrating solar power (CSP) plant in the South African context. The objective was to determine the real advantages of these technologies, if any.

To determine the performance of the two types of Renewable Energy (RE) technology, the study simulated a Solar Aided Power Generation (SAPG) plant at Lephalale, Limpopo province and compared it with a model of a stand-alone Concentrating Solar Power (CSP) plant near Upington, Northern Cape.

SOLAR-AIDED POWER GENERATION

The integration of solar thermal collectors into conventional fossil plants, or SAPG, has proven a viable solution to address the intermittency of power generation and combines the environmental benefits of solar power plants with the efficiency and reliability of fossil power plants.

The basis of SAPG technology is to use solar thermal energy to replace the bled-off steam in regenerative Rankine power cycles. The increased steam output then enables additional power generation from the turbine (solar boosting mode) or fuel consumption can be reduced (fuel saver mode).

The temperature of the heat source is one of the major defining factors of a power plant — higher temperature results in higher overall power plant efficiency. With SAPG, the heat source temperature is not limited by the solar input temperature and is therefore an effective means of utilising low or medium solar heat (250˚C) for power generation. However, internationally the adoption of the technology has been slow, despite it being a viable and quick means of CO_2 emission reduction.

The study was conducted on a simulated SAPG power plant at Lephalale, which was based on a generic 600-MW electric subcritical fossil power plant with a reheater and regenerative rankine cycle with two

low pressure FeedWater Heaters (FWH) downstream of the deaerator and three high-pressure FWHs upstream.

STAND-ALONE CSP

CSP plants convert the sun's rays into high-temperature heat using various mirror configurations. This thermal energy is converted to mechanical energy with a heat engine (for instance a steam turbine) and ultimately to electricity utilising a generator.

The plants consist of two parts: one that collects solar energy and converts it to heat, and another that converts heat energy to electricity. Thermal energy storage is a possible addition which accommodates dispatachable power — a drawcard for solar thermal amongst renewable energy resources.

For the study, the plant was simulated in the solar booster mode, which has proven to produce more rewarding and stable results than fuel saving mode.

The following components, which are standard to power plants with steam turbines, were integrated into a whole-plant model:

Boiler – with a furnace, water walls, drums, evaporative bank, superheater, reheater, economisers and air heaters;
Steam turbine – extraction condensing type with high-pressure, intermediate and low-pressure sections;
Electrical generator – no gearbox included
Condenser – heat exchanger between turbine exhaust steam and cooling water from cooling towers (either wet or dry);
Feedwater system – feedwater pumps and heaters;
With the above components, a sequential approach was followed and heat and mass balances were performed with efficiency analyses.

Solar-aided Power Generation vs Concentrating Solar Power

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SAPG AND CSP COMPARISON

The case study compares a SAPG plant in Lephalale, home to the Matimba and under-construction Medupi coal-fired power stations, with a CSP plant near Upington, a very good solar resource area. In order to make a direct comparison with the SAPG, the solar field for the CSP plant was unaltered — actual aperture area of 80,000 m^2 was used, equating to around 50-MW thermal peak capacity. No thermal energy storage was considered.

Annual simulations at a conventional North-South orientation were performed. Parabolic trough collectors are the most mature concentrating solar technology and was used for the simulations. The selection of suitable solar collector technology is outside the scope of this study.

Furthermore, the same power block specifications were used for both plants. From a SAPG perspective this can be seen as being conservative.

The stand-alone CSP plant is a complete plant, including solar field, power block and balance of plant, while the SAPG is essentially a solar field integrated into a power plant. The National Renewable Energy Laboratory developed a component-based cost model for parabolic trough solar power plants for use with Systems Advisor Model (SAM). From this database, the cost of SAPG was extracted as 72 percent of that of a stand-alone CSP system (solar multiple of 1.1 with no storage).

RESULTS

While the solar resource at Upington, in terms of annual total Direct Normal Irradiation, is 20 percent higher than at Lephalale, the study found that:

In terms of the conversion of solar thermal energy, SAPG proved 1.5 times more efficient than CSP (similar results were found in previous studies).

Ultimately, the annual electricity generated from solar thermal at the SAPG plant is over 25 percent more than from the stand-alone CSP plant.

The breakdown of costs showed that SAPG is 72 percent of the cost of CSP. Therefore, a solar assisted high pressure feedwater heater system (SAPG) at an existing coal-fired power station is 1.8 times more cost-effective than a stand-alone CSP plant.

A 2012 study, The value of hybridizing CSP (Siros et al), found SAPG to be competitive with large scale, ground-based photovoltaic plants in terms of 'levelised' cost of electricity

CONCLUSIONS

SAPG is a more viable solution for South Africa in the short to medium term, with its significant coal base and good solar resource, and is comparable to large scale, ground-based photovoltaic plants.

In South Africa and other developing countries, CSP has been identified as having a high potential for localisation of manufacturing. Thereby, creating jobs and stimulating the green economy.

SAPG has a higher local content potential than standalone CSP due to simpler sub-systems.

SAPG can assist utilities to meet their CO_2 emission reduction targets in a quick and feasible manner SAPG is a mechanism for the deployment of large scale CSP technologies.

The innovative concept of SAPG allows conventional coal-fired power stations the ability to generate renewable electricity.

The integration of solar energy into conventional power stations provides a viable solution to overcoming the many legislative and cost-related issues of implementing large scale renewable energy. wn

SAVING ENERGY

TO SAVE ENERGY AT HOME

Switch off:

- ⇨Electricity appliances not in use
- ⇨Geysers during peak period
- ⇨Electricity appliances on standby mode
- ⇨Lights, heaters and air-conditioners in unoccupied rooms

Use the following:

- ⇨A shower instead of a bath
- ⇨Compact Fluorescent lights
- ⇨Alternative energy like solar geysers and gas stoves

TO SAVE ENERGY IN THE OFFICE AND FACTORY

Switch off:

- ⇨Kettles and urns after boiling water
- ⇨Lights that are not of vital importance
- ⇨Computers, printers and other appliances when leaving office
- ⇨Machinery neither in operation nor production line
- ⇨Office electrical appliances when going home

Do the following:

- ⇨Reduce lights in your office to a minimum
- ⇨Use windows instead of air-conditioners to cool office
- ⇨Avoid using heater to warm office unless under extreme cold conditions
- ⇨Use alternative energy such as solar and gas where possible

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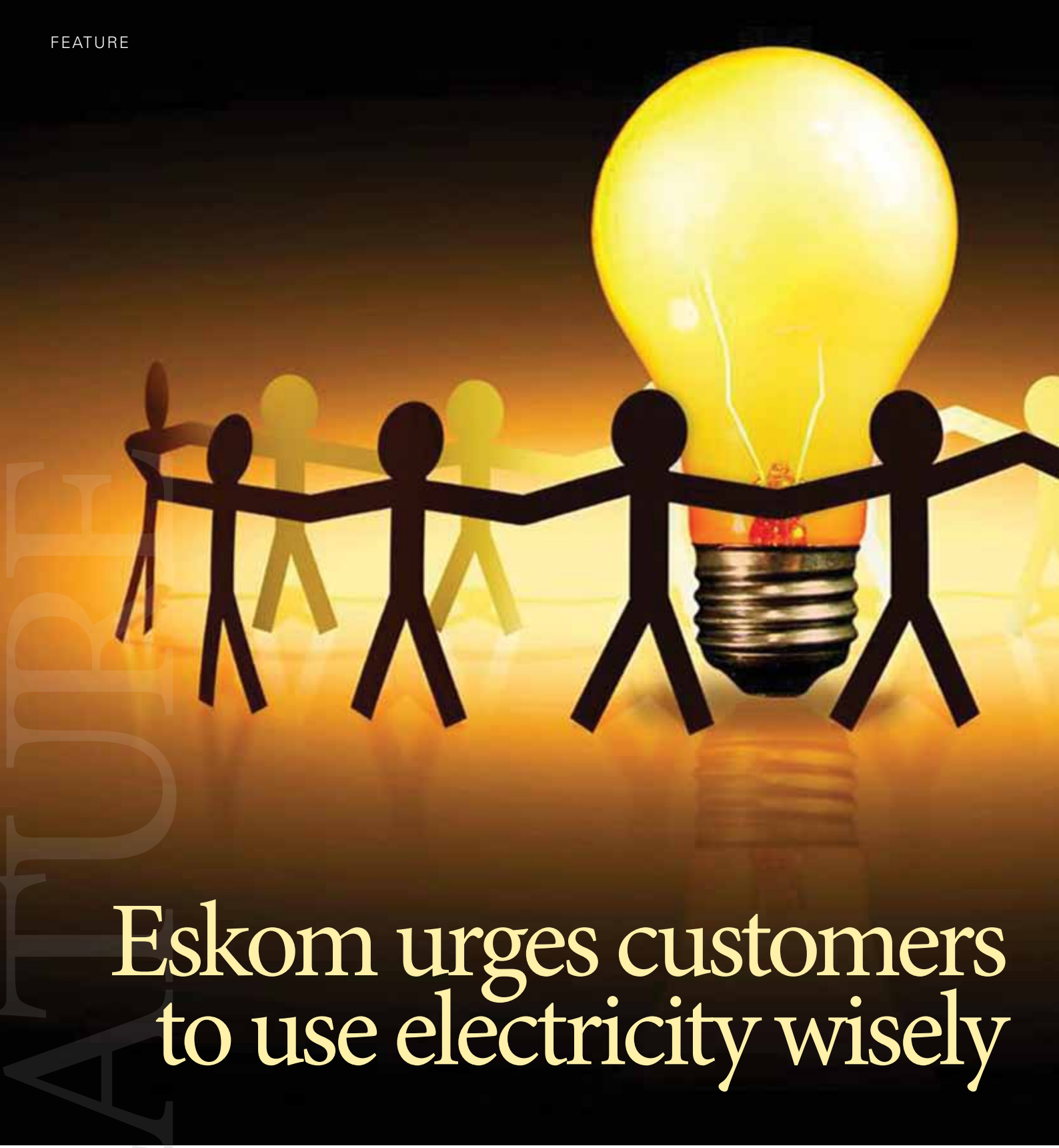

Eskom urges customers to use electricity wisely

Addressing the media at the Quarterly State of the System briefing, Eskom Chief Executive Mr Brian Dames said power supply was constrained this summer, culminating in the declaration of two system emergencies during February. Despite the emergency declaration, no rotational load-shedding was done – thanks to immediate demand reduction by all our customers and the utilisation of emergency reserves. Up to 1000MW of demand was reduced by our industrial, commercial and residential customers during the emergency periods.

The national electricity grid remains constrained and this will continue until new generating capacity comes on line and essential generation maintenance is done.

Dames thanked all Eskom customers for heeding the call to use electricity sparingly, but cautioned that the power system still remains vulnerable going into winter.

"With the projected demand and current trends in planned maintenance and in plant performance, extensive use of open cycle gas turbines (OCGTs) is anticipated resulting in limited operating reserves to deal with volatility in demand or generation performance. We call on all customers particularly the municipalities and the commercial sectors to manage and cut out all electricity wastage. The industrial and commercial sector can make significant contributions particularly in large office blocks and shopping centres. If this is done, it will ensure a stable power system and reduced costs. We thank all our customers who continue to assist by reducing consumption," he said.

Chairman of the Eskom Board, Mr Zola Tsotsi thanked all South Africans for heeding Eskom's call to reduce electricity usage saying, *"I would like to convey a special word of thanks to all our customers who supported us by agreeing to reduce their electricity usage during challenging times. Our call for all South Africans to save electricity therefore remains and is louder than ever before. Every South African has a role to play in conserving energy."*

Public Enterprises Minister Mr Malusi Gigaba also urged customers to be prudent with the electricity usage: *"The power system is currently tight and will remain like that until new generating capacity comes online. We therefore appeal for sustained savings throughout the day in order to reduce demand on the electricity grid. The less electricity you use, the more electricity will be available to go around. The electricity system remains tight and will remain so for a foreseeable future. We can assure you that we will only use load shedding as a last resort – one to protect the national grid from total collapse. We thank all South Africans for uniting and for responding by making energy efficiency their way of life."*

Eskom adopted a five-year plan aimed at ensuring a sustainable generation fleet, one that will not only generate power more reliably now but will continue to do so over the useful lives of our power stations.

Dames said: *"The plan will see us target 10% of our generation capacity on average through the year to do fixed planned maintenance, to address reliability and environmental issues at our power stations. In the short to medium-term, this will introduce higher risks to balancing supply and demand. In order to manage these risks, the country must continue to focus on additional supply options, energy efficiency and some form of an energy conservation scheme as a safety net."*

As in 2013, the planned maintenance programme will continue throughout the year and this could potentially increase the level of constraint. It remains critical for customers to maintain or achieve 10% savings especially in the commercial and residential sector.

Much of the planned maintenance will be fixed, providing certainty, while outages

Eskom urges customers to use electricity wisely

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will be done to ensure we can comply with environmental legislation. The average age of Eskom's power stations is 30 years and they therefore require higher levels of planned maintenance work.

Maintenance will continue at high levels based on the generation sustainability strategy and to comply with environmental legislation. Planned outages vary between 5GW to 6GW up to April 2014, thereafter between 4GW and 5GW and by June will decrease to about 2GW.

Unit 2 of the Koeberg nuclear power station will be shut down for planned refuelling at the end of March this year.

The energy imports from the Cahora Bassa hydro scheme are back at full capacity of 1 500 MW following the repair of towers that were damaged by the floods in Mozambique in 2012. In addition, approximately 2 100 MW of interruptible demand, for up to two hours a week, is contractually available from the aluminium smelters.

About 320 MW of renewable energy from the independent power producers will be connected to the national grid in the first half of this year. An additional 320 MW will be connected in the first half of 2015.

Tsotsi also outlined the importance of regional partnerships. He said, *"Eskom is a member of the Southern African Power Pool (SAPP) and trades with neighbouring countries. Without supply to and from each other as SADC countries (i.e imports and exports), our power systems and economies would be impacted negatively. However, supply contracts with our neighbours are designed in a manner that doesn't prejudice our domestic customers. If there was a need to go into rotational load shedding, supply to these countries would be cut off."*

Eskom is committed to completing the new build programme and has put the necessary resources in place to achieve this objective. Work has resumed at the Ingula pumped storage following an accident that happened at the facility in October last year. Medupi and Kusile continue to demonstrate world-class safety performance at 0.1 loss time incident rate.

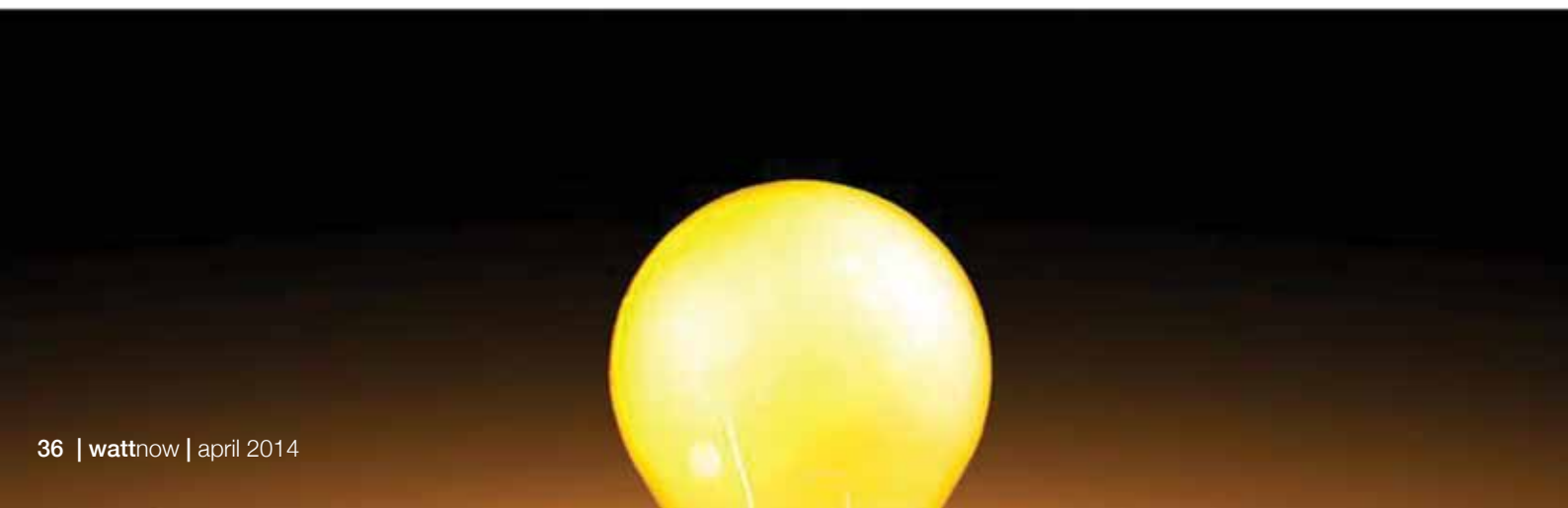
Medupi's first unit is still expected to be synchronised in the second half of this year, and Kusile's first unit will follow a year thereafter. The technical issues at both Medupi and Kusile are being addressed.

Three of the 50 wind turbines at Sere power station are complete and the station's 100 MW is expected to be commissioned by 2014/15.

The strengthening of the transmission power lines is also progressing well, with major sections of the network (Western Cape, Limpopo and Gauteng) having been completed.

By the end of this decade, we will have added a total of 17.1 gigawatts to the grid, boosting our capacity by almost 50%, from a range of new plants including return-to-service stations and open cycle gas turbines, as well as Medupi, Kusile and Ingula. *"These are large and complex projects that take time to build. We have said all along that the power system would remain tight for the next few years until we get substantial new capacity online from our large new power stations,"* said Dames.

Eskom calls on all consumers to pull together over the next few months and use electricity sparingly by *"Living Lightly"*. Residential, commercial and large industrial customers can make the biggest difference by switching off geysers and pool pumps at night; switching off non-essential lights; using air-conditioners efficiently by setting the room temperature at 23˚C and responding to the Power Alerts messages. wn



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2014 Outlook on Power and Utilities

Leaders across the power and utilities industry have weighed in on the strategic, financial, and regulatory constraints that are challenging the traditional economic models of our industry.

BY | JOHN McCUE
VICE CHAIRMAN
DELOITTE LLP

These critical issues warrant continued dialogue here and elsewhere. However, it is also worthwhile to step beyond these challenges and highlight some of the technological advancements that can pave the way to future solutions.

Recent Deloitte white papers focus on the dual industry challenges of steeply rising costs and flat or declining demand for electricity, as well as the technological, regulatory, and competitive forces driving the industry into a potentially disruptive period. The reports conclude that innovation and new business models may be required to meet these challenges.

Edison Electric Institute (EEI), which represents U.S. investor- owned electric utilities, addresses the same issues directly and insightfully in its January 2013 report *"Disruptive Challenges: Financial Implications and Strategic Responses to a Changing Retail Electric Business."* The paper indicates that declining costs for distributed generation and other distributed energy resources could directly threaten the centralized utility model. EEI advises the industry to work on changing the regulatory paradigm and addressing disruptive threats, even if it means transforming established business models. New technologies will play a key role in 2014 and beyond.

As the power and utilities industry heads into this period of transformation, power, gas, and water companies are poised to benefit from a wave of technological advancements that can positively affect results across the value chain. Consider just three categories of technology that will continue to drive the evolution of our industry: 1) advancements in shale oil and gas production, 2) advanced analytics enabled by in-memory database technology, and 3) advanced nano-engineered materials.

SHALE PRODUCTION

At the first link of the power and utilities value chain, natural gas has clinched its position as a key baseload fuel for electric power companies due to low prices and its lower emissions profile. Moreover, prices are likely to remain relatively low over the next two decades as the shale gas revolution continues to play out. Deloitte MarketPoint's World Gas Model projects an average U.S. Henry Hub spot price of R64 per MMBtu over the next 20 years (2014-2034). While this is a 58% increase from the 2013 average spot price of R40 per MMBtu at Henry Hub (January to August) reported by the Energy Information Administration, it would still make natural gas one of the least expensive fuels for generators. So how will oil and gas companies maintain the production levels required to keep gas prices low?

Producers are tapping heavily into scientific and technological advancements to boost recovery and improve efficiency in North American shale plays, which are known for low recovery and steeply

2014 Outlook on Power and Utilities

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declining production rates compared with conventional wells.

Advancements such as multi-well pad drilling, multiple fracture stages, and improved well and pipe design have already boosted drilling efficiencies significantly. Producers are using fewer rigs to extract more oil and gas in less time, which keeps costs down. Further advancements promise to keep driving efficiencies in shale production. Consider these examples:

Rock physics – Scientists and engineers are studying how different types of rock fracture to produce hydrocarbons and learning how to optimize drilling in shale formations through more precise well siting.

Sensing, stimulation, and fracking - Producers are making strides with new seismic software based on radar and sonar techniques to help them "see" how the rock is fracturing digitally and target "sweet spots" in real time. They are stimulating oil and gas flow with new methods such as hydraulic pulsing and reducing water use with water-free fracturing technologies.

Lessons learned – Scientists and engineers believe technology combined with field experience will lead the way to enhanced oil and gas recovery in new shale reservoirs. Producing companies are amassing enormous databases and expect to make significant advances as data is combined and shared. The effects of these technologies will be magnified as producers use advanced analytics tools to gain insights from the data and continue flattening the cost curve.

In-memory database technology combined with smart data enables advanced analytics Power and utilities companies are also benefiting from advanced analytics tools – to boost efficiency, save money, ensure reliability, and provide better service to customers. The key is a combination of in-memory database technology, a technology that has been commercialized in other industries in recent years, with the so-called "data tsunami" inundating utilities, primarily from smart meters and other intelligent devices being deployed across power, gas, and water systems.

IN-MEMORY DATABASE TECHNOLOGY

Before this technology, databases had to continually access disk-based memory to retrieve data. Today, the declining cost of semiconductors has made chip-based memory affordable, enabling storage of large volumes of data in primary memory. This accelerates processing and allows companies to store hundreds of terabytes of data in-memory – more than 10 times what the largest U.S. electric utilities store in data warehouses. Software vendors are continually improving products to help utilities harness the data coming off the grid and analyze it in real time, opening up a range of possibilities that are just now becoming economically viable for the industry. For example:

- Predictive asset maintenance – Companies can now communicate in real time with physical assets across the electric grid (or gas or water system), such as substations, reclosers, and meters. They can continually evaluate metrics, such as temperature and vibrations and use them to create predictive models to optimize the system and indicate imminent failure.
- Customer service – Advanced analytics provide more information to help utilities restore service during emergencies, such as crew locations, ongoing weather conditions, and downed wires. Companies are prototyping advanced dashboards to help operations teams boost reliability as part of overall system maintenance.
- Segmentation and targeting – Utility companies are mining customer data to help segment and target customers for new services and programs like energy efficiency and demand response.
- Revenue protection and fraud/theft detection – Utilities are increasingly using analytics to detect fraud and theft from the electric grid, or leaks in the gas and water infrastructure. A $4 million power company project to detect, collect, and analyze tampering could feasibly payback the investment in less than a year.

ADVANCED NANO-ENGINEERED MATERIALS

Imagine materials lighter than a feather, stronger than steel, more conductive than copper, impermeable to standard gases, and as thin as an atom – and you will start to grasp the promise of nanotechnology. Advanced nano-engineered materials are creeping in across the entire energy value chain and will have a multitude of impacts.

Nanotechnology is, simply, the ability to manipulate particles at a molecular level. Special properties of the resulting nanomaterials can create tremendous efficiencies across the energy value chain.

Consider these examples:

- Oil and gas production – Nanotech particles increase the strength to weight ratio of pipelines, making them more durable, while nanocoatings help equipment resist corrosion. Nanoballs prop shale fractures open to optimize oil and gas flow and reduce water and chemical requirements.
- Electricity generation – Using nanocomposites in wind turbine design

improves blade performance by maintaining strength and stiffness. Nanolubricants with friction coefficients near zero maximize system efficiency in wind and conventional power generation turbines. Several evolving nanotechnologies reduce the size and enhance the efficiency of solar panels, such as thin film graphene and nanowire coating.

• Electricity transmission and distribution – Highly conductive carbon nanotubes can substantially cut energy loss from transmission lines, and researchers believe a breakthrough in mass production of the material is on the horizon. In five to ten years, smaller, faster, and cheaper nanosensors will help utilities detect operations issues in advance by monitoring current and voltage along the grid, detecting the condition of underground cables, and evaluating transformers and other equipment.

• Electricity storage – Nanotechnology is contributing to the development of high capacity affordable energy storage, the game-changer expected to help mitigate renewables' intermittency. Nano-infused electrodes increase batteries' storage capacity, and materials like carbon nanotubes will eventually be used to produce ultra or super capacitors that store energy more efficiently.

These technological advancements and others will help support power and utility companies through the coming industry transformation. One important caveat, however, is that as the industry becomes increasingly technology- driven, companies will need to employ greater numbers of "knowledge workers," currently in short supply. Power and utility companies would do well to join others in the business community who are seeking solutions to the dearth of "STEM" students (science, technology, engineering, and math) through education initiatives, partnerships, apprentice programs and increased research & development funding.

A combination of technological know-how and a pool of job candidates who know how to harness it will serve the power and utilities industry well into the 21st century. WN

Earn CPD Credits

A ZERO CO_2 AND H_2O FOOTPRINT HOUSE

An energy efficient approach to housing

The earthship is a concept that was developed by the architect, Mike Reynolds, in New Mexico, USA. It is nothing new and some books on eco-architecture will mention earthships. This concept was created more than 40 years ago.

BY | LUDWIG EVERSON | PR ENG

Fig 1. View of our earthship, the "Sonskip"

More than a thousand earthships have been built world wide. Mike Reynolds is known as *"The Garbage Warrior"*, because he declared war against garbage and in his designs recycling plays a major role. Why create new bricks and waste energy to make them if there is an abundance of materials ready to use that require no extra energy to manufacture?

Earthships got their name from the idea that the earth is a "spaceship". Think of the difference between a luxury cruise ship and a fancy hotel. They both offer comfortable accommodation, restaurants and other entertainment although the one is connected to all kinds of pipes and wires while the other one is an independent system that generates its own energy, has its own water, food. A ship is independent and can survive for quite a long time without docking. In the same way an earthship differs from a house. An earthship is an off-grid system and not just a house or building. Furthermore this type of home will ensure that you live a zero CO_2 and H_2O footprint life.

Somewhere in the Karoo between Hopetown and the Vanderkloof dam our earthship, the *"Sonskip"*, was built that adheres to all six the earthship principles,

i.e. to build with natural and recycled materials, make use of natural climate control, generate its own power, capture its own water, produce its own food inside and maintain its own sewerage.

THE WAR AGAINST GARBAGE

In earthships the roof bearing walls are mostly built with motorcar tyres filled with rammed earth. However if you build your house far away from a supply of motorcar tyres (e.g. as in cities), another principle apart from purely recycling comes to play. In order to keep the CO_2 footprint as low as possible while building the house, it is important to mostly use materials found locally. This will lower the CO_2 footprint that transportation can cause. For our earthship the closest source of tyres was at least 160 kilometres away in Kimberley. Unfortunately none of the tyre replacement centres there had enough storage space to collect enough tyres for us to make the trip worthwhile and cost effective. We did manage to acquire enough tyres for the foundation of the building.

This dilemma was a potential show stopper for the project. What could we do now? One of our friends, who worked on another type of natural building project, suggested earthbags. At first we were very reluctant to go that route, but eventually we decided to incorporate other natural building techniques like strawbales and earthbags. Both these methods made it possible to increase our use of materials found locally. For the roof bearing walls we used a foundation of earth rammed tyres and the walls were built with earthbags. It is interesting to note that about three wheelbarrows full of earth is rammed into each tyre. The earth in the earthbags must have a 10 - 20% clay content to prevent leakage and collapse of the walls if a bag somehow breaks before the wall is plastered. We used natural cob plaster and lime plaster. The bags we used were recycled bags for fertilizer, rice or corn. Both the tyres and earthbags were filled with earth that we got from the building site itself.

Other interesting recycled materials we used include glass bottles, plastic bottles and metal cans. This type of recycling can be called "upcycling". The recycled material will not be used in a landfill or for the same purpose than before, but rather for a higher purpose than before. We used these materials for the non-bearing walls and a typical wall can contain up to 2000 bottles or cans. This is a very neat way to handle materials that other people refer to as garbage, and which would otherwise be burnt or just used for landfill. Both landfill and burning cause problems for future generations. In order to keep the building's CO2 footprint low, we used natural materials where possible. Instead of cement to build these walls we used cob. To make our cob mixture we used earth and shale from the building site and straw from a neighbouring farm. Once again we try to make use of local natural materials.

When it comes to floors, it is common to use either cement or wood. Wood is definitely more natural than cement. However, this has the disadvantage that it is not a local product. We decided to make use of earthen floors. Our floor consists of five main layers; insulation, thermal mass, damp course layer, cob, finishing layers. For insulation we used second hand polystyrene. In the Karoo town where our

Fig 2. Volunteers having fun while building with cob and cans.

Fig 3. The completed earthen dining room floor.

Fig 4. Upcycling tiles.

An energy efficient approach to housing

continues from page 43

earthship is built, the residents separate their garbage at home before it is collected by the municipality. It is then taken to the recycle centre, where different materials are processed separately. This makes it easy for us to obtain the recycled material we need. Second hand polystyrene is free and has excellent insulation properties. On top of the insulation layer we placed shale, which is a good thermal mass. To prevent water from penetrating the earthen floor a plastic damp prevention layer was placed on top of the shale. We then poured a cob mixture on top of the plastic. After the cob mixture has dried completely, the finishing layer can be poured and spread out evenly. The finishing layer consists of a mixture of clay rich earth and river sand. Any cracks that may appear can easily be patched and smoothed out. Once the finishing layer is dry and free from cracks, we oil and finally polish the floor. The floor is as hard as a wooden floor with the added advantage that it is fairly easy to repair if it gets damaged.

For the bathroom and kitchen we used recycled tiles with beautiful mosaic artworks incorporated in the floors. The tiles were picked up for free at our recycle centre and some tiles came from a broken down display at a tile centre. So once again we upcycled tiles destined for landfill.

In other words the earthship makes use of recycled and natural materials as building material.

PERFECT CLIMATE WITHOUT AIR CONDITIONERS OR HEATERS

How do you control the climate? To be able to do that it is important to limit the space to be controlled. Earthships usually incorporate four (4) different natural techniques to control the climate in the confined space of the house. In the Karoo town where our earthship is built we have a by-law for builders to use at least one of these techniques.

Fig 5. A guest witnessing the measurement of the depth that the sun rays reached during winter solstice.

First of all and by far the easiest way to control the climate is to make sure that your house faces North. Our earthship faces solar North. The main advantage of facing North is that we can now control the sun, or rather the amount of sunlight that enters the house. Our house's entire north-facing wall consists completely of windows, plus there is a small roof overhang over the windows.

This design enables the sun's rays to penetrate the house maximally in the winter and not at all in the summer. The winter sunlight through the front windows create a solar gain effect similar to that of a motorcar baking in the sun. So even in the winter the house has a lovely tropical climate. On the day of the winter solstice we measured the sun rays reaching 4.6 metres deep into the house at 12:15 in the afternoon. At this time of the year the sun actually reaches the back wall (seven metres) earlier in the morning and late afternoon. However because of the small roof overhang the direct sun rays do not shine in at all the whole of summer, thus no heating up of the house in the summer.

The second and third principles in climate control are that of insulation and thermal mass. A cooler box also makes use of both these principles. The outside wall of the cooler box is a double layer of plastic filled with an insulating material. These walls will cause a resistance in temperature flow from outside to inside and visa versa. If we place an ice brick in the cooler box, this represents the thermal mass. Without the thermal mass the food in the cooler box will not stay as cool as with the ice brick. If for instance you leave the lid off the cooler box without an ice brick, the temperature inside and outside the cooler box will be the same in a very short time. With the ice brick the temperature inside will stay cold for much longer even without the lid on the box. The ice brick, or thermal mass, acts as a type of "temperature battery" or energy store.

Our earthship also makes use of these two principles. We insulated the house right around. Under the roof we used an insulation lining that looks like a sheet of wool and is made of recycled plastic. Air is a good insulator as long as it does not circulate. That is why this plastic wool is a good insulator, because of the trapped air in the wool. For more insulation, more air can be trapped by placing empty cold drink bottles (with their caps on) on top of the

ceiling. The bottles are not heavy and they will act as an insulator. Our earthship does not have any windows on the southern side, because it is built into a hill. The southern and (part of) the eastern walls are insulated from the hill with two layers of empty cold drink bottles. Our western wall is protected by the garage. On the northern side where we have the windows we use double glazing for insulation. As we previously mentioned we used second hand polystyrene under the floor for insulation.

For thermal mass we use the thick floor and walls. The eastern, southern and western walls are all 500 mm thick earthbag walls. Also, behind the eastern and southern wall is an extra 1000 mm of earth. Just like in the case of the ice brick in the cooler box, our thick walls store the energy and act like a temperature battery. So even if we open the doors or windows then the energy stores, the earthbag walls, will maintain the temperature in the home.

The fourth principle that our earthship incorporates to control the climate is ventilation. Normally a house uses only windows for ventilation. The problem with windows is e.g. where the temperature is 40 degrees (or -2 degrees) outside and you open the windows, the inside temperature will rise to 40 degrees (or drop to -2 degrees). In order to prevent this, the earthships use underground ventilation pipes for the intake of air. In our earthship these ventilation pipes are buried 2000 mm underground and they emerge on floor level at the back (southern side) of each room. This will cause the intake air to cool down if the outside temperature is high, or the air will be warmed up if the outside temperature is low. The ground temperature at that depth is fairly stable and does not vary as much as the surrounding air temperature. In order to force cross ventilation the northern top windows can be opened to let warm air out.

To recap: our earthship makes use of solar gain, insulation, thermal mass and ventilation to control the climate in a natural way.

Fig 6. The thermal mass in the southern earthbag wall and the white insulation underneath the metal roof.

POWER TO THE PEOPLE

A Dutch friend of mine once told me that the reason the Dutch had a golden era was because they started to understand the importance of energy and that by conquering energy they could conquer the world. By harvesting wind energy they managed not only to build their ships faster, but they also used wind to power their ships. So this brings us to the aspect of energy. For an earthship to be off-grid it is important that the energy consumption must not only be managed, but also lowered to the bare minimum. This does not necessarily mean you have to do without.

First of all, all heating devices should rather not use electricity. For instance, in our earthship we use an indirect heated solar hot water system. The system has a 250 litre highly isolated water reservoir and 24 vacuum collectors with no electricity backup. Even in the winter this system works very well, but we are planning to install a wood-burning backup geyser for the cloudy days. For cooking we use a gas stove with two burners, a single plate induction stove, a combination convection-microwave oven, a solar oven and solar stove. Both the induction stove and microwave oven are high wattage users, but they are usually used for shorter periods of time than other methods of cooking. The solar oven is the equivalent of a 1(one) kilowatt oven. The solar oven can cook a whole meal in 3 hours. The solar stove is ideal for the side dishes, but can cook a full meal as well. For additional cost saving and to use less LPG we are planning on installing a bio-gas digester.

For heating and (if necessary at all) in the middle of the winter we plan to install a fire place.

All our other electrical appliances are run from our solar system. We have nine 220

An energy efficient approach to housing

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Fig 7. Let the sun do the work with two solar stoves and the 1kW solar oven.

Fig 8. The regulator (black) regulates the voltage for the 24 batteries and the inverter, inverts the 48V DC to 220V AC.

watt PV panels and currently we generate up to 9500 kWh per day. The energy that is not used directly, is stored in a 48 volt battery bank of 24 (twenty-four) 2 volt batteries. A regulator ensures that the batteries do not get overcharged and a pure sine wave converter, converts the 48 V DC to 220 V AC. Our earthship is only wired for 220 V, seeing that most A and A+ rated household appliances are made for 220 V AC.

Our A+ fridge works from 220 V and even all our light fittings are 220 V LED bulbs. Our most power hungry light bulb is only 6 watts and has the equivalent brightness of a 60 watt incandescent globe.

WATER IN ABUNDANCE FROM HEAVEN

Fig 9. The water filter system.

It is said the next world war will be because of water. How can that be on a planet of which 70% is covered by water? If that is the case we are doing something very, very wrong. Do you know how big your H_2O footprint is, or with other words how many litres of water you use per day? I am proud to say that in our earthship, we do not use any water ... other than rain water. We catch the rain water in tanks and use it four times before we release the water back into the environment. That means our earthship is effectively a Zero H_2O footprint living environment. How do we achieve this? It can be explained in a few simple steps.

The rainwater falls onto a metal roof and flows into the gutter. The water is then funnelled into a debris filter, from where it flows into six (6), 5000 litre tanks. This debris filter consists of various sizes of stones and gravel. The water then goes through a particle and carbon filter before it is pumped into the house for washing and drinking purposes. This is the first time we use the water. The water that comes from the sink, basin, shower, bath and washing machine is called grey water.

This grey water is directed to the internal planter where it feeds the plants. This is the second time the water is used. The water flows through the planter to the end where there is a collecting well for the excess water. From this well the water is pumped to the cistern of the toilet.

As soon as the toilet is flushed, the cistern is filled again with the grey water that has been filtered by the roots of the plants. This is the third time the same water is used. The flushed water is called black water and flows to the septic tank. The overflow from the septic tank goes to the French drain where more plants can be grown. This is then the fourth time the rain water is used.

Fig 10. The two planters are on the left, inside the northern windows. At the back, see the wall made of bottles and cans. Earthbag walls are being plastered on the right.

Fig 11. Various types of plants in our planter. Same planter as in the previous picture.

FOOD FOR THOUGHT

Most earthships have an indoor planter. The planter is actually part of the system and has a very important function. As already mentioned, it assists in the handling of the grey water, but just as important is the fact that it supplies the occupants of the house with food. This gives the occupants a great means of independence and satisfaction. The planter has a thick plastic lining to ensure that the water does not compromise the foundation of the building.

Our earthship has two connecting planters, each 20 metres in length, which covers a total of 40 square metres. Most of the planter is under ground level; only about 200 mm is above the ground level. The depth of the planter varies. It starts at 600 mm, where the grey water enters the planter and slopes gradually to 800 mm just before the collecting well. The well is about one cubical meter. First we placed a layer of gravel up to the ground level in the planter. We also placed baffles in the gravel to slow down the water flow to the well. This will ensure that the plants get enough water. On top of the gravel we placed a thin layer of river sand and top of that we placed potting soil.

The roots of the plants help to filter the grey water. In our earthship we have the following plants growing successfully: parsley, coriander, basil, rosemary, pumpkins, origanum, garden cress, geraniums, nasturtiums, beans, tomatoes, spinach, lettuce, bunching onions, carrots, cabbage, strawberries, bananas and avocado. The cabbage, bananas and avocado must still prove to bear fruit.

The planter is always moist, but the soil is not soaking wet. Furthermore, seeing that the planter is inside the house, this implies that most tropical plants will thrive in these conditions. However this also means that those plants that need a dryer and colder climate might not be suitable for our earthship's indoor planter. Luckily those plants can be planted outside in the winter.

NOTHING GOES TO WASTE

Not surprisingly, the sewerage system of our earthship is also off-grid. Currently the sewerage runs into a septic tank, where the micro-organisms break the waste down and the excess water flows into a French drain. On top of the French drain there are some more plants that use the excess water. Eventually we will also add a bio-digester to the system. A bio-digester works similar to a septic tank with the difference that the bio-digester is sealed to capture the resulting methane gas. This gas can be used to run a generator, a gas geyser or stove. The excess water will then flow to the septic tank. A pump in the septic tank will make this compost rich water available anywhere in the garden.

CONCLUSION

The most important points of the earthship are the concepts of energy efficiency and sustainability. This energy efficiency concept is carried through to almost all aspects of the earthship, i.e. materials, climate control, energy, water, waste and food production. For example: by selecting local ecological and recycled materials the transportation is limited and thus energy saved, using natural climate control saves energy, reusing the water saves the cleaning of all the water to drinking quality and producing food locally also saves transportation costs.

In fact, the building is no ordinary house, but rather a system (a living organism or machine). If managed correctly it can take care of you, the occupant. A win-win situation. wn

Earn CPD Credits

The use of Mobile data for substation commissioning

Distribution Automation (DA) provides greater visibility to an organisation's electrical network.

BY | SHADIL SINGH | PRENG | MSAIEE

The use of mobile data to provide communications is a simple and short term solution that contrasts with the cost and time required to implement a fibre solution to every distributor substation. During commissioning of the Supervisory Control And Data Acquisition (SCADA) points, there are several benefits to being on site with a remote connection to the SCADA network. To this end, if there is no fibre or network point provided on site, the next best solution would be to use mobile data networks and log into the SCADA system via a secured Virtual Private Network (VPN). A wireless link to the SCADA network brings about the challenges of security, speed and network availability.

The use of mobile data technology to assist in commissioning was qualitatively tested as part of eThekwini Electricity's Distribution Automation project. The test showed the future potential for this form of commissioning but also highlighted the shortcomings in the existing technology.

INTRODUCTION

EThekwini Electricity's grid consists of a Transmission network (mostly 132 kV) and a Distribution network (mostly 11 kV). Historically, there has always been an emphasis on providing controllers with visibility at the transmission level with the cost of communication services being a limiting factor at the distribution level. In recent years the lowering cost of mobile data has opened up a new avenue to provide communication services to the distributor substations. EThekwini Electricity is currently installing

Remote Terminal Units at the distributor substations as part of the Distribution Automation (DA) project. Each RTU installation needs to be commissioned to ensure that the SCADA configuration is correct.

This paper aims to provide insight into the factors that must be considered when utilising a mobile data (public) network to create a link to SCADA remotely from site to perform the commissioning.

COMISSIONING PROCESS

In the context of this paper, commissioning refers to testing the correct configuration of the SCADA system between the remote site and the controller display. To test a particular SCADA point, a value is simulated from either the SCADA system at control or from site. A summary of the architecture is provided in Figure 1.

Table I describes the flow of data during commissioning. There are various methods that can be used to commission SCADA systems:

Remotely using a telephone or radio system

This method utilises two teams and a telephone or radio system to communicate between the teams. At least one person is on site and at least another one person is at the control centre viewing the SCADA system from the controller's point of view. It is very simple to use this method but it has the downside of using at least two people and at separate locations creating a potential for misunderstanding.

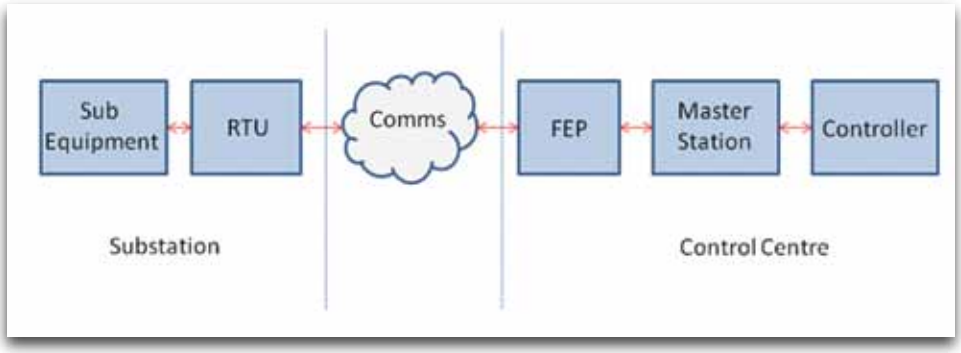

Figure 1: Components of a simplified SCADA system

CADA POINT	SOURCE	DESTINATION
Status	Substation	Control
Analogue	Substation	Control
Control	Control	Substation

Table I: Data flow

Remote login to the RTU from the control centre

If there are intelligent RTUs in the field that allow remote connections and the simulation of SCADA points then it is possible for a single person to commission an RTU from the control centre. The drawback is that there is no visibility on site and there is a dependency on the intelligence of the RTU.

Remote login to the control centre from site

This is the method contemplated in this paper. This method is independent of the RTU installation, requires only a single person and provides visibility to both the SCADA system and the field equipment simultaneously. The commissioning engineer will be on site and use a mobile terminal unit such as a laptop to communicate to the control room. The laptop will need to connect to a MODEM and utilise a VPN with authentication, encryption and other security measures to ensure the integrity of the SCADA system is not compromised. The most important components required are a capable laptop and a modem. The main factors to consider for this method are: security, network speed and network availability.

The use of Mobile data

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SYSTEM ARCHITECTURE

The following diagram shown in Figure 2 is the proposed architecture.

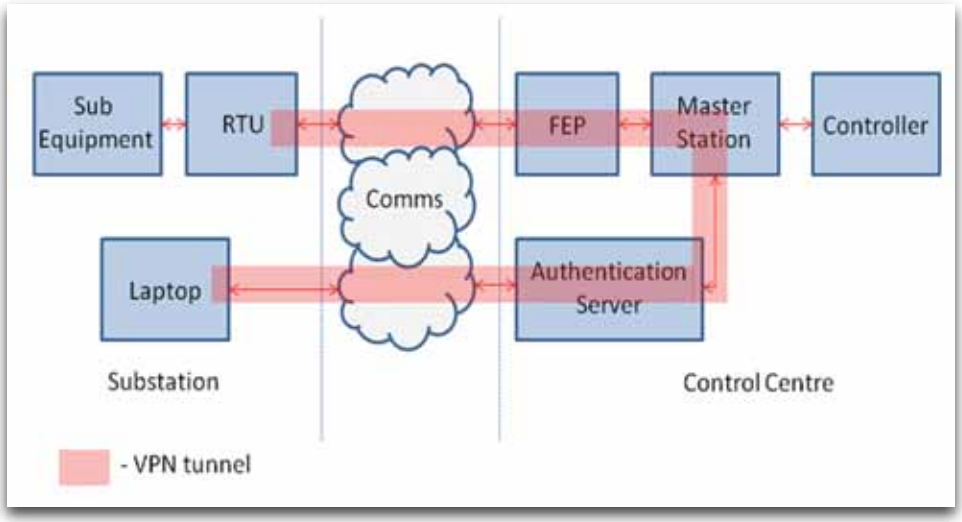

Figure 2: Mobile data system architecture

The intention is to create a VPN through the unsecure public network between the laptop and at least the Master station, however if it is possible to log into the RTU via an IP connection, this would be beneficial when trouble shooting. Not shown in Figure 2 are the MODEMs at the various interfaces. The MODEMs that are selected must be capable of supporting a VPN client.

SYSTEM CONSIDERATIONS

When implementing such a system, the security, network speed and network availability are the main aspects to consider.

Security

The highest priority concern is the security. The information on a SCADA network is sensitive and should thus not be accessible to any unauthorised individual, group or system. The mobile data communication medium is a public network owned and operated by a telecommunication provider. A VPN is required to extend the SCADA LAN over a public (unsecure) network. The IEC62351-3[1] specifies that security be provided at the transport layer. Providing the appropriate level of security as per the IEC62351-3[1] standard will counter security threats such as:

I Man-in-the-middle attacks via authentication
II Replay attacks via specialized processing state machines
III Eavesdropping via appropriate encryption

With SCADA communications it may be important to permanently maintain a link[1] as opposed to a short duration connection. The security used must be capable of supporting transparent security key renegotiation to allow a continuous link to be maintained. Certificates and security keys must be generated and shared between the authentication server and connecting device.

Additional security measures can be taken at various levels beyond the authentication server. The firewall can be configured to allow specific ports and IP addresses to be utilised. A unique IP address can be used per user and single sign in accounts should exist at the SCADA master station above and beyond the identity management policy.

Speed

The network speed is not guaranteed by the cellular network providers. The actual SCADA data is not significant enough to warrant 3G network speeds[2], however, the additional headers introduced by the security and authentication as well as the data required for any diagram imports can make the exercise of commissioning a bandwidth intensive exercise.

Security is a non-negotiable and the actual speed is never guaranteed. The SCADA client may be the only variable that can be controlled. There are papers available online[3] listing the benefits and shortcomings of using either a thin-client or fat-client architecture. When thin-client architecture was utilised it demonstrated considerably lower speeds in densely populated areas that prevented commissioning from being practical. The thin-client was not web based. The low performance was not experienced while working on the command line interface. Once the diagram was called up, the performance dropped to the extent that it did not allow commissioning to continue in some instances, while in other areas the commissioning would be slow but manageable. Had there been a fat-client installed on the laptop, the graphic processing could have been accomplished at the client level and therefore remove the need for importing as much data and therefore making it possible to work with

Figure 3: The effect of the surrounding buildings

lower speeds. A fat-client may reduce the overhead on the bandwidth but this is entirely dependent on the implementation of the architecture. Some developers may optimise the thin client to work efficiently with low speeds. It is not simply a case of "thin-client will not work".

SCADA systems that utilise a fat-client may perform better over a mobile data connection that a thin-client. Even if the thin-client is web based, it can be a frustrating event to have to wait for a page to reload or experience issues with the browser settings.

Availability and signal strength

The network availability is also not guaranteed by the cellular network providers. Time and location can affect the availability of network services.

The time during which commissioning is done can affect availability. During peak periods, network traffic is high and leads to network congestion. This will in turn affect the availability of the network. During commissioning it was noted that the network availability was affected more in residential areas during the school holidays. With the immense popularity of social media this may have been a result of increased cellular data usage by students on holiday. There is no priority assigned to any connection over a mobile data network (except LTE) and there will be competition for bandwidth.

The availability of communication services can be determined prior to going to site. All network providers have a coverage map that shows the 3G and 2G availability. If the site is in a low lying area it may affect the signal strength as the surrounding buildings may attenuate the signals[4],[5]. A high gain antenna can be used. Note that a high gain antenna may have a shortened cable. This may prove to be a limitation in tightly congested work areas.

CONCLUSION

With the widespread use of mobile data communications it is no longer costly to utilise this for some electrical network control purposes. As such, substation SCADA commissioning via a mobile data connection can be accomplished by a single competent SCADA engineer. The equipment required is very minimal. The areas of concern are the security, speed and availability. The security concerns are well documented and there are standards to assist in deployment. The speed and availability cannot be controlled but there are factors that can be considered to improve performance. It is a viable option to be considered even if only for an alternative or back-up plan. wn

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4 www.mobilebroadbandcoverage.co.uk

5 www.vodafone.co.uk

BY I DU TOIT GROBLER
INTPI(SA)(EE), PRING(EE), PRDIPLING(EM), BSC(ING) (ELEK)(PRET), FSAIEE, SMICMEESA

"Decades of Engineering Excellence" is a 216 page hardcover prestige coffee table publication of the Engineering Council of South Africa.

"Decades of Engineering Excellence"

THE EARLY DAYS

Efforts to achieve statutory recognition of individual engineers through the legislative structures of the Cape and Transvaal Colonies, the Zuid-Afrikaansche Republiek and later the Union of SA, go back as far as the 1880s

A number of developments took place until early 1935, when at the instigation of the SA Institution of Engineers (SAIE), a Status of Engineers Joint Committee (SEJC) was formed with the SA Society for Civil Engineers (SASCE) and the SA Institute of Electrical Engineers (SAIEE). The SEJC drafted a Bill for the registration of civil, electrical

and mechanical engineers. The proposed Bill made provision for the reservation of the title "Statutory Registered Engineer" and the performance of the work of such an engineer. The three institutions who were members of the committee were named as "Statutory Societies" who constituted the sole registration authorities. During mid-1937 the draft Bill was approved in principle by SASCE but was accorded only qualified approval by the other two organizations.

In 1938 the Associated Scientific and Technical Societies (AS&TS) became involved and approached the Minister of Commerce and Industries to discuss the introduction of the proposed Bill by a private member of Parliament as a Private Bill.

In 1942 graduate engineers and lecturers at the University of the Witwatersrand founded the Engineers Graduate Association (EGA) with its main objective the improvement of the status of the graduate engineer.

On 16 May 1945 SEJC resumed its activities after the war. The Chemical, Metallurgical and Mining Society of SA was were admitted as a member.

The next meeting held on 25 July 1945 amended the Bill to make provision also for the registration of chemical engineers.
On 25 October 1945 EGA changed its scope and became the Engineers Association (SA)(EASA). EASA supported individual registration of engineers while SEJC supported society registration.

THE ENGINEERS ASSOCIATION AND THE INSTITUTES

The next meeting of SEJC took place on 30 April 1946. SASCE was in favour of the Bill while the other three institutions had reservations. Mr White advised that the SAIEE had applied for registration of the name of the Institute, its badge and letters of designation under the "Protection of Names, Uniforms and Badges Act of 1935", which would restrict their use to the Institute and its members. He also mentioned the intention to apply for the registration of the title "Corporate Electrical Engineer".

During 1947 AS&TS approached the Councils of the "Constituent Societies" to enquire whether they would support a proposal that the Government be requested to sponsor a Bill to effect the registration of individual scientific and technical societies as such.

THE EASA BILL

EASA drafted a bill which provided for the registration of individual engineers and industrial scientists in line with the Medical and Dental Act.

EASA established a "Status Action Committee" together with the Ingenieursafdeling van die SA Akademie vir Wetenskap en Kuns (Akademie).

In 1949 they approached members of SEJC who rejected the principle of individual registration.

EASA, SAICE and Akademie continued to pursue the EASA Bill and when the SAIEE, SAICE and SA Institution of Mechanical Engineers (SAIME) failed to resolve their differences on 12 September 1955, it was decided to invite EASA and the Akademie to establish a Joint Registration Committee (JRC).

At the first meeting of the JRC on 7 August 1956, a Registration of Engineers Sub-committee was appointed with Mr AR Mullins as chairperson. The terms of reference of the sub-committee were:

a. To consider the question of the registration of engineers ab ignition (from the beginning)
b. To give further consideration to a scheme affecting the members of the engineering profession only.

On 7 May 1957 the sub-committee produced a report which stated that agreement had been reached on three issues:

a. legal recognition of the qualifications of professional engineers,
b. the establishment of a code of ethics and legal machinery for its enforcement, and
c. registration of all practicing professional engineers should become compulsory under a single control for (a) and (b).

On 17 July 1959 the JRC resolved that it be dissolved.

The SAICE, SAIEE and SAIME established a Liaison Committee (LC) to consider heads of agreement for the unification of the profession. The committee concluded that all societies should be invited to attend a National Conference (NC) on the proposed establishment of a Joint Council on which all acceptable engineering societies would be represented.

THE PROFESSIONAL ENGINEERS JOINT COUNCIL

The NC met on 21 November 1960 to implement the formation of the Professional Engineers Joint Council (PEJC). Five societies became foundation members. Over the next two years four more institutions were admitted.

The inaugural meeting of the PEJC was held on 21 February 1961 where Prof JEB Jennings (SAICE) was elected as President. Deliberations continued.

On 20 April 1964 PEJC appointed a "Drafting Committee" with Mr M R Gericke, SAIEE President 1965, as convener to redraft the Bill based on the Bill which was published by EASA in June 1955.

SAICE suggested that consulting engineers in private practice should be required to register within six months of the promulgation of the legislation and that

Decades of Engineering Excellence

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other engineers would not be forced by law to register for a period of at least 5 years after promulgation, and then only on recommendation of the registering council. This suggestion was accepted. The revised Bill was accepted.

Comments included a strong recommendation that the Bill must be introduced as a government measure and not as a private act. A legal advisor assistance with the redrafting of the Bill.

Discussion were held with the Department of Economic Affairs and Leader of the House of Assembly to gain Government's support for the Bill.

WHICH GOVERNMENT DEPARTMENT?

From 20 August 1965 discussions were held to determine which Department the Engineering Profession would fall under: Planning, Economic Affairs, Education, Arts and Science or Public Works (DoPW)?

On 19 June 1967 Mr M R Gericke was elected as PEJC President and on 7 July 1967 the outcome of a referendum was overwhelming in favour of the registration of individual engineers (95%).

On 25 August 1967 the Secretary for Education, Arts and Science advised the PEJC that Cabinet had decided that DoPW would handle the proposed legislation.

THE FINAL HURDLES

The first meeting between the PEJC and DoPW took place on 25 October 1967. Issues raised included the proposed size of a council of 32 members and the definition of the work to be reserved for "professional engineers". A council of 9 was unacceptable to the PEJC since it was felt that all branches of engineering, all professional societies and all universities had to be represented on Council.

On 11 November 1967 the department had completed a revised Draft Bill for comments by the PEJC which were carefully considered and were accepted and included in the Bill. On 14 November 1967 the Cabinet decided that the Bill would be introduced early in the 1968 session of Parliament. The revised Draft Bill was accepted by the PEJC on 26 January 1968.

BILL BEFORE PARLIAMENT SELECT COMMITTEE

On 1 March 1968 the Hon W A Maree, Minister of Public Works introduced the Professional Engineers' Bill in Parliament. At the First Reading of the Bill it was referred to a Select Committee that introduced a number of changes.

PROFESSIONAL ENGINEERS' BILL PASSED

On 14 June 1968 the Minister of Public Works proposed the Second Reading of the Bill. After some discussion the Third Reading of the Bill followed immediately and the Bill was unanimously passed by Parliament. The Bill was unanimously approved by the Senate on 17 June 1968.

The State President signed the Professional Engineers' Act, 1968(Act No 81 of 1968) (PEAct) on 20 June 1968. The PEAct would come into effect on 14 February 1969 and the Minister appointed the members of Council and members of the Professional Advisory Committees (PACs) effective from that date.

THE SHADOW COUNCIL

All the Members appointed to serve on Council and PACs were invited to attend meetings of a "Shadow Council" and of "Shadow Committees" in preparation for the de jure Council and Committees. On 7 October 1968 Mr M R Gericke was unanimously elected as Chairman of the "Shadow Council".

THE SOUTH AFRICAN COUNCIL FOR PROFESSIONAL ENGINEERS (SACPE)/(SARPI)

The first council meeting of the SARPI took place on 14 February 1969. Mr M R Gericke was elected as President and Prof DW de Vos as Vice-President.

The PEAct as amended provided for the registration of graduate engineers in nine disciplines:

- Aeronautical
- Agricultural
- Chemical
- Civil
- Electrical
- Industrial
- Mechanical
- Metallurgical
- Mining

The Minister presented Mr M R Gericke and 4 others certificates of registration as Professional Engineers. Registration commenced henceforth.

BOARDS OF CONTROL

In 1979 the PEAct was amended to provide for Boards of Control for the registration of engineering categories other than professional engineer. On 14 November 1983 the Board of Control for Technicians, on 1 March 1985 the Board

of Control for Technologists and on 18 November 1987 the Board of Control for Certificated Engineers.

ENGINEERING COUNCIL OF SOUTH AFRICA

It became evident that the four registration categories had much in common and that unification under one umbrella body should be pursued. Steps were taken to plan this unification embodied through the promulgation of a new Act.

SARPI and the Boards of Control operated autonomously until 18 April 1991 when the Engineering Profession of South Africa Act, 1990 (Act No 114 of 1990) (EPSAAct) established the Engineering Council of South Africa (ECSA) as a unified body.

REGISTRATION OF LIFT INSPECTORS

After comparatively short discussions with the Department of Labour the first persons were registered as Registered Lift Inspectors in 1995.

FORUM FOR THE PROFESSIONS IN THE BUILT ENVIRONMENT

After the elections in 1994, the Public Works Minister established a Forum for the Professions in the Built Environment (die "Daargestelde Omgewing") in 1995.

The aim of the forum was to review the seven professions in the Built Environment. The Ministry aimed at creating a regulatory framework for the professions that would -

- take cognisance of the context in which the professions developed in South Africa;
- promote and protect the public against exploitation by practitioners;
- take due cognisance of the need to promote and maintain sustainable built and natural environments;
- promote a culture of mutual accountability within the professions, their clients and the public;
- facilitate the professions' participation in integrated development in the context of national goals;
- maintain healthy professions in terms of standards, competence and performance;
- promote ongoing human resources development by providing for the necessary diversity of professional skills;
- make it possible for all persons with the required competence to obtain professional recognition;
- make professional services available to the public and state; and
- promote sound governance of the professions.

PUBLICATION OF THE ENGINEERING PROFESSION OF SA BILL

The Engineering Profession of South Africa Bill was published in the Gazette on 9 July 1999 together with the "Policy Document on the Statutory Regulation of the Built Environment Professions".

NEXT MONTH

Synopsis of Chapter 5:
The Engineering Council Of South Africa (ECSA).

CONTACT DETAILS

If you are interested in obtaining a copy of the book, contact du Toit on 083 666 6855 or du.toit.grobler@gmail.com wn

April

COMPILED BY | JANE BUISSON-STREET
SMSAIEE | PMIITPSA

April was the second month of the earliest Roman calendar, before *Ianuarius* and *Februarius* were added. It became the fourth month of the calendar year during the time of the *decemvirs* about 450 BC.

1 April

April's Fool Day: "This is the day upon which we are reminded of what we are on the other three hundred and sixty-four" - *Mark Twain, in Pudd'nhead Wilson's calendar, 1894*

1973 John and Yoko form a new country with no laws or boundaries, called Nutopia. Its national anthem is silence.

2 April

1930 Clarabelle Cow is introduced in The Mickey Mouse comic strip.

1957 The British naval base at Simon's Town, near Cape Town, is handed over to South Africa after 143 years of continual use.

3 April

1900 Boer War: Battle of Mostertshoek - The beginning of a two-day battle between General De Wet's forces (400 men, no artillery) and British encamped behind stone breastworks on the heights of Mostertshoek (near Reddersburg). De Wet sends a note to the British demanding their surrender and claims to have three Krupp guns and reinforcements on the way.

4 April

1902 Cecil John Rhodes' will bequests £6 million to fund scholarships to Oxford University for citizens of the British Empire, United States of America and Germany.

1975 Bill Gates and Paul Allen founded Microsoft in Albuquerque, New Mexico, to develop and sell BASIC interpreters for the Altair 8800.

5 April

1652 At 2:30 pm Table Mountain is sighted from the Drommedaris, the ship carrying Jan van Riebeeck.

6 April

1869 Isaac Hodgson received patent #88,711 for the "roller skate".

7 April

1501 João da Nova lands at Mossel Bay where he erects a stone with inscription to commemorate the event and builds a small stone hut to act as a church. Da Nova names the bay Golfo dos Vaqueiros (Bay of Herdsmen) after the local Khoi-Khoi, who he fails to make contact with. The bay was renamed Mossel Bay by the Dutch navigator Paulus van Caerden on 8 July, 1601.

8 April

1766 The first fire escape was patented. The contraption was a wicker basket on a pulley with a chain.

9 April

1820 The first contingent of British settlers arrive at Algoa Bay (now Port Elizabeth). Over the next few weeks they make their way to allotted homesteads in the district of Albany.

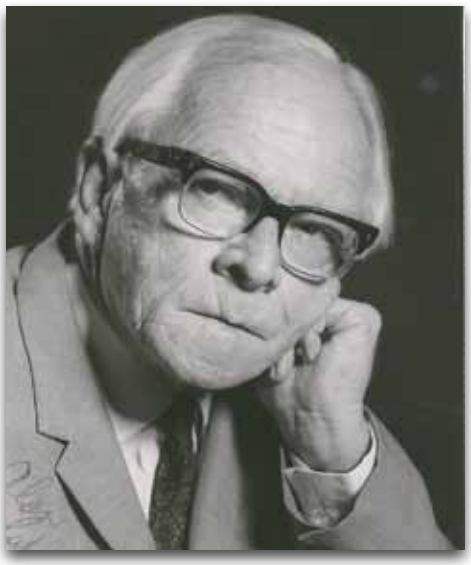
10 April

1993 Martin Thembisile (Chris) Hani is assassinated in South Africa.

11 April

1905 A bridge and railway line across the Zambezi River, close to the Victoria Falls is completed.

12 April



1988 Death of Alan Paton, founder member of the Liberal Party in South Africa and renowned author of Cry, the Beloved Country.

13 April

1688 The first contingent of French Huguenots arrive at the Cape aboard the Voorshoten.

15 April

1738 The Bottle opener was invented but it is not known who the inventor was.

17 April

1916 General Jan Christiaan Smuts, in charge of the British, South African and Indian troops in Kenya finally have the Germans on the run. Colonel Paul von Lettow-Vorbeck's troops (3,000 Europeans and 11,000 Askari) heavily outnumbered the British East African Rifles.

18 April

1980 Zimbabwe is proclaimed an independent republic. Dr Cannan Sodindo Banana is inaugurated as president, and Robert Gabriel Mugabe as prime minister.

19 April

1957 The first British ship pays an Egyptian toll for use of the Suez Canal.

20 April

1964 During his testimony at the Rivonia Trial, Nelson Mandela says it is in response to the South African Government's Apartheid policies that African nationalist leaders have resorted to violence.

21 April

1859 David Livingstone arrives at Cape Town on the start of his expedition through the interior of Africa.

22 April

1692 Edward Bishop is jailed for proposing flogging as cure for witchcraft

23 April

1977 UN officials and various missionaries are expelled from Ethiopia.

24 April

1900 Boer War: Espionage - A dynamite factory, which forms part of the Begbie Engineering Workshop, Johannesburg, is destroyed in an explosion. The destruction is blamed on British sabotage.

25 April

1961 Robert Noyce was granted a patent for a semi-conductor device-and-lead structure, the integrated circuit otherwise known as the chip. Noyce was the co-founder of the Intel Corporation.

26 April

1892 An ironing board patent was granted to Sarah Boone (No 473, 653).

27 April

1994 First ever multi-racial elections held in South Africa.

28 April

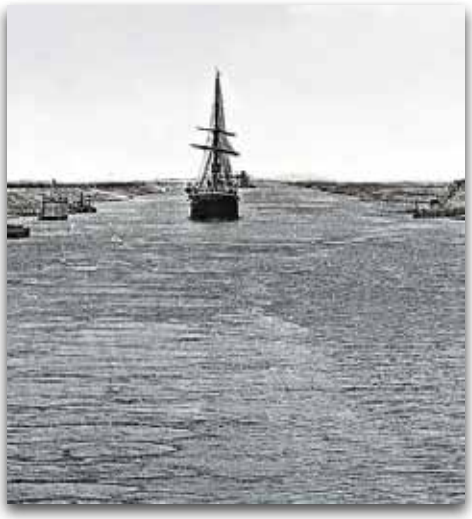
2001 Millionaire Dennis Tito becomes the world's first space tourist

29 April

1958 Egypt pays $81 million for the Suez Canal.

30 April

1979 The cargo ship Ashdod is the first Israeli ship to pass through the Suez Canal for over 50 years. wn



IN MY OPINION : PAUL VAN NIEKERK

The denationalisation of the Power Supply Industry in South Africa

Despite the cries from certain 'wanna-be' political parties to nationalise the mining industry and certain major Industrial employers in the Country, I submit that South Africa Inc. should denationalise the Electricity Supply Industry.

BY | PAUL VAN NIEKERK **|** PR. ENG

"IN MY OPINION" provides an opportunity for us mere mortals to express an opinion on national matters of great importance that may affect the economic future of our country. What I am proposing is not new at all, just a new look into what has been proposed a long time ago.

The power cuts recently have illustrated that Eskom cannot cope with Electricity supply in South Africa let alone comply with power pool agreement to export energy to neighbouring Countries when required in terms of the power pool agreement.

South Africa is desperate for growth and for the jobs that this growth will create. Industry needs affordable electricity prices and a reliable consistent supply. Introducing IPPs and a more competitive market in the mainstream energy market, not just in renewables, will achieve this faster and quicker than Eskom can ever deliver.

I am proposing the widespread introduction of independent fossil fuelled power production.

Before I get attacked for this draconian proposal of taking us back to the dinosaur era of giant coal fired power stations, polluting our beautiful country, please hear me out.

Despite multiple and simultaneous challenges, the DoE and Treasury have done excellent work in managing South Africa's renewable energy IPP procurement (REIPPP) process, however, renewable energy by nature cannot always be available and is self-despatched when permitted by the prevailing weather conditions permit.

In all scenarios set in IRP 2010, there is a requirement for additional coal-fired generation between 2020 and 2025. The common element is the option for a regional coal project (of the order of 1200 MW) which is preferred to all other coal options as it is expected that the emissions from the generation will not count to the South African total in a future global emission targeting regime. The procurement for the regional coal option should be initiated by the end of 2014 to ensure the capacity is available by 2021/22. I am suggesting that this plant should be built, owned and operated privately.

I am suggesting the liberalisation of the Electricity Supply Industry and provision for well-considered private entry into the power generation market.

This market should be moderated and regulated by a *'totally independent'* National Energy Regulator (NERSA should be self-regulated and not controlled by government) including the following:

- Separation of the National Power Giant into three totally independent Generation, Transmission and Distribution companies.

- Free entry into the generation market with any form of primary fuel including:
  - o Gas generation techniques
  - o Clean Coal technology
  - o Underground coal gasification
- Introduction of an Independent system and market operator – ISMO. That is empowered to purchase bulk energy 'blocks' on a stock market from the lowest offer.

I am suggesting smaller independently licenced fossil fuelled IPP's 800-1200MW's controlled by a power purchase agreement. Each fossil fuel station would then be required to introduce pollution control measures to comply with licence agreements and be 'taxed' according to carbon production and given concessions or 'tax relief' for innovative mitigation measures.

South African Engineers are innovative by nature, and if sufficient incentives are introduced on "Carbon Tax"' for carbon reduction, various methods to reduce carbon will be implemented.

As an example, it is assumed that Carbon to Liquid or Gas to Liquid will continue to be an option for meeting Liquid Fuel Demand in South Africa, Carbon Capture and Storage (CCS) may play an ever increasing economically viable option in mitigating emissions, depending on the future world that evolves and South Africa's mitigation action and introduction of a carbon tax.

If Carbon Capture and Sequestration is to be pursued as an option for mitigation of greenhouse gas emissions from the sector, the following will required:

- Establishment of a suitable regulatory framework for CCS.
- Maintenance of support for relevant institutions and study programmes, such as the South African Centre for Carbon;
- Innovative carbon capture and Storage techniques;
- Progress with the program to characterise viable storage options and demonstrate a successful test injection;
- Demonstration of a significant reduction in costs;
- Continued engagement with international gas experts in research and development progress in respect of the capture and transport of CO_2;
- A study of the economics of components of the Carbon capture and sequestration;
- Securing of international funding (or investment).

In this way, the IPPs can provide investment opportunities, and save the cash-strapped Treasury from this task, while supporting Eskom in dealing with its generation shortages. Keeping the lights on can and should be a partnership between IPPs and Eskom whose credit rating can only improve.

"In my opinion" – the free market will then dictate the price of energy and it will balance out by means of supply and demand in the same way as any other commodity.

The National Government can then proceed with creating incentives for private industry to establish job creating type mineral beneficiation industries and the continue with the national Development programme. wn

Watt's your Opinion?
Please submit your comments or your own opinion piece to minx@saiee.org.za.

Is anyone watching the weather report?

Rain, rain go away…. come back another day… (P.S. Please advise Eskom as to the expected return date).

BY | ANGELA PRICE

The recent (maybe no longer recent when you are reading this) downpours in most of SA and central Gauteng have left us all running for cover. Literally.
Well… not everyone it seems.

Armed with umbrellas, I have successfully navigated the traffic and rain on the school run each morning this week. Now, in between all this running around after kids and stuff, I certainly do not have time to watch the news or check the weather report.

But we moms are notorious for multi-tasking. I manage to keep myself updated with breaking news whilst peddling furiously on the stationary bike at gym (all that wasted power generation…sigh). Courtesy of CNN repeating the same news loop ten times in 20 minutes, I am now well aware that Russia and the Ukraine are no longer on talking terms. For my up-to-the-minute weather reports I rely on parents in Howick KNZ to call and tell me when they are experiencing rain. Their info, partnered with my dickey knee *(which acts up in the wet weather)*, gives me a pretty good 'heads up' that we may be in for some bad weather.

So whilst I may have an excuse for not religiously watching the weather report, Eskom does not. To a *(soon to be voting)* SA subject, it seems that our state power utility was caught napping and missed the weather report warning of torrential rain and flooding in large parts of the country.

As I write, Eskom has declared a power emergency as a result of the heavy rains. For the first time since 2008, rolling black outs are back (… better type fast).
Reasons given are:

- At certain power stations there are open cast coal mines = wet coal – mmm…I feel their pain, my washing has been wet for a week and now smells odd. Fortunately I have a reserve of dry clothes... pity they didn't stock pile enough reserves of dry coal. I would use my tumble dryer for the clothes but what with electricity shortages and all… Anyone looked into coal drying techniques?
- Transportation of coal is a problem on wet roads – well getting kids to school on wet roads is also a problem but you plan ahead, leave earlier and cover up!

However, we are assured that our power utility are constantly monitoring the situation *(maybe they should have constantly monitored the weather report instead).*

Interestingly/Ironically, the word 'utility' has its origins in the Latin word Utilis and its definition useful, advantageous, helpful. *(cough.….sorry…something just got stuck in my throat).* I suspect that industry and the 1000's of households and businesses left without power at short notice for the next 4 days might balk at using these terms to describe our state power provider.

From an economics perspective the word 'utility' is defined as *...'Utility is usefulness, the ability of something to satisfy needs or wants. Utility is an important concept in economics ….because it represents satisfaction experienced by the consumer of a good. Not coincidentally, a good is something that satisfies human wants and provides utility….."*

Sitting here trying to pay my slowly-but-steadily increasing electricity account on my laptop (before the battery dies) I have to state that:

a) I do not feel satisfied.
b) I do not find the present situation helpful in the least.

I would suggest that we do not have a power utility – what we have is a periodic power provider. Either way - someone should notify Simon Gear, Eskom clearly needs some inside weather info ASAP. wn

Performance of pole mounted MV transformers and equipment

BY | L.E.HUNT | LIFE MEMBER | RETIRED

I note the interest in lightning in the February issue of **watt**now.

An experience I had gave me food for thought. After I took over as Town and Electrical Engineer at White River in October 1973, I came across a system which was, if not unique, then very rare.

We were a small town, receiving supply at 11 kV from an ESKOM sub-station, some three km south of the town boundary. It was routed by cable and also by overhead lines on wood poles, to our western substation.

From the ESKOM Sub, we also had rural lines feeding through the farms and agricultural holdings, and providing a ring feed to the eastern end of town.

These three phase lines fed many rural consumers at single phase, where the transformers were wound for 6 350 volts, and connected between phase and continuous overhead earthed neutral/lightning conductor, which then required only one lightning arrestor and one drop out fuse/isolator per connection.

The main reason for the overhead earth is because of the extreme variability of the terrain, varying from huge granite domes to thixotropic slush, but I believe that it served a very important other function, in keeping the lines to 6 350 volts above earth and so not attracting lightning strikes. We had very few problems from this system, and I do not remember our having to replace lightning arrestors, or transformers. But we did have to replace many dropout fuses, as blue gum branches often fell over the lines during strong winds

On the ESKOM rural lines, where the transformers were fed between phases, I saw many lightning arrestors with the bottoms blown out. Initially the conductors were all placed vertically above one another, but after experiences with doves, we started to use delta arrangement to get greater spatial separation.

If ESKOM, on their 11kV rural lines wound install overhead earth/lightning conductors, and at strategic points, would put equipment similar to Neutral Earthing Compensators, this would keep the lines to 6350 volts above earth and so not attracting lightning, probably saving many lightning arrestors, transformers, equipment and the labour involved. wn

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

Calendar of events

APRIL 2014

6-8	Civilution Congress 2014	Emperor's Palace, Johannesburg	www.saice-congress.co.za
8-9	CSP Today South Africa 2014	Southern Sun Cape Sun Hotel, Cape Town	www.csptoday.com
8-10	2014 IET 7th PEMD	Manchester, United Kingdom	www.theiet.org.com
14-17	2014 IEEE PES Transmission & Distribution Conference & Expo, Chicago, USA		www.ieeet-d.org

MAY 2014

5-7	POWER-GEN INDIA 2014	New Delhi, India - Asia	www.power-genindia.com
6-9	IEEE Wireless Communications and Networking Conference, Istanbul, Turkey		wcnc2014.ieee-wcnc.org
8-10	2014 IET 7th PEMD	Manchester, United Kingdom	www.theiet.org.com
13-14	Africa Utility Week	Cape Town Convention Centre, Cape Town	www.african-utility-week.com

JUNE 2014

3-5	Renewable Energy World Europe 2014	Koelnmesse, Cologne, Germany	www.renewableenergyworld-europe.com
21-22	3rd Intl Conf Economics & Social Sciences	Durban University of Technology, Durban	www.ifrnd.org

JULY 2014

1-2	Africa Ports and Harbours Show	Sandton Convention Centre, Johannesburg	www.terrapinn.com

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